The GEO Quarterly

Group for Earth Observation

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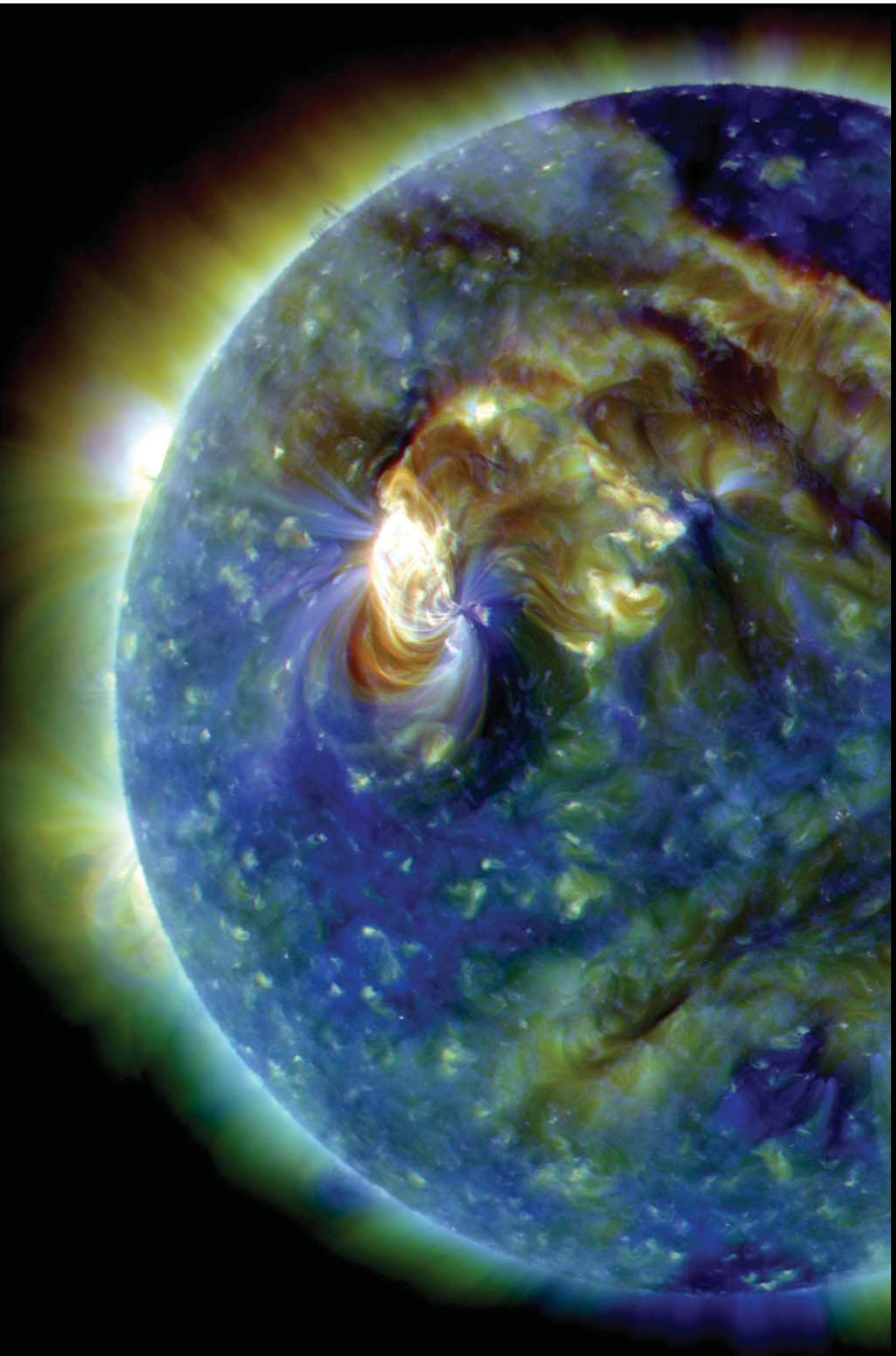
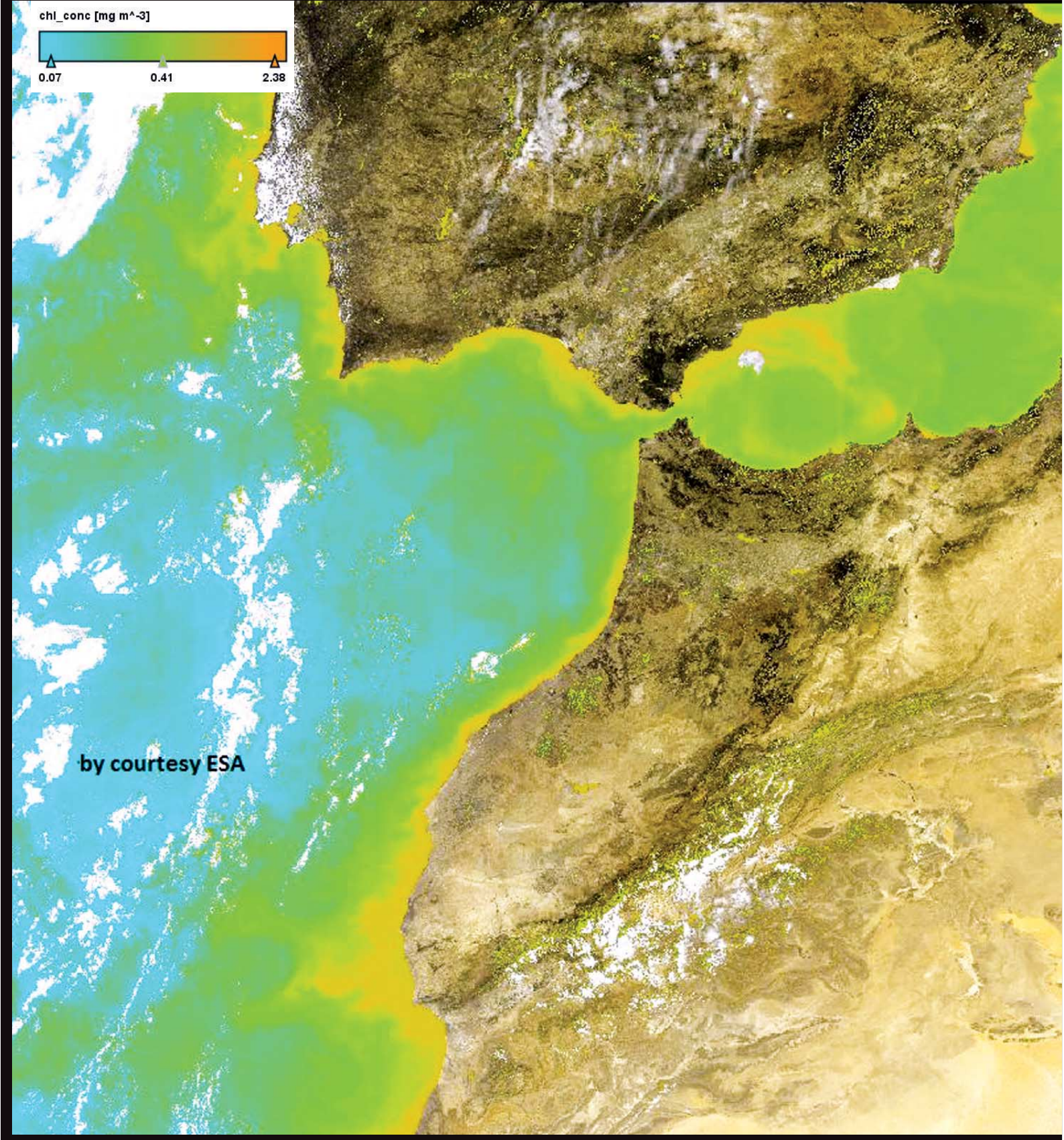


Inside this issue . . .



ENVISAT images of Gibraltar Clorophyll concentration September 2010

Peter Burden made the above image available to us, he explains briefly how this was achieved.

The MERIS MER_FRS_1P level 1b product , 630 640,00 KB, was downloaded from the ENVISAT satellite in September 2010 with the ESA DDS receiver software and processed with the BEAM VISAT software which is programmed in pure JAVA and runs on Windows or other operating systems.

VISAT extracts all the data from the product and the RGB image can easily displayed with View>Open RGB image view.

To show the chlorophyll concentration in the ocean the 'MERIS Case-2 Waters Processors' in the VISAT Tools folder is used, this processes the data and displays a black and white image.

This takes 10 minutes with my ASUS P7p55D-E + Intel Quad 2.6 .

Selecting chl_conc from the 'Product View' that is displayed on the left of the screen, the Meris2r / Bands a BW image is displayed. The false colours can be added from within 'Colour Manipulation" section at the bottom left of the screen. Using 'Manage view layer visibility and transparency' from the toolbar, the image is overlaid and produced from View>"Open RGB image view.

The colour concentration legend is obtained from File>Export>Export colour legend.

There is a BEAM tutorial here:

http://www.brockmann-consult.de/cms/web/beam/tutorials

BEAM is an open-source toolbox and development platform for viewing, analysing and processing of remote sensing raster data. The software is free to download and is available for Windows,Mac,Linux and UNIX

http://www.brockmann-consult.de/cms/web/beam/

GEO MANAGEMENT TEAM

Public Relations
Francis Bell,
Coturnix House, Rake Lane,
Milford, Godalming, Surrey GU8 5AB
England.
Tel: 01483 416 897
email: francis@geo-web.org.uk

General Information
John Tellick
email: info@geo-web.org.uk

GEO Quarterly Editor
Peter Green
'Hollowtree'
Eggesford, Devon EX18 7QX, England.
email: geoeditor@geo-web.org.uk

Assistant GEO Quarterly Editor
Les Hamilton
email: les.hamilton@tiscali.co.uk

Membership and Subscriptions
David Anderson,
35 Sycamore Road,
East Leake, Loughborough LE12 6PP
England, UK.
email: members@geo-web.org.uk
Tel: 01509 820 067
Fax: 01509 559 015

Technical Consultant (hardware)
David Simmons
email: tech@geo-web.org.uk

Webmaster and Website Matters
Ray Godden
e-mail: ray-geo@lescharriols.eu

Education Coordinator
David Painter
email: education@geo-web.org.uk

GEO Shop Manager
Clive Finnis (Assistant: David Simmons)
email: tech@geo-web.org.uk

International Liaison
Rob Denton
email: international@geo-web.org.uk

Nigel Evans
email: nigel@geo-web.org.uk

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The *GEO* Quarterly

December 2010

Editorial: Peter Green

Readers may be surprised to see an image from the Sun on the front cover of this issue, associated with an article on the Aurora Borealis. After all, GEO is the Group for Earth Observation! What may come as a surprise to you is the fact that Earth observing satellites, including the familiar NOAAs and Metop, are continuously observing Earth's polar atmosphere to determine the current state of the Aurora. The Aurora is an indicator of strong solar radiation reaching us, and has important implications for world-wide communications.

Even the astronauts on the ISS are fascinated by this phenomenon. On the back cover is a picture taken by one of them from the new viewing platform recently attached to the ISS. This picture was 'tweeted' live from the ISS. Everyday numerous images that are unique and personal to the astronauts are available via twitter if you are following them and these picture may not be available elsewhere. If you have not tried twitter yet, why not give it a go, sign up via www.twitter.com, where you can also follow GEO @GEOWEBUK. Best of all it's free and a free program to view tweets try Tweetdeck, www.tweetdeck.com.

The following is a request for any member to donate an unused / spare laptop to the group. The computer does not have to be high specification and a dead battery or missing power supply can be dealt with. It would be very useful to have these laptops which could be loaded up with slide shows for any rally or exhibition stand. I don't think the processor speed or memory will matter for this simple dedicated use. A 14 or 15 inch screen would be useful because passing public may struggle when viewing anything smaller. This appeal is the result of Francis having his personal laptop stolen from the Kempton rally which he attended for GEO recently.

You will see in this issue that GEO is announcing it's intention to hold our 2011 symposium at the National Space Centre, Leicester on May 7th. We would like you suggestions and ideas for speakers and workshops, see page 17. GEO also wants this year to return to EUMETSAT in Darmstadt, we had such an enjoyable visit in 2007 that we would like new and older members to join us for what looks to be a packed and enjoyable few days with friends from across Europe.

Please keep sending in your articles and images for the Quarterly, I want to reflect the wide spectrum of interest our members have, I can't do it without you.

If you have an iPad, Kindle or similar device please let me know as I would like to investigate delivering the Q via the ePUB format.

Contents

The GEO Report

Francis Bell

The past few months have been particularly busy for me progressing the interests of GEO. In late July there was the AMSAT-UK colloquium in Guildford where David Simmons and I made a presentation to the delegates relating to the new Envi-Ham project. Encouragingly, the feedback from this presentation has been very positive. I believe three AMSAT-UK members successfully applied for an Envi-Ham license to join the project. There were also the National Hamfest held at Newark, the RMetS conference at Reading which I attended fleetingly on one day, and my three-day visit to Italy representing GEO at the joint AMSAT-Italia / Envi-Ham conference at Frascati. As I write there is still the South London Computer and Radio Fair to be held at Kempton Park in November to come. Some reports of these event appear elsewhere in this Quarterly.

The European Space Agency (ESA) 'Bulletin'

I have just received my copy of the latest edition of the ESA Bulletin (No 143). I have previously reported to GEO members about this publication. I enjoy reading the paper copy which is sent to me; however, out of curiosity for this edition, I also looked at ESA's website for the same publication. The web version was identical, even to the electronic method of turning pages. To access 'Bulletin No. 143' visit **www.esa.int/publications**. I found this particular Bulletin interesting because it covers topics such as satellite observations of earthquake damage, oil spills in the Caribbean and atmospheric shedding of vortices south of the Canary Islands, a phenomenon which has been featured from time to time in GEO Quarterly. I was also interested in page 15 which analyses the water recycling within the International Space Station. I have another interest relating to water in the ISS because they are currently flying one of my experiments relating to the behaviour of water in zero gravity. More on this topic in a future Quarterly.

Envi-Ham

Elsewhere in this Quarterly is an account of my recent visit to Frascati, Italy. It is quite straightforward, almost like a diary, but in the background there is information and encouragement for those GEO members who may be interested in participating in the Envi-Ham project. When I joined the project about a year ago my only direct cost was the purchase of a one-metre dish from the local satellite TV shop, which cost me £80. I already owned a DVB World satellite receiver. If you don't have one, it costs £60 from the GEO shop. The receiving and display software is free from ESA. Of course you need a computer!

Both a note of encouragement and caution here. ESA, via the Envi-Ham project, have agreed to issue without charge 100 licenses for this project (70 having already been issued). I know nothing of their policy beyond these 100. My usual proviso applies here: don't apply for a license unless you are really serious about Envi-Ham reception because it will just clog up the system for others; however, if you wish to participate then contact ESA-ESRINusing at their email address (**tta@esa.int)**, stating that you want to participate in the Envi-Ham project. Again, don't do this unless you are serious! Examples of images I have received using my home system are published in this and previous Quarterlies, and can be stunning in detail. If you live within the Ku band footprint of the geostationary satellite Eutelsat W2A, located at 10°E, which covers Europe then you should be able to receive Envi-Ham data for yourself.

A very serious point here. If potential users of satellite data, such as amateur, educational and non-commercial organisations express little interest in receiving satellite images and other data then there will be little incentive for satellite operators such as ESA to provide a dissemination infrastructure them. I know ESA's plans are well in hand for future generations of Earth observation satellites such as 'Sentinal', and I hope a system will be in place allowing users like myself access to these data.

Banking changes

The decision has been taken to close our Barclaycard account, effective from the end of 2010. In the past the Barclaycard account has been very useful, but today it transacts very little business and, because of its fixed monthly charge it is judged no longer worthwhile. Payments via PayPal, cheque or direct bank transfer are the preferred means of money transactions.

Membership issues.

Here is my usual and constant reminder for you to renew your membership when it becomes due. It can be a destructive process: you forget to renew your membership hence the consequences that you receive no more Quarterlies to remind you that you are a member of GEO. The reason I am writing this now is that I am just about to post some 100 reminder letters to lapsed members, a worthwhile exercise, because there will be positive responses from many, but it's just so costly and time consuming.

Coming Events

The United Kingdom Space Agency (UKSA) are expected to have a conference in Godalming Surrey in late March 2011. GEO will attend if invited.

NOAA are holding a Direct Readout conference In Miami Florida April 2011. GEO will be represented either by an individual member or, if necessary, by a poster presentation.

EUMETSAT are holding their annual conference in Norway from September 5-9, 2011. Again GEO will try to be represented by literature and a poster presentation.

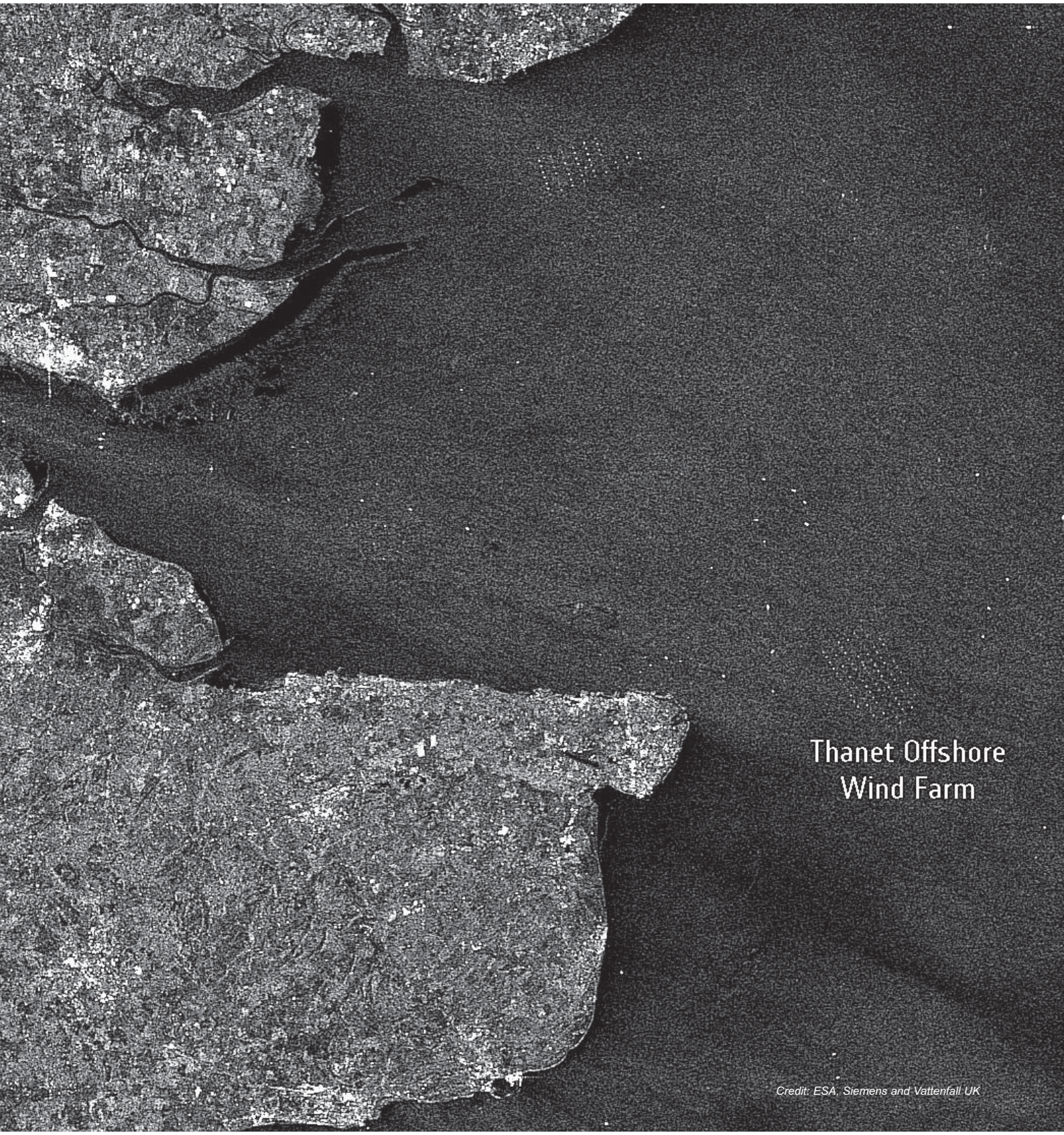
AMSAT-UK are holding their annual colloquium from July 29-31, 2011 at the Holiday Inn Guildford. It is hoped that GEO will be represented in some way, if invited.

GEO Symposium. The date and venue for this event still have to be fixed.

There are other plans for GEO events in 2011 and details, which still have to be finalised, will be published both on our website and in the March 2011 Quarterly.

Thanet Offshore Wind Farm, Kent, England

John Tellick



Credit: ESA, Siemens and Vattenfall UK

The world's largest offshore wind farm, off the UK's Kent coast in the North Sea, is seen in this Envisat radar image. The Thanet Offshore Wind Farm opened last week on 23 September, boosting UK wind energy capacity by 30%. The wind farm is made up of 100 turbines that generate 300 megawatts (MW) of renewable electricity – enough to power more than 200 000 homes.

Continued on page 6

Colouring APT Images in WxSat

Les Hamilton

After describing how to set up an APT Ground Station in *GEO Quarterly 27*, and recommending *WxSat* as the recording software, this article takes newcomers a stage further by explaining how to obtain attractive colour composite images from *WxSat*. But first, an apology is in order and I'm grateful to Laurence Holderness for pointing this error out to me. The previous article incorrectly listed the available NOAA satellites. The current satellites are of course NOAAs 15, 18 and 19. With a number of pages still to be filled as copy deadline approached, we decided to reprint this article from our Launch issue for the benefit of newcomers to APT; and as so often is the case, a rushed job creates mistakes. I hope no-one was seriously inconvenienced spending hours searching for a non-existent NOAA-12.

These days, most APT enthusiasts use more modern software such as SatSignal[1] and WxToImg[2] to produce APT images, as they offer a much wider range of features, are easier to configure, and have been frequently updated over the years following user feedback. *WxSat* was the first program of its type, has not been updated for over a decade now, and is consequently harder to work with. Nevertheless, *WxSat* does offer a challenge, and is capable of producing excellent coloured APT images. Just one word of warning: during the winter months, coloured images are not feasible, due to the low intensity of winter sunlight which renders the visible images sadly lacking in detail. The NOAA-19 pass used for figure 1 was acquired on October 2 this year and the colour composite version (figure 6) is decidedly lacking in contrast.

Installing WxSat

The most recent version of the software is *WxSat 2.59*, released in 1999, available as the self-installing file *inst257e.exe* [3]. Just run this file to install the program, complete with subfolders for BMP images and WAV files, and a desktop shortcut. Connect the audio output from your weather satellite receiver to the left channel of the sound-card, and you're ready to start. (In practice, any stereo audio lead with a 3.5 mm jack-plug at each end should do the needful).

Decoding NOAA Signals with WxSat

WxSat permits the user to produce images in real-time during actual reception of a NOAA satellite signal. This image is saved in BMP bitmap format while the raw data can be archived as a wave (WAV) file. The program can also allow unattended capture of images and wave files, the latter being specially useful for future decoding and manipulation purposes. There are facilities to decode either NOAA channel (visible or infrared) individually, to decode both images side-by-side, and even to combine the two channels to create a colour composite image (though principally during the summer half-year, when daylight levels are high).

Soundcard Capture

Load *WxSat*, open the **<Parameters>** menu and select item No 0. By default, this is configured to produce a visible and an IR greyscale image, side by side, as shown in figure 1.

From the **<Recording>** menu, select '*Start at Subcarrier*' then '*Save Bitmap & Wave*'. This means that you will be able to see the image building on screen as the satellite passes overhead but **also** store the data as a WAV file for future manipulation. As soon as a NOAA APT signal is detected, *WxSat* will start decoding it and the image will build up on the screen, one line at a time. Files are saved with names derived from the PC clock, e.g. the file 07231341.wav, which was recorded starting at 13.41 UT on July 23.

The Initial NOAA image

If all goes well, you should receive an image similar to the one in figure 1, which shows the two NOAA images side by side (infrared on left, visible on right). Although you will probably obtain an image of sorts on your first attempt, it may well be too dark or overly light, and lack a full range of tones. To produce an optimum result, you must make adjustments to *WxSat's Parameter Window* and apply them to a saved WAV file.

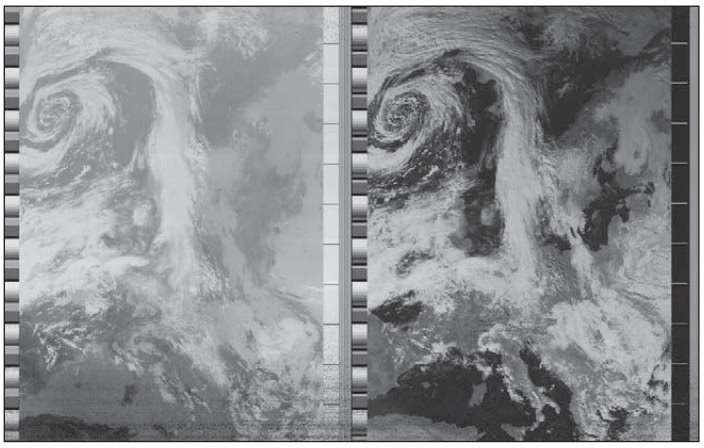


Figure 1 - NOAA 19 at 13:10 UT on October 2, 2010

Setting the Luminance Range

Immediately after decoding an image from a saved WAV file, click **<calibrate / Histogram>** on the *WxSat* menu bar. A histogram overlay will pop up over the image (figure 3). To ensure the widest range of tones in the image, the upper curve (Amplitude distribution) must stretch along the baseline to as nearly as possible 1.00. If it only stretches to 0.50, the image will be very dark; if it overflows beyond 1.00 the image will be pale with washed-out cloud highlights.

To adjust the **amplitude distribution** in the image, click the **<Parameters>** option on the menu bar to reveal the *Parameter Window* (figure 2), then select the topmost option '*Decoding*'. The key item is the value in the **<BasicAmp>** field. Keep adjusting this value and decoding the WAV file until its histogram stretches fully across the graph.

Next, the **luminance histogram** (figure 3) must also be adjusted to fit along its horizontal axis, in identical fashion. You can do this by making adjustments to the **<Ampl.1>** value on the *Parameter Window*. Processed images should now display a full range of greyscale tones.

Saving the New Parameters

After making the above changes to the default parameter set they must be saved in order to be used automatically with future NOAA data. Do not click the 'OK' button at the foot of the *Parameter Window* yet or your changes will be lost when you load the next file. Instead, click the **<File>** option on the *Parameter Window's* own menu bar and click **<Save Current Parameter Set>** followed by 'OK' in the subsequent '*Save Parameter Set*' confirmation window. When you are asked to confirm '*Overwrite existing parameter set*' in the '*Store Parameters*' popup window—click 'OK' to confirm. Now you can safely click 'OK' at the foot of the *Parameter Window* to complete the process. All subsequent images from this satellite should now decode with a full range of tones. You may wish to fine-tune the '*BasicAmp*' value occasionally as solar illumination waxes and wanes over the year.

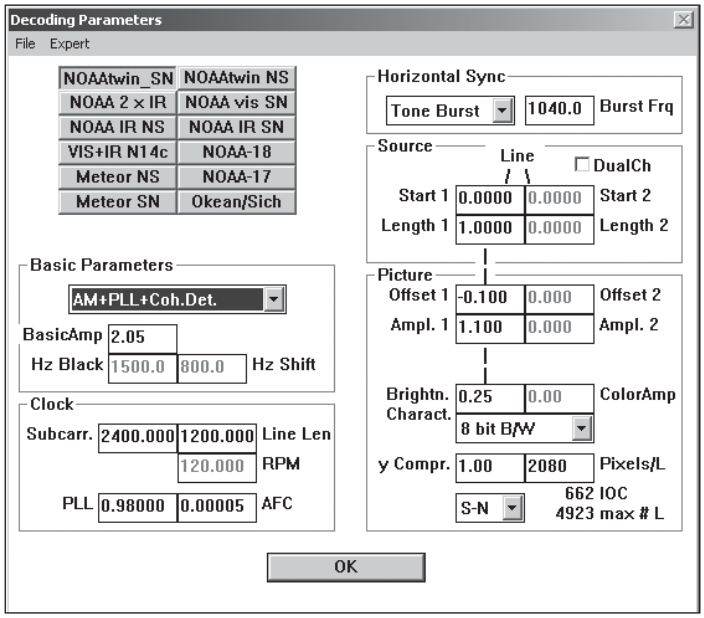


Figure 2 - The WxSat Parameter Window

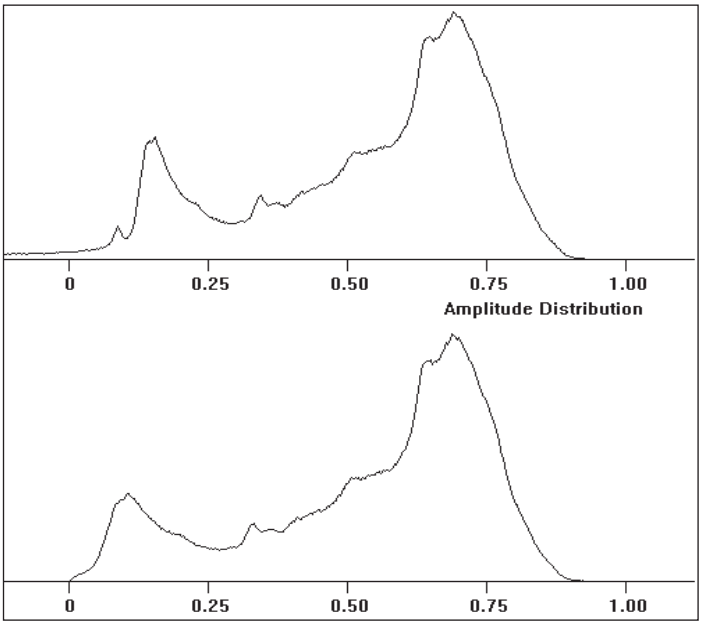


Figure 3 - The WxSat Histogram Display

Processing Wave Files

Every WAV file you save on your hard drive contains all the data required to reproduce visible light, infrared and colour composite images. The file can be decoded time and again while you experiment with the variables in WxSat's *Parameter Window*. So, after selecting a WAV file, you can decide which image to decode from the **<Parameter>** option (figure 4). Select the *NOAA_VIS* button to decode just a channel-2 visible light image, *NOAA_IR* for the channel-4 infrared image or *NOAA_mIR* for the channel-3 overnight IR image. All these modes produce full-resolution 1040 pixel-wide images. (Note that *mIR* is only transmitted during the hours of darkness, has poor contrast and does not provide very satisfying images). To create an image, move to the **<File>** menu and select '*Start processing*'. Decoding may be terminated at any time through the **<File/Stop Processing>** option (or just pressing 'S' on the keyboard).

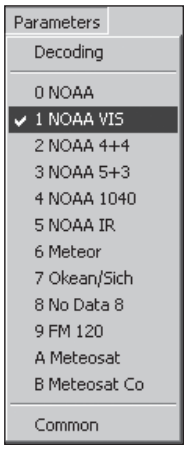


Figure 4

Images processed from WAV files are not saved automatically so you must save them manually using the **<Bitmap/Save>** option.

Note

You will also have to adjust the specific 'BasicAmp' and 'Amp.1' values and save these for each of option on this menu to obtain optimum results.

Automatic Image Acquisition

For those who have to be at work for most of the day, automatic, unattended reception of satellite images is highly desirable, and *WxSat* is well able to meet this need through the **<Recording>** menu. There are several possibilities—you can choose to save bitmap images, wave files, or both.

