The GEO Quarterly

Group for Earth Observation

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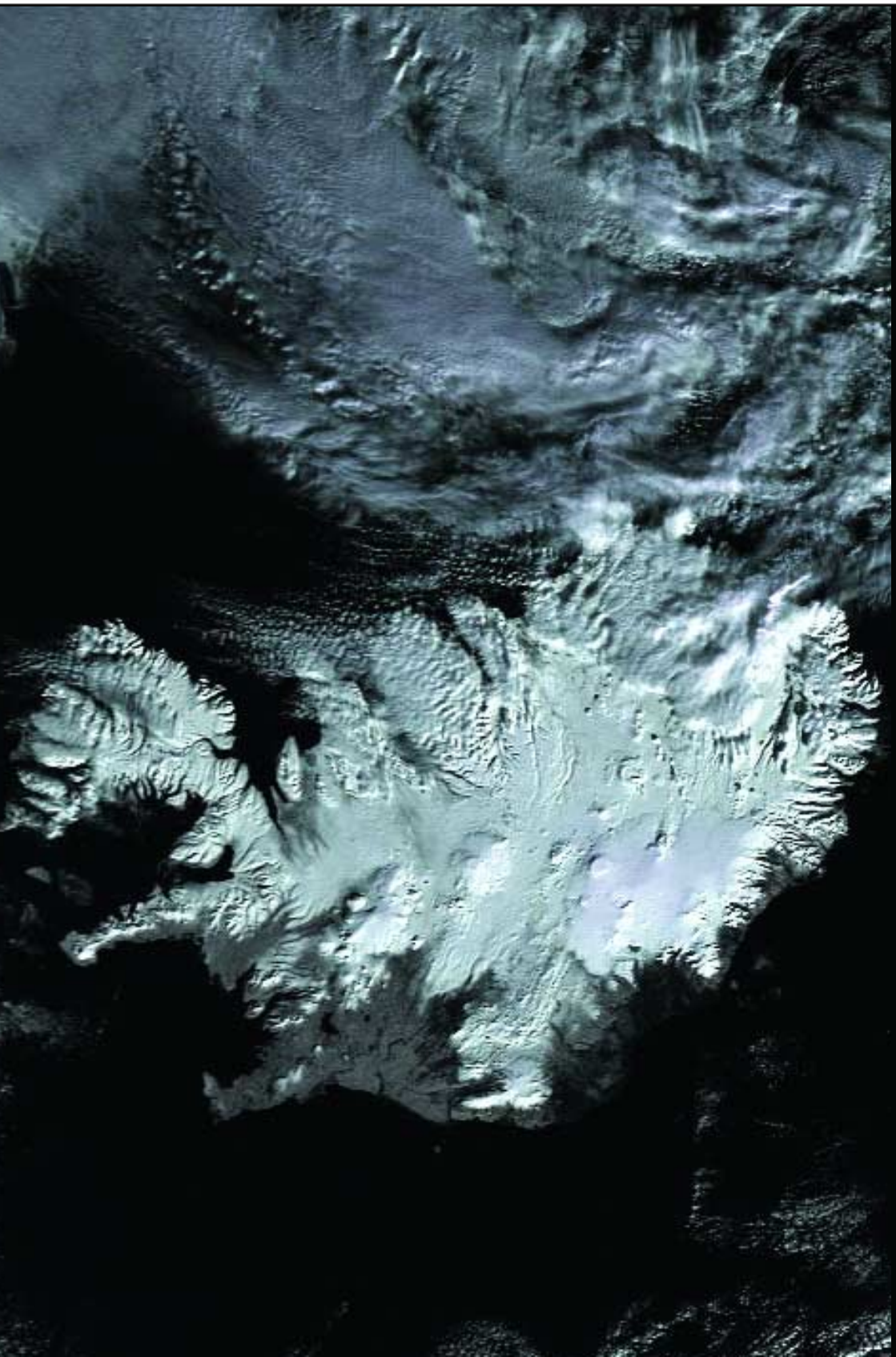


Inside this issue . . .

TQchanSel: software from Rob Alblas to give instant control of your EUMETCast downloads—completely 'on the fly'.