Use the menu to select a recording mode, say NOAA_VIS, make certain that your receiver is active on the correct channel, then make your selection from the **<Recording/Start at Subcarrier>** options. Each time the satellite passes over your location, *WxSat* will become active on detecting the satellite signal, and save data continuously until the signal fades again. The process is elegant and works perfectly for all the NOAA satellites.

How to Make Colour Composite Images

WxSat can produce attractive coloured images by using the IR channel data to impose a colour palette on the visible image (though generally this gives good results only between March and October, when daylight is strongest). This simple process can produce surprisingly attractive results once you have optimised the parameters, in particular, detailing layering in cloud structure by subtle changes in hue. Only the middle luminance values are modified by this process, as *WxSat* retains black and dark neutral shades for the lowest intensities (sea) and white and light greys for the highest intensities (cloud).

First, select the '*NO_VIS+IR*' parameter set from the *Decoding Parameters* page. Note that the '*DualCh*' box is already selected, an essential prerequisite for producing coloured images. Follow the procedure already described above for histogram optimisation of monochrome images. Note however, that the upper histogram now shows **two** curves (figure 5), a black one containing the channel-2, visible light data, plus a red one with the channel-4, infrared data. This time, the entire histogram, *from the start of the black curve to the conclusion of the red curve*, must sit squarely between zero and 1.00 on the horizontal axis.

Colour Adjustment using the Lower Histogram

The lower histogram consists of two overlapping curves, the black channel-2 trace and a multicoloured trace representing channel-4. First, adjust the **<Ampl.1>** value so that the black curve of the 'Luminance/Chrominance' histogram lies exactly between zero and 1.00 on the horizontal axis (exactly as previously), then adjust the **<Ampl.2>** field to ensure that the coloured curve straddles the same range. As usual, decode a file following each adjustment till you achieve a balanced histogram.

You will certainly be obtaining coloured images now, but you may find that the land colouring is too 'blue' or 'cold' for your taste. This is easily rectified by gradually decreasing the value in the **<Offset 2>** field; this slides the coloured histogram to the left (it doesn't matter if it no longer stretches fully to 1.00). As this value increases, more and more brown tones start appearing in the land areas.

I find that the default value of -0.12 has to be decreased to between -0.20 and -0.30 to produce land showing a pleasing mix of green and brownish tones. Experiment till you find the value that seems most realistic and save it using the **<File>** option in the *Parameter Window.* Provided output from your receiver into the soundcard is constant, these settings should not require changing again.

Summary

Even though it is now somewhat dated, *WxSat* is still one of the best entry-level software packages available for decoding weather

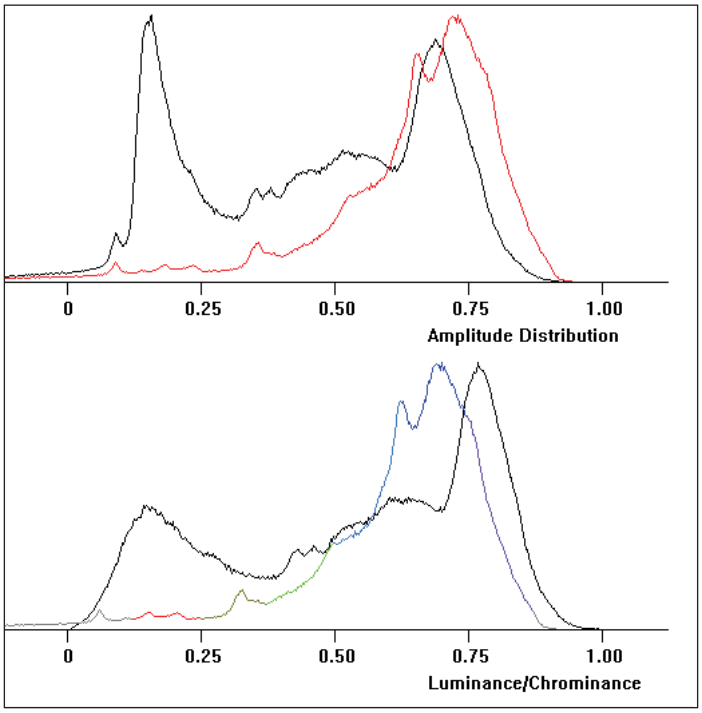


Figure 5 - Histograms for Colouring Images

satellite signals, particularly as it is completely free of charge for amateur use. In addition to producing high quality monochrome APT images showing striking detail, the program includes a few features for optimising image quality.

For the enthusiast who enjoys experimenting, *WxSat* is a dream come true. However, as can be seen from the colour composite image in figure 6, cloud structures do tend to have a distinct colour cast that cannot easily be corrected. Even after all these years, I still consider *WxSat* to be the best software for recording WAV files from NOAA satellite transmissions while at the same time providing an immediate rough idea of the scene depicted. But I have long since moved on to use other software (see references) to create coloured images that suit my taste.

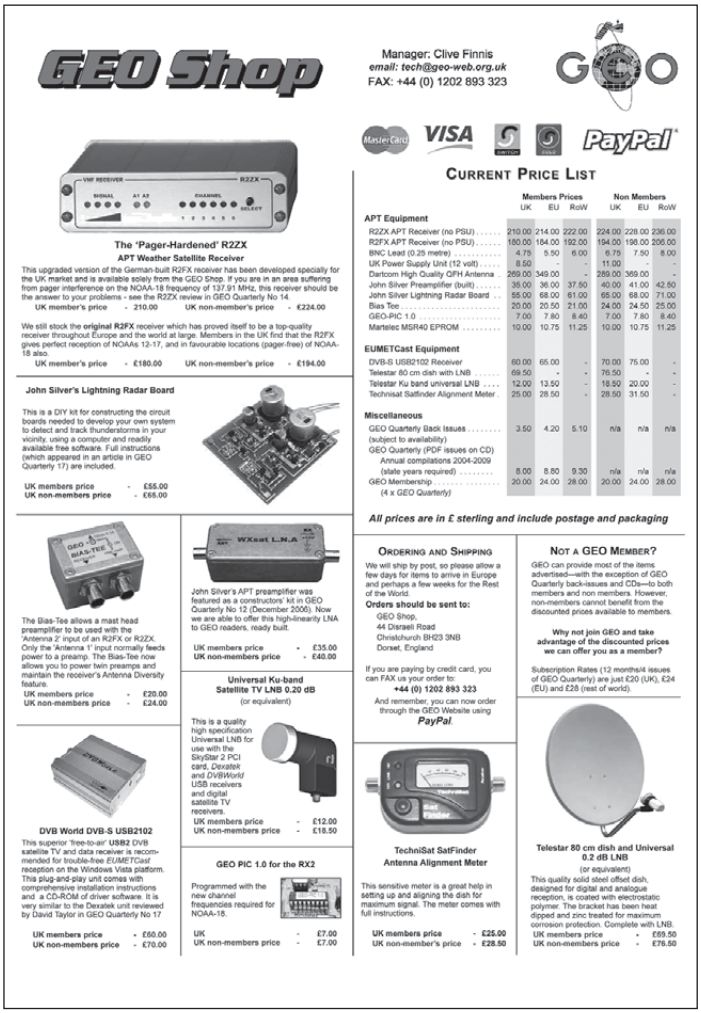


Figure 6 - NOAA 19 colour composite - 13:10 UT on October 2, 2010

References

1 http://www.satsignal.eu/software/satsignal.htm
2 http://www.wxtoimg.com
3 http://www.hffax.de/inst257e.exe

Thanet Offshore Wind Farm continued from page 3.

Some 12 km off the most eastern part of Kent, the farm covers an area of 35 sq km. The distance between turbines, each 115 m tall, is approximately 500 m along rows and 800 m between rows.

There are about 250 wind farms operating in the UK, with a further 12 offshore farms, and plans are under way to install another 10 000 turbines. The farms are part of a plan to cut greenhouse gas emissions from coal, oil and gas-fired power stations and help Europe meet its climate change targets.

Offshore wind farms have started to contribute important supplies of renewable energy. However, to be viable they have to generate at least 200 MW, and building on that scale costs at least €300 million.

Quantifying the amount of energy that can be expected from a prospective offshore wind farm site is vitally important for increasing the cost-effectiveness of planning wind farms. The traditional approach to obtain this information is to measure coastal wind with an offshore meteorological mast for at least a year. Gathering in-situ data from a single mast can cost a million euros a year, and provides data for only a small area.

Using data from Earth observation satellites enables a shift from a local to a global view and provides a cost-effective approach to determining potential energy fields. The sophisticated radar sensors on ESA's ERS-2 and Envisat satellites can provide high-resolution 100-m data on the wind field, and a 15-year-long data archive is available.

Optical sensors such as Envisat's Medium Resolution Imaging Spectrometer can be used to carry out environmental impact assessments. Satellite images can also be used for marine traffic management during initial construction and later maintenance work, as well as for forecasting daily energy production.

The Gunfleet Sands Offshore Wind Farm is visible off the Essex coast (centre top), and the port town of Dover is seen in the bottom as a white circular feature on the coastline.

Envisat's Advanced Synthetic Aperture Radar acquired this image on 14 September.

Siemens connection map

As part of the grid connection for the Thanet offshore wind farm, Siemens is constructing an offshore substation platform which will be the world's largest to date and the first with more than one power Transformer. A 33/132-kV substation with two 180-MVA power transformers will be installed on this platform. Prysmian will supply two three-phase 132-kV high-voltage subsea cables to transport the electrical power to the grid connection point, a new high-voltage switching station, which will be built by Siemens in Richborough, Kent.

BUFR Files

What are they and what can you do with them?

Francis Breame - vf0123@btinternet.com

Introduction

A lot of data files broadcast by EUMETCast are in the BUFR format (see my Internet site [1] for a partial list). These somewhat enigmatic files have generally been viewed as difficult to use, mainly because of the lack of amateur-friendly interpretation software [4]. A notable exception is David Taylor's BUFR Viewer [2], another in his definitive line of meteorological display software, which displays scatterometer and polar winds data.

So what exactly is BUFR? Standing for Binary Universal Form for the Representation of meteorological data, it is more properly known as the World Meteorological Organization (WMO) binary code FM 94 [3,5]. It was first approved by the MWO in 1988 and is widely used within the meteorological community. It apparently had the following design aims:

- The data contents would be self-defining (at least up to a point).
- Any form of data could be held.
- The file would use as little space as possible. To this end, extensive use is made of external tables which are use to expand 'data definitions' within the file (which is why it is not completely self-defining). New data definitions can be added by updating the tables, rather than by changing the BUFR decoder itself. The data itself is encoded to use minimum space, as well as using built-in data compression. A consequence is that the file is just a string of binary 1s and 0s and not text which could be human-read.

Whilst there are probably better and more general-purpose ways of doing all this now, BUFR, it seems, is here to stay. Unfortunately, BUFR seems to have been, and continues to be, modified over the years, with a considerable number of extensions as particular facilities were found to be needed. This doesn't make the task of writing a decoder easy, as there are many special cases and exceptions to be taken into account if a complete job is to be done.

A couple of years ago, I decided to write some software to analyse the data definition part of the EUMETCast BUFR files to find out just what was in each one. The answer was quite surprising—there is often a lot more that one would expect. I emphasise that I am not a meteorologist, so a lot of the data is over my head. Things like temperature, pressure, and wind speed I can understand: however, 'parcel lifted index' is beyond me.

Once I learned something about the file structure, I extended my program to decode the data into numbers suitable for processing by other software, and then added display facilities so that geographical data could be plotted on a map. Thus BUFRdisplay came into being.

BUFR File Basics

How is a BUFR file structured? I appreciate that this is not of general interest, but it shows where some of the terminology such as 'message' and 'subset' fits in.

Each **BUFR file** consists of one or more **messages**. Normally each **message** contains data in the same format, although there is nothing in BUFR which mandates this. A **message** is made up of a number of **headers** which provide general information about the message, and **data descriptors** which define the data format. Each descriptor is a number of the form n-nn-nnn, e.g. 0-01-007, which is used to access a BUFR table, which in turn defines how the data is encoded and what units it is in. Some descriptors perform operations on the data, rather than simply describing data values.

A message also contains **subsets**, which hold the data as defined by the data descriptors. There are one or more data subsets, each having the same format. Usually there are quite a few, e.g. a number of observations.

I have introduced further terminology, **data fields** and **data elements**, which are not part of the BUFR specification. Each subset consists of a number of **data fields**, each field holding one data element per subset.

A **data field** corresponds to a data descriptor which is capable of holding data (not all are). A **data element** is the data contained within a data field, per subset. Thus each subset holds a row of data elements, one for each field.

So, conceptually, where

s = total number of subsets
n = total number of fields

we have

	Field 1	Field 2	.....	Field n
Subset 1	value 1,1	value 1,2	.....	value 1,n
Subset 2	value 2,1	value 2,2	.....	value 2,n
.....	.....	.....	.....	.....
Subset s	value s,1	value s,2	.....	value s,n

Data elements can be empty if the data is not available.

Values are usually simple numbers (e.g. degrees, m/s), but can also refer to code values which require lookup in yet another BUFR table to discover the meaning of the number.

For example, descriptor 0-01-007 is 'Satellite Identifier'. A value of 209, say, if looked up in the table for 0-01-007, will translate to 'NOAA 18'. Flags are similar, but the number is encoded differently so that several meanings can be incorporated within a single number.

Finally, each message is terminated by an end marker.

The BUFRdisplay Program

If you want to try this software, the latest version of my program, BUFRdisplay, can be downloaded from my Internet site [1]. I'll just give a brief outline of it here, as it has quite a few options. A fuller user guide is included with the program.

BUFRdisplay is written in Perl and Perl/Tk, and is distributed as a self-contained .exe file which includes all the necessary Perl runtime files. You do not therefore need to

have Perl installed. It runs under most versions of Windows. Being written in Perl, it should also run under Linux but I haven't tested this yet.

BUFRdisplay isn't installed as such: just unzip the downloaded file 'BUFRdisplay.zip' to a convenient folder then click on 'BUFRdisplay.exe' to run it (or setup a shortcut on your desktop). The first time you run the program it will cache some files which will make it take longer to start. Thereafter it will start normally.

Using BUFRdisplay

When run, you should see the main program window (figure 1). Assuming that you have used David Taylor's MSG Data Manager, MetOp Manager, or AVHRR Manager to save some EUMETCast files, use the **<Files/Open>** menu to select one from the folder where it is stored. I'll use Global Instability Index data in this example, which is saved by MSG Data Manager under the MSG/MPEF folder structure. A typical filename is 201009200000-gii.bfr+.

BUFRdisplay will scan the first message in the file and produce, in the **DATA SELECTION** pane, a list of the data fields contained therein. This example in the table below doesn't contain many fields; some files contain hundreds. Some field numbers may be missing (2 and 22 in this case). This is either because they are used internally by BUFR itself or because they contain data which is not relevant.

Check that 'Data field' is selected in the **DATA SELECTION** pane. Browse through the fields, choose one which looks interesting—say 'K index'—and click on it. This is field No 17, which will appear in the 'Data field' box underneath.

Data Field	Unit
1 Satellite identifier	Code table
3 Satellite classification	Code table
4 Segment size (nadir) X	m
5 Segment size (nadir) Y	m
6 Year	year
7 Month	month
8 Day	day
9 Hour	hour
10 Minute	minute
11 Second	second
12 Row number	numeric
13 Column number	numeric
14 Latitude (high accuracy)	degree
15 Longitude (high accuracy)	degree
16 Satellite zenith angle	degree
17 K index	K
18 KO index	K
19 Parcel lifted index	K
20 Maximum buoyancy	K
21 Precipitable water	kg m^{-2}
23 Pressure	Pa
24 Pressure	Pa
25 Precipitable water	kg m^{-2}
26 Pressure	Pa
27 Pressure	Pa
28 Precipitable water	kg m^{-2}
29 Pressure	Pa
30 Pressure	Pa
31 Precipitable water	kg m^{-2}

'Latitude field' (No 14) and 'Longitude field' (No 15) will be automatically selected (if there are no latitude/longitude fields, then the data is non-geographical and cannot be displayed). Now press 'Input/decode data' at the bottom of the screen to decode the file (this is not done automatically when the file is opened since some files can contain vast amounts of data). Finally, press 'Generate map' and you should see something like figure 2, the value ranges being colour coded. Once you've input the data, you can make different data selections and generate new maps.

Map Projections

Data can be displayed in a variety of map projections, probably far more than are actually useful, but I like playing with them. The two which are handiest are Mercator (the default) and orthographic, the latter producing a view of the Earth as seen from infinity, which is particularly useful for polar views. By default, the BUFR data is used to select automatically the latitude and longitude limits of the map for Mercator projection, or the central latitude and longitude for orthographic. However, you can choose the map parameters yourself. A zoom facility allows you to draw a map larger than the screen, which can then be scrolled. This is mostly useful for the orthographic projection.

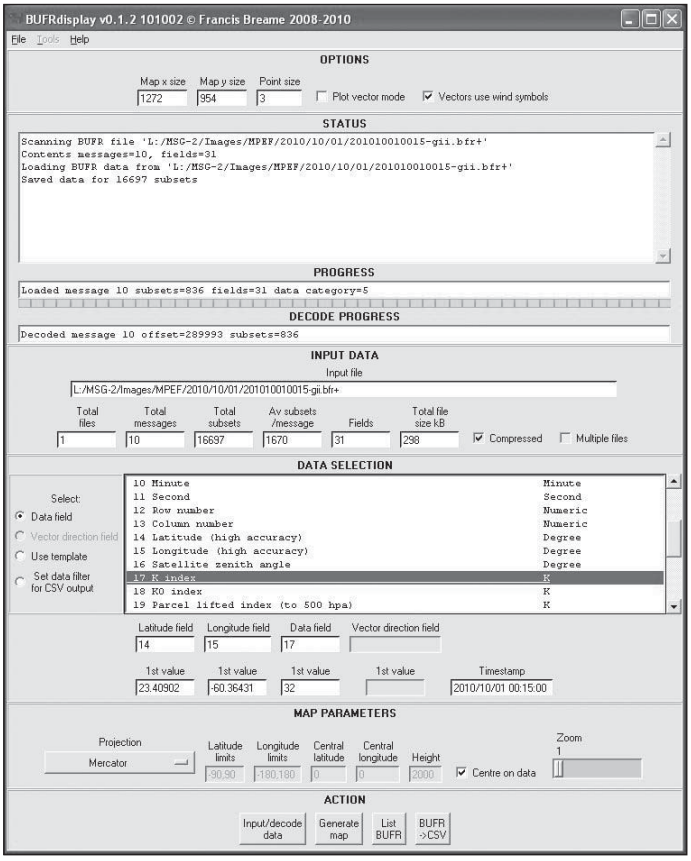


Figure 1 - The main *BUFRdisplay* window

An example of orthographic projection is shown in figure 3, which shows Total Ozone data.

Templates

Because some BUFR files have a very large number of data fields, many of which are of little interest, certain files have a template facility to make data selection easier (for technical reasons, not all files can at the moment use templates). Select 'Use templates' in the **DATA SELECTION** pane, and you will be given a shorter list of interesting data items rather than the full set. I have selected those items which I think are interesting, but let me know if you would like changes.

Vector Display

Some data, notably winds, can be displayed as a vector quantity, consisting of two data fields providing both a value and a direction. To display these, if not using templates, tick 'Plot vector mode' in the **OPTIONS** pane at the top of figure 1. Then choose 'Data field' from the **DATA SELECTION** pane and select the data (value) field as before. Then choose 'Vector direction field' and make your selection from the associated direction data field. If using templates, this is all done automatically.

Two displays are possible—a simple arrow pointing towards the direction value and standard winds symbols selected

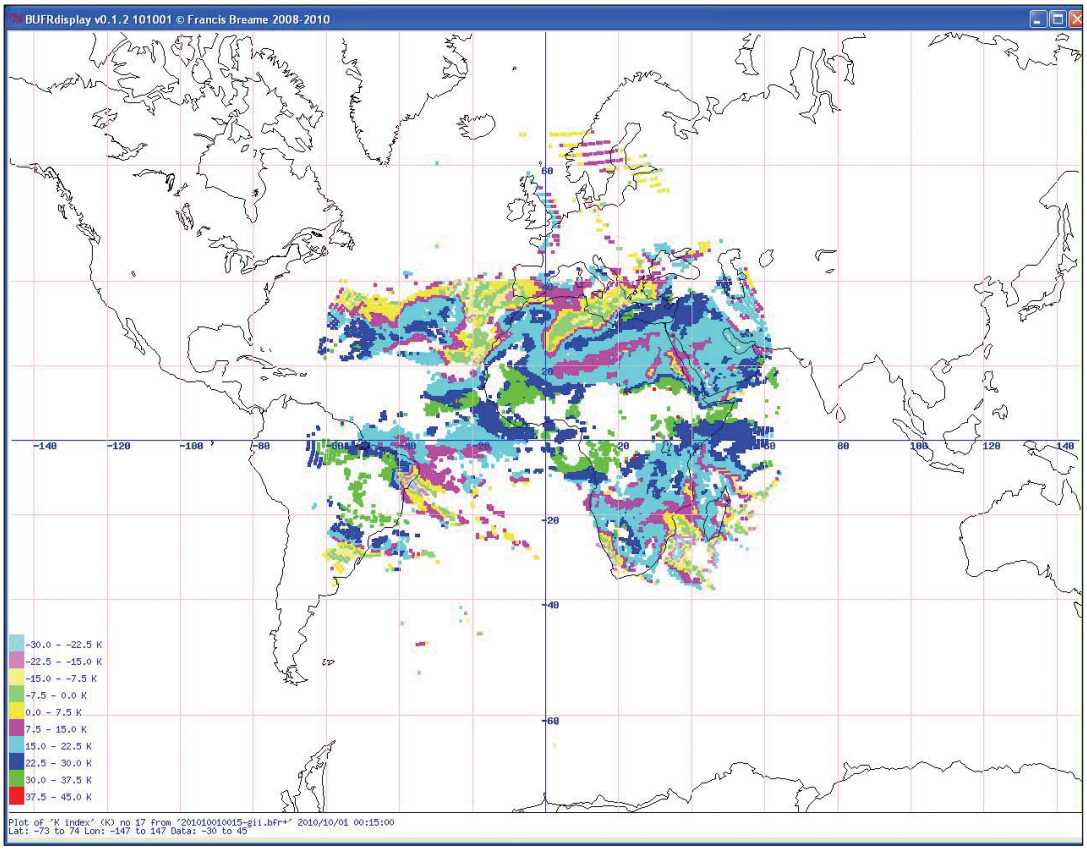


Figure 2 - A map of K index generated by BUFRdisplay

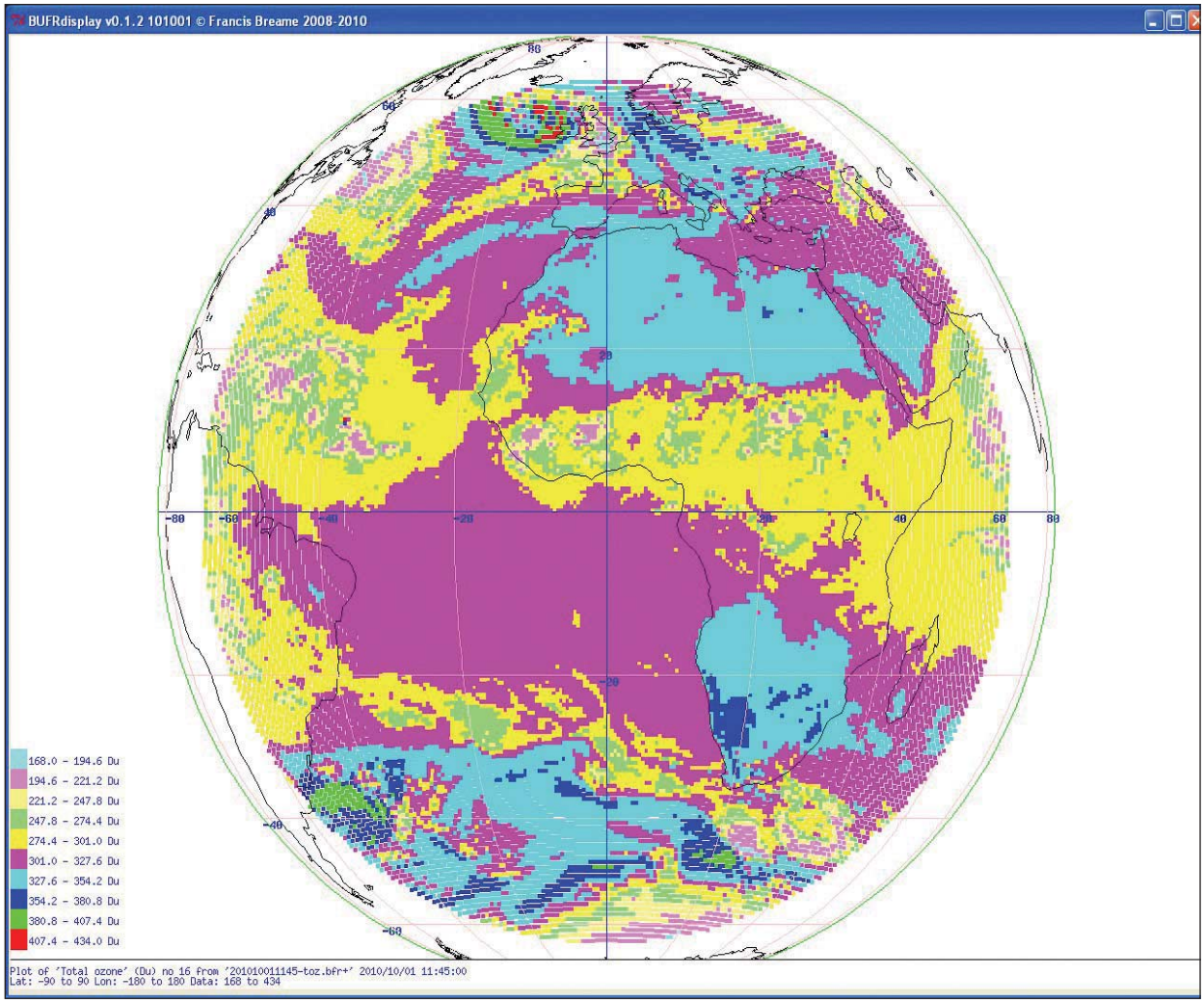


Figure 3 - An orthographic map of *Total Ozone* concentration

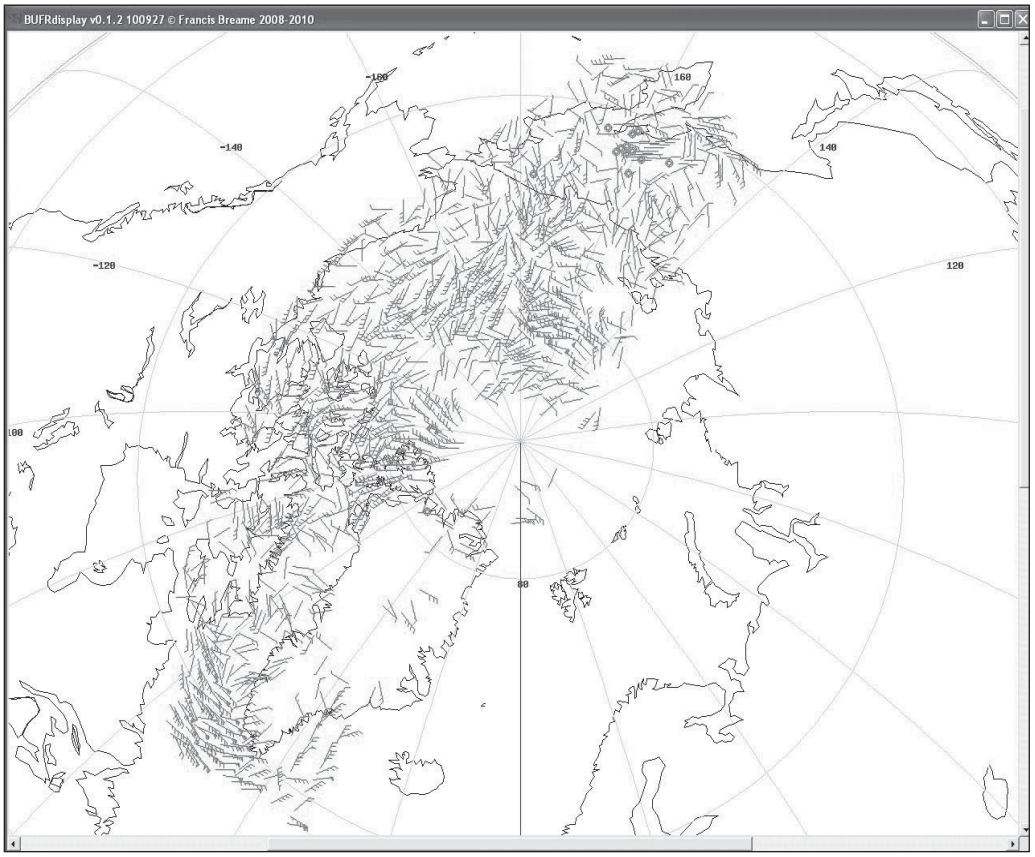


Figure 4 - An example of *Polar Winds* data

by ticking 'Vectors use wind symbols' under **OPTIONS**. I believe that I have the latter right but I'm open to correction. The direction of either symbol will be corrected for the map projection so that it is shown relative to north on the map. An example of Polar Winds data is shown in figure 4.

Multiple Files

A lot of data is distributed across several files, each contributing to a world view. When opening a file, it is therefore possible to select several files (by holding down the control key while clicking on them), and process them as if they were one. Beware though that this can produce a lot of data, which may therefore take some time to decode. The files must obviously all be of the same type.

List BUFR

This button is used to generate a text file containing a description of the contents of the opened BUFR file(s). A separate window is opened which allows the degree of detail to be specified.

BUFR–>CSV

This button is used to generate a comma-separated variable (CSV) file containing decoded data from the opened BUFR file(s), which will be useful if you want to process the data with another program. The format of this file is given in the user guide. Again, a separate window is opened which allows the data to be filtered if there is a large quantity.

I also have available a separate program, called BUFRextract, which uses the same decoding engine and produces the same CSV file. It doesn't have a Windows user interface and so is useful if you want to call it as a decoder from another program of your own. In fact, David Taylor's BUFR Viewer uses this for decoding some of its data.

Caveats

Bear in mind that BUFRdisplay is based on my personal understanding of the BUFR format, which is incomplete and possibly incorrect in some areas. In particular.

- It handles the BUFR files received by EUMETCast. It may well handle other BUFR files, but BUFR includes a lot of cases which are rarely used and which it may not handle properly.
- Many BUFR files include information relating to the quality of the data, which is important to professionals but less so to this community. BUFRdisplay ignores it.
- Although I've tested it extensively myself, it has had limited beta testing, so there are certainly bugs (thanks Douglas/Ian).
- BUFRdisplay is under continuous development, so things are apt to change without notice!

Conclusion

There is a lot of data available in BUFR format. Admittedly it's not as easy to use or appreciate as simple images, but try having a look at it and see what you can do with it. Please contact me (***vf0123@btinternet.com***) with any problems or suggestions concerning my program.

Links and References

1 My Internet site
http://www.vf0123.btinternet.co.uk/
2 David Taylor's BUFR Viewer program
http://www.satsignal.eu/software/bufr-viewer.html
3 WMO Documentation, especially 306 Manual On Codes, vol 1.2
http://www.wmo.int/pages/themes/wmoprod/manuals.html
4 European Centre for Medium-Range Weather Forecasts (ECMWF) - Unix BUFR decoding software
http://www.ecmwf.int/products/data/software/bufr.html
5 A Guide To The WMO Code Form FM 94 BUFR - very useful if you want to write a decoder
dss.ucar.edu/docs/formats/bufr/bufr.pdf

EUMETCast & Satsignal software keeps Gliders and Ultra lights flying

Esko Petäjä & Hannu Korhonen

This article describes how *EUMETCast* and *SatSignal* software can be used to assist in flying gliders and other light planes such as ultralights. The history of gliding started with Sir George Cayley around 1849 and later, Otto Lilienthal, who started to build (barely) controllable gliders around 1880.

Otto Lilienthal first hop with glider

How Gliders are Built

Gliders—or sailplanes—have a cockpit between the plane's wings, where the pilot sits. Materials used in these aircraft are carbon-fibre, fibre-glass and *kevlar*. There are two methods of launching sailplanes: towing behind either a light aeroplane or a ground-based winch. In the former case, the glider is towed behind a powered plane using a rope about 60 metres long; the glider pilot then releases the rope after reaching the desired altitude. For a winch launching, a powerful stationary engine located on the ground at the far end of the launch area is attached to the glider by an 800–1200 metre length of cable, which the winch rapidly winds in.

Cockpit of glider

Glider having Aero tow

Flying by Glider

Once launched, gliders must gain height using thermals, rising currents of warmed air. After finding a thermal, a plane can stay aloft for several hours and fly hundreds of kilometres. To able to do this, glider pilots must have good information as to where they can expect to find thermals, and also how the weather is forecast to develop during a long day. Without this information, the pilot could find himself sitting, in his cockpit, in a harvest field.

Hannu Korhonen in his cockpit

Esko with Dynamic WT-9 ultra light plane

Continued on page 44

The Aurora

Les Hamilton

David Taylor's article in *GEO Quarterly 27*, relating his experiences 'aurora hunting' north of Norway, reminded me that the fast approaching winter could be one of the best opportunities in a long while for most GEO readers to observe the phenomenon. Aurorae occur all the time in Earth's far polar regions but are a much rarer occurrence in the planet's temperate zones. The frequency and strength of aurorae mirror solar activity; they are observed to best advantage within a couple of years of the peak of the eleven-year *sunspot cycle*. NASA currently forecasts that the next solar maximum will occur during May 2013. If you haven't seen the aurora before, readers may have their best chance to remedy the situation during the clear, dark nights of the next few winters. August 2010 has already produced numerous aurorae world-wide, such as that photographed by Colin Chatfield below on August 3, this year.

The Active Sun

Although, to the casual observer, the sun is simply a large uniformly white disc in the sky, closer study reveals that this is not the case. As early as the 4th century BC, Greek observers had recorded what we now call sunspots on the surface of the sun. These mysterious dark patches appear and fade: some last only a few hours while others survive for several complete revolutions around the sun, the actual numbers of sunspots varying over an approximately 11-year period. During this cycle, the sun gradually changes from a state of low activity (solar minimum, few sunspots) to high activity (solar maximum, many sunspots) then back to low activity once more.

The variability of our sun is often taken on board by misguided opponents of man-made climate change. In denial over the role elevated atmospheric carbon dioxide concentration plays, they claim the effects we are observing stem from variable solar output. Given that the average solar output received over the surface of our planet is 1366 Wm^{-2} (watt/square metre), and the variance between solar maximum and minimum is a minuscule ±0.65 Wm^{-2} this idea just does not hold water.

While the average temperature of the sun's surface is close to 6000°C, that of sunspots can be as much as 1500° cooler, and hence they appear darker. These sunspots are regions of intense magnetic activity, which can heat the

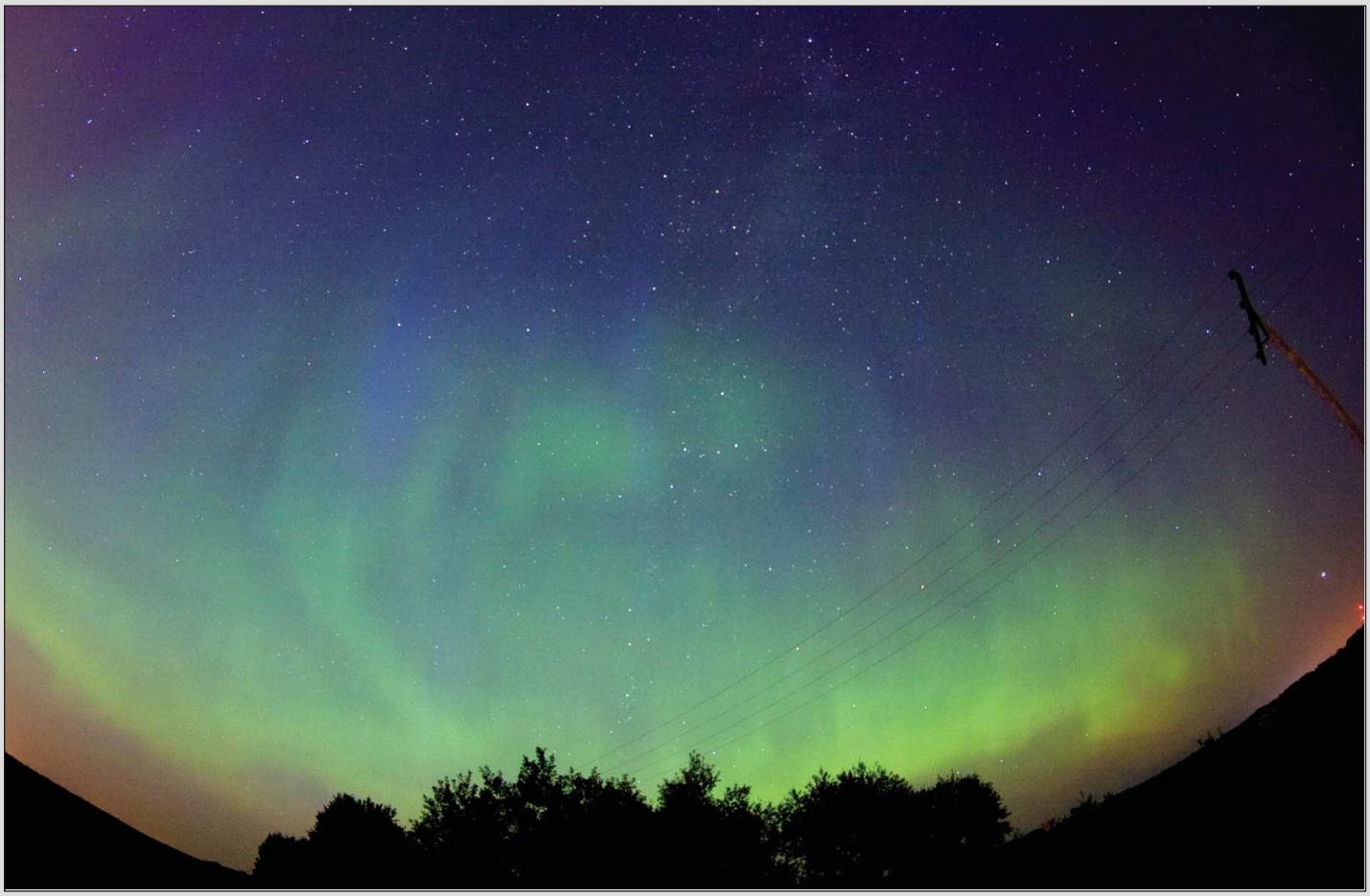


Figure 1 - A fine display of the Northern Lights above Saskatoon, Saskatchewan, Canada on August 3, 2010.
Photographed by Colin Chatfield using a Canon 40D with Tokina 10-17mm fisheye lens - ISO: 1600, Exposure: 20s, f/3.5, Focal Length: 10mm.

overlying solar corona to temperatures as high as two million°C; they also generate immense turbulence in the corona, which may lead to the production of a *Coronal Mass Ejection* (CME)—the sun's equivalent of a volcanic eruption—which hurls vast quantities of material out into space at enormous speed. As noted above, the sun is now well on the way towards its next sunspot maximum.

Figure 2, acquired by the *Solar Terrestrial Relations Observations* (STEREO) spacecraft last May, shows a CME leaving the solar corona. Though directed predominately sideways and not directly towards the Earth, its effect still created coloured auroras across polar skies. The Sun ejected this CME on May 23 this year, when a bright mass of charged particles looped from its atmosphere and was catapulted out into space. The image shows only the corona, the outermost layer of the solar atmosphere. A dark disk in the detector obscures the glare of the Sun and the white circle represents the Sun's surface. When the charged particles from this CME reached Earth, they caused no damage, but did generate sheets of coloured light dancing across polar skies.

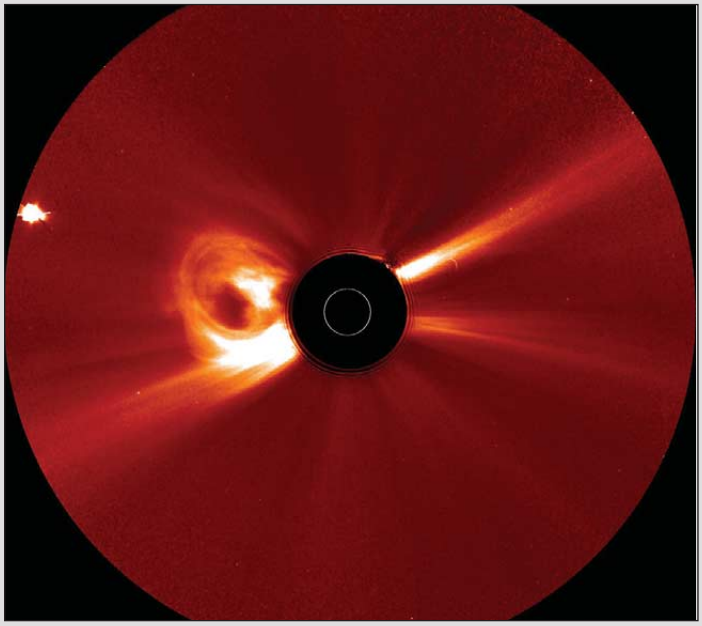


Figure 2 - A CME is ejected from the Sun's corona on May 23, 2010
NASA image courtesy the Solar Terrestrial Relations Observatory Team.

The front cover image, obtained from NASA's new *Solar Dynamics Observatory* satellite (SDO) on August 1, 2010, shows the first major Earth-directed coronal mass ejection for some considerable time being launched towards us. Almost the entire Earth-facing side of the sun displays a tumult of activity and this multi-wavelength extreme ultraviolet image shows the sun's northern hemisphere during mid-eruption. A few days later there were reports of splendid aurorae over Denmark, Norway, Greenland, Germany the northern United States and Canada as material from the CME encountered the atmosphere: see Colin Chatfield's fisheye photograph of the ensuing aurora over Canada, above.

What Causes the Aurora?

Earth's aurorae originate 150 million kilometres away, in the sun's corona, that normally invisible outermost layer of its atmosphere. In addition to radiation in the form of light and heat, the sun is continuously emitting into space a highly rarefied stream of electrically charged particles, mainly electrons and protons. Popularly termed the *solar wind*, this stream of particles travels at about 400 kilometres per second as it moves out from the sun and takes around four days to reach Earth.

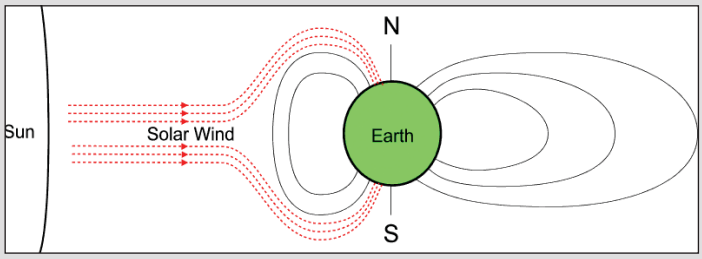


Figure 3 - Interaction of the Solar Wind with Earth's Magnetic Field

At a distance of some 70 000 km from Earth, the *solar wind* encounters the planet's magnetosphere: this is the volume of space within which moving charged particles interact with Earth's magnetic field (figure 3). The electromagnetic interaction between Earth's magnetic field and the *solar wind* causes charged particles to be deflected along the magnetic field lines. Though some of these particles simply travel around the Earth and back into space, the electrons in particular (because of their relatively tiny mass) become funnelled towards the north and south poles. There, they collide with molecules of atmospheric gases, chiefly oxygen and nitrogen, at an altitude of some 80 to 120 kilometres.

This has several effects

- oxygen and nitrogen molecules (O_2 and N_2) can be split into single atoms by the energy of collision
- these molecules and atoms may have one of their own electrons stripped away to create an ion
- electrons within the molecules and atoms can be displaced into excited energy levels within their parent particle

All these processes absorb kinetic energy from the *solar wind* particles and produce excited, unstable intermediates; when these return to their original states, this extra excitation energy is emitted in the form of coloured light.

The Auroral Oval

Although the aurora is not visible to the naked eye regularly on a nightly basis, it is almost always present. The solar wind is continuous and the stream of particles bombarding Earth's atmosphere never ceases. The same NOAA satellites that provide us with APT and AVHRR imagery of the Earth and its weather monitor the aurora every time they orbit above the poles. Figure 4 shows a typical auroral oval chart

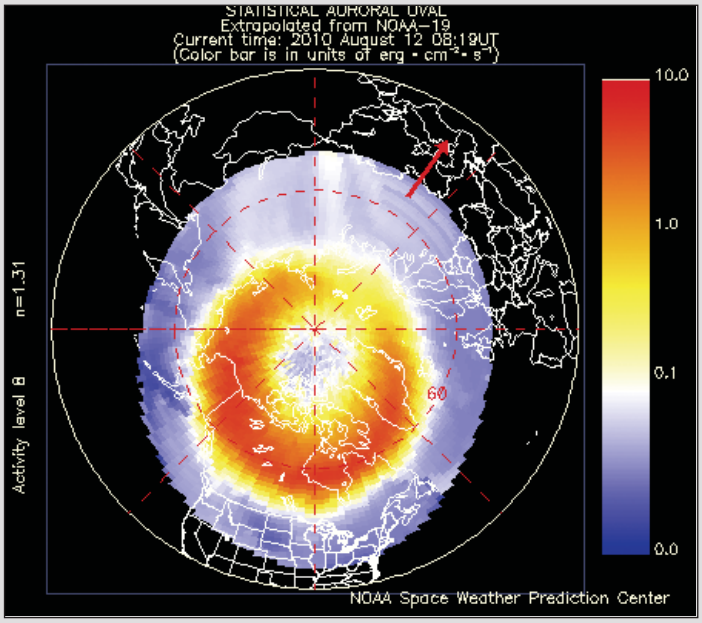


Figure 4 - The auroral oval surrounding the North Pole
Image: NOAA

Figure 5 - This is another photograph of the Northern Lights from Colin Chatsfield, Again from Canada on November 9, 2004 using a Canon Powershot A80. *ISO: 400, Exposure: 15s, f/3.2, Focal Length: 9.6 mm.*

generated from NOAA-19 data on August 12, 2010. You can always view the extent of the current auroral oval at

www.swpc.noaa.gov/pmap/

It is clear that, over Europe, the aurora only extends as far south as Northern Norway on this date. Because the magnetic north pole is currently off the west coast of Ellesmere Island, at 83°N, the auroral oval tilts several degrees towards North America where, in consequence, the aurora is more frequently visible than in Europe. In general, the oval is centred some 5° to nightward of the magnetic pole and has a typical radius of 17° of latitude, around 2400 kilometres. Observers farther away or nearer to the magnetic pole, will observe the phenomenon less frequently.

The NOAA POES Instruments

Ever since the polar orbiting TIROS-N satellites—forerunners of the current NOAA series—started orbiting Earth in the late 1970s, NOAA has furnished the majority of them with a *Space Environment Monitor* (SEM). This package contains instruments to measure the flux of energetic charged particles encountered by the satellite. The current version of the monitor, SEM-2, has been flying aboard all satellites since NOAA-15, as well as Metop-02. The SEM-2 contains two instruments, the *Total Energy Detector* (TED) and the The *Medium Energy Proton and Electron Detector* (MEPED).

The TED measures the energy flux carried by auroral particles (principally protons and electrons) into the polar atmosphere. The magnitude and extent of this flux provide measures of the level of auroral activity. Data from TED is used to produce Auroral Oval charts like figure 4.

The MEPED includes a set of solid-state particle detectors that monitor the intensities of energetic species from all sources, including solar particle events and lower energy galactic cosmic rays. Enhanced fluxes of these particles entering the atmosphere can produce significant and widespread degradation in short-wave radio propagation and, in extreme cases, even radio blackouts.

The Aurora from Space

Spectacular though the Aurora can be when viewed from Earth, it it even more splendid when viewed from orbit, where it can create a halo of light girding each of Earth 's poles. The *Aurora Australis* was observed by NASA's *IMAGE* satellite on September 11, 2005, four days following a record-setting solar flare (figure 6). The glowing halo of the Aurora appears green, superimposed on a *Blue Marble* image of the Antarctic. If viewed from below, this display would have appeared as a curtain of light shimmering across the night sky.

Although scientists had long understood that aurorae occurred when charged *solar wind* particles interacted with the Earth's magnetic field, they were unable to actually measure the interaction until NASA launched the *IMAGE* (Imager for Magnetopause-to-Aurora Global Exploration) satellite in 2000. This satellite's mission was to collect data that would allow scientists to study the structure and dynamics of Earth's magnetic field for the first time. Designed to operate for two years, *IMAGE* sent its last data to Earth in December 2005 after a highly successful five-year mission.

Aurorae have also been observed from both the Space Shuttle and the International Space Station (ISS). Figure 7 shows a particularly striking green Aurora image acquired over the southern Indian Ocean following the May 23 CME shown in figure 2.

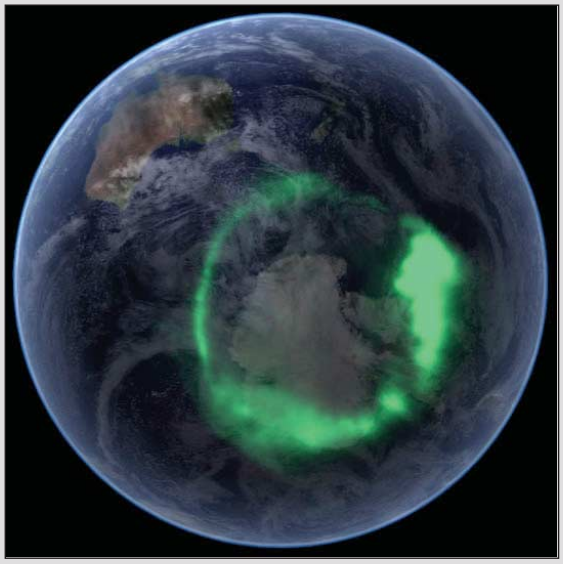


Figure 6 - The Aurora is seen encircling Antarctica by NASA's IMAGE satellite during September 2005.
Image: NASA

Figure 7 - A striking aurora image taken from the ISS on May 29, 2010
Image: NASA/Johnson Space Center

Figure 8 - An Aurora viewed from Space Shuttle during the 1991 solar maximum
Image: NASA/Johnson Space Center

Figure 9 - An image of the Aurora taken from the ISS on February 2, 2003
Image: NASA/Johnson Space Center

Figure 8 shows an *Aurora Australis* photographed during a Space Shuttle mission at the time of the 1991 solar maximum. Red and green colours predominate in this view. The red aurora displays from as high as 500 km altitude and reaches down to around 200 km. The green aurora occurs between about 250 km to 100 km altitude.

Figure 9, acquired from the ISS some 400 km above the Earth, provides a splendid edge-on view of the upper atmosphere, where its 'visible edge' at around 50 km lends scale to the Aurora. The green emissions extend from the ever present thin shell of airglow at about 100 km altitude to perhaps 300 km. The red emissions are again at higher altitudes. They lie atop the green and extend beyond that layer by a further 200 km.

Frequency of Aurorae

Aurorae occur most frequently in the years near solar maximum, and are particularly strong after a CME is directed straight towards the Earth. The CME increases the density of the *solar wind* which in turn expands the auroral oval over the Temperate Zones, spreading the aurora closer to the equator. During the 1958 solar maximum, the *Northern Lights* were observed as far south as Rome (40°N).

It has been estimated that, given clear skies, the aurora can be observed on well over 100 nights a year in the regions where it is most frequent. However, imaging cameras aboard satellites—much more sensitive than the human eye—observe a diffuse aurora around the polar cap almost all the time. How often the aurora can be seen depends on several factors, not least light pollution at the observer's location.

Over the years I have, on rare occasions, been fortunate to see a number of auroral displays from my home in northeast Scotland. One of the most spectacular was on April 12, 2001, when we were treated to a stunning display of red and green Lights in the sky. This followed the eruption of a CME from one of the largest sunspots recorded during a decade. However, a friend of mine who used to live on a farm up country, 40 km from Aberdeen, where light pollution was negligible, told me that sightings of the *Northern Lights* were commonplace at that time, particularly over his northern horizon.

Polar latitudes, of course, experience the most frequent Aurorae. In the northern hemisphere, there is a 50% or greater chance of seeing an Aurora between the latitudes of 55° and 80° north, where, in theory, it could be in evidence on at least half of the nights throughout the year. Auroral displays usually increase during the periods of solar maximum and are also usually more frequent during the winter months, where the nights are longer and the skies less hazy. Occasionally, the *Northern Lights* have been observed south of latitude 35°N, usually when a large solar CME has created a huge geomagnetic storm in Earth's outer atmosphere. This occurred during the night of November 5 and 6, 2001, when amazing Auroral displays were seen as far south as Texas and Arizona. Another significant event was on the night of April 7-8, 2000 when a strong aurora was visible, not only throughout Scotland, but right down to the south coast of England. The effect was strong in Aberdeen, even with nearby street lighting, and took the form of a 'vaulted temple', consisting of streamers, mainly green with just a tinge of red, angling down on all sides from a point close to the zenith, like fluted pillars .

Types of Auroral Display

The aurora manifests itself in numerous guises which often change dynamically while we observe them. The strongest and brightest aurorae tend to display as discrete arcs and bands of light, often characterised by 'folds', leading to a curtain-like appearance. A weak aurora may simply produce a diffuse band of light across the northern horizon, not dissimilar to the reflection of city lights on cloud when seen from a distance. If you are far from any such source of light pollution you can be sure you are observing an aurora.

The the most common form of Aurora is the **arc**, which takes the form of a simple, slightly curving band of light across the night sky. Arcs often extend from horizon to horizon, a distance of several thousand kilometers or more and can stretch more than 100 km upward, following the near vertical magnetic field—and yet they may be less than a hundred meters thick.

Another term is the **band**, which refers to an Aurora which has an irregular shape with kinks or folds. There is also the **patch** aurora, in which case it resembles transient patches of pulsating, luminous cloud. The term **veil** describes an Aurora which covers a large area with uniform light, often covering most of the heavens while a **Ray** aurora is made up from straight vertical shafts of light aligned in the direction of Earth's magnetic field lines.

Most typically, the aurora appears as either a diffuse glow or as 'curtains' that generally extend east-west. Auroral curtains consist of numerous parallel rays, all lined up with the local direction of Earth's magnetic field.

A superb auroral 'curtain' photographed in Alaska appears at the top of the inside back cover of this issue. And below it is a photograph obtained on August 13, 2010, from the ISS, by NASA astronaut Doug Wheelock. Although there weren't widespread auroral displays on Earth at the time, the view from orbit was sublime. Although the planet directly below is partially sunlit, the aurorae remain visible against the black, starry backdrop beyond Earth's limb.

Auroral Events of Historical Significance

An aurora which occurred as a result of the 'great geomagnetic storm' on September 2, 1859 has been considered the most spectacular ever witnessed. It followed an exceptionally intense solar flare on September 1 and produced Aurorae so extraordinarily brilliant that they were reported in ship's logs and newspapers throughout the United States, Europe, Japan and Australia.

Photographing the Aurora

Colin Chatfield

Now that you have seen the splendid aurora images accompanying this article, some of you may now be encouraged to try this for yourselves. So what exactly is required?

First, particularly if you live near street lighting, you will have to relocate out of town to a location with minimum light pollution, on a clear night when the moon is below the horizon. Also, because exposure times are likely to be 10-20 seconds, a tripod is essential to prevent camera shake. But what about the camera?

Colin Chatfield's 'green curtain' aurora (figure 5) was made using a relatively simple *Canon PowerShot A80*. This is a fairly simple camera with a 3x zoom and several shooting modes. The image was obtained using 'Auto' mode, giving a 15 second exposure. In order to prevent camera shake with a point-and-shoot camera like this, try using the timer. For example, set the timer for a 10 second delay and let it snap the picture, with your hands off the camera.

For more ambitious photographs like figure 1, which displays the entire northern sky, a *Tokina* 10-17mm fish-eye lens was used, and with it a digital SLR camera. Colin acquired this superb image using a *Canon EOS 40D* SLR, a more advanced camera which allowed him to choose manual operating mode, setting exposure as 20 seconds and aperture to f/3.5. While a fish-eye lens is not required, a wide or super-wide angle lens with a range from 8mm-18mm is. The other factor when choosing a lens is its 'speed'. The lower the *f* number the better. For example, an f/4.5 lens is considered slow. Most kit lenses (those that are sold in camera packages) generally range from f/3.5 to f/5.6, so they are not so suitable for long exposure shooting. When using exposure times above 10 seconds with a lens like that, star trails usually start to appear. With an f/3.5 lens, up to 20-25 second exposures can be taken and with an even faster lens, such as an f/2.8 or f/1.8, up to 60 second exposures can be taken before star trails appear.

A further advantage of this camera is that the sensitivity (ISO number) could be increased to a maximum of 3200 (the *PowerShot* has a maximum ISO of just 400). One consideration however, is that the higher the ISO number, the more noise that is introduced into the photograph. In order to prevent camera shake in a DSLR, the best way is to use either a wireless remote or wired shutter release cable. That way, your fingers are not touching the shutter release button, thus preventing shake. If you do not have a remote or a cable release, again try setting the timer. Most DSLRs have a 10 second (or longer) delay setting that will wait for 10 seconds after the shutter button is pressed to take the picture.

There are two more important aspects when talking about camera shake. The first is this: if a lens with image stabilisation is being used with a camera mounted on a tripod, turn off the image stabilisation. The second is to use exposure delay mode, if your camera is so properly equipped (usually just DSLRs are). This delays taking the picture for a second or so. The specific purpose of exposure delay is to eliminate the vibration caused by the mirror flipping up. It's mostly useful on short duration exposures on a tripod, where the slight and short-lived vibration is enough to cause blur. Of course, it's useful even for a long exposure if there's something bright in your image (such as Aurora) that you are capturing.

The *New York Times* claimed that 'ordinary print could be read by the light of the aurora'. This Auroral storm was also notable as the first occasion where an Aurora became unambiguously linked with electricity, after many thousands of kilometres of telegraph lines were significantly disrupted for many hours throughout the storm. Indeed, that night, after disconnecting their normal power supply (batteries), two operators of the *American Telegraph Line* between Boston and Portland conversed with each other for some two hours, powered solely through current induced by this Aurora. Claimed to have 'smothered two-thirds of the Earth's skies in a blood-red aurora', the so-called 'Carrington flare' (named after its discoverer) that gave rise to the event also burned out telegraph wires across Europe and the USA and crippled all global communications, such as they were at that time, as phantom electricity surged through telegraph wires. Navigation also became impossible as compasses needles spun and danced in the gyrating magnetic field, rendering them useless.

More recently, in 1989, a smaller but still enormous storm caused the power grids in Quebec to go down for nine hours, resulting in hundreds of millions of dollars of lost revenue.

The Colours of the Aurora

The light emitted from excited ions, atoms and molecules in the ionosphere creates the Aurorae that we see. The actual colour produced depends on the identity of each particular particle that interacts with the solar wind and how strongly its electrons become excited. Following a collision involving a highly energetic solar wind electron, the quantity of energy released when excited gas molecule electrons return to their original states is likely to be large also—which would give the Aurora a bluish tinge. On the other hand, a less energetic electron exciting a gas molecule would result in the release of a smaller quantity of energy when the excited state returns to normal: this time, the Aurora would take on a reddish shade.

Different species emit specific colours when they become excited. Oxygen at about 100 kilometres altitude gives off the familiar yellow-green colour, whereas oxygen at higher altitudes produces the all-red aurora. Nitrogen ions produce the blue light while neutral nitrogen atoms give off red-purple hues. Altitude is all-important, as this governs how closely atmospheric particles are to each on average, and hence how easily they can interact (i.e. collide) to release their 'excited' energy.

As a general rule you can judge the altitude of the Aurora from its colour

Red	- oxygen, above 250 km altitude
Green	- oxygen, up to 250 km altitude
Purple/violet	- nitrogen, above 100 km altitude
Blue	- nitrogen, up to 100 km altitude

The most commonly observed colour of aurora is green, caused by light emitted from excited oxygen atoms at wavelengths centred at 0.558 μm. Red aurorae are generated by light emitted at a longer wavelength (0.630 μm), and other colours such as blue and purple are also occasionally observed.

Acknowledgements

Thanks are due to Colin Chatfield for providing some of his superb contemporary photographs of the *Northern Lights* to illustrate this article, and also for his help in producing the guide: '*Photographing the Aurora'*.

I am also indebted to sources on the Internet, too numerous to mention, for further illustrations and background information.

Further Reading

http://www.geo.mtu.edu/weather/aurora/

http://en.wikipedia.org/wiki/Aurora_(astronomy)

http://www-spof.gsfc.nasa.gov/Education/aurora.htm

http://www.crystalinks.com/aurora.html

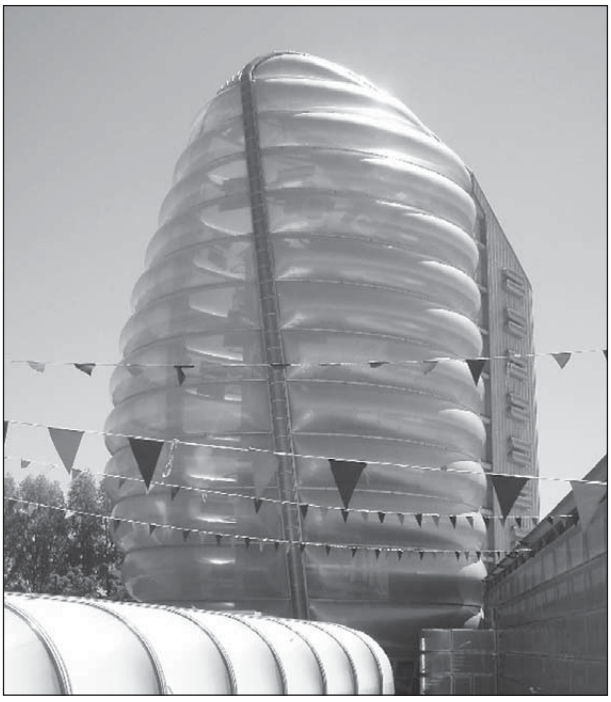
GEO Symposium 2011

Our annual symposium has been booked for 7th May 2011 at the National Space Centre, Leicester. In the past we have used this venue for our symposium and feed back from the membership suggests this is a favoured venue.

On the day we hope to have presentations bringing us up to date with EUMETCast, Envi-Ham, other relevant satellite schedules together with speakers on topical issues which relate to GEO's interest areas. GEO members are invited and encouraged to make their own presentation or run workshops and time will be allocated within the programme for this purpose. Contact Fancis Bell ***francis@geo-web.org.uk***

It is anticipated that May 7th 2011 will be a busy day but time will be allowed for personal demonstrations and importantly for interaction with other members.