Are you having problems receiving EUMETCast using a RAMdisk? Mike Stevens explains his alternative method for trouble-free DVB reception

Are you experiencing too much clutter with multiple PCs, monitors, mice and keyboards? Guiseppe Cico describes how he operates several PCs with a single monitor and keyboard

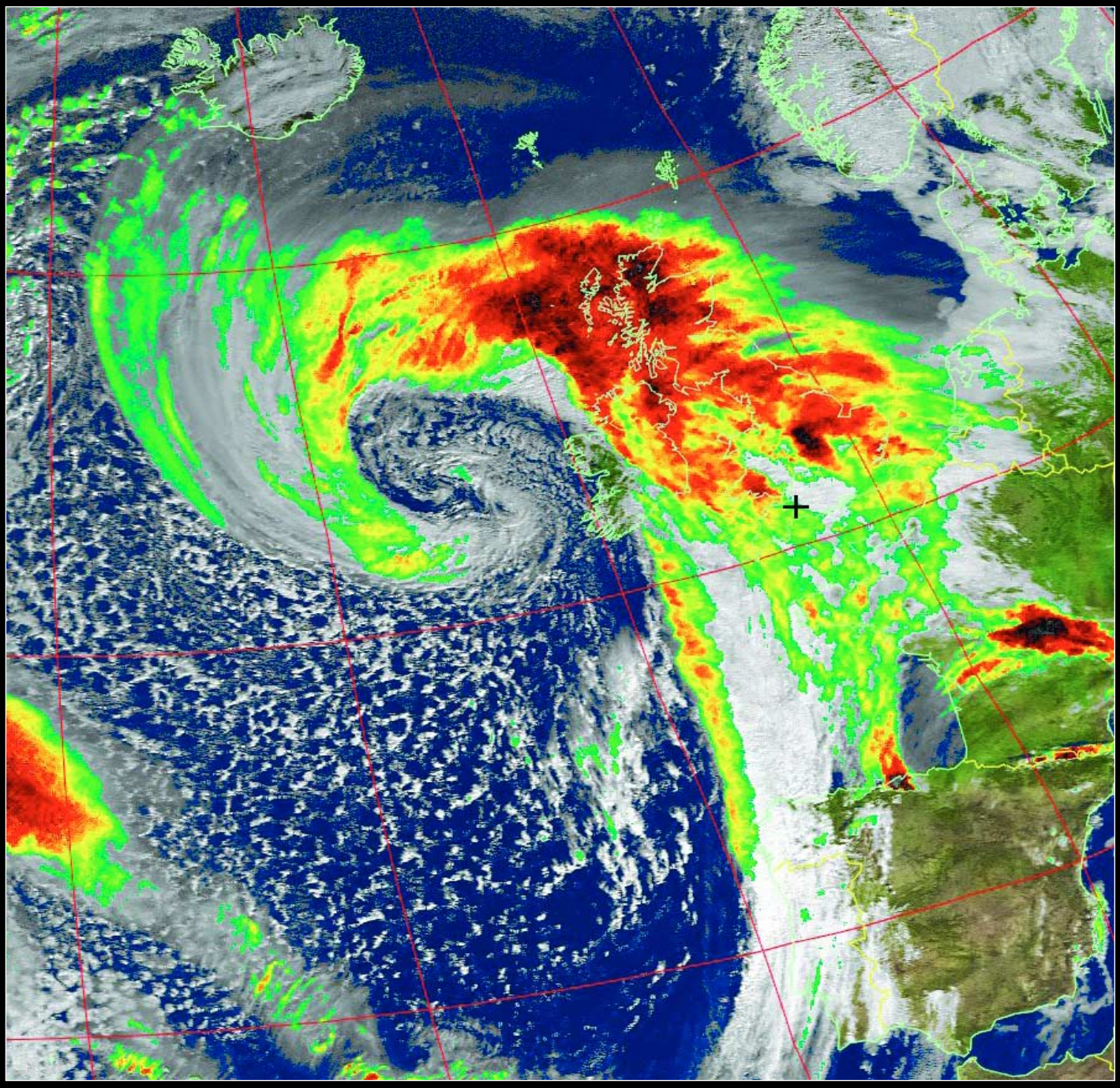
Reviewed: The R2ZX, the new, pager resistant APT weather satellite receiver—available exclusively from GEO

Peter Wakelin describes the highly eccentric Molniya satellite orbit

Alan Banks writes about this year's intense Tropical Cyclone season in the Indian Ocean

Read David Taylor's illustrated description of a recent visit to the new Met Office Headquarters in Exeter

Plus many more features ...