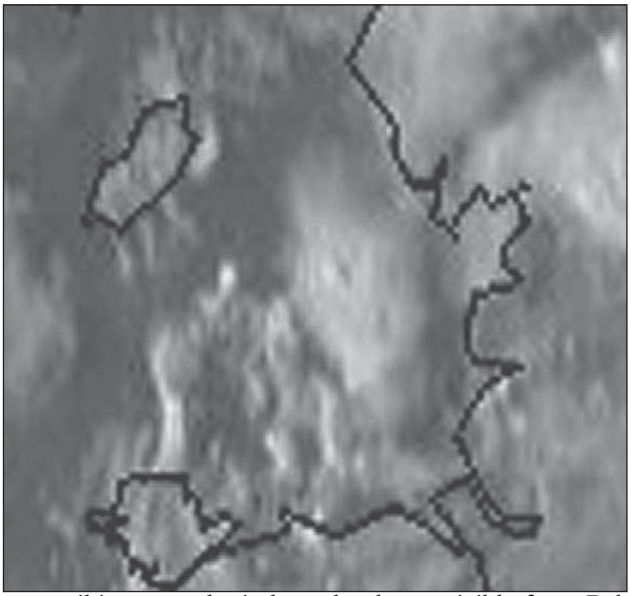
Further details will be published in our March Quarterly but in the meantime please record the 7th May 2011 as an important date in your diary. There are several modestly priced hotels in Leicester for anyone staying overnight. Rob Denton a member of GEO's management team will be taking registrations for the symposium at the NSC Leicester. He is currently preparing a location map and a list of hotels the fine detail of this will be published in our next Quarterly. Please register with Rob via email ***international@geo-web.org.uk***



Observations

Robert Moore

Striking cumulonimbus cloud was visible from Robert Moore's window at 1800 (BST) on the 7th September.



A very striking cumulonimbus cloud was visible from Robert Moore's window at 1800 (BST) on the 7th September. The photograph shows the classic anvil formation as vigorous convection hits the boundary of the troposphere and spreads outwards. The overshooting tops of the cumulonimbus cloud showed up clearly on the current Meteosat 9 imagery (above).

Sakhalin Island is Russia's largest island. The island is very rich in natural resources with a great diversity of wild-life and geology. Sakhalin is in 'the ring of fire' and therefore earthquake-prone.The Amur river can be seen in the left of the image. The sea between the island and the mainland regularly freezes in winter. In the summer the prevailing winds bring ice flows to the east coast of Sakhalin, the climate of which may be described as 'cold and cloudy'. The image (full page right METOP-A 12-09-10) is therefore an unusually clear view of Sakhalin.

Ownership of the island has long been disputed between Russia and Japan. In the 19th century the majority of the 33,000 population were Russian convicts. The Korean population, forcible moved there during the second world war largely remains. Much of the native Ainu population moved to Hokkaido (at bottom of picture) after the war when the Japanese were expelled.

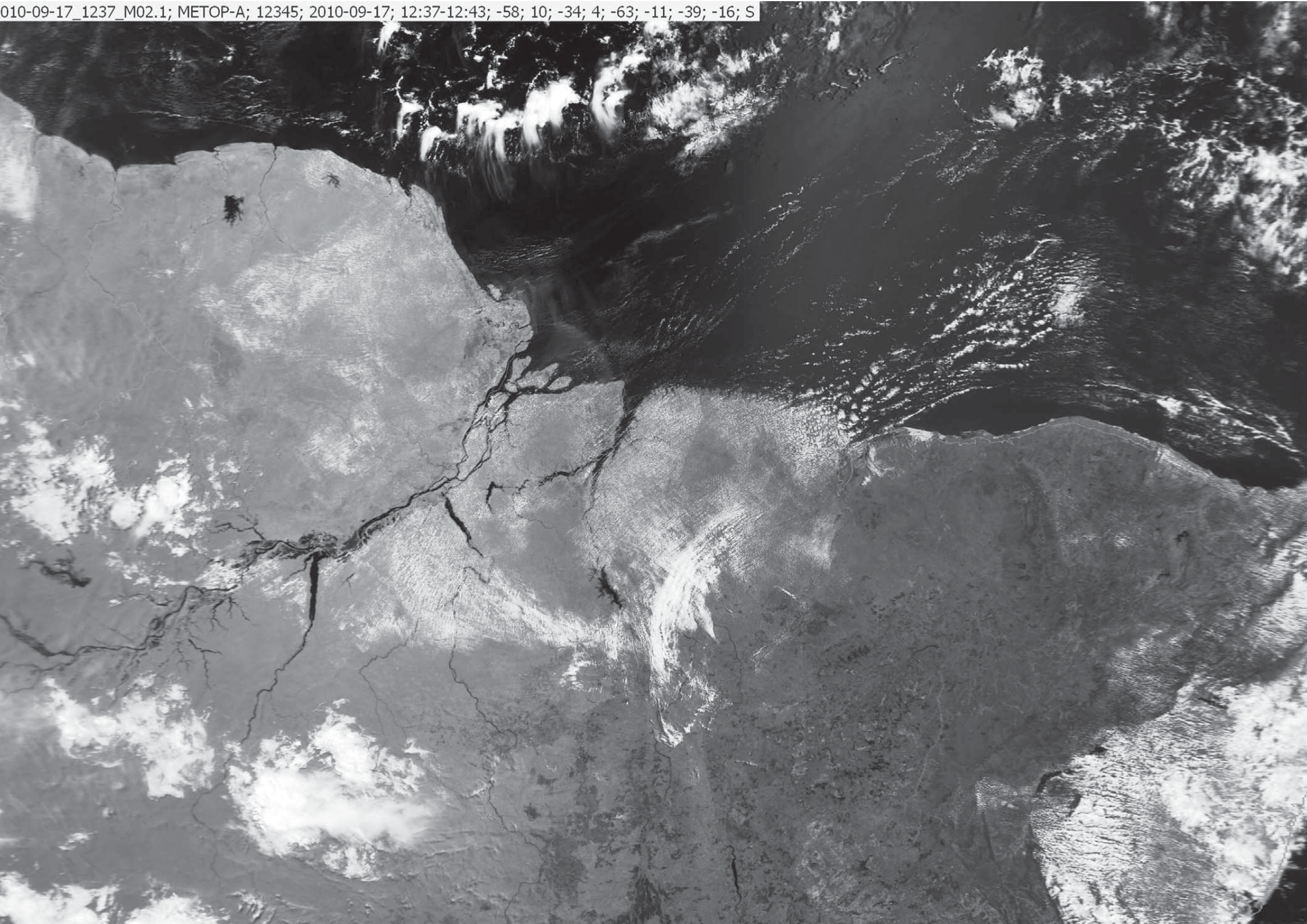
Full Page image

With the huge amount of worldwide high resolution imagery now available from weather satellites from a wide range of sources including direct reception, Internet and DVB sources, it is now very easy to find an image of a particularly interesting meteorological condition.

Often the temptation is to look at the worldwide HRPT data and select the satellite pass that best coincides with the geographic area of interest.

However sometimes much more can be seen when the imaging satellite is not directly overhead and when the sun is low on the area of interest. This often highlights interesting topography not seen with an overhead pass.

The image (page 22) is such an example. It shows Hurricane Igor on the 13th September 2010, north east of the Leeward Islands. Amazingly this was imaged by Meteosat 9 at 0 degrees and demonstrates the points made above.


010-09-17_1237_M02.1; METOP-A; 12345; 2010-09-17; 12:37-12:43; -58; 10; -34; 4; -63; -11; -39; -16; S

ESA - Observing the Earth

Development of Meteosat Third Generation to start

Marking a significant milestone for Europe's next fleet of meteorological satellites, ESA has given the go-ahead to Thales Alenia Space in France to start work on developing the Meteosat Third Generation.

The 'Preliminary Authorisation To Proceed' was signed today after a kick-off meeting between ESA and Thales Alenia Space. This approval follows several months of negotiations that has resulted in a final industrial team of Thales Alenia Space (FR) and the initial consortium members, OHB (DE) and Kayser Threde (DE), together with, in a range of complementary functions, Astrium (DE/FR).

Formal introduction of Astrium into the consortium will take place over the next six months.

Following on from Meteosat Second Generation, the Meteosat Third Generation (MTG) is being created through cooperation between Eumetsat and ESA to ensure continuity of high-resolution meteorological data to beyond 2037.

This next series of geostationary weather satellites will be a step change by providing significant improvements over the capabilities of the current Meteosat generation.

The series will comprise six satellites: four MTG-I imaging and two MTG-S sounding satellites. The two types will be positioned over the same longitude in their geostationary orbits.

The sounding element, which also carries the Sentinel-4 payload for the Global Monitoring for Environment and Security programme as a guest payload, is a key innovation. For the first time, Meteosat satellites will not only image weather systems, but also analyse the atmosphere layer by layer and provide deeper insight into the complexities of its chemical composition.

The first MTG-I satellite is expected in late 2017, with the first MTG-S following in early 2019.

With the go-ahead now in place, the resulting consortium sees Thales Alenia Space as prime contractor and responsible for the MTG-I imaging satellite, including the primary Flexible Combined Imager. OHB is prime for the MTG-S satellite, supported by Astrium (DE) as the System Architect. The Infrared Sounding Instrument will be developed by Kayser Threde.

Information courtesy

ESA www.esa.int

Attenuation by Glass

Rob Denton g4yrz@wxsat.org

I remember some time back Francis Bell was enquiring in GEO Quarterly about the effect of satellite signals onto dishes when received through glass .My story relates to Atomic Time Signals and GPS reception through glass.

Having recently moved into a new home I was very excited to find that I would be getting new double glazed windows. I am all for energy conservation and cost cutting but it was only recently I learned the drawbacks.

On a positive note I immediately noticed an increase in room temperature of 2 degrees and it was so much quieter as previously my house was single glazed.

On a drawback I noticed my DCF77 atomic time signals were being attenuated and to make things worst, my GPS signals for the weather satellite programs were also being affected.

It was not an immediate reaction at first but then I noticed the clocks were not receiving time signals, this however only seems to apply to my DCF signals on 77Khz and NOT to the MSF 60Khz signals from Anthorn, Cumbria UK. I know Anthorn transmitter outputs 15Kw (15,000 watts) and DCF at Frankfurt Germany outputs a massive 50Kw (more than 3 times the power of Anthorn) but further from UK. I guess the DCF signals are not strong enough to penetrate the glass. But find it very strange that the MSF signals do as they are on similar frequencies.

As for the GPS signals, I first noticed a problem when running my APT software. It would state no signals have been received from my GPS receiver. I never realised it was the window glass attenuating the signal but decided to experiment. The GPS antennas (I have 3) that normally sit on my inside front window ledge but to test them I placed one just outside the window on the ledge whilst observing the satellite reception. The signals immediately came to life and normality was restored. I now have to find a route through my new windows or wall to place the antennas so they have a clear line of site of the open sky (South Facing).

The thing is, here in UK it's very likely someone will take a liking to them being outside and maybe I could wake up one morning to find they are gone. I guess I will have to disguise them or place them high up out of reach of prying eyes. .The flashing LED's don't help the disguise.

I would just like to point out that when my house was single glazed, I had no reception problems,

So, there is a lesson to be learned, I know I will find a solution but bear that in mind before having new windows installed. I would love to hear from readers where they mount their antennas and how, you can email me privately or write to GEO so that all the world can hear about it.

Related Article: GPS in Weather Satellite stations GEO Q18 2008

Courtesy Wikipedia

LF transmitter: National Physical Laboratory time signal

The National Physical Laboratory (NPL) has installed three atomic clocks at Anthorn and on 27 February 2007 Britain's national time signal transmissions, retaining their original call sign of MSF, were transferred there on a trial basis, moving formally on 1 April 2007. Monitoring and logging of the clocks and control of the transmissions is by internet link from the NPL offices at Teddington, using comparison with GPS signals at both locations. Signal monitoring is by radio. To ensure accuracy, dynamic adjustment of the aerial according to local conditions (such as wind distortion) is controlled from computers on site. The signals, transmitted at 60 kHz, also provide a national frequency standard. The effective radiated power is 15 kW

National Hamfest

Francis Bell

Francis talking with a member of the Worthing Amateur Radio Club

I thought this year's National Hamfest based in Newark, Nottinghamshire was an outstanding success. This was the second year of this two day event which was held on the Newark showground, it seems to have taken over from the pervious Leicester radio rally at Donnington which GEO attended for several years. The National Hamfest was organised by the Lincoln Short Wave Radio Club in association with the Radio Society of Great Britain (RSGB)

I think everybody who attended last year's event was impressed with the organisation, the number of trade and special interest groups who had stands, not to mention the number of the general public who attended.

This year was even better. I judged there to be more stands inside the exhibition hall plus other traders and sales stands just outside the exhibition hall. There were marquees for information and a meeting point for administration. There were mobile exhibition trailers, for example the RSGB's GB4FUN mobile station. The whole event was well located with easy car parking. It was only on the second day that I realised that in addition to cars with individual groups of the public attending there were organised coach visits to the event, presumably organised by their own radio clubs.

GEO was allocated a stand in the special interests area within the main exhibition hall. We were very happy with this as it was close to where we had been last year. The only complication was the cable run from the outside where we had our EUMETCast receiving dish linking our stand which was well within the exhibition area: 'Health and Safety' dictated a safe route for the cable. Accordingly we had brought a 3m steel pole which we clamped to our stand and ran the cable from the pole tip to the outer wall of the exhibition hall, thence to the dish. We had some problems with aligning the dish but these were later resolved.

The photographs show our GEO stand in the exhibition area. The display boards were intended to give a general perspective of GEO's activities and interest areas. Additionally there was available literature from EUMETSAT plus our own general guide to home weather satellite reception. I had written a one page summary relating to APT, EUMETCast and Envi-Ham reception which was printed on the back of our blue GEO flier. Those visitors to our stand who expressed particular interest in personal live satellite reception were given one of these guides.

In addition to literature we had on display computer pre-recorded ENVISAT images, NOAA APT images and almost live EUMETCast images with appropriate animations.

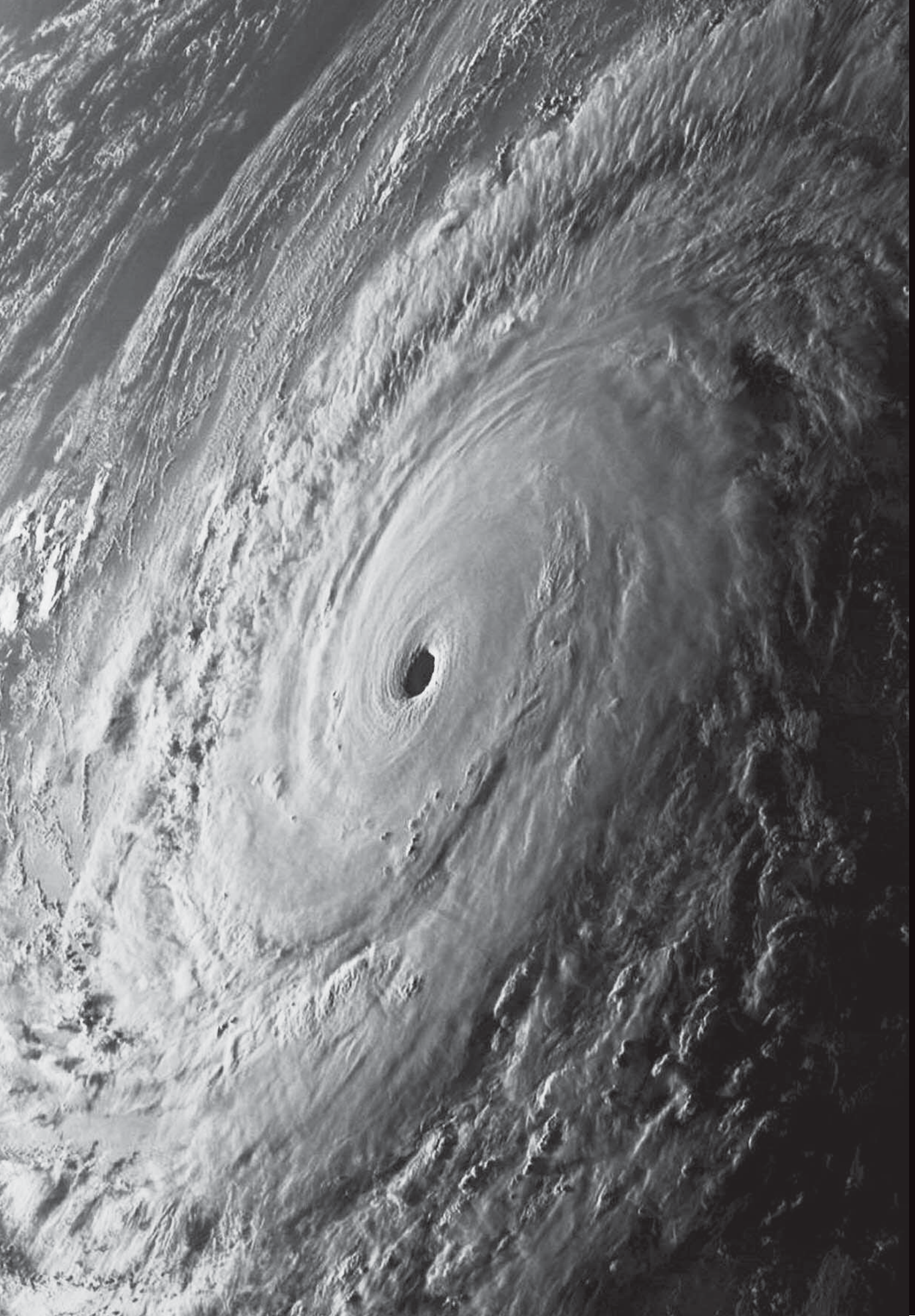
The displayed ENVISAT images generated several quite specific questions from a number of visitor to our stand relating to the ground resolution possible with this system. My response was to give an almost standard answer: 'The MERIS instrument will give a 300m ground resolution '. I'm not sure whether this was convincing or accurate but I believed what I was saying.

GEO stand with David Anderson

Other particular enquiries came separately from representatives / staff from Salford and Nottingham universities, each wanted satellite reception for research and student based projects. In both cases they left our stand saturated with information and an invitation to join GEO.

Because the two days at the Hamfest were so busy I find it a little difficult to quote the numbers who visited our stand, perhaps a thousand visitors, of whom a few hundred stopped and took an interest. An encouraging number of visitors joined GEO on the spot and we also took renewals from members who had joined last year.

My congratulations to the organisers of the Hamfest and particular thanks to David Anderson our GEO Membership Secretary who was supportively there on both days.



GEO Shop

Manager: Clive Finnis
email: tech@geo-web.org.uk
FAX: +44 (0) 1202 893 323

The 'Pager-Hardened' R2ZX

APT Weather Satellite Receiver

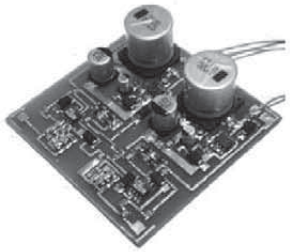
This upgraded version of the German-built R2FX receiver has been developed specially for the UK market and is available solely from the GEO Shop. If you are in an area suffering from pager interference on the NOAA-18 frequency of 137.91 MHz, this receiver should be the answer to your problems - see the R2ZX review in GEO Quarterly No 14.

UK member's price - 210.00 UK non-member's price - £224.00

We still stock the **original R2FX** receiver which has proved itself to be a top-quality receiver throughout Europe and the world at large. Members in the UK find that the R2FX gives perfect reception of NOAAs 12-17, and in favourable locations (pager-free) of NOAA-18 also.

UK member's price - £180.00 UK non-member's price - £194.00

John Silver's Lightning Radar Board



This is a DIY kit for constructing the circuit boards needed to develop your own system to detect and track thunderstorms in your vicinity, using a computer and readily available free software. Full instructions (which appeared in an article in GEO Quarterly 17) are included.

UK members price - £55.00
UK non-members price - £65.00

The Bias-Tee allows a mast head preamplifier to be used with the 'Antenna 2' input of an R2FX or R2ZX. Only the 'Antenna 1' input normally feeds power to a preamp. The Bias-Tee now allows you to power twin preamps and maintain the receiver's Antenna Diversity feature.

UK members price - £20.00
UK non-members price - £24.00

John Silver's APT preamplifier was featured as a constructors' kit in GEO Quarterly No 12 (December 2006). Now we are able to offer this high-linearity LNA to GEO readers, ready built.

UK members price - £35.00
UK non-members price - £40.00

DVB World DVB-S USB2102

This superior 'free-to-air' **USB2** DVB satellite TV and data receiver is recommended for trouble-free *EUMETCast* reception on the Windows Vista platform. This plug-and-play unit comes with comprehensive installation instructions and a CD-ROM of driver software. It is very similar to the Dexatek unit reviewed by David Taylor in GEO Quarterly No 17

UK members price - £60.00
UK non-members price - £70.00

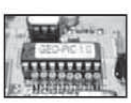
Universal Ku-band Satellite TV LNB 0.20 dB

(or equivalent)

This is a quality high specification Universal LNB for use with the SkyStar 2 PCI card, *Dexatek* and *DVBWorld* USB receivers and digital satellite TV receivers.

UK members price - £12.00
UK non-members price - £18.50

GEO PIC 1.0 for the RX2



Programmed with the new channel frequencies required for NOAA-18.

UK - £7.00
UK non-members price - £7.00

Current Price List

	Members Prices UK	EU	RoW	Non Members UK	EU	RoW
APT Equipment						
R2ZX APT Receiver (no PSU)	210.00	214.00	222.00	224.00	228.00	236.00
R2FX APT Receiver (no PSU)	180.00	184.00	192.00	194.00	198.00	206.00
BNC Lead (0.25 metre)	4.75	5.50	6.00	6.75	7.50	8.00
UK Power Supply Unit (12 volt)	8.50	-	-	11.00	-	-
Dartcom High Quality QFH Antenna	269.00	349.00	-	289.00	369.00	-
John Silver Preamplifier (built)	35.00	36.00	37.50	40.00	41.00	42.50
John Silver Lightning Radar Board	55.00	68.00	61.00	65.00	68.00	71.00
Bias Tee	20.00	20.50	21.00	24.00	24.50	25.00
GEO-PIC 1.0	7.00	7.80	8.40	7.00	7.80	8.40
Martelec MSR40 EPROM	10.00	10.75	11.25	10.00	10.75	11.25
EUMETCast Equipment						
DVB-S USB2102 Receiver	60.00	65.00	-	70.00	75.00	-
Telestar 80 cm dish with LNB	69.50	-	-	76.50	-	-
Telestar Ku band universal LNB	12.00	13.50	-	18.50	20.00	-
Technisat Satfinder Alignment Meter	25.00	28.50	-	28.50	31.50	-
Miscellaneous						
GEO Quarterly Back Issues (subject to availability)	3.50	4.20	5.10	n/a	n/a	n/a
GEO Quarterly (PDF issues on CD) Annual compilations 2004-2009 (state years required)	8.00	8.80	9.30	n/a	n/a	n/a
GEO Membership (4 x *GEO Quarterly*)	20.00	24.00	28.00	20.00	24.00	28.00

Payment by direct bank transfer can be arranged. Please email
francis@geo-web.org.uk
for BIC and IBAN bank details

All prices are in £ sterling and include postage and packaging

Ordering and Shipping

We will ship by post, so please allow a few days for items to arrive in Europe and perhaps a few weeks for the Rest of the World.

Orders should be sent to:

GEO Shop,
44 Disraeli Road
Christchurch BH23 3NB
Dorset, England

If you are paying by credit card, you can FAX us your order to:

+44 (0) 1202 893 323

And remember, you can now order through the GEO Website using ***PayPal***.

Not a GEO Member?

GEO can provide most of the items advertised—with the exception of GEO Quarterly back-issues and CDs—to both members and non members. However, non-members cannot benefit from the discounted prices available to members.

Why not join GEO and take advantage of the discounted prices we can offer you as a member?

Subscription Rates (12 months/4 issues of GEO Quarterly) are just £20 (UK), £24 (EU) and £28 (rest of world).

TechniSat SatFinder Antenna Alignment Meter

This sensitive meter is a great help in setting up and aligning the dish for maximum signal. The meter comes with full instructions.

UK members price - £25.00
UK non-member's price - £28.50

Telestar 80 cm dish and Universal 0.2 dB LNB

(or equivalent)

This quality solid steel offset dish, designed for digital and analogue reception, is coated with electrostatic polymer. The bracket has been heat dipped and zinc treated for maximum corrosion protection. Complete with LNB.

UK members price - £69.50
UK non-members price - £76.50

NOAA Satellite Predictions

(Based on Latitude 52°N, Longitude 2°W, UT/GMT)

Compiled by Les Hamilton

NOAA 15 137.62 MHz	NOAA 18 137.9125 MHz	NOAA 19 137.10 MHz
Dec 01 03:55 05:35 15:23 17:03	01:24 03:04 12:57 14:39	01:58 03:39 11:51 13:32
Dec 02 05:11 06:51 14:59 16:39	02:53 04:35 12:47 14:28	01:47 03:28 11:41 13:21
Dec 03 04:47 06:27 14:35 16:14	02:43 04:24 12:36 14:17	01:37 03:18 11:31 13:11
Dec 04 04:23 06:03 14:12 15:50	02:32 04:13 12:25 14:06	01:26 03:07 11:21 13:00
Dec 05 03:59 05:39 15:26 17:07	02:21 04:02 12:15 13:55	01:16 02:57 11:11 12:50
Dec 06 05:15 06:55 15:03 16:43	02:11 03:52 12:04 13:44	01:06 02:46 12:39 14:22
Dec 07 04:51 06:31 14:39 16:18	02:00 03:41 11:54 13:34	00:55 02:36 12:29 14:11
Dec 08 04:27 06:07 14:16 15:54	01:49 03:30 11:44 13:23	02:25 04:07 12:19 14:00
Dec 09 04:03 05:43 15:30 17:11	01:39 03:19 11:33 13:12	02:15 03:56 12:08 13:50
Dec 10 05:19 06:59 15:06 16:46	01:28 03:09 13:02 14:44	02:05 03:46 11:58 13:39
Dec 11 04:54 06:35 14:43 16:22	02:58 04:39 12:51 14:33	01:54 03:35 11:48 13:28
Dec 12 04:30 06:10 14:19 15:58	02:47 04:28 12:40 14:22	01:44 03:25 11:38 13:18
Dec 13 04:07 05:46 15:34 17:15	02:36 04:17 12:30 14:11	01:33 03:14 11:28 13:07
Dec 14 05:22 07:02 15:10 16:50	02:26 04:07 12:19 14:00	01:23 03:04 11:17 12:57
Dec 15 04:58 06:38 14:46 16:26	02:15 03:56 12:09 13:49	01:13 02:53 11:07 12:46
Dec 16 04:34 06:14 14:23 16:01	02:04 03:45 11:58 13:38	01:02 02:43 12:36 14:18
Dec 17 04:10 05:50 15:37 17:19	01:54 03:35 11:48 13:27	02:33 04:14 12:26 14:08
Dec 18 05:26 07:06 15:14 16:54	01:43 03:24 11:37 13:17	02:22 04:03 12:15 13:57
Dec 19 05:02 06:42 14:50 16:29	01:32 03:13 13:06 14:48	02:12 03:53 12:05 13:46
Dec 20 04:38 06:18 14:26 16:05	03:02 04:43 12:55 14:37	02:01 03:42 11:55 13:36
Dec 21 04:14 05:54 15:41 17:22	02:52 04:33 12:45 14:26	01:51 03:32 11:45 13:25
Dec 22 05:30 07:10 15:17 16:58	02:41 04:22 12:34 14:15	01:40 03:21 11:34 13:15
Dec 23 05:06 06:46 14:54 16:33	02:30 04:11 12:24 14:04	01:30 03:11 11:24 13:04
Dec 24 04:42 06:22 14:30 16:09	02:19 04:00 12:13 13:53	01:20 03:01 11:14 12:54
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EUMETCast On-Line Registration Guide

If you require to register as a first-time user for any of the free *EUMETCast* data streams such as MSG, NOAA AVHRR, Metop etc., or need to renew an existing subscription, this **must be done on-line**.

GEO has produced a step-by-step guide to the entire process at

http://www.geo-web.org.uk/eumreg.html

This guide also contains a direct link to the official *EUMETCast* on-line **registration form**, which can otherwise prove somewhat tricky to locate.

GEO Helplines

Douglas Deans
Dunblane, Perthshire, SCOTLAND
All aspects of weather satellites from APT, HRPT to Meteosat-8 DVB/EUMETCast systems.

- telephone:(01786) 82 28 28
- e-mail: dsdeans@bt.com

John Tellick
Surbiton, Surrey, ENGLAND
Meteosat-8 advice - registering for the various MSG services, hardware and software installation and troubleshooting. John will also field general queries about any aspect of receiving weather satellite transmissions.

- telephone: (0208) 390 3315
- e-mail: info@geo-web.org.uk

Geoff Morris GW3ATZ
Shotton, Flintshire, NE WALES
Geoff has lots of experience with aerial, co-ax,connectors, mounting hardware etc. and has also done a lot of work with the orbiting satellites. Geoff has been a EUMETCast Meteosat-8 user for some time and is familiar with David Taylor's MSG software; he should be able to share his experiences with newcomers to this branch of the hobby.

- Tel: (01244) 818252
- e-mail: stevens312@btinternet.com

Mike Stevens
Portland, Dorset, England.
Advice offered on EUMETCast (MSG and Metop) and APT.

- email: mikeg4cfz@mypostoffice.co.uk

Guy Martin G8NFU
Biggin Hill NW Kent, ENGLAND
Guy is prepared to advise anyone who wishing to receive MSG/Metop using Windows 2000 or XP. Can also help with networking and ADSL router setup..

- gmartin@electroweb.co.uk

Hector Cintron
San Juan, Puerto Rico, USA
Hector is prepared to field enquiries on HRPT, APT, EMWIN and NOAAPORT

- Phone: 787-774-8657
- e-mail: n1tkk@hwic.net

Email contact can of course be made at any time, but we would ask you to respect privacy by restritricting telephone contact to the period 7.00-9.00 pm in the evenings.

Internet News/ Discussion Groups

There are a numerous Internet-based discussion groups available to weather satellite enthusiasts. You can join any of these by sending an e-mail to the appropriate address, with a request to subscribe. Indeed, a blank e-mail containing the word 'subscribe' in its Subject line is all that is required. Some of the more useful groups and their contact addresses are listed below.

APT Decoder
This is a group where users of Patrik Tast's APTDecoder can share information and problems.

http://tech.groups.yahoo.com/group/APTDecoder/

GEO-Subscribers
This is GEO's own group, where members can exchange information and post queries relating to any aspect related to weather satellite reception (hardware, software, antennas etc), Earth observation satellites and any GEO-related matter.

http://tech.groups.yahoo.com/group/GEO-Subscribers/

Satsignal
An end-user self help group for users of David Taylor's Satellite Software Tools (SatSignal, WXtrack, GeoSatSignal, HRPT Reader, GroundMap, MSG Data Manager, AVHRR Manager and the ATOVS Reader).

http://tech.groups.yahoo.com/group/SatSignal/

MSG-1
A forum dedicated to Meteosat Second Generation (MSG), where members share information about the EUMETCast reception hardware and software.

http://tech.groups.yahoo.com/group/MSG-1/

METOP
A forum for users of high-resolution AHRPT data from the MetOp satellite, available via EUMETCast.

http://tech.groups.yahoo.com/group/METOP/

AVHRR
A forum for users who download high-resolution EARS-AVHRR data from the NOAA polar orbiting weather satellites via EUMETCast.

http://tech.groups.yahoo.com/group/AVHRR/

ATOVS
A Group for discussions about using ATVOS data. Data from the whole world is available from CLASS (www.class.noaa.gov) and for an extended Europe, via EUMETCast.

http://tech.groups.yahoo.com/group/ATOVS/

Weather Satellite Reports
This group provides weekly reports, updates and news on operational aspects of weather satellites.

http://tech.groups.yahoo.com/group/weather-satellite-reports/

WXtoImg
Users of the WXtoImg software package for capturing and imaging NOAA APT can air their problems, discuss its features and ask questions about it.

http://groups.yahoo.com/group/wxtoimg-l/

The Copy Deadline for GEO Quarterly No 28 is Saturday, Oct 30, 2010

The Editor is always delighted to receive articles and images for inclusion in *GEO Quarterly*. These can relate to any aspect of Earth Imaging, especially

- Technical articles concerning relevant hardware and software
- Construction projects
- Weather satellite images
- Reports on weather phenomena
- Descriptions of readers' satellite imaging stations
- Activities from overseas readers
- Letters to the Editor
- Problems and Queries for our experts to answer

Contributions should of course be original and, where possible, should be submitted to the editor in electronic format (floppy disc, e-mail attachment, CD, DVD). But of course we will also accept handwritten and typed copy should the need arise.

Please note, however, that **major articles** which contain large numbers of satellite images, photographs or other illustrations should be submitted **as early as possible**, so that they can be prepared and made up into pages in time for publication.

Images and Diagrams
Images can be accepted in any of the major bitmap formats: **JPG, BMP, GIF, TIFF** etc. Images in both monochrome and colour are welcomed. Line drawings and diagrams are preferred in Windows metafile and postscript formats. We can also scan original photographs, negatives and slides.

Gridding, Overlays and Captions
Please note that readers' satellite images should be provided **without** added grid lines, country outlines or captions **unless** these are considered essential for illustrative purposes within an article.

If your article submission contains embedded images and diagrams, please note that you must **also submit the individual, original images**, in one of the formats described above: these are essential for page make-up purposes.

Submission of Copy
All materials for publication should be sent to the editor,

Peter Green
'Hollowtree'
Eggesford, Devon EX18 7QX, England.
Tel: 01769 580 700

The most efficient way to do this is as **email attachments** to the following address

geoeditor@geo-web.org.uk

And finally . . .
if you do have material ready for the next issue of GEO Quarterly, please submit it **as soon as it is ready**—do not wait till the deadline above: this will simply create an editorial log-jam and delay publication.

Group for Earth Observation

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- UK residents may pay by means of a **personal cheque** or **Postal Order** made payable to '*Group for Earth Observation*'
- Payment by **direct bank transfer** can be arranged. Please email francis@geo-web.org.uk for BIC and IBAN details.

Name (please PRINT clearly)

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Declaration

I wish to join GEO, the Group for Earth Observation, for a period of one year.

I sign below to confirm that I have no objection to my membership details being held on a computer database and understand that these details will be used exclusively for internal GEO administration purposes.

Signature

Date

Your subscription is valid for one year from your date of application and entitles you to all the privileges of membership of the Group for Earth Observation, including four issues of GEO Quarterly. Please note that your subscription will commence with the issue of GEO Quarterly that is current at the time of your application. Back issues, where available, may be ordered from the GEO Shop.

Please send your completed form to:
David Anderson (GEO subs),
35 Sycamore Road,
East Leake
Loughborough LE12 6PP, UK

GEO Subscriptions
35 Sycamore Road.
East Leake.
Loughborough LE12 6PP
England, UK.

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The PADAT137 Again

Ruud Jansen PA0ROJ – translation by Chris van Lint

I received many enquiries regarding the availability of the hard to get parts for this aerial, following my articles in "De Kunstmaan" and GEO Quarterly no. 9 and 10.

Since the various sizes and materials used are critical for the correct functioning of the aerial, there are few alternatives which use other materials or sizes. By way of example I would refer you to our aerial measurement comparisons in Zoetermeer (GEO Quarterly no.16).

Due to transport difficulties, I had removed the head and strip elements from my aerial mast. Once I arrived at the measurement site, the aerial was quickly re-assembled, positioned, followed by waiting on the arrival of a satellite. Fully confident in the performance of my aerial, I awaited further developments. However during the pass it became obvious that my aerial performed poorly, compared to the other aerials to be measured. In fact, I had to conclude that my aerial was completely useless for receiving weather satellite signals. After accepting that fact, I removed the aerial from its mount and checked all cables and connections. Everything appeared to be fine! The only possibility left, were problems of a mechanical nature. When I checked said mechanical components I discovered that in my hurry I had made a mistake during the re-assembly of the head and the vertical strips to the mast. This meant that the large loop was 1cm shorter and the small loop was 1 cm longer, i.e. a difference of only plus/minus 10mm. Once the head was re-assembled correctly, my PADAT 137 functioned as expected.

Back to the aerial itself

In order to facilitate home construction, I have developed a new head. Instead of a piece of solid POM material, I now use a piece of thick walled POM pipe. Whilst the catalogue claims this material has an inside diameter of 40mm and an outside diameter of 60mm, the actual measurements of the pipe as delivered are 38mm and 62mm. Although the external diameter is now 60mm instead of 70mm, the head is sufficiently sturdy to permit mounting of the horizontal rod pieces. There is no change to the length of the rods. Only the position of the holes in the rod pieces to allow fixing to the head and the solder lugs require change (fig. 1 and 2).

The mounting of the head to the mast also requires modification. If the 32mm (diameter) PVC tube is used an adapter to accommodate the 38mm inside head diameter has to be constructed. I solved this problem by machining the bottom of the head with a lathe to 40mm, which permits the use of readily available PVC adapters from your local DIY hardware store (Wickes etc). The piece of printed circuit board is also no longer required. In this design the coaxial cable is soldered directly to the solder lugs (fig. 3). A profile of this aerial is shown in fig. 4 and 5.

Some practical tips

The drilling of the holes in the top of the mast must be carried out with great accuracy. If the horizontal rod pieces or not square in relation to one another, the shape of the cylinder will change, resulting in a direct and very negative effect on the radiation pattern. In this article I will explain a method which will facilitate the drilling of holes at right angles.

The mast

Before drilling the 4 x 12mm holes in the mast, we measure the exact location of the where the holes are to be positioned on the mast. (fig. 5) . A handy aid to do this can be easily constructed at home. Take a 32mm socket and saw off just less than half, which leaves a ring which can be slid over the tube. Now position the non-sawn end exactly on the first marked drilling position. Using a blunt pencil, draw a line around the circumference of the pipe (fig. 6). Slide the ring exactly 40mm on to the pipe and draw a second line.

Next we place a so-called V-block on the drill platform and a small long drill (3-5 mm or better a small centre bit) bit is placed in the drill chuck. The block is shifted in such a way that when the drill bit is lowered, it is positioned exactly in the centre of the V-block (fig. 7).

We now fix the V-block onto the drill platform with a G-clamp and after placing the mast in the V-block a hole is drilled through the pipe in the previously marked spot. The small bit is now replaced with a 12 mm bit and is slowly drilled through the pipe. The pipe is now shifted 40 mm for the second hole. This hole must be drilled at right angles (90°angle) relative to the first hole. The 90° rotation is achieved as follows: The piece of rod which will later be mounted in this hole is placed in the already drilled 12 mm hole. If we now ensure that by rotating this piece of rod it is in a horizontal position, we only need to ensure that when drilling is commenced (first small, followed by large), the drill is positioned on the second ring we have drawn on the pipe. We can now also drill the two 4 mm holes on both rings, which are required to fix the pieces of 12 mm rod in the pipe.

The choice as to whether or not to use the two reinforcement sleeves to pass the rod through is left up to you. Using the sleeves results in added strength, but is a little difficult to accomplish mechanically. If sleeves are used, a 12 mm hole has to be drilled first into the sleeve, following the completion of the mast holes, however only on one side. The sleeve is now slid over the mast and the hole which has already been drilled in the sleeve is positioned exactly over the hole in the mast. This can be checked, by sliding a piece of scrap rod through the sleeve into the mast. The rod is now removed and a 12 mm hole is drilled through the sleeve and mast. Repeat this step for the other sleeve (fig. 8).

V-block?

I am aware, that not everybody necessarily has a V-block lying around on the shelf, but there is a good and cheap alternative available, which you can construct yourself. Go to your local hardware store or metal shop and buy a piece of scrap aluminium U profile. Mark the middle of the profile on the back and drill a 3 mm hole in this spot. When we turn this piece of U profile around we will see a gutter with a hole in the bottom exactly in the middle. Since the U profiles available generally have almost the same wall thickness, both left and right, we now have made a cheap construction aid. The procedure as above with the V-block is described in fig. 9 and 10. The result of a practical exercise can be in fig. 11.

The head

The drilling of the 12 mm holes proceeds as described above. We do however have the disadvantage that when the 12 mm holes are drilled in the head, the pipe will be slightly squeezed. This means that the rod pieces are not horizontally positioned. Therefore use only a small amount of pressure when drilling. Actually (if possible) a special drill bit should really be used, which has been ground in such a way to make it suitable for plastic. (different cutting edge angle compared to a normal steel bit). In response to requests by a number of members of our group I found a shop prepared to produce a complete head, which satisfies the most stringent requirements. (fig. 12).

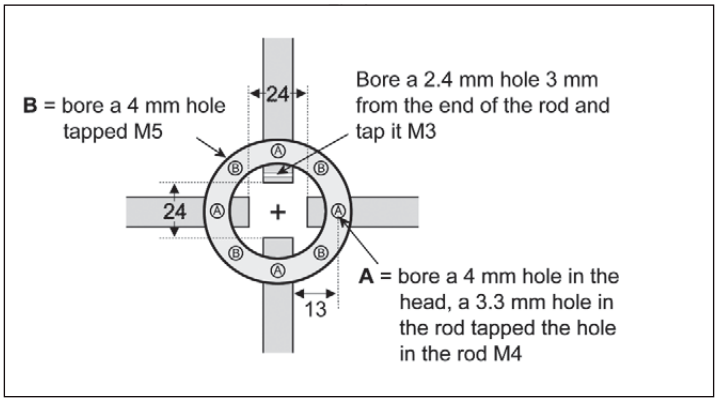


Fig 1

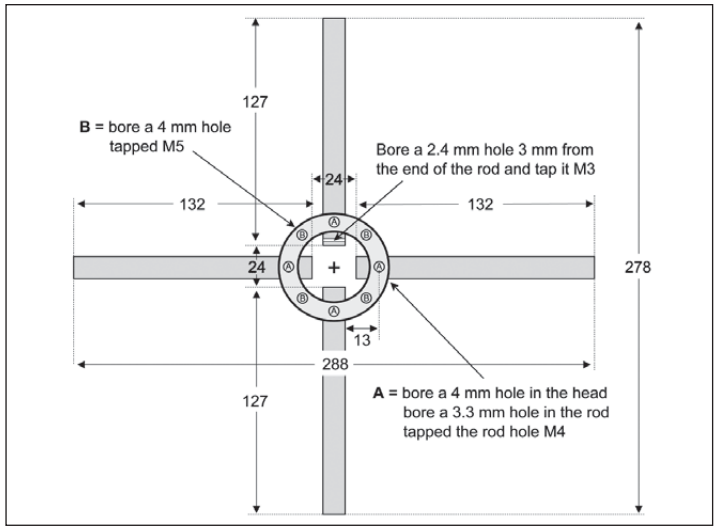


Fig 2

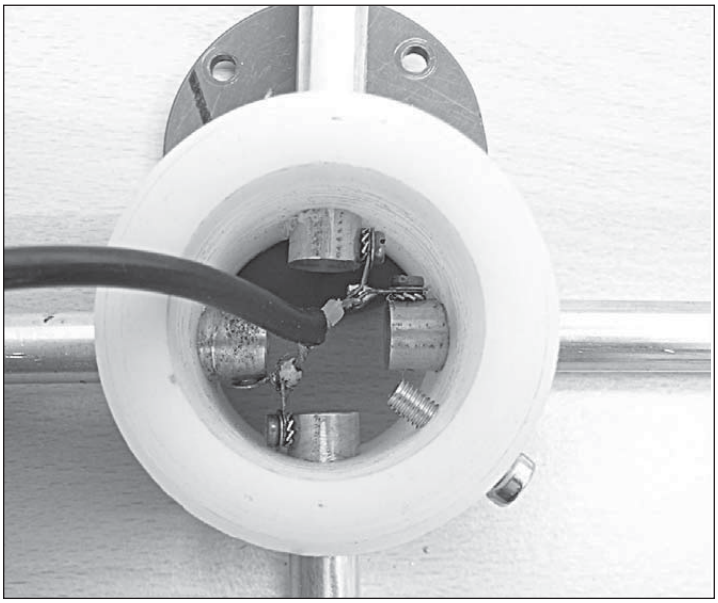


Fig 3 In this design the coaxial cable is soldered directly to the solder lugs

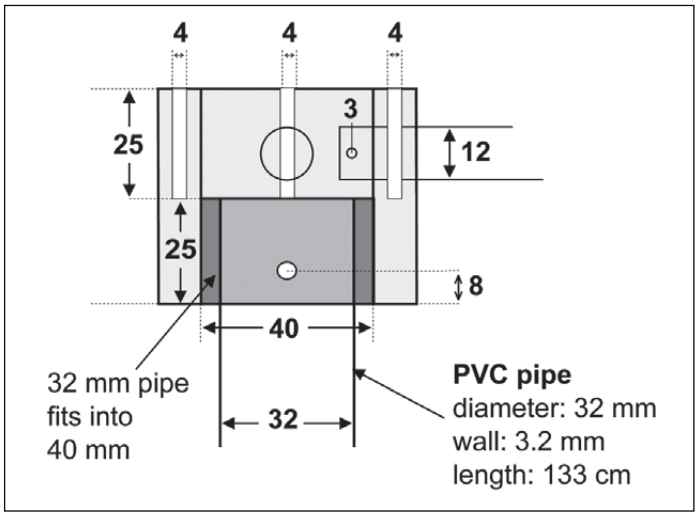


Fig 4 Aerial profile

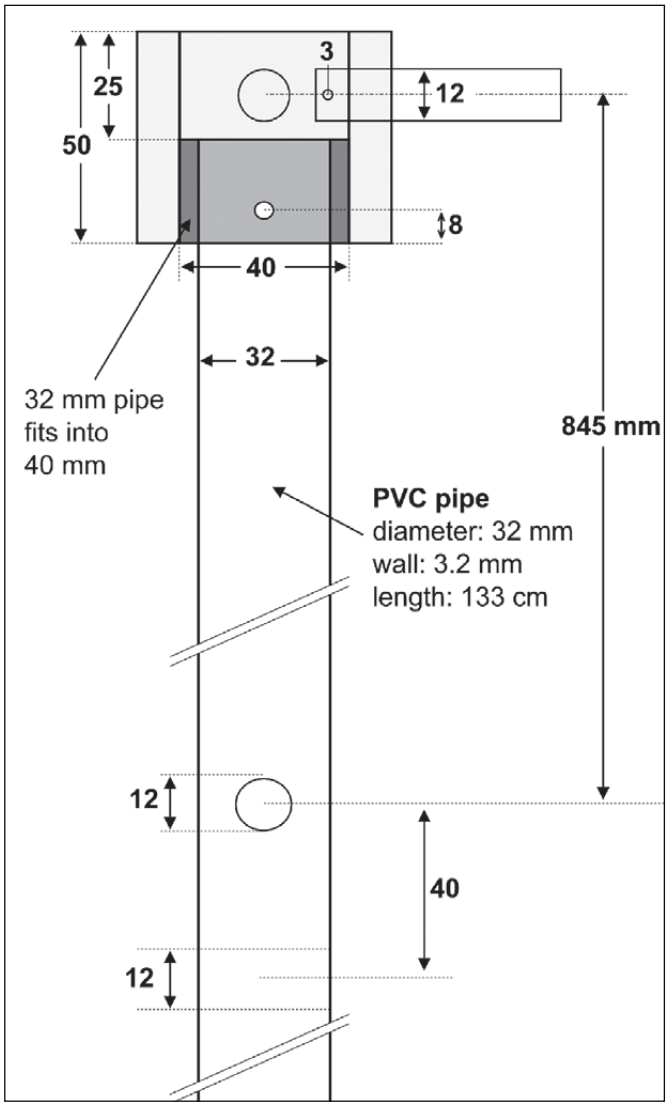


Fig 5 Aerial profile

Note: The 12 mm holes on the side, as well as all other holes are produced on a special computer guided CNC milling machine. The required thread is also included.

Points to watch

- About the seal between head and lid. Rings which are perfectly suited for use as a seal are available at the local DIY store. A self produced packing of non hardening kit may also be used.

- Protection of the coaxial cable connections, as well as solder connection between the pieces of coax against the elements.

- Protection against corrosion of the mechanical joints – refer to the previous PADAT 137 article.

Tip

When marking the hole position on the mast, maintain a distance of about 840 mm to 880 mm, measured from the top of the mast (exactly 40 mm between both holes). When the

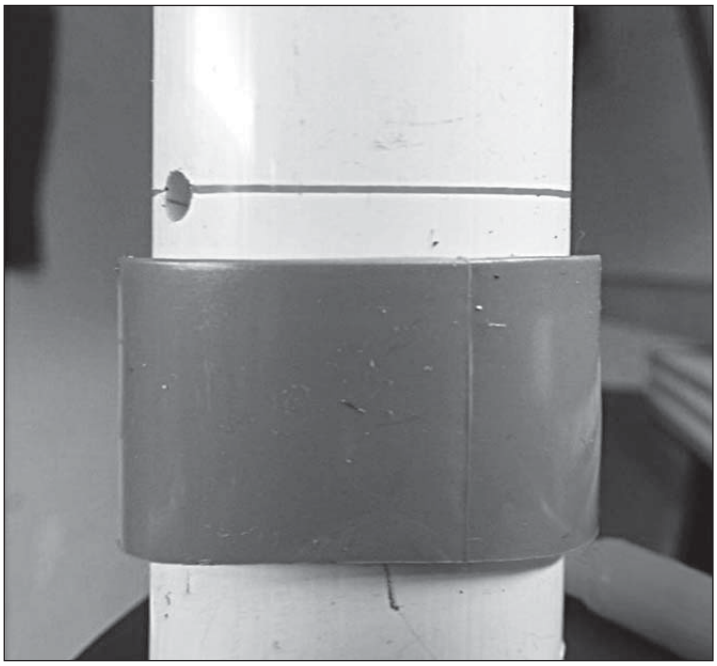


Fig 6 You must measure the exact location of the holes

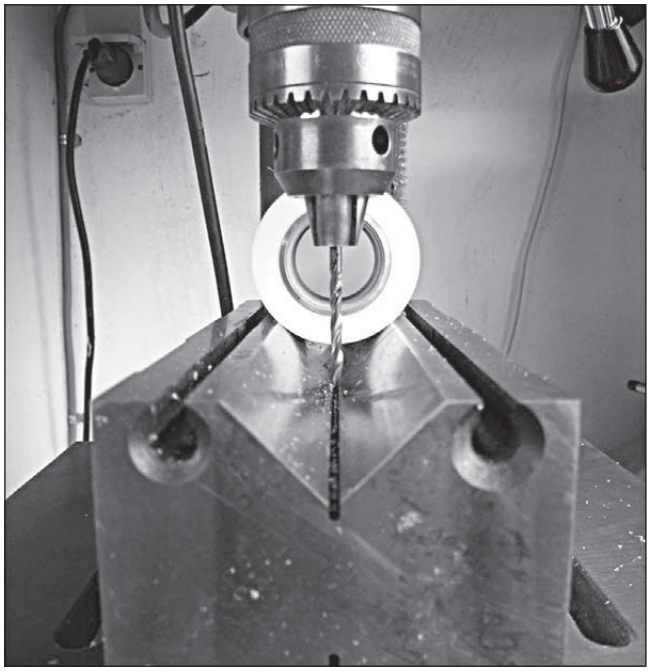


Fig 7

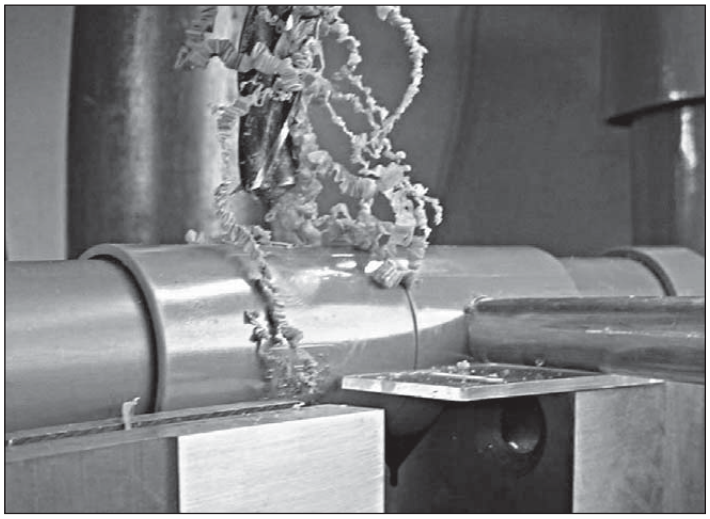


Fig 8

Fig 9

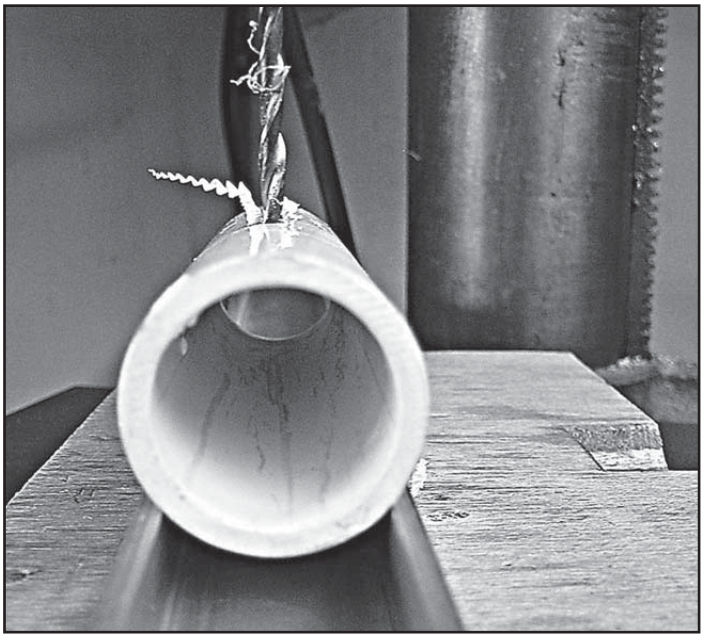


Fig 10

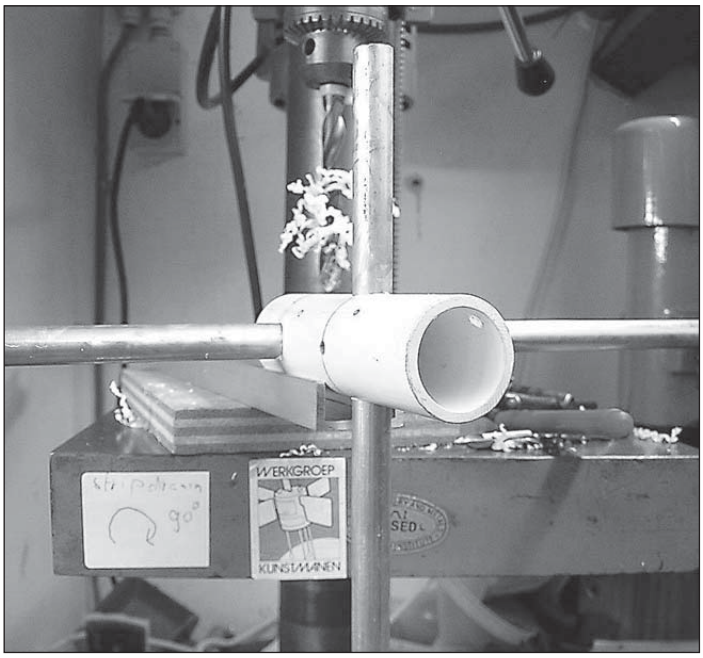


Fig 11

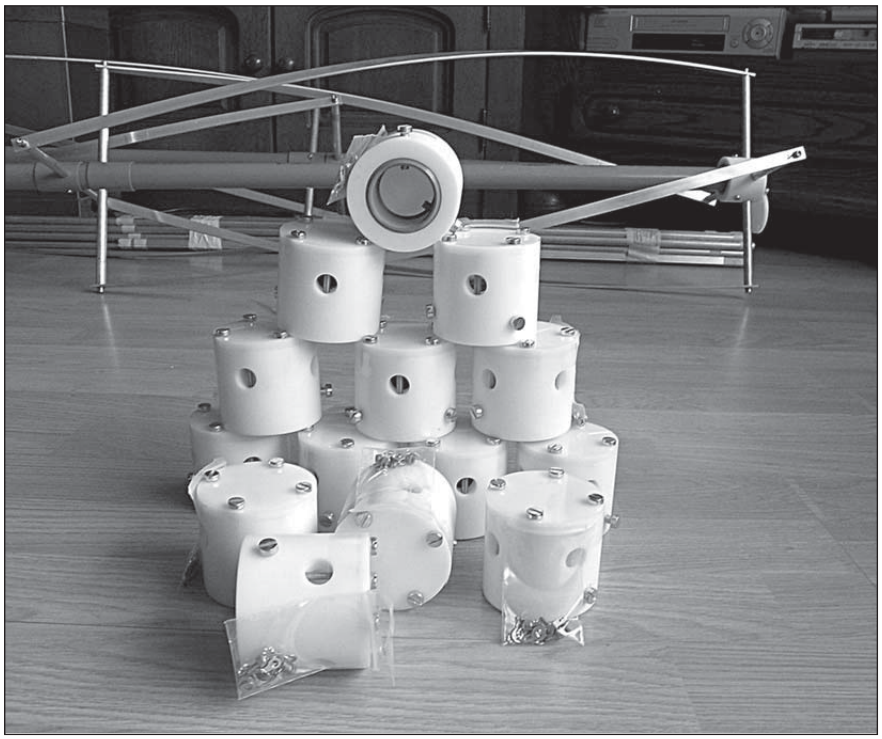


Fig 12 The completed head

holes in the mast have been drilled, the mast can be pushed into the head and the distance is measured as shown in fig. 5. This should be 845 mm between both holes (middle point to middle point) for the topmost hole in the mast. Trim the mast, to ensure that the dimensions in fig. 5 are achieved. It is better to have to trim the mast a bit, rather than having to work with sleeves.

Conclusion

Providing one has access to the required materials and tools and construction is carried out with the necessary accuracy one is quite capable of producing this aerial, which compares favourably with other very expensive professional aerials, but is much cheaper.

Impedance matching with inductor and capacitor

By way of (for the time being) addition to my articles relating to the PADAT 137, I would like to refer to the impedance matching. We know that this aerial exhibits a low impedance when the dimensions and materials I have used are adhered to, which needs to be shifted to 50 Ohm. Although matching with pieces of coax cable of differing impedance or through

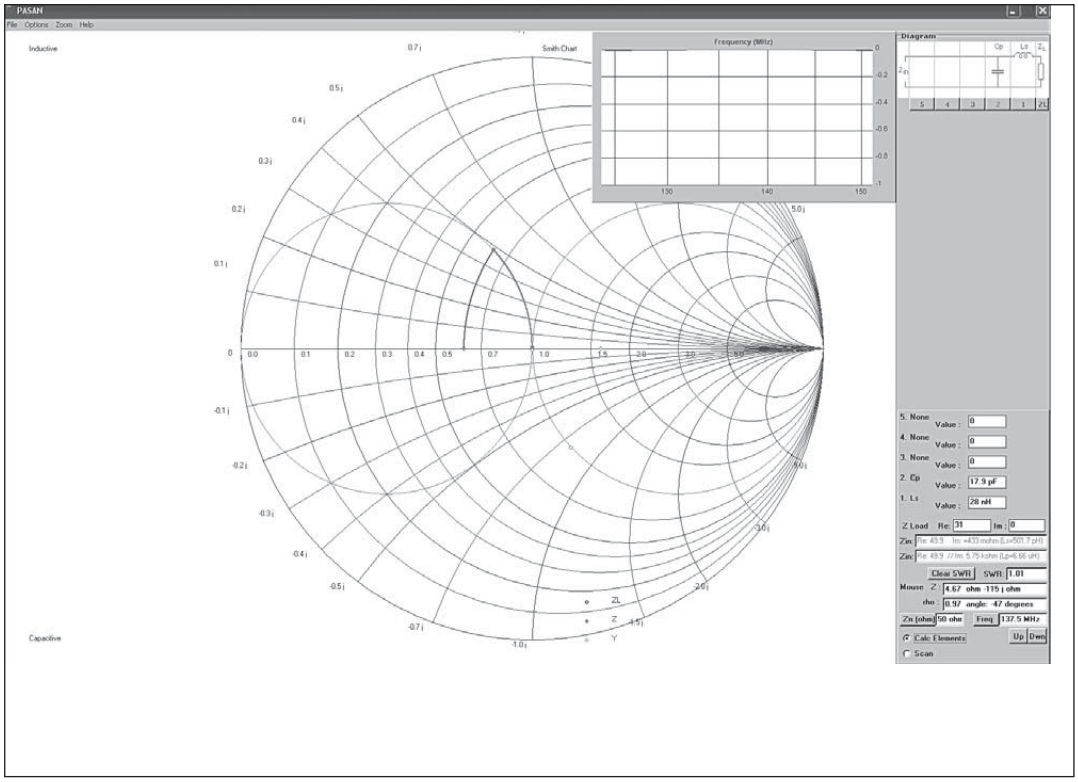


Fig 13

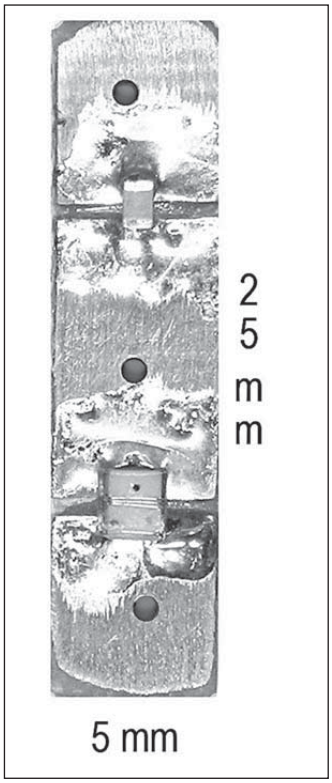


Fig 14

soldering in a series capacitor is a suitable solution, I have looked for a method which will avoid having to mess about with soldered coax cable joints. Experiments with the PASAN programme suggest that a circuit consisting of a series inductor and a parallel capacitor, providing we use lossless components would perform at least as good.

Refer to fig.13 for the LC solution. When using the LC approach, I assumed that both components are lossless. By using SMD inductors and capacitors it was possible to fit the whole circuit on a small single sided pc board strip measuring 25X4 mm (fig. 14).

By removing a thin strip of copper in two places on the pc board, using a very small file or a hack saw or coping saw, three copper islands are formed. Both ends of the pc board strip are soldered to the solder lugs in the aerial head, using as little wire as possible. The inner conductor of the coaxial cable to the receiver is soldered to the middle island and the cable shield of the cable is soldered to the one strip end (fig. 15 and 16).