A glance at the panel opposite will reveal a new email address for contacting the editor—***geoeditor@geo-web.org.uk***. Recent increases in Internet spam have meant that scarcely one email per thousand addressed to the editor has been genuine. It is probable that the problem has arisen because Management Team email addresses had been listed, with direct links, on the GEO website. These have now been replaced by web forms which conceal the actual addresses from hackers but still allow members to contact GEO Team members.

Please note that the old email address for the editor will remain valid only until the end of June. Please update your records now.

Rob Alblas, a leading member of Werkgroep Kunstmanen, has produced *TQchanSel*, an ingenious computer program that should appeal to anyone using *EUMETCast*. *TQchanSel* allows you to determine which type of data (MSG, AVHRR, Metop, ATOVS etc.) is to be downloaded from the DVB stream and stored on your PC for processing. If, on a given day, you only wish to receive Meteosat, one mouse-click is all that is required to set this up: if you decide to add Metop—again, a single mouse-click instantly adds that service. You can discover all about *TQchanSel* in Rob's article on page 34.

APT enthusiasts will be pleased to learn that the R2ZX, an upgraded version of the popular German weather satellite receiver, which now resists pager interference on the 137.91 MHz NOAA-18 frequency, has been developed exclusively for GEO's UK market. You can read about the new receiver in articles on pages 24 and 28.

Finally, it's nice to conclude with a little unashamed trumpet-blowing. *GEO Quarterly* is highly thought of in the highest echelons of the satellite industry and recently brought warm words of commendation from Claudia Ritsert-Clark, Head of Communication and Information Services at *EUMETSAT*. You can read her comments on the 'Letters' page.

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Responsibility for Constructional Projects and Software
Every effort is made to ensure that the technical and constructional articles published in this Quarterly are correct. However, the ultimate responsibility is with the reader to ensure the safety of constructions and for any interfacing with other equipment. GEO cannot accept liability for shortcomings in any published design or any constructions carried out by members or other third parties.

The GEO Report

Francis Bell

Established GEO members will have noticed that we now have an addition to our Management Team, David Anderson, who is now actively fulfilling the role of Membership Secretary for us. David is experienced in weather satellite reception, is an established member of GEO and is very competent with software, data bases and record-keeping. On the subject of our Management Team, and on behalf of all the membership, a formal thanks to them for running GEO, not forgetting their wives, who are also supportive of GEO. These are all honorary roles: that is, nobody gets paid and there is no routine coverage of expenses.

Satellites and Earthquake Prediction

GEO activities and travel have kept me particularly busy recently. There was one evening in London at the London Centre for Social Studies where I gave a straightforward talk about the non-commercial reception of weather satellite images. There was a connection for the use of these images in predicting earthquakes but I did not become involved in that issue as any associated background science here is unknown to me. I just kept to the practical issues of image reception. I was interviewed by Turkish TV so next time I'm in Istanbul I may be famous.

Equally as serious as Istanbul, with its earthquake threat, I have just returned from California USA where my hotel was located close to the San Andreas fault. I did look superficially at the local geology from my amateur perspective and collected a few rock samples. Parts of this area are a bit scary. Weather satellite imaging for earthquake prediction would be a valuable tool for any part of the world, if it was backed by scientific understanding.

GEO at Rallies

GEO had a stand at the *South London Amateur Radio and Computer Rally* at Kempton recently. This was well attended by the general public and we had many visitors to our stand. There is a report about this rally in the May edition of the RSGB's *RadCom*. From GEO's perspective it was judged to be a worthwhile day. We did get new members joining GEO and some renewals.

A new venue for us was the well-attended *Mid-Cheshire ARC Rally* at Nantwich where I gave a talk in the speaker programme and we had a well presented exhibition stand. Another new event for us was the *British Rocket Oral History Programme* (BROHP) three day conference held in Godalming, Surrey. GEO had a display in the exhibition area and ran live EUMETCast reception on all three days.

At this conference, as well as the programme of speakers, there were a number of exhibition stands in the main hall. I collected literature from some of the stands and bought a meteorite from another. More about this meteorite in our next Quarterly perhaps.

It was the literature from the British National Space Centre (BNSC) in the exhibition area which particularly caught my eye. I collected some papers and read them at home on the first evening. In conversation next day I commented to a BNSC representative about the breadth of their influence in the UK space effort. Their reply was: 'Yes, not many people understand the BNSC'. One of their publications, which I found particularly interesting, informative and well illustrated is titled '*UK Space Activities 2006*'. It's easy to read in about 45 minutes. If you want to know where the UK's public annual budget of £207 million is spent (of which £82 million goes to Earth observation) then this is a must-read booklet.