To facilitate attaching, it will be necessary to drill 3 holes of approximately 0.8 – 1 mm in the strip, through which the wire ends are fed. This methodology ensures at the same

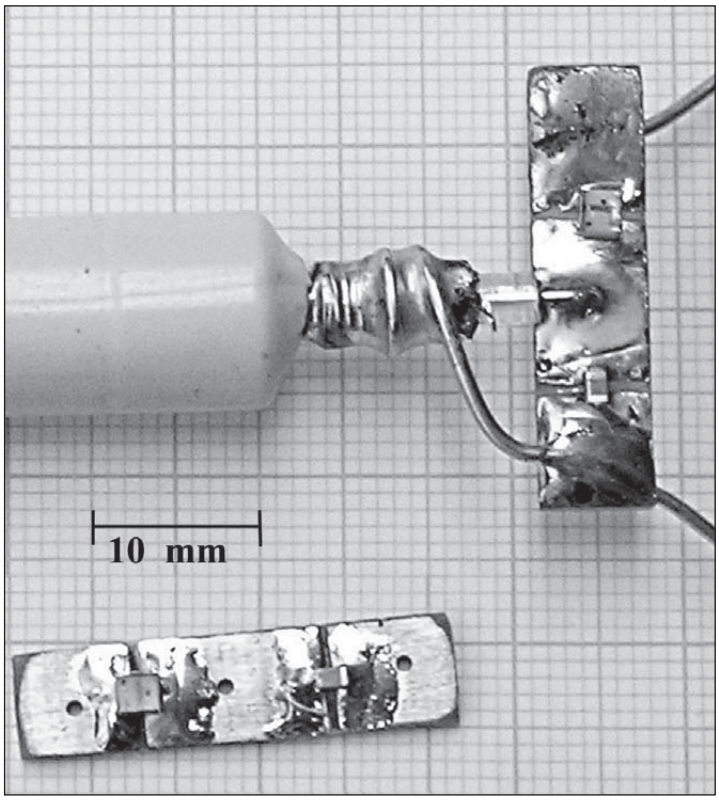


Fig 15

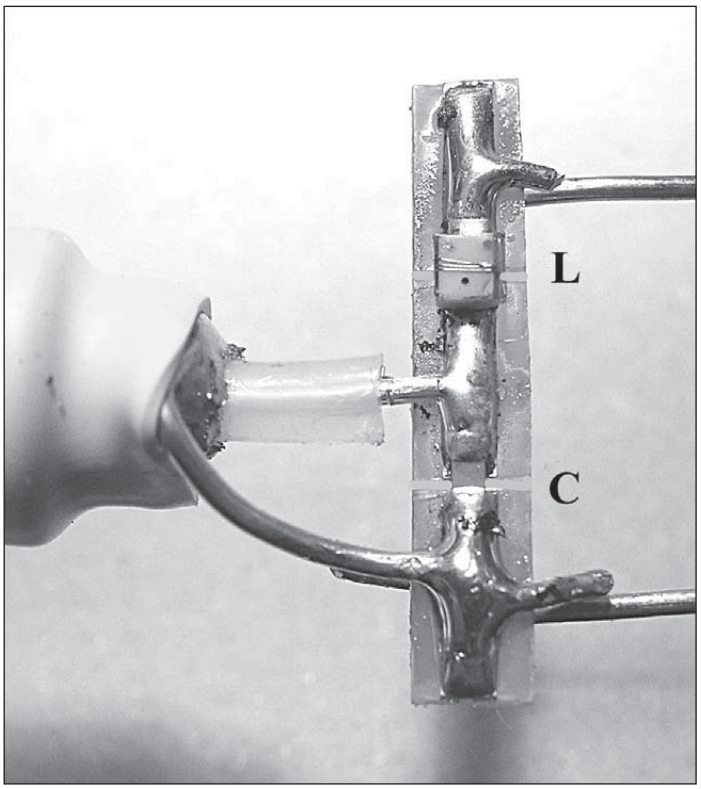


Fig 16

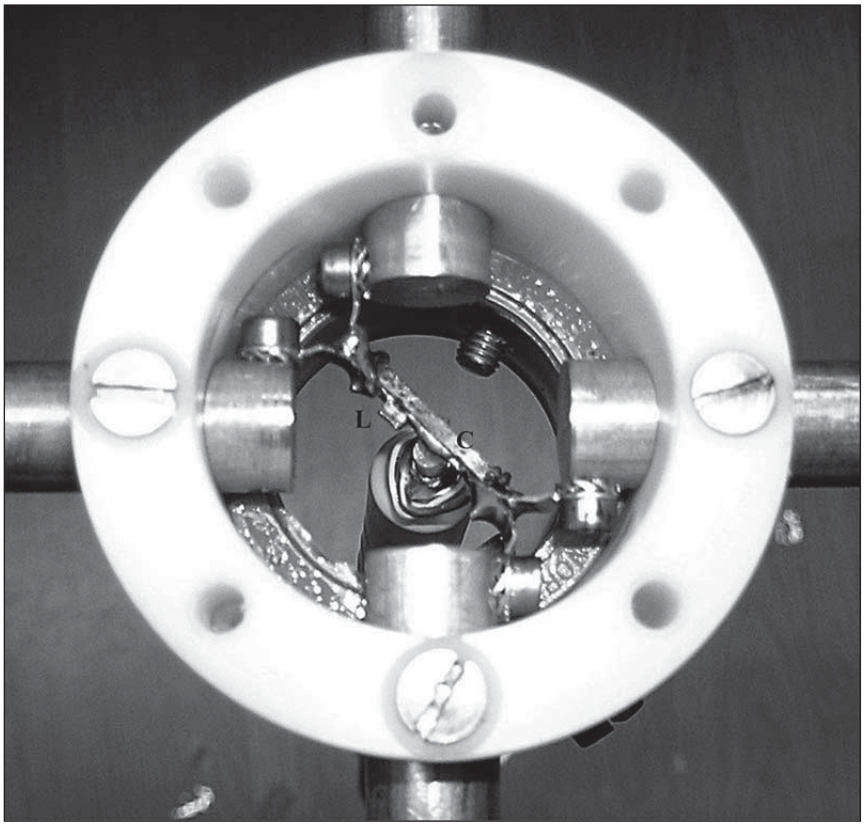


Fig 17

time that the coaxial cable is provided with good strain relief. When everything been mounted and/or soldered into the aerial head (fig. 17) and in order to prevent corrosion, the print, the coaxial cable end and the solder joints can be sprayed with a plastic spray suitable to protect HF circuitry against weathering (Plastik 70, Kontakt Chemie).

In conclusion

After having completed a number of aerials (more then 20) using this method, I have often wondered why I did not think of this before. I guess it was due to the fact that I only recently came to have access to SMD inductors suitable for this application. The only disadvantage of using this matching method is the size of both SMD components. A steady hand, a fine tipped soldering iron and a decent magnifying glass (I use a Leitz stereo microscope for watch makers) is essential for this method. Luckily the SMD components are usually bought in lots of 10. It is my experience that I generally need two or three inductors and capacitors for one pc board strip – one to solder into the circuit and two to allow for the ones which are ejected by my tweezers into the workshop. You will never find these escapees again. It is also helpful to fix the pc strip onto the bench with some double sided adhesive tape on the back. At least it will not move.

Note I must order a minimum order of 10 heads.

Please note that the above article was published earlier in the group journal of the “Werkgroep Kunstmanen”, titled “De Kunstmaan”.

Also now on my website in Dutch

http://www.jendela.nl/Padat137kop_LC_compleet.html.

For other relevant articles relating to weather satellites, please refer to:

www.kunstmanen.net

The Quarterly Question

The Quarterly Question in GEO Q 27 related to an image I had received from the Earth Observation satellite ENVISAT. This satellite carries many sophisticated instruments, the image was created using the Medium Resolution Infrared Spectrometer (MERIS). At best the MERIS instrument will give a ground resolution of about 300m in many spectral bands. A subset of the complete imaging program is disseminated via the Envi-Ham project which is how I received that particular image. When I recorded this image I was on a sharp learning curve about ENVISAT reception and image processing.

The image in question shows the Cape Verde Islands. It just happened to catch my eye as one of a number of images I received one day. Although the published image is in black and white I did subsequently practice colour processing and using other facilities offered by the 'ESA Beam' software to enhance the image. For example with some processing I was able to reveal some interesting patterns in the sea which were presumably created by local currents and marine life.

I thought the question was quite straightforward as there are only a few island groups in the Atlantic: such as The Bahamas, The Azores, Canary Islands, Madeira but the answer I was looking for was Cape Verde Islands.

Much of the history and background to the Cape Verde Islands can be found on the Internet. However, it was interesting to note that the islands were newsworthy in early October 2010 because a local thunder storm close to the islands which developed into a hurricane and then, as is often the case, it swept westward across the Atlantic.

I received the follow competition entries, all correct:-

Nick Tebneff VK5NT Willunga South Australia
Mike Bragg Timaru New Zealand
Herman ten Grotenhuis Neterlands
David Rennolds G0BXS UK
Peter Shulver Portsmouth UK
Chris Warrington UK
Jack Willford G0TGP UK
Elmar Bogels Peterborough UK
Dave Lane G3VOM also AMSAT-UK
Adrian Chamberlain G4ROA Coventry UK

The fact that the Cape Verde Islands also featured in the same Quarterly on page 16 was a coincidence, but well spotted by several members who included this item of information in their answer. I have not yet picked a winner for the completion but I will do this shortly. The prize to be something marine from the Comoros Islands.

The Quarterly Question for this issue:-

Again this question stems from an ENVISAT image I received.

The question is:- Name the river shown in the images opposite?

One of the reasons for my own curiosity in this case was the detail of the river which could be seen in the image I received at home using the Envi-Ham project. Another reason was the fact that the river in question is a political boundary between two countries. Political boundaries do not often show up on satellite images unless they are coastal features. An interesting exception to this was an image I received from ENVISAT showing the middle east. This image was published and is shown on page 37 of GEO 26. The boundaries between Egypt, Israel and Palestine can be seen. Citrus groves in Israel with adjacent desert in Egypt can be seen as a boundary and the lack of vegetation in Palestine shows up compared with Israel. I know some part of the boundary between the USA and Canada can be distinguished as a result of different agricultural practices but I do not have a personal image. Please can somebody submit an image to the editor showing this boundary?

A river as a political boundary can cause disputes because rivers can change their course and the political claims caused by changing or new islands generated by meanders can be dynamic. In the 1960s Russia and China were almost at war over such a territorial dispute in some remote desolate part of central Asia.

There are two clues to help with an answer to this Quarterly Question.
One clue is that one of the two countries bounded by the river in question is Mozambique. The second clue is present in the Meteosat 7 image showing a part of the Indian Ocean and some adjacent countries. The line of the river is just shown, if you can spot it! It is also interesting to note the difference in resolution between the Meteosat 7 image and the one from ENVISAT.

Answers to Francis Bell by email francis@geo-web.org.uk or by letter -see page one for contact details, copy deadline for GEO Quarterly 29. And yes the winner picked at random will receive some marine related goodie from the Comoros Islands. We depart just after Christmas 2010.

GEO Returns to EUMETSAT HQ Darmstadt in 2011

GEO's first visit to the EUMETSAT HQ in Damstadt was in 2007.

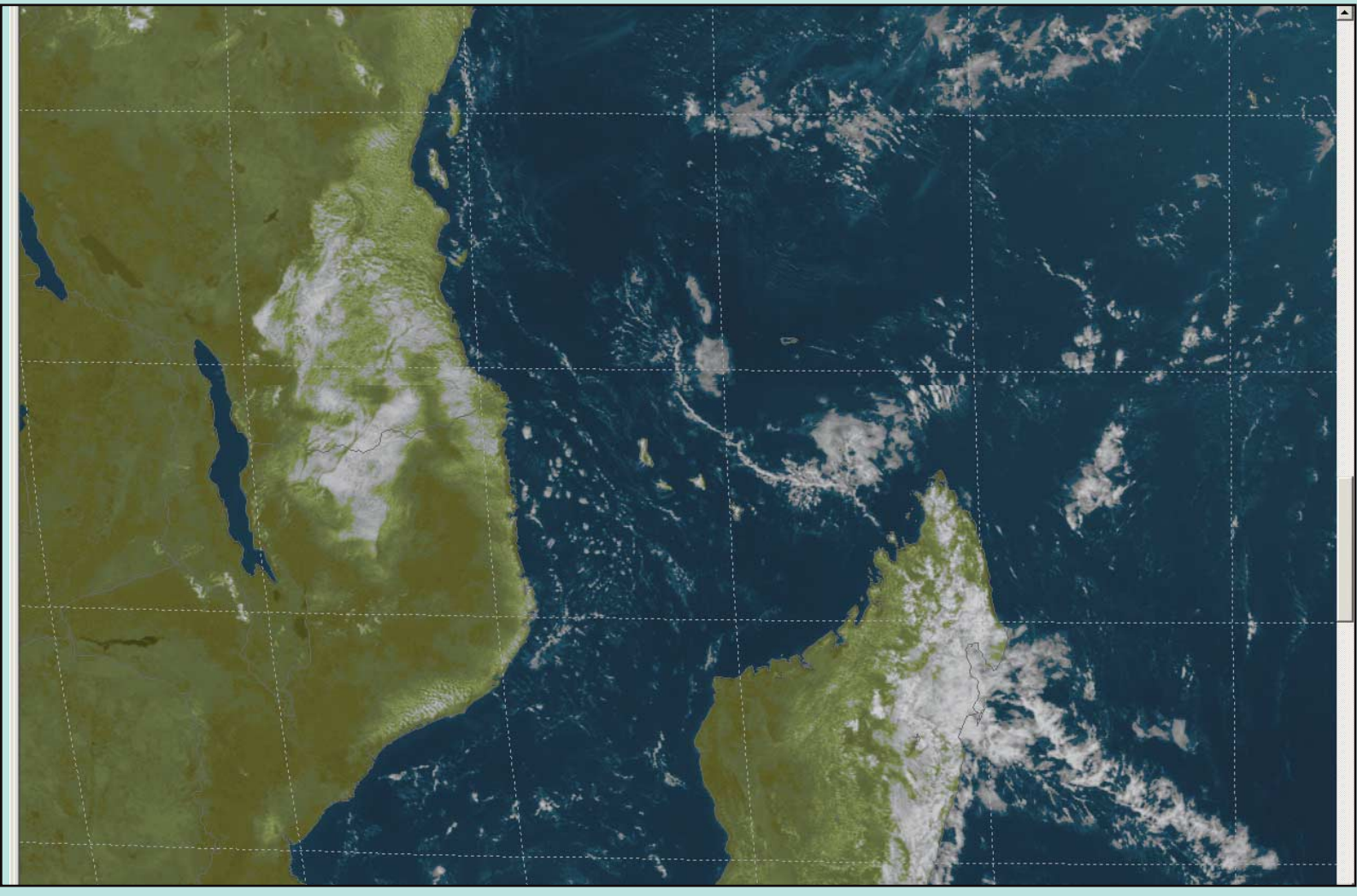
To be supportive of new members, those who missed the first visit and those members who wish to be brought up to date with EUMETSAT's services, another two day visit is planned for 7th and 8th July 2011. It should be noted that this date has to be confirmed by EUMETSAT but verbally they are encouragingly supportive and consider our visit very worthwhile.

The outline plan is to visit EUMETSAT's HQ on the 7th July. Then on the morning of 8th July visit their satellite communication centre at Usingen.In the afternoon of that day there is a planned visits to the European Space Operation Centre (ESOC) which is also located in Damstadt.

There will be no charge for these two days visits except a small payment to cover shared costs of local coach hire and the cost of a guide for the ESOC visit.

Confirmed details will be published in our next Quarterly but in the meantime put the dates of 7th and 8th July 2011 in you diary.

Quarterly Question,can you name this river? © ENVISAT



Meteosat 7 image showing a part of the Indian Ocean and some adjacent countries. The line of the river is just shown, name the river. © EUMETSAT

EUMeTrain

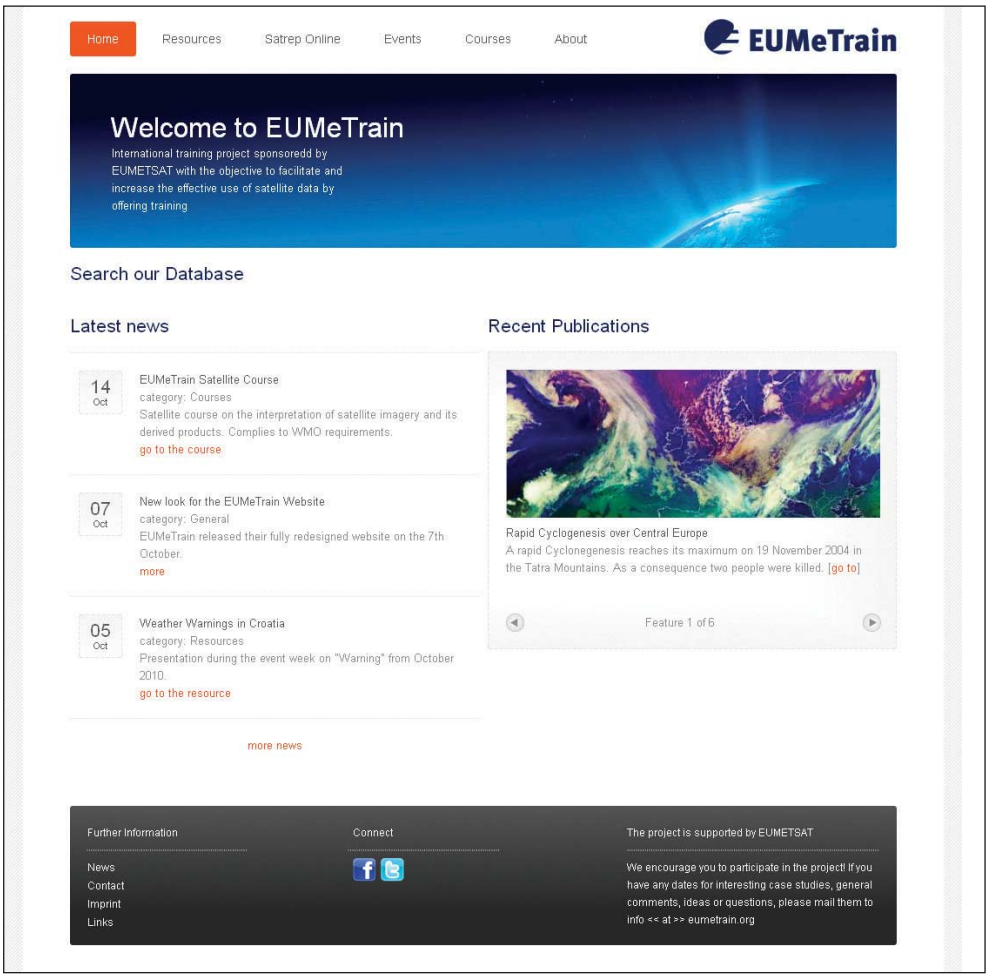
Jarno Schipper (ZAMG)

EUMeTrain is the biggest training project of EUMETSAT . It started in 2005 and for the past 5 years has been dedicated to the development of training resources and methods in satellite meteorology. By this it responds to training requirements expressed by European National Meteorological Services (NMS) over the recent years and gathered from a direct contact with NMS trainers and operational forecasters.

The principle goal of EUMeTrain is to provide users of EUMETSAT satellite data and products with training resources that will assist them to make more effective use of this satellite data, either as stand-alone material or in combination with other meteorological data sources. The project team of EUMeTrain consists of the national meteorological services of Austria (ZAMG), Croatia (DHMZ), Finland (FMI), Germany (DWD) and Portugal (IM).

Training Activities of EUMeTrain

The EUMeTrain training resources that were built in the course of years comprises training modules (sometimes referred to as CAL Module, where CAL stands for Computer Aided Learning), case studies and recorded lectures. Many of these resources come with interactive exercises designed for self-testing. The resources are freely available and a student can access them wherever and whenever he/she has the time. A more interactive approach with the trainee is achieved by the weather briefings, that are organised every month (Satrep Online), the event weeks and the blended satellite course.



The EUMeTrain homepage at www.eumetrain.org

Case Studies

Some scientists blame it on the global warming and the change of our climate, but the fact is that we are faced with more hazardous weather such as convection with tornadoes and large hail, extreme rainfall causing flooding and abundance of snow during winter months. All of these affect our public life with different severity. Especially where convection is concerned, a more precise warning for a more precise area is required by the public. With the spin-up of the models, that usually takes several hours, the use of remote sensing tools such as satellite and radar proves to be beneficial for nowcasting. In the case studies such hazardous or extreme weather situations are described revealing the benefit of a good interpretation of satellite data. One example is a case study of a severe storm over the island of Mallorca in October 2007. With no radar data being available over the island and a wrong forecast by the model the forecasters had to rely on Meteosat Second Generation (MSG) satellite imagery to monitor the progress of a large supercell which was suddenly setting course to the island. A warning was issued just in time and probably prevented casualties that could have occurred when an F2 tornado swept over the island.

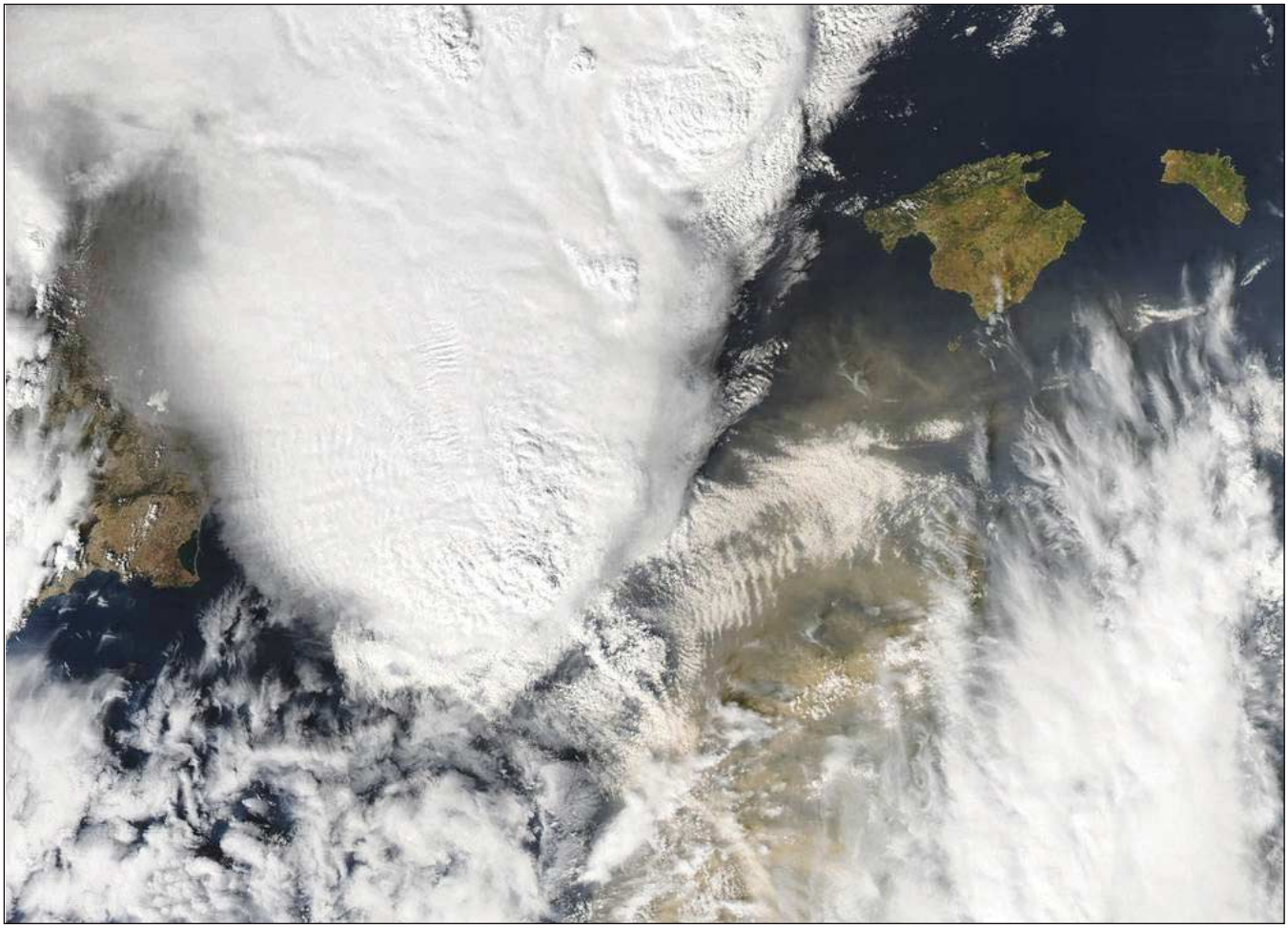
Training Modules

These comprise of more comprehensive topics and include a large variety of interactive exercises for self testing. One such example is the module “Operational use of RGB”, which explains the different channels of the MSG satellite and the need for combining the information of some of these channels in to RGB images, where the R, G and B refer to the colours red, green and blue, respectively. The introduction of such composed images in the operational forecast has been a very slow process, despite the fact that they provide the forecasters with much more information than before the MSG era. Therefore a training module, teaching the benefits and use of these was an absolute necessity.

Weather Briefings

Organised by the Satrep Online platform which was developed in 2007, weather briefings are aimed at teaching the meteorologist to recognise cloud patterns in satellite images by using the technique of conceptual models.

Cloud tops and cloud patterns seen by the satellites, are the fingerprints of physical processes in the troposphere. Conceptual models describe the physical processes through cloud phenomena, physical parameters, life cycles and weather events. Analysing a satellite image in terms of conceptual models is the initial step in retrieving a 3D- or even a 4D-mental picture of the weather. Discrepancies between the NWP model output and the satellite image can also act as an indication of the model error.



MODIS image used for a case study of a severe storm over the island of Mallorca in October 2007 ©NASA

The analysis of a satellite image by means of conceptual models has proven not only to be useful to weather forecasts but also serving as a great training tool. In SatRep Online this training aspect is addressed.

The Satrep online consists of a web based platform **(http://www.satreponline.org)** in which operationally four times day, the 00, 06, 12 and 18UTC Meteosat satellite images are presented in a combination with a corresponding set of ECMWF model parameters and derived products such as GII and products from NWC SAF. It thereby offers the student the challenge to operationally analyse a satellite image using the SatRep method. This concept is also the basis for a monthly weather briefing. Coordinated by either ZAMG (Austria), DHMZ (Croatia), IM (Portugal) or FMI (Finland) a discussion of the actual SatRep is lead once a month providing a more in-depth training on the interpretation of the different satellite images of MSG.

This form of training, performed online, uses a software called Elluminate and no costs are charged for the participation to a weather briefing. Depending on the time of the year the analysis is done using different satellite imagery and derived products. The use of NWCSAF and related products, such as the Global Instability Index (GII), have been very beneficial to the forecaster when it was trained during the weather briefings during the past summer. During the winter season the weight will shift from convection to fog and snow. More weight is now also being given to the warnings issued by METEOALARM and their relation to the conceptual models.

Over the past three years Satrep Online has trained dozens of forecasters from all over Europe. The website itself gets several hundreds of visitors per day. The whole production chain of the images is changing to present new products which are fitted depending on the season of the year. Future developments, including the monthly training sessions, are already planned and are found in the calendar at the SatRep Online website.

Event Week

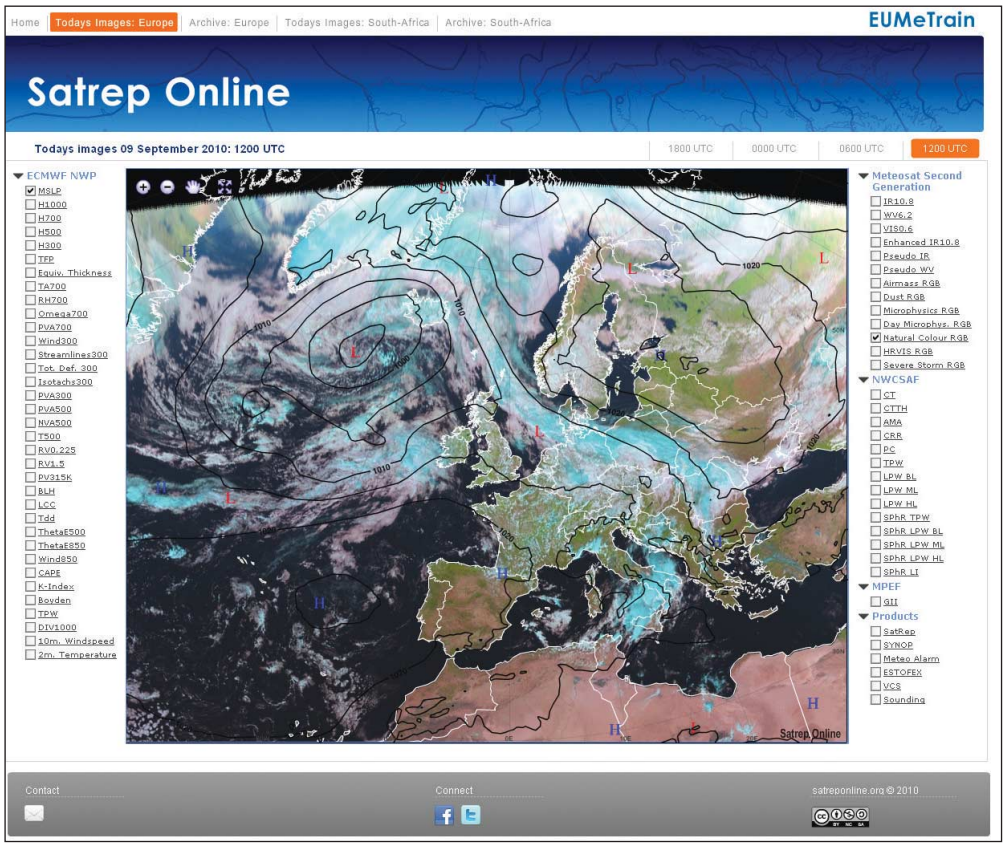
The event weeks are probably the most popular part of training organised by EUMeTrain. In one week there are usually twelve online presentations dealing with topics like convection, fog, snow etc. Half of the presentations are done by researchers, explaining the new products that are being developed and the way they can be used operationally. After such an expert talk of 30 minutes a forecaster from one of the European meteorological institutes takes over to explain how he deals with the topic in the forecasting room. Up to 500 people worldwide follow these presentations and have shown their interest for future event weeks.

Blended Satellite Course

The word blended implies a mixture of online and face-to-face training. These satellite courses last for about three months and comprise mostly of online lectures by experts on the different topics related to meteorological satellites. The lectures always conclude with exercises that the students need to perform. A full assessment on how the student has performed over the entire course is done in the classroom part, usually conducted at the training site of the Deutscher Wetterdienst in Langen, Germany. The student is then given a wide variety of exercises and he/she also needs to present some of the work (usually a case study) that they have produced. The WMO has issued the guidelines on what a Meteorologist should know about satellite meteorology. These requirements are found in the WMO-258 document. The blended courses organised by EUMeTrain meet these requirements.

The launch of Meteosat Second Generation (MSG) in 2002 provided forecasters with satellite images of higher spatial and temporal resolution. The Earth could be observed in 12 different spectral channels. These channels can be combined to produce so called RGB images. Such images were the main ingredient of the training material in the first 5 years of EUMeTrain. Several case studies dealing with high impact weather were produced, showing the benefit of these images when correctly interpreted. Also an extensive training module on the operational use of RGB images was produced. In the meanwhile the development of derived satellite products continued.