GEO's diaplay at the BROHP Conference

I have spoken to BNSC's London office and they will send copies to individuals on request. If you do this, also ask for their 18 month calendar, which is informative and well illustrated. In order to obtain copies you should make contact

- by email - ***bnscinfo@bnsc.gsi.gov.uk***
- by telephone to their publications bureau on 0845 0150010
- by letter to DTI Publications Orderline, Admail 528, London SW1W 8YT.

Quote the references URN 06/88 for the '*UK Space Activities 2006*' and URN 06/ST28 for their calendar. There will be no charge for these publications. Our European members may also wish to obtain this literature. Although the financial report relates to the UK, many of the activities and reports transcend political boundaries. Give your full postal address with any request.

Power Supplies and Standby

I was very interested to read Geoff Darby's follow-up article to my comments in GEO Q13 relating to power supplies and the prudence or otherwise of leaving equipment on standby (page 31). The irony here is that shortly after reading the draft of his article, one of my computer monitors which I had turned off overnight (and which is not left of standby) died the following morning the instant I turned it back on!

Membership Renewals

Here is the usual reminder about checking your membership renewal. We do not wish to lose membership by the default of forgetting to renew. Of course some current members will not renew for valid reasons but don't just let it be by omission. GEO's financial viability is guaranteed by the company structure but our financial margins are small and we need to maintain a robust membership to sustain our activities. On a formal note I regularly report to Companies House and send them our accounts which are a matter of public record. I also take copies of these papers to our Leicester symposium.

GEO Shop

Our GEO 'Shop' is a double edged asset. It provides an outstanding service to our membership with a 'one stop' access to

the equipment needed for our activities. It also makes a small profit for us. If you need any new hardware, do please buy it from our shop, everybody comes out a winner that way.

Several new items have been added to our stock recently. Keep up to date with the latest developments by directing your Web browser towards

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

And remember, you can order items from the GEO Shop using the Internet, either by credit card or *PayPal*.

Atlantic Cruise

Readers may recall my report relating to Nadine and myself on a transatlantic cruise (reported in GEO Q12) and our encounter with hurricane Florence and severe Atlantic storms. There has now been a legal development. The lawyers have taken to court over the questionable decision-making process which endangered all the lives aboard the ship. Would you believe it! The travel company blamed the ship owners and the ship owner blamed the travel company. Well life's like that!

The ship we were on has now been renamed '*Athena*'. I have just learned that, under its previous name of '*Stockholm*', this ship was responsible for sinking the Italian transatlantic liner '*Andrea Doria*' close to Nantucket Island in 1958. I don't think I will sail aboard this ship again.

The busy GEO Stand during the South London Amateur Radio and Computer Rally, Kempton

The Quarterly Question

Thanks to those who submitted answers to the last Quarterly question which related to the calculated distance travelled by Metop-A in one year. I picked Frank Skillington as the winner. He submitted the correct answer 235 million km. The calculation goes as follows

- take the mean radius of the Earth
- add the altitude of the satellite
- multiply by 2 x pi to give the distance travelled in one orbit
- next divide the orbital time of 101 minutes into the number of minutes in a year
- multiply the two products together to give the answer.

QUARTERLY QUESTION

Now for a new Quarterly Question.

Sometimes, when talking to people, a misconception becomes apparent. Many people think that objects in space just float around because there is no gravity out there.

This concept is quite wrong!

At an altitude of say 800 km, where some of our weather satellites orbit, the Earth's gravitational field is only a little less than on the surface of the planet. Satellites orbit because their forward motion together their falling matches the rate at which the Earth's curved surface falls away from them.

The Question

If a satellite at an altitude of 800 km suddenly ceased all forward motion, how long would it take to fall to the ground?

Assume that the acceleration due to gravity gravity is constant at 10 ms^{-2} (metres per second per second) throughout the fall and discount the effect of atmospheric drag (plus the fact that the satellite would probably burn up). To calculate the answer, which surprised me when I worked it out, you will need the following standard equation of motion:

$$s = \tfrac{1}{2} a t^2$$

where

s = the distance fallen
a = the acceleration due to gravity
t = time taken to fall from orbit

Send your answers, to the nearest full *minute*, to Francis Bell:

- by email to ***francis@geo-web.org.uk***
- or by post to the address on page 1.

The prize will be a book on the Earth's weather written by Storm Dunlop, generously donated by Oxford University Press.

The winner will be chosen at random one week before the copy deadline for GEO Q15 (Saturday, July 28, 2007).