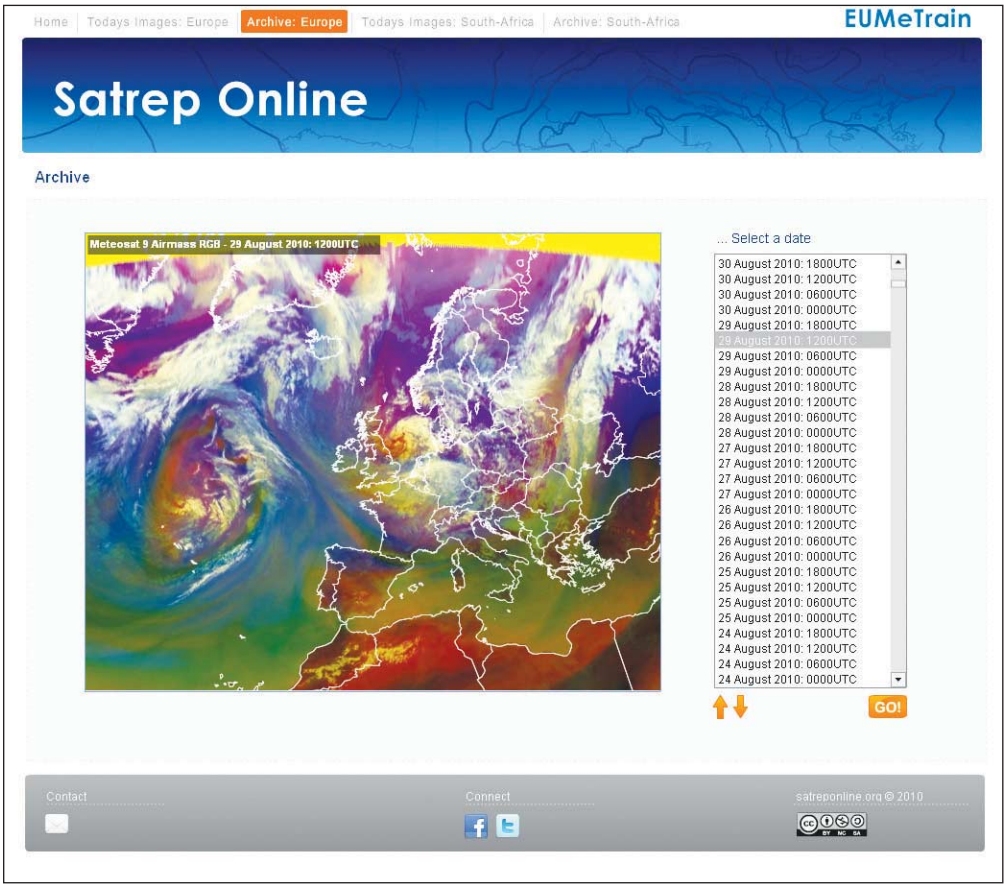
The Nowcasting Satellite Application Facility (NWC SAF) has played a major role in these developments. By exploring the 12 channels and knowing about their physical properties, new products have been developed that can, for example, help to discriminate between different cloud types, identify the height of the clouds but also derive the information on which clouds produce drizzle, rain or hail. In the last few years a trend to identify the pre-convective environment (GII) and to recognise very small convective cells (Convective Initiation) has taken a major step forward. These developments will continue to improve and in the coming years the training should address these new derived products. This inevitably also implies that the target audience for the training material, which until now used to be the forecasters in Europe, will be widened to other interest groups such as hydrologists and climatologists.



Satrep online consists of a web based platform (http://www.satreponline.org) in which operationally four times day, the 00, 06, 12 and 18UTC Meteosat satellite

New Training Resources

The best way is to visit our website **(www.eumetrain.org)**. There you will find a calendar informing you about the scheduled weather briefings, event weeks and the start of a new satellite course. It also contains the latest news item updating you on the new resources being developed. If you are more into that, you may also sign up at our Facebook or Twitter to be informed on any new updates being done in the project.



The EUMeTrain Satrep archive page

www.eumetrain.org

www.satreponline.org

www.eumetrain.org

Jarno Schipper (ZAMG)

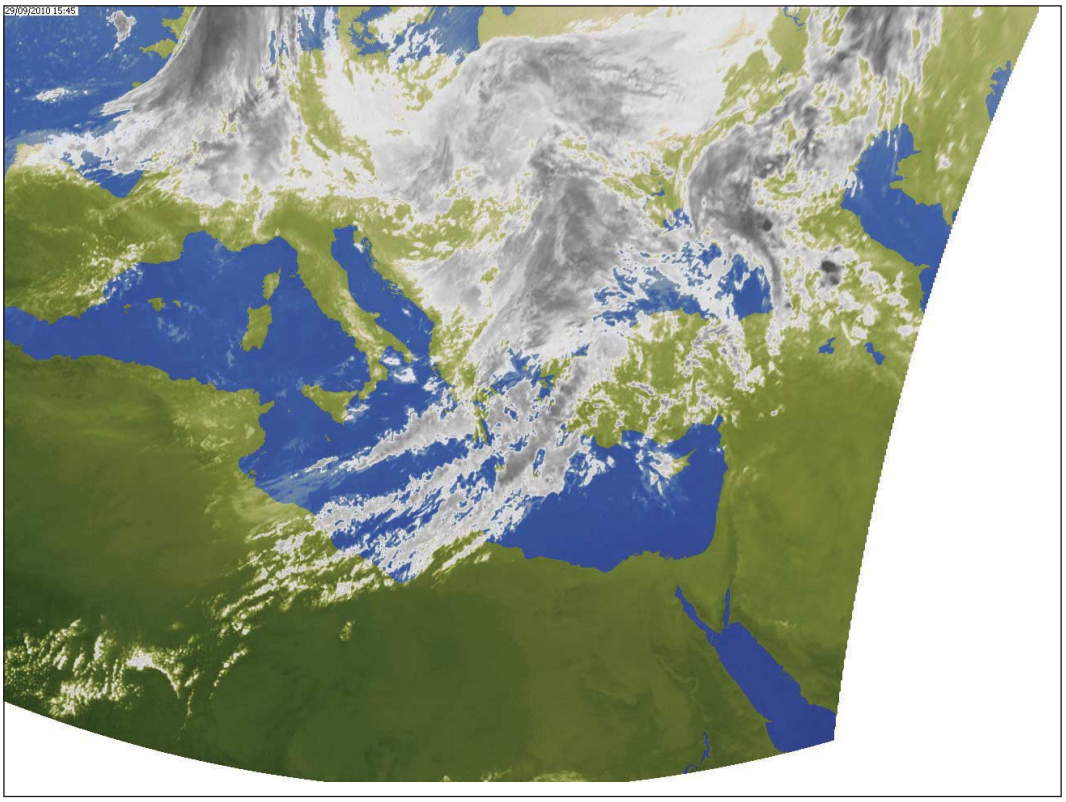
Natasa Strelec-Mahovic (DHMZ)

Vesa Nietosvaara (FMI)

A view from North Cyprus

Nigel Heasman

A week ago we awoke to an overcast sky and after weeks and weeks of clear blue sky and scorching sun, this was a very welcome relief. The local forecast is saying that we could soon see the start of the long awaited rains and, indeed, the MSG images for today seem to show that as a possibility.



MSG image 29th September 2010 ©EUMETSAT

However, as often is the case out here, "promises, promises" and we haven't yet had the pleasure of standing out in a refreshing downpour. The ground is bone dry and even the weeds have stopped growing. Luckily, the piped drinking water supply has held up throughout the summer and, apart from the occasional pump breakdown, we have had water for at least an hour every day to top up the storage tanks that every house is equipped with.

The Carob **(http://en.wikipedia.org/wiki/Carob_tree)** harvest has been and gone with, apparently, a good crop being gathered by the local folk.

Very soon now the local olives will be ready for picking and it looks as if there will be a bumper crop - most trees are very heavily laden and just waiting to be shaken loose. No “health and safety” regulations out here!! Local folk lore has it that we get a good harvest every 7 years and this looks to be the one.

The recent harvest moon was pretty spectacular last week (below) and made eating outside in the evenings very pleasant, with the

Spectacular thunderstorm on 8th October (– sorry about the raindrops on the lens!)

temperature hovering around 30C.8th October 2010

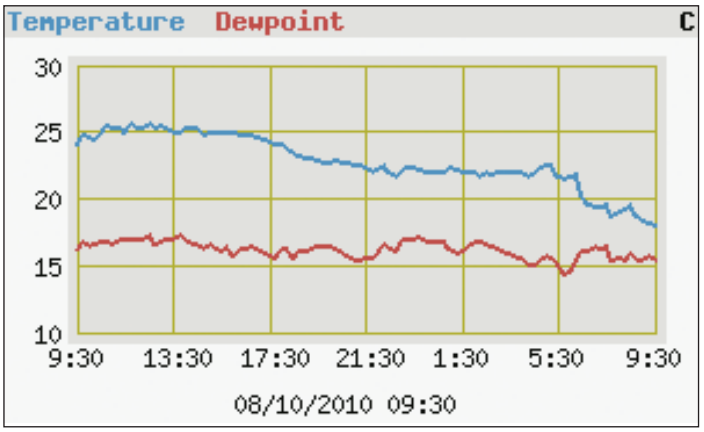
Wonderful news - the rains arrived this morning, accompanied by a very spectacular thunderstorm and in the last 4 hours we have had nearly an inch of the lovely stuff! The highest rainfall rate recorded so far is 4.7" per hour and the thunder is rolling around the surrounding hills in a very dramatic fashion. The temperature has dropped by 7C in the last few hours (see plot on the right) and, of course the humidy has shot up. The smell of the rain falling on bone dry ground is quite wonderful.

The advancing rain can be seen very clearly in an animation available at **www.nigelheasman.com/animations/easternmed.avi** which was made from Eumetcast RSS images, using MsgDatamanager and MSGAnimator from David Taylor. **www.satsignal.eu**

I find it fascinating to see the clouds "well up" as they approach land but what causes them to do it over the open sea remains a mystery, to me!

The olive harvest started on Monday, (by government decree) and yesterday the olive grove just down from my house was alive with villagers climbing up the trees to fill their sacks. They will then carry them to the local mill where each persons "take" will be separately processed and the oil taken back home for use in those special meals.

A long awaited project, to bring water to the island from Turkey, has now started apparently. It is being paid for by Turkey and will deliver around 70 million cubic metres of water each year, through 80 Km of plastic pipe suspended



Temperature plot from Nigel's home on Cyprus

250 metres below the surface of the Mediterranean. **(http://www.articlesbase.com/news-and-society-articles/turkey-to-northern-cyprus-water-pipeline-by-2012-537589.html)**

This project will be of very great benefit to both farmers and the general population in Cyprus and will, hopefully, mean the end of the near drought conditions experienced almost every year. Whether the Greek, south side, of the island will take advantage of it remains to be seen, however, due to political differences between Turkey and Greece.

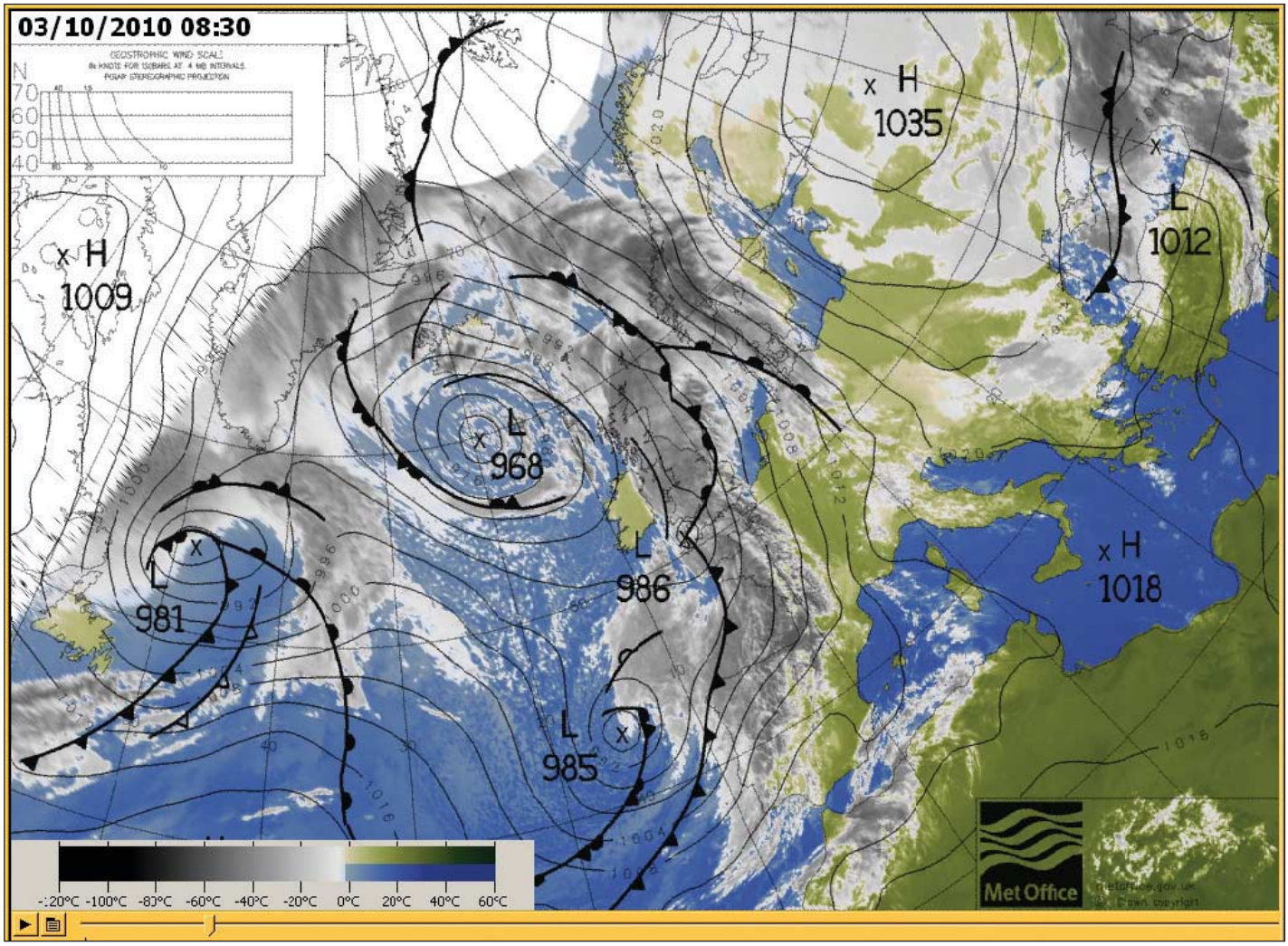
More news from North Cyprus soon!

Using 'IrfanView' for remote viewing of animation files

Terence Smith

I accept that those for whom this modus operandi would be useful may be few in number, but I hope it is worth relating nonetheless.

In March 2008, the Geo Quarterly Journal No.17 carried an article of mine (but not forgetting the very significant input of the then editor, Les Hamilton, to layout) describing the overlaying of isobaric charts onto various animations produced by David Taylor's GeoSatSignal software. At that time I mentioned the employment of Irfanview (or indeed any suitable equivalent image viewing programme) to conveniently screen one's animations – particularly in full screen mode.



An example of a Bracknell isobaric chart overlaid on a EUMETCast image received using David Taylor's GeoSatSignal software and subsequently made into an animation

The article also illustrated how such animations can be automatically updated using command-line files, so I will not repeat that here; but the method will be helpful with what follows below, and the article is available as a PDF online at **http://www.rifleman.org.uk/mslp_article.htm**

If you are comparatively new to EUMETCast reception, and have yet to delve into the preparation of such animations, several examples are available to view at **http://www.rifleman.org.uk/mslp.htm.**

This follow-on development of my use of Irfanview was called for when I moved my desk and day-to-day computer to a room in the house remote from that which housed the two-PC EUMETCast receiving and processing system. The latter PCs remain in their original room, which is necessarily situated within a short cable-run from the satellite dish.

I have no experience of remote networking, but suspect that what I am about to describe may also be a practical proposition over a VPN system, were one to be remote from one's home network.

In order to have my several animations readily available to watch on my remote PC, I ensure that those generated by both GSS and MSG Animator are saved to the same directory on my processing PC. This enables each of them to be viewed using Irfanview from anywhere on my network, and obviates any need for further instances of either of David's programmes to be installed on a remote PC. Whilst not directly connected with the subject of this article, it is perhaps worth mentioning that the same technique can be employed to remotely view individual images such as Metop and NOAA AVHRR files.

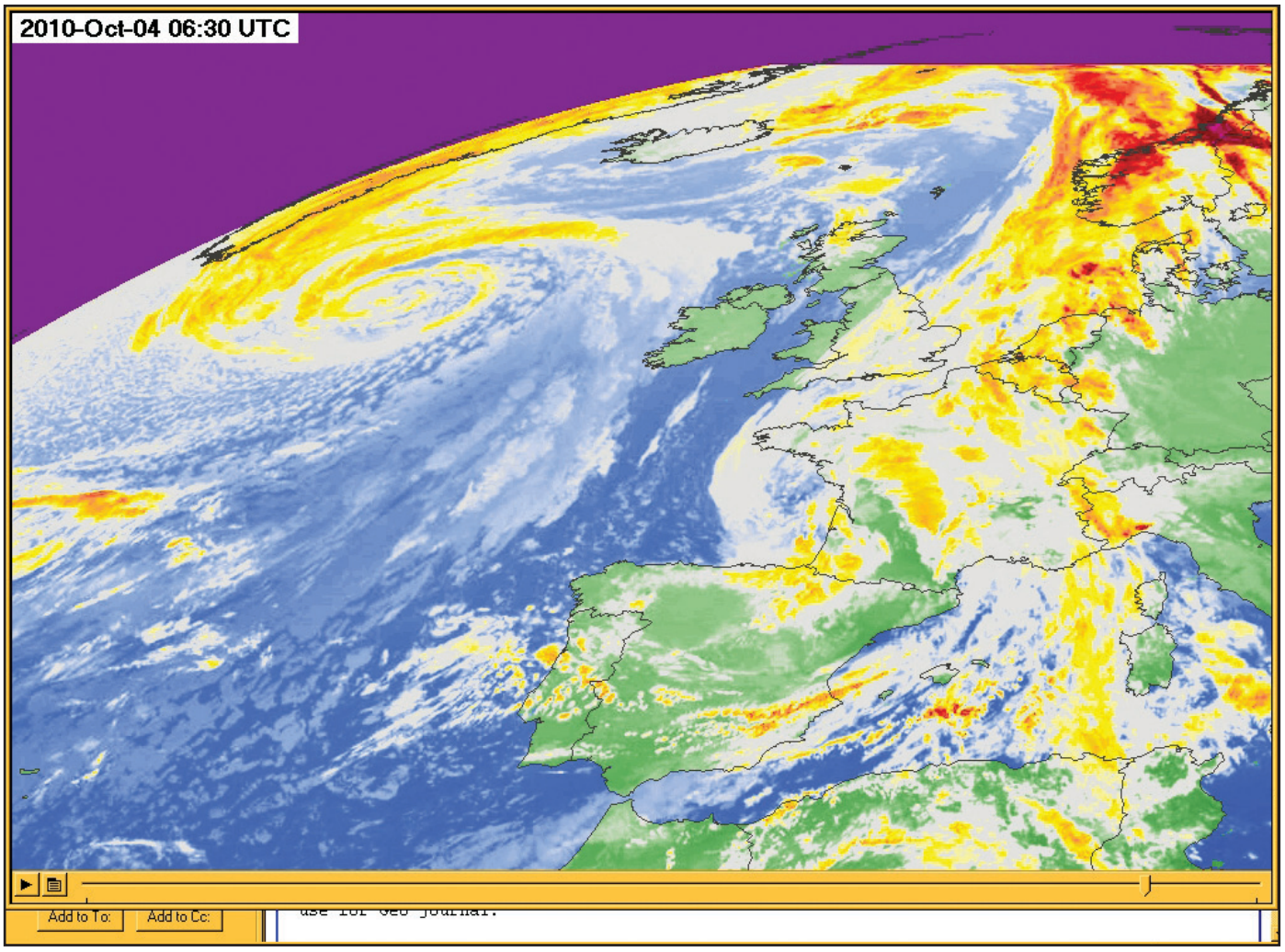
I hope David will not mind me advertising the fact that he generously elected not to key-code his superb HRPT Reader software, thus permitting installation of the programme on any computer and allowing anyone in receipt of the image files to view them – from anywhere networked to the receive PC.

If you do not have the freeware Irfanview progam already up-and-running, but would like to give it a try, simply download and install both the latest version of the programme file, and the plug-ins/add-ons file, from **http://www.irfanview.com/** and install each in turn. The latest version at the time of writing is v4.23.

Open the programme and, using '**File > Open**', navigate to the network directory holding your (***.AVI**) animation files. Select the topmost file and open it. The animation should open and run once. Either by rolling your mouse wheel, or perhaps more controllably using the page-up/down keys (down first), each animation in the directory may be viewed in turn. In the programme's default configuration, if you attempt to move down to the next animation when the last file is being viewed, then a window will appear asking if you wish to remain in that directory or change to another. Hitting **Enter** will close the box and re-open the first animation file. The same situation applies if you work back to the first file and try to go 'page-up' from there. This setting can be amended, in the programme's set-up, to roll over to the first file from the last, and vice-versa. Go to "**Options > Properties/ Settings > Misc.1**" and check **"If the end/begin of the folder is reached, loop current folder (during browsing)"**

It is just possible that you are not aware where the animation files produced by MSG Animator are saved; so this would need to be ascertained. The top of the default directory tree has hitherto usually been the **MSG-1** directory under which lies the **Images** directory to which one is advised to set the path for MSG Animator's source files. However you have chosen to save your Meteosat image files, the **Animations** directory, under that Images directory, is most likely to be the one to which the MSG animations are automatically saved. Because there is an option provided within GeoSatSignal to save its animations anywhere you wish, I find it simplest to save GSS .AVI files straight to the **C:\MSG-1\Images\Animations** directory, where they accompany the MSG Animator files. Any or all of these files may then be accessed from that same source by Irfanview.

To re-open any file, and thereby load the latest build of an animation, it is only necessary to press 'Shift and R'. This effectively re-opens the updated files for ALL your animations in that directory. If, as I, you prefer this to be done automatically, say every fifteen minutes to bring up the latest HRIT animations as



A frame from the false colour animation using Irfanview with GeoSatSignal software

they are received and processed, then this can be achieved using Command Line operation via the Windows Task Scheduler***.**

It is only necessary to make one command (**.cmd**) file to do this, since, as soon as one animation file is opened in Irfanview, the others in the same directory are each available at a key-press. If you are unfamiliar with how to do this, please download the PDF file at the URL given above. Remember that the command file (e.g. animations.cmd) must lie within the Irfanview programme directory and be called up from there by a Windows scheduled task. There is also a description of how to do this in the old article on page 4; but do bear in mind that the method shown relates to Windows XP, and subsequent Operating Systems may entail different means to achieve the same end.

Irfanview can be set up to show your animations in several ways. By default the programme opens a window of a size less than your full screen, and this may well best suit your needs. If you wish the animations to be opened full-screen, then add " **/fs** " to the end of your command line. In this mode the file name of each animation is shown above the imaged section.

A typical command line, saved as a **.cmd** file in Windows Notepad, could be

i_view32.exe \\local or remote PC\c\msg-1\images\animations\ north_atlantic_ir_rss.avi /hide=15 /one /fs

In this example, Irfanview opens the file "North_ Atlantic_IR_RSS.avi, hides the Toolbar, Status bar, Menu bar and Caption(**/hide=15**), closes the previous instance of Irfanview (/one) (*or you will end up with multiple instances open*), and opens in full-screen mode (**/fs**). Note the spaces before each oblique ('*slash' to our younger or North American readers*).

The hiding of Caption and bars can be applied to each or all. The numbered values can be combined as shown in the example above, but the values must be added together for the required configuration; i.e. "**/hide=15**" amounts to 'hide=1+2+4+8' for all four. The separate values are

Toolbar	1
Status bar	2

Menu bar	4
Caption	8

There are many options for display of video, but it is by far preferable to use the original GSS or MSG Animator programmes to determine basic display speed (frames per second) and any smoothing required, leaving Irfanview to do nothing but show the animation. However, there are useful exceptions, and there is a playing speed option available by right-clicking on the running animation. If the animation is stopped at any point, the frame can also be copied to the clipboard from the options box opened by the same right-click of the mouse – very handy.

To loop the animations, go to " **View > Full Screen Options > Video/Sound** " and check the **Loop** box. There are a number of "full-screen" options too; a notable one permitting sight of only the images and the slider at the bottom of the screen. Set this by again going to " **View > Full Screen Options > Video/Sound** " and checking " **Stretch all images/movies to screen**". The slider is particularly useful, offering the ability to wind back and forth through the animation to any point, and at varying speeds. You can transit as slowly or quickly as you and your mouse care to move the slider, and stop at any frame.

If you like to see your animation in a 'clean' window but not necessarily in full-screen, then you can hide one or all of the caption, status, menu and tool bars using the "**View**" menu. If using full-screen with your Windows Taskbar hidden, it will be necessary to press **Alt+Tab** to change between programmes. If viewing in Normal mode, a single press of the **Enter** key will take you to full-screen, and one press of **Esc** will revert to Normal.

There is a plethora of viewing options available in the programme, and there are a great many command line options too. Irfanview is an excellent tool for handling images of almost any type. It has one of the best screen-shot or screen-capture facilities that I have come across. The **Help** for the programme is most comprehensive, and the command line options are all listed there.

To afford some idea of the practicality of this medium, I regularly run animations of MSG-1 RSS - IR ch.09, as illustrated here, UK and other locations of Ch.12 Visible data; plus MSG-2 animations of various FSD and Fire products, as well as two GSS isobaric chart overlain animations – perhaps eight or nine animations in total. In either MSG Animator or GSS it is a multi-mouse-click task to change from one animation to another; not to mention that with frequent updating of lengthy animations in Animator there are long periods when the animations are not available to view. Using Irfanview makes animation-switching incredibly easy and convenient. With this in mind, it should be apparent that the use of an image-viewing programme such as IrfanView can be helpful not only for remote viewing, but even on the processing PC itself. I am well aware that MSG Animator has the useful option to cycle through the animations at varying timed intervals, but, with more than just a couple of animations in progress, this can result in either a considerable wait before the one you most wish to see comes into view, or such short viewing periods that you can barely assimilate the imagery before it changes. Switching animations in GSS is also time consuming, as each file requires loading separately.

***** The one thing that does require careful handling is the timing of any auto-scheduling of Irfanview to bring up the latest animation update. The Task Scheduler should be set to re-open Irfanview outside the MSG Animator or GSS update times; a good reason not to attempt to update every 5 minutes if animating Rapid Scan imagery from MSG-1 (RSS). If you are shown an error message "**Unknown format or file not found**" when manually opening a file, it is probable that an animation build is underway. Just wait a few moments for that to finish on the processing PC before trying again.

As I wrote at the beginning, this manner of remote animation-display may be of limited interest to the majority of readers, but if it proves useful to only one or two then it will be worth having put pen to paper.

Good world and weather-watching.

GEO attends AMSAT-I and Envi-Ham conference, Frascati

Francis Bell

For the second time, I was delighted to be telephoned by Stefano Badessi in Frasacti. The European Space Agency (ESA) have located their European Space Research Institute (ESRIN) at Frascati, which is located about 20 km SE of Rome, and Stefano is a senior member of their staff. The first call I received from Stefano was about a year ago when I was invited to take part in the 'Envi-Ham' project. The outcome of that call resulted in my joining the project and some of the images I have received have been published in GEO Quarterly.

This recent call related to a joint AMSAT-I and Envi-Ham conference to be held in Frascati. I was instantly attracted by the invitation and, with the help of the ESRIN travel office in Frascati, took about two hours to check accommodation and travel details before accepting the invitation to attend. My contribution was to be a guest and to give a 30 minute presentation relating to GEO and our members' experiences with Envi-Ham.

I did check the language to be used at the conference and was told that it would be English. This was reassuring because the only word I know of Italian in Pizza. In fact the common language of ESA, ESRIN and EUMETSAT is English . The reality was that some of the AMSAT-I conference presentations were given in Italian, as you would expect, but otherwise almost everybody on site spoke English.

My outward travel to Italy was straightforward and after checking into my accommodation I arrived at the ERSIN centre on the outskirts of Frascati by mid afternoon on the day before the conference. I was a little flattered by the VIP treatment which I received. I was shown around the technical areas by Stefano and allowed to walk around the rest of the site on my own with camera in hand.

Although I had no particular expectation, I was slightly surprised by the ESRIN centre. Not only were there offices and technical areas bristling with electronics, but also on site were the satellite communication dishes. Without comment to anyone I contrasted this with our GEO visit to EUMETSAT Headquarters in Darmstadt. The EUMETSAT offices accommodate their administration and many of their technical facilities, but their main satellite communication dishes are located at Usingen about 50 km north of Damstadt. I'm sure there are commercial, geological and RF reasons for locating EUMETCast's main satellites dishes away from the centre of Darmstadt.

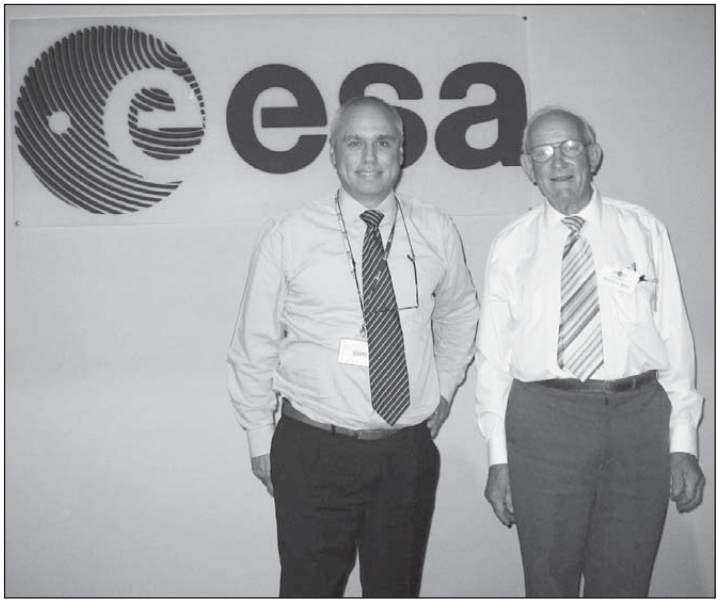
I did consider the local geology around Frascati which is located on a rocky hill. The ESRIN site, formally an olive grove, is in an almost earthquake free zone, which is not the case for most of Italy which suffers from many earthquakes, some devastating. The site also benefited from a clear view of the sky thus providing communication links with satellites. I'm sure it's beneficial to have the satellite communication dishes and the computing and radio all on the same site.

It was quite by coincidence that my visit to ESRIN overlapped with a number of 'European Science Evenings'. ESRIN was hosting one of these events, and immediately after the AMSAT-I / Envi-Ham conference, some of the facilities were open to other visitors. I benefited from this because I used any spare time to look round the exhibition areas and displays which were being prepared. Some of these were in the same hall as our conference, so visiting them was easy, with no formalities. I had managed to take a laptop computer with me to the conference, together with a small quantity of GEO literature, and was grateful to be allocated a shared table in this exhibition area. I was pleased to note that, during the conference day, this table proved to be attractive to visitors and the conference delegates.

ESRIN satellite communication dishes

I have been a member of AMSAT-UK for about 20 years. There are AMSAT groups in a number of other countries and I know the groups in America, Italy, Germany and elsewhere are particularly active in promoting the use of satellite communication, all of which is in the very best tradition of amateur radio. On a number of occasions I have given presentations at the annual AMSAT-UK conference and reports and photographs of past events have often been published in GEO Quarterly. This year, David Simmons and I gave a presentation at the AMSAT-UK conference in Guildford. The feedback from this was very positive and apparently a number of the AMSAT members later successfully applied for an Envi-Ham license. This may have been part of the rationale for inviting me to Frascati for the AMSAT-I / Envi-Ham conference. I never asked.

What I did ask Stefano about were the origins and background



Stefano Badessi and Francis Bell at the Frascati conference

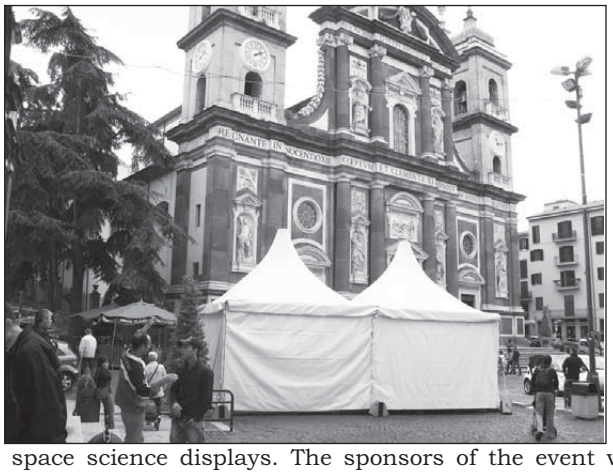
Conference sponsors

to the Envi-Ham project. It became clear as a result of our conversations that the vision of Envi-Ham was principally Stefano's, perhaps triggered by enthusiasm within the AMSAT-I membership. I quite specifically congratulated him for his vision, technical skills and administration for bringing the Envi-Ham project to so many people. I repeat these congratulations now in writing!

The programme of conference presentations related to both amateur radio in space—that is the AMSAT-I perspective—plus other contributions relating to the Envi-Ham project. My 30 minute presentation was split between the background of GEO, our members interests and then more specifically about experiences I and other GEO members have experienced with Envi-Ham reception: all illustrated with example images I had received at home. I know that Arne van Belle had been invited to the conference but was unable to attend in person because of other commitments. Instead, Arne submitted a computer presentation illustrating his reception of EUMETCast and Envi-Ham using the same dish and computer and Stefano read the text relating to Arne's presentation. I admire the technical skills of Arne and other members of Werkgroep Kunstmanen, who seem to work at the leading edge of satellite reception and subsequent computer processing . I tend to take the soft option with dedicated computers for each application, one for EUMETCast with a dish, one for Envi-Ham with a dish, and one for APT with turnstile antenna. Living on the edge of a village with plenty of garden, I am fortunate in being able to run as many dishes as I like without upsetting anybody. The conference was televised and shown live on the Internet: it may still be available for viewing. From some feedback I have received, I know that some of our GEO members did follow events via a TV Internet link.

Giving my presentation

I have already mentioned the European Science Evenings which coincided with my visit to Frascati. Not only did I benefit from the exhibitions that ESRIN were preparing on their site but, additionally, there were other events in the town centre on the Friday and Saturday evenings. The town centre was sprinkled with lines of marquees containing exhibitions and hands-on experiences. Topics covering physics, chemistry and biology were on display. I was particularly interested in



the space science displays. The sponsors of the event were impressive and to be congratulated. On the Friday evening I was in the town centre which was full of children and adults visiting the science marquees but unfortunately I had left my camera behind so my photographs taken next day record the venue but without the activity.

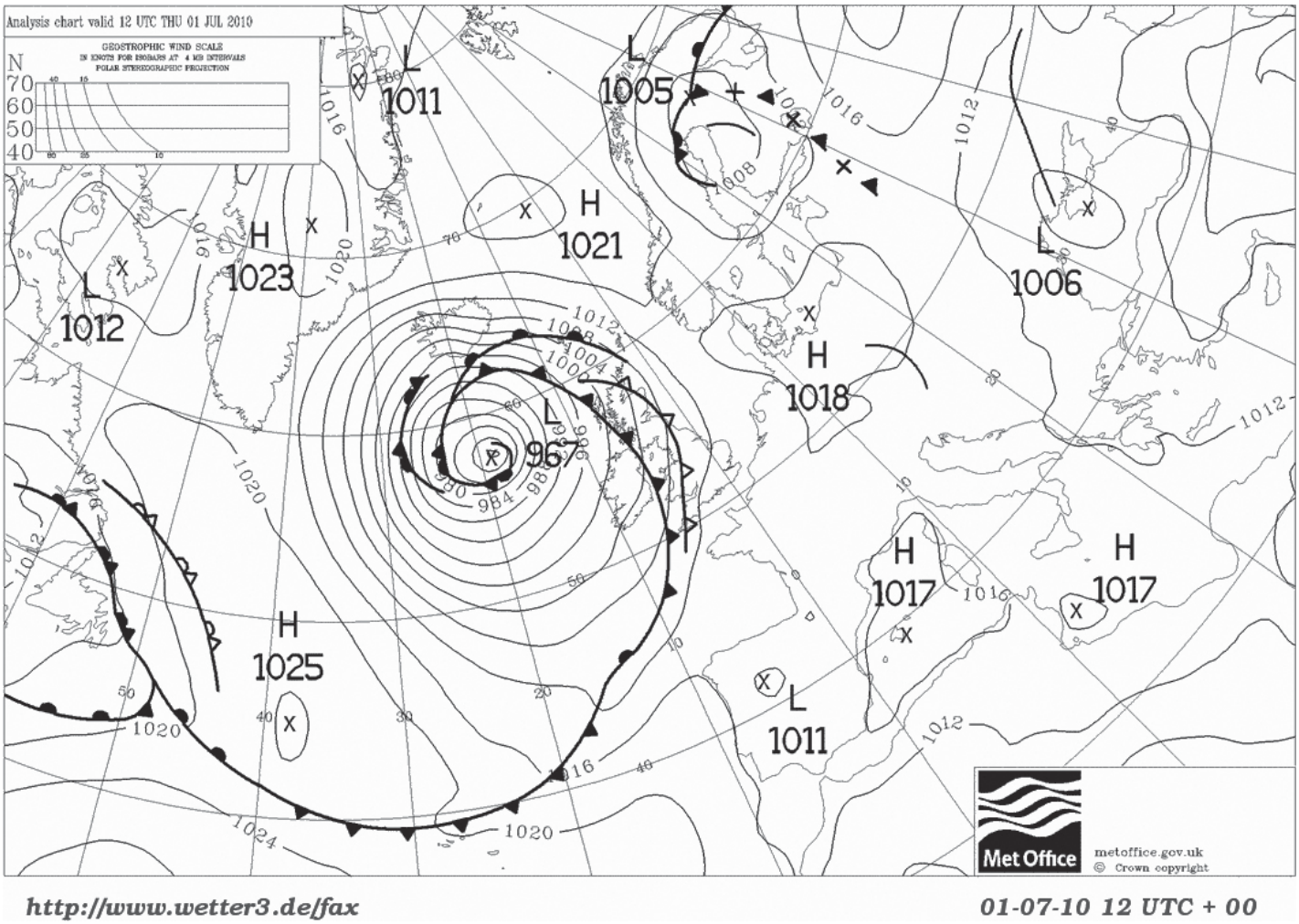
My thanks to AMSAT-I and to Stefano Badessi on behalf of ESA / ESRIN for inviting me to their conference. I had a delightful two and a half days there. On behalf of the GEO membership I will continue to promote the Envi-Ham project and the stunning Earth images which it provides. For more information relating to ESA and ESRIN visit their web site

www.esa.int

FEEDBACK

The Column for Readers' Letters and Queries

email: geoeditor@geo-web.org.uk



In response to the query by David Taylor (Geo 27, p38) concerning the feature 'Comma Cloud or Cyclone?' from July 1st 2010. David asks if the cloud formation is a comma cloud, though I think the question is posed just to open the discussion, as he answers the query himself in the quotations he gives on the same page. The answer is that it is most certainly not. It is in fact a mature cyclone or depression, quite a deep one for a summer month too, central pressure 967 mbar. Attached is the ASXX analysis for 1200z on the 1st July.

A comma cloud has a much smaller scale than this gigantic cyclonic feature. Generally a comma cloud has a scale of a few hundred or so kilometres. Most comma clouds consist of conglomerations of convective clouds, although some of the larger ones may be associated with a developing depression with multilayered cloud, probably with some convection embedded. Comma clouds in one of their most common forms are a visible manifestation of what is known as a PVA or Positive Vorticity Advection feature. Regions of PVA are typically found on the forward (upwind side) of a short-wave upper trough. They are often identified on a surface chart as a trough, and can be associated with quite large but short-lived pressure falls and rises as the comma crosses a particular location. The dynamic ascent produced in a PVA region can lead to the comma shaped convective cloud when the troposphere is unstable to moist convection, and is most often seen in situation where the large-scale flow is bringing air of cold origin over a relatively warm sea.

The image at the location below shows a comma cloud just to the west of Ireland, and readers can see from the scale of this feature that it is far smaller than the synoptic scale cyclone shown in David Taylor's image.

Image from NOAA19 at 1424z on the 10th September 2010. Received at Wokingham and processed using David Taylor's HRPT Reader and AVHRR Manager software, it is a combination of spectral channels 1, 2 and 4, with channel 4 alone near the pole, which is in near darkness.

http://www.woksat.info/etcsi10/si10-1424-a-apt-w.html

Weather satellite images at:

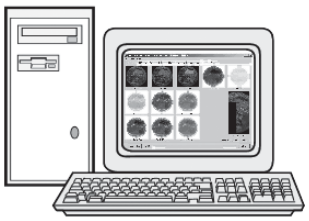
www.woksat.info/wwp.html

Dover Ham Radio Rally 2011

January 16th 2011 see return of the Dover rally which was revived having missed out a few years. This year we are hiring additional space to accommodate more traders. Tables are a modest £10 pre booked. Last year several traders had bits and bobs relating to Wx sats.

www.doverradiorally.com

Computer Corner



Douglas Deans - dsdeans@btinternet.com

Since my last column I have invested in a new computer specifically to help with running EUMETCast more efficiently. It is something I had been considering for a long time but having taken the plunge, the results have been excellent. Perhaps a brief background to this may be of interest to those also running a EUMETCast system and for those not, my experience using a very small computer may still prove interesting.

EUMETCast now provides huge amounts of data although there are many ways which allow you to be selective in data choice. Nevertheless even just taking the various sources of high resolution imagery can constitute a few Gigabytes of data coming in every hour. Recommendations are to run a two computer system so that the receiving computer is solely employed for EUMETCast. Some people do well with a one computer system but undoubtedly two is preferable. I had tried both and whilst the two system was the best, being loss free, the inconvenience of 2 desktop computers, their associated noise and running costs was off putting. In particular, depending on your house layout, a noisy computer can be a real nuisance when running overnight.

So when the option of a mini-computer, small in size, not too expensive, low in running cost and relatively quiet (only the power supply has a fan) came about it seemed a perfect solution. Both myself and my brother had used a company before called Pcspecialist where you can specify how your computer is to be built. A visit to their website confirmed that in addition to all their other products they now offered mini-computers and so I went on to their site to try combinations of hardware for price and specification comparisons. Let me say from the offset that other than a very satisfied customer I have no association with this Company. For more information about what this company offers please go to :-

http://www.pcspecialist.co.uk/

The mini–computer is small, approximately 225mmW, 193mmD and 76mmH. It can stand flat or on its edge. My model uses the very low power and efficient Intel dual core Atom processor on an Intel D510MO motherboard and has 2GB of RAM fitted. I could easily increase this to 4GB but there seems little point given its use and since it is a 32 bit system. As this computer is solely for EUMETCast I chose to have very few additions. I did select the faster 2.5 inch 7200rpm, 16MB cache hard drive (250GB) and also chose to have a small RW DVD recorder. I already had a copy of Windows Vista which was no longer in use and as it was not an OEM it could be activated in another computer so there was a big saving in not having to purchase a new operating system. I probably would have preferred to use either XP or Windows 7 as Vista still gets the name of being a bit bloated but beggars (or rather pensioners) cannot be choosers and the set up is working perfectly. Suffice to say that the whole package was just a little over £200.

I did some power checks whilst it was receiving EUMETCast data for about 12 hours and found that the entire set up is rated about 30W. For a computer with the specification it has that is quite an incredible figure and constitutes a running cost of less than 10p for a full 24 hour operation.

I did have a few concerns about the lack of a fan other than a small one incorporated in the power supply unit. The processor uses quite a large heatsink so cooling is purely passive. This, of course, keeps the noise down and provides one of the real attractions of this unit. However the box is well ventilated and despite having run so far in summer conditions there have been no problems. I am hoping to do some tests on temperatures at a later date but my concentration has been on tests on its performance for my EUMETCast system.

It does mean that I can now run overnight without any noise and with low running costs although as yet I have not done this on a regular basis.

As I write this column a number of GEO members including myself have been testing a new EUMETCast Client Software for Windows. Readers will have read Arne's excellent preview of the new client testing in the previous journal (GEO Q 27) and I expect further information will be provided when this Journal goes to press. So I will make no further comment other than to say I loaded the new Client into my new mini-computer and it worked perfectly without issue. I am no longer using a RAMdisk mainly as it is not needed by the new Client particularly when used on a dedicated EUMETCast computer.

This quarter I will briefly explain what Aero Snap shortcuts are in Windows 7 and will also be continuing with my new section on EUMETCast data channels.

As a reminder to readers I have already dealt with Channels 1, 2 and 5. This quarter I am tackling the rather complex Channel 3. Again I hope readers will consider building up a comprehensive package of the EUMETCast Channel file types as the project continues. Those who do will have something not available elsewhere.

Aero Snap Shortcuts.

Aero Snap is a new feature in Windows 7 management, which allows you to easily position (Snap) windows on the edges of your computer screen. It is fast and effortless and for that reason is particularly useful. How often do you need to have two windows open to edit or copy a file name or even drag and drop. The ideal scenario for that is to have the two windows on your monitor side by side. That can be a fiddly process but Aero snap allows you to do it with 2 simple mouse operations.

Simply drag the first window to the right side of the screen and it will align itself to the edge and fill half the screen. Repeat this with the other window on the left side. Job done ! In addition this option allows you to maximise a window in the vertical direction only, something that may be appealing for widescreen users. I often do not find Windows shortcuts of much use but this is one I use regularly. Of course there are other options as well. To maximise a window vertically and horizontally to fill the screen simply drag it to the top of the screen. There are also a number of aero snap shortcut keys but personally I hate shortcut keys as they are anything but shortcuts if you cannot remember them so I will leave you to check them out yourselves.

EUMETSAT Data Channel 3.

Channel 3 has a heady mix of data types and file types making it a complicated channel to detail. Because of that it is difficult to know just what data it contains so all the more reason for this to now be tackled.

The first group of data on this channel is the Primary Low Rate SEVIRI data (LRIT) from the geostationary satellite located at 0°. For the moment the primary satellite is Meteosat 9, also known as MSG 2 being the second of the Meteosat Second Generation of satellites. You will recall that in GEO 27 we identified and listed Channel 2 for the equivalent High Rate SEVIRI data from Meteosat 9. Unlike the lossless HRIT data, the LRIT data is in lossy jpeg compression with data in 30 minute repeat cycles instead of the 15 minute repeat cycles of the HRIT data. In addition there are only 5 channels of data sent as opposed to the 12 HRIT channels. In other words the LRIT channel only contains sub-sets of data compressed by higher factors but the lower bandwidth may be appealing to secondary data users. So in summary features of the Low Rate SEVIRI are :-

Data in 30-min repeat cycles.

Lossy JPEG compression.

Full spatial resolution in 5 spectral channels:

Channel 1 (VIS 0.6)

Channel 3 (IR 1.6)

Channel 4 (IR 3.9)

Channel 5 (WV 6.2)

Channel 9 (IR 10.8)

Each repeat cycle nominally consists of 8 segments of image data. A repeat cycle prologue file precedes the delivery of the image segments and a repeat cycle epilogue file follows after the delivery of the segments. The image segments are numbered and a fixed relationship between the image segment number and the line offset is established. The image segment numbering direction follows the radiometer scan direction.

Now let us look at the typical file names and types you will see on Channel 3 for the LRIT data.

L-000-MSG2_-MSG2____-IR_016__-000008__-201008100615-C_

Some features to note.

The 'L' refers to the Low rate previously explained.

MSG-2 confirms the satellite of origin.

The IR_016 is the channel reference where 016 represents the wavelength of 1.6 μm.

The 000008 refers to the 8th segment of the cycle.

201008100615 refers to the 06.15 segments on the 10th August 2010.

So with 8 segments per channel and 5 channels there will be a total of 40 segments per cycle plus a further 2 for the prologue and epilogue files.

The prologue and epilogue files take the form :-

L-000-MSG2_-MSG2____-____-PRO___-201008100615

L-000-MSG2_-MSG2____-____-EPI___-201008100615

Channel 3 also carries some of the Foreign Satellite Data (FSD) but in keeping with this awkward channel even this data is not straightforward.

The data consists of 3 hourly GOES E (GOES 13), 3 hourly GOES W (GOES 11), 3 hourly MTSAT-2, and half-hourly Meteosat 7 for the IODC project. GOES E, GOES W and MTSAT-2's data is provided in 4 wavelengths whilst Meteosat 7 is in 3 wavelengths.

Just as a reminder, and to be dealt with in another column, that the additional GOES E and W data to provide the hourly service, the additional MTSAT-2 data to provide an hourly service comes in Data Channel 4. Feng Yun geostationary data (CMA) is provided on Data Channel 11 and will be dealt with separately.

Here is a description of the file types provided for the FSD service on Channel 3.

L-000-MSG2_-GOES13_____-00_7_075W-PRO___-201008092100-_

L-000-MSG2_-GOES13_____-00_7_075W-000001___-201008092100-C_

Repeated for segments 000002 – 000007 inclusive and for each of the other 3 wavelengths.

L-000-MSG2_-GOES11_____-00_7_135W-PRO___-201008092100-_

L-000-MSG2_-GOES11_____-00_7_135W-000001___-201008092100-C_

Repeated for segments 000002 – 000007 inclusive and for each of the other 3 wavelengths.

L-000-MSG2_-MTSAT2_____-00_7_145E-PRO___-201008092100-_

L-000-MSG2_-MTSAT2_____-00_7_145E_000001___-201008092100-C_

Repeated for segments 000002 – 000006 inclusive and for each of the other 3 wavelengths.

L-000-MTP__-MET7_____-00_7_057E_PRO___-201008092100-_

L-000-MTP__-MET7_____-00_7_057E_000001___-201008092100-C_

Repeated for segments 000002 – 000010 inclusive and for each of the other 2 wavelengths.

In addition there is an administration file provided in the following format.

L-000-MSG__-SERVICE____-ADMIN___-03840_001-201008092100-_

And the final group of products provided in Channel 3 is the MPEF meteorological products. There are too many of those to give a detailed description so I will limit each to a brief description with file types and leave the reader to get more information from the EUMETSAT Product Navigator with which all EUMETCast users should now be familiar.

CLM (Cloud Mask)

The Cloud Mask product describes the scene type (either 'clear' or 'cloudy') on a pixel level. Each pixel is classified as one of the following four types: clear sky over water, clear sky over land, cloud, or not processed (off Earth disc). The product is provided every 15 minutes.

L-000-MSG2_-MPEF_____-CLM____-PRO____-201006191815-_

L-000-MSG2_-MPEF_____-CLM____-000001____-201006191815 etc to 000006

FIRA (ASCII format)

The active fire monitoring product is a fire detection product indicating the presence of fire within a pixel. The underlying

concept of the algorithm takes advantage of the fact that SEVIRI channel IR3.9 is very sensitive to hot spots. The product is provided every 15 minutes.

L-000-MSG2_-MPEF_____-FIRA____-PRO____-201006191815-_

L-000-MSG2_-MPEF_____-FIRA____-000001____-201006191815-_

FIRG (Grib format)

The active fire monitoring product is a fire detection product indicating the presence of fire within a pixel. The underlying concept of the algorithm takes advantage of the fact that SEVIRI channel IR3.9 is very sensitive to hot spots.

The product is provided every 15 minutes.

L-000-MSG2_-MPEF_____-FIRG____-PRO____-201006191815-_

L-000-MSG2_-MPEF_____-FIRG____-000001____-201006191815-_

GII(Global Instability Index)

Atmospheric air mass instability in cloud free areas. The original statistical algorithm was developed by the SAF in support of Nowcasting and Very Short Range Forecasting but the GII is produced at EUMETSAT.

The product is provided every 15 minutes.

L-000-MSG2_-MPEF_____-GII____-PRO____-201006191815-_

L-000-MSG2_-MPEF_____-GII____-000001____-201006191815-_

MPEG(Multi-Sensor Precipitation Index GRIB)

The Multi-Sensor Precipitation Estimate (MPE) product consists of the near-real-time rain rates in mm/hr for each Meteosat image in original pixel resolution.

The product is provided every 15 minutes.

L-000-MSG2_-MPEF_____-MPEG____-PRO____-201006191815-_

L-000-MSG2_-MPEF_____-
MPEG____-000001____-201006191815 etc to 000004

AMV(Atmospheric Motion Vectors)

Atmospheric Motion Vectors at all heights below the tropopause, derived from 5 channels (Visual 0.8, Water Vapour 6.2, Water Vapour 7.3, Infrared 10.8 and the High Resolution Visual channel), all combined into one product.

The product is provided every hour.

L-000-MSG2_-MPEF_____-AMV____-PRO____-201008092145-_

L-000-MSG2_-MPEF_____-
AMV____-000001____-201008092145-_

ASR(All Sky Radiances)

This product contains information on mean brightness temperatures and radiances from all thermal (e.g. infrared and water vapour) channels. It includes both clear and cloudy sky radiances and brightness temperatures.

The product is provided every hour.

L-000-MSG2_-MPEF_____-ASR____-PRO____-201008092145-_

L-000-MSG2_-MPEF_____-
ASR____-000001____-201008092145-_

CLA(Cloud Analysis)

Identification of cloud layers with cloud type and coverage, height and temperature.

The product is provided every 3 hours.

L-000-MSG2_-MPEF_____-CLA____-PRO____-201008092145-_

L-000-MSG2_-MPEF_____-CLA____-000001____-201008092345
etc. to 000003

CLAI (Cloud Analysis Image)

Identification of scenes type for each image segment. This is an image product derived along with CLA.

The product is provided every 3 hours.

L-000-MSG2_-MPEF_____-CLAI____-PRO____-201008092345-_

L-000-MSG2_-MPEF_____-CLAI____-000001____-201008092345
etc to 000003

CSR(Clear Sky Radiances)

This product contains information on mean brightness temperatures and radiances from all thermal (e.g. infrared and water vapour) channels, for those regions containing no or only low-level clouds.

The product is provided every hour.

L-000-MSG2_-MPEF_____-CSR____-PRO____-201008092345-_

L-000-MSG2_-MPEF_____-CSR____-000001____-201008092345
etc to 000003

CTH(Cloud Top Heights)

The product indicates the height of highest cloud. Based on a subset of the information derived during Scenes and Cloud Analysis, but also makes use of other external meteorological data.

The product is provided every hour.

L-000-MSG2_-MPEF_____-CTH____-PRO____-201008092345-_

L-000-MSG2_-MPEF_____-CTH____-000001____-201008092345
etc to 000002

DIV(Divergence)

The Divergence is calculated directly from the field of the MSG channel 6.2 Atmospheric Motion Vectors. Only high level (above 400 hPa) vectors are considered, and the output variables are Horizontal Divergence and Relative Vorticity on a 32 x 32 pixel grid.

The product is provided every hour.

L-000-MSG2_-MPEF_____-DIV____-PRO____-201008092345-_

L-000-MSG2_-MPEF_____-DIV____-000001____-201008092345-_

TH(Tropospheric Humidity)

Relative humidity in both mid and upper layers of the troposphere, using a 16 x 16 pixel segment grid. The upper level is derived from the mean layer relative humidity between about 600 hPa and 300 hPa using the WV6.2 micron channel, while mid-tropospheric humidity represents the mean value between 850 hPa and 600 hPa using the WV7.3 micron channel.

The product is provided every 3 hours.

L-000-MSG2_-MPEF_____-TH____-PRO____-201006192345-_

L-000-MSG2_-MPEF_____-TH____-000001____-201006192345-_

TOZ(Total Ozone)

Total density of ozone in atmospheric column for each image segment, based on the SEVIRI 9.7 micron Ozone channel and other IR and WV channels.

The product is provided every 3 hours.

L-000-MSG2_-MPEF_____-TOZ____-PRO____-201006192345-_

L-000-MSG2_-MPEF_____-TOZ____-000001____-201006192345-_

Not everyone will find the meteorological data of great interest but for those, like myself whose weather satellite interests are meteorologically based, there is a wealth of interesting data included. As an example I have provided an image from an AMV file showing wind speeds and directions at different pressure levels. I have included the corresponding surface weather analysis chart to show where wind directions would be expected. Out of interest the lower pressure level winds (0 – 350hPa) are shown in the lighter shade of purple. The image is shown on the page opposite.

Next quarter I hope to look at Channel 4 which is a little simpler than Channel 3.

Updates.

BUFRdisplay V0.1.2 101004 by Francis Breame.

You will find a detailed review of this program by the author elsewhere in this journal. The program examines the contents of BUFR encoded files to ascertain what data is included in the file and also provides a detailed list of the file structure. The program also decodes files and displays the data on a selection of map projections, assuming, of course, there is data within the file that can be represented geographically. This is a free program and so far I have not found a BUFR file it will not open although do remember that some files only include numerical data and not image data. To download the file and get further information please go to :-

http://www.vf0123.btinternet.co.uk/

David Taylor's programs (latest releases)

Just a reminder that the list below is for fully tested releases and does not include the latest beta (or alpha) versions currently on test. Those can also be downloaded from David's site.

To learn more about those programs and to download the latest updates please go to :-

http://www.satsignal.eu

ATOVS Reader	v 1.2.2
AVHRR Manager	v 2.0.6
BUFR Viewer	v 1.1.4
CMA Viewer	v 1.2.0
DWDSAT HRPT Viewer	v 1.2.4
GeoSatSignal	v 7.1.6
GRIB Viewer	v 2.3.10
GroundMap	v 2.1.6
HDF Viewer	v 1.4.4
HRPT Reader	v 2.9.6
Kepler Manager	v 1.3.2
MapToGeo	v 1.1.8
Metop Manager	v 1.4.8
MSG Animator	v 2.5.40
MSG Data Manager	v 2.5.42
PassControl	v 3.2.4
SatSignal	v 5.2.2
Sea-Ice & Viewer	v 1.4.2
Wxtrack	v 3.8.10
MODIS L1 & Fire Viewer	v 1.0.4

Continued from page 11

How EUMETCast aids Gliding

Hannu has used Meteosat satellite information since 1985, first receiving the WEFAX data through an Italian VHF receiver and video converter and displaying the images on a monochrome TV screen. The same system was used to receive polar satellite images but needed too much manual work. The next significant step was the Dutch *Digisat* PC software in 1995, which made it possible to show the Meteosat data automatically in a continuous coloured strip. The Meteosat WEFAX data service stopped operation in summer 2006 so Hannu had to start using *EUMETCast* data and the whole bundle of David Taylor's software that same summer. First, LRIT data was downloaded through the Internet but, after a very short time, a parabolic antenna and *Technisat* card, to receive HRIT data straight from the satellite, were added to his system.

All the time the most interesting data have been the six-hourly visual images of views over northern Europe. From those images one can see how the fronts and overcast areas are moving, and on this base the start time and flight plan. This is very important during gliding competitions on tricky days. You can also even see single cumulus clouds and when and where they are starting to develop with the new HRIT data false colour images. Originally, it was not possible to have images from *GeoSatSignal*, but an update has now made this possible.

With this new system, it is also possible to make use of the previous 12 hours of infrared images to view front movements. During the evenings you may try to visualize what will happen during the night for the following day's weather, but modern weather forecasts are much better now.

Ultralight Application

Ultralight planes are only used in good weather conditions (VFR-flights). Before flying, it is necessary to check the current weather and also forecast for the planned flying route. Aviation authorities offer meteorological services for current weather (METAR) and weather forecast (TAF). Each forecast is given by codes, which include data on winds, cloud cover and also probabilities as to how the weather is forecast to develop.

EFVA 111730Z 1118/1218 VRB03KT 9999 SCT012 BKN020
TEMPO 1119/1124 OVC012 TEMPO 1200/1207 4000 BR BKN004
TEMPO 1208/1218 6000 RA BKN013

TAF forecast for Vaasa airport

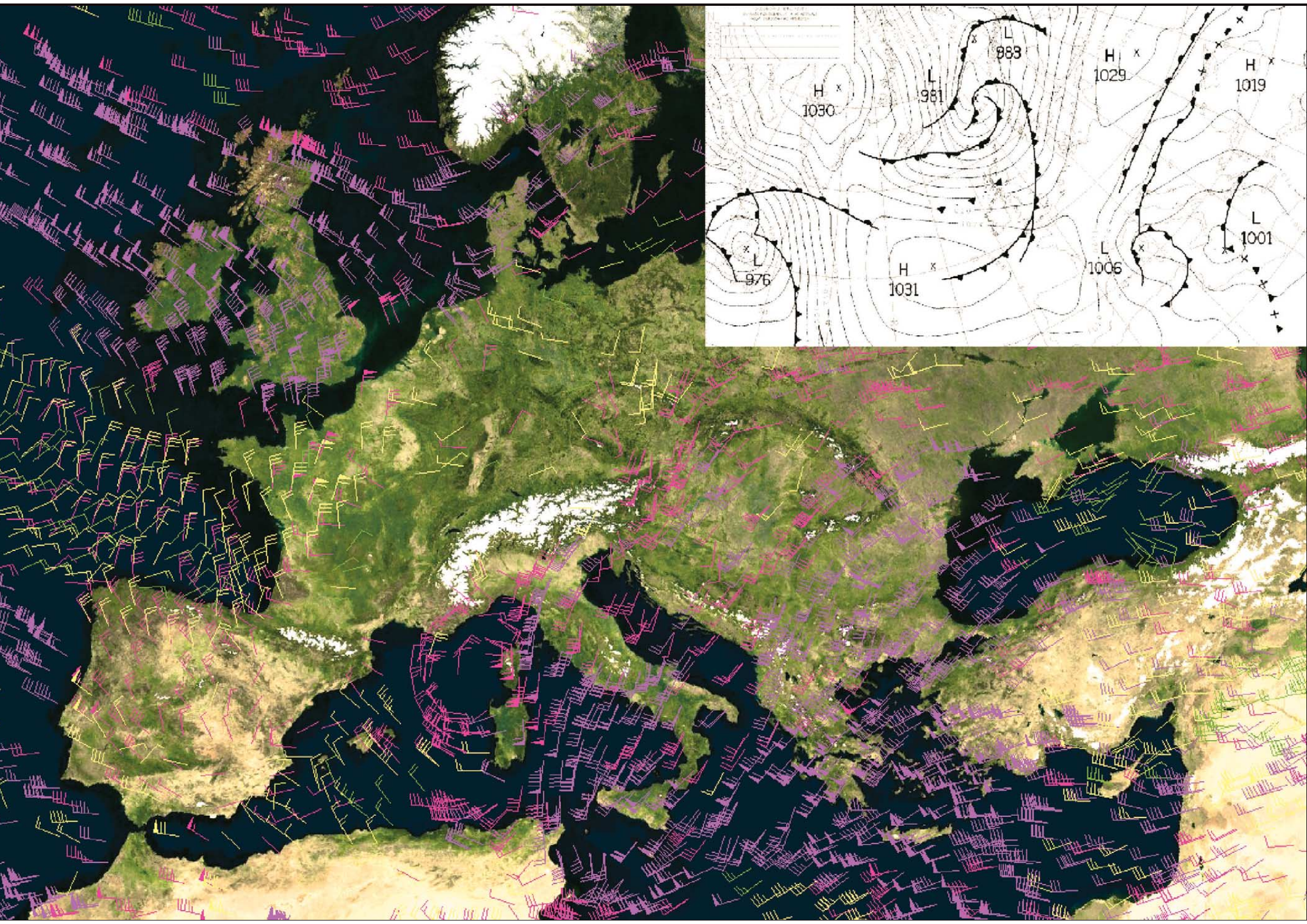
Weather codes are clear but it is quite hard to make a visual understanding how weather could develop. Using Meteosat 12-channel information it becomes quite easy to get an exact picture of the current weather and forecast.

The writer is using *MSG Data Manager*, *MSG Animator* and *GeoSatSignal* for data visualisation.

About the Authors

Hannu Korhonen is a senior glider pilot with over 5000 hours of flying experience. He has a master's degree in aviation engineering and has designed several types of gliders (PIK 20 series). He has also won a gold medal in his national gliding championships. Today he is the happy owner of an ASG29 glider plane and works in his own company, HKAvionics, selling equipment needed in gliding.

Esko Petäjä is a junior glider and ultralight pilot, with as yet only a few hundred flying hours. He is also a Ham radio operator: call sign OH6MQM.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