New Editor

Required by GEO

This post should appeal to a member who is proficient in document and image processing on a personal computer and who would like to be involved in GEO.

Interested parties please contact

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ASTER

Reveals Currents in the Strait of Messina

NASA Earth Observatory

(Image on page 38)

Between the island of Sicily and mainland Italy lies the Strait of Messina, that narrow strip of water that connects the Tyrrhenian Sea in the west with the Ionian Sea to the east. At its narrowest point this 32-km long channel measures just three kilometers across.

The Strait widens toward the south but remains relatively shallow with a maximum depth of only about 90 meters. As the tides ebb and flow, strong currents flow through the Strait, often ripping seaweed from the sea floor, while converging currents form a natural whirlpool which may well be the origin of the legend of Scylla and Charybdis, the two sea monsters that threatened Odysseus and the Argonauts on their journey in search of the Golden Fleece.

For such a narrow, shallow body of water, the Strait of Messina has long posed problems for sailors.

The main current runs from south to north but a smaller current runs in the opposite direction. These currents alternate every six hours or so, producing complicated wave patters that can be seen from space.

ASTER, the Advanced Spaceborne Thermal Emission and Reflection Radiometer aboard NASA's Terra satellite took the image reproduced on page 38, showing the Strait of Messina, on August 11, 2003.

At the time of acquisition, the sun was at just the right angle to illuminate these waves, which appear as a series of concentric rings heading southward. At right angles to them are shallower waves that give the water a rough appearance.

The dark region at the lower left-hand corner of the image (with white puffy clouds hovering above it) is Mount Etna.

NASA image created by Jesse Allen, using data provided courtesy of the NASA/GSFC/MITI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team

Cover and Full-Page Images

Front Cover

Snow-covered Iceland, visualised from the 12:15 UT NOAA-17 pass on February 26, 2007, and downloaded from the EARS-AVHRR stream on EUMETCast by David Taylor.

Image © EUMETSAT 2007

Inside Front Cover

Maurice Elwell obtained this striking NOAA-17 image of an Atlantic depression hitting the British Isles on March 4, 2007. In an email to the GEO Shop Maurice stated: 'I'm sending you this image taken today to show how pleased I am with my new R2ZX receiver'. The image was processed using *WXtoImg*, taking advantage of its colourful 'precipitation enhancement' option. The pass was received using a Paul Hayes copper QFH antenna on an outside pole 6 metres above ground and a new R2ZX pager-resistant APT receiver.

Inside Back Cover

NOAA 14 is still producing some superb results, as can be seen in this 09:39 UT pass over frozen Scandinavia on February 19 this year. The Gulf of Bothnia is completely frozen over as is the pincer-shaped Lake Onega. But large stretches of open water persist in the Gulf of Finland and on Lake Ladoga, Europe's largest lake.

Image: Lawrence Harris

Below is a February 15 MODIS image from NASA's *Terra* satellite showing the distant Kerguelen Archipelago in the southern Indian Ocean. The small population comprises some 50 to 100 scientists (Earth sciences and biology). Since 1992, CNES (the French government space agency) has maintained a satellite tracking station there.

Image: MODIS Rapid Response Team

Back Cover

NOAA-17 imaged Cyclone *George* passing over the Pilbara and the Kimberleys in Western Australia at 01:17 UT on March 10 with winds in excess of 270 kph. Roofs were ripped off, trees uprooted while power and phone lines were cut. The storm caused two fatalities, with some 20 injured.

Image: Ken Morgan

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Great Britain is almost cloud free in this NOAA-17 HRPT image acquired at 11:08 UT on February 3, 2007, with a wreath of lee cloud fringing northwest Scotland.

Image: NOAA CLASS Library (www.class.noaa.gov)

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Tropical Cyclone *Favio* forms an attractive spiral as it brushes past the island of Madagascar on February 19. David Taylor submitted this Metop-A image.

Image © EUMETSAT 2007

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This fine channel-2 AVHRR image showing Scandinavia and northwest Russia embalmed in ice was acquired by Metop-A at 09:18 UT on February 9, 2007.

Image: NOAA CLASS Library (www.class.noaa.gov)

Toba Caldera

Footprint of a Great Eruption

(Image on page 5)

Around 74,000 years ago, the Earth was rocked by the largest volcanic eruption to have occurred in the past 2 million years. Over what was probably a two-week span, thousands of cubic kilometers of debris spewed from Toba Caldera on northern Sumatra. Pyroclastic flows (fast-moving clouds of hot gas, rock fragments, and ash) buried at least 20,000 square kilometers around the caldera. As far away as India, ash from the Toba eruption lies in layers up to 6 meters thick; on Samosir Island, the ash layer reaches a depth of over 600 meters! Placed in context with the 1980 Mount St Helens eruption, which expelled just one cubic kilometre of ash, Toba is estimated to have produced 2800 cubic kilometres of ash which covered at least four million km2—equivalent to almost half that of the continental United States.

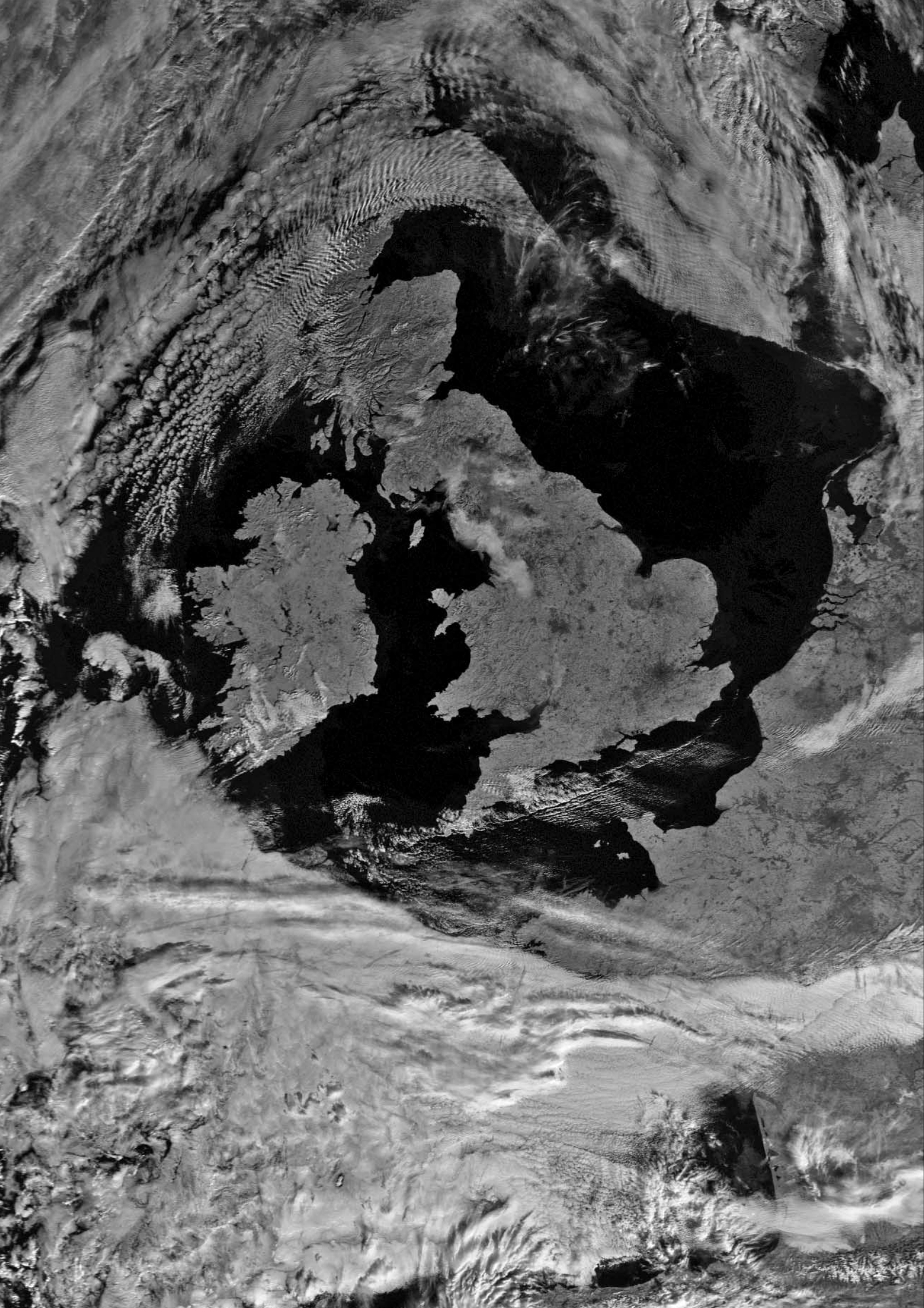
Following the eruption, the ground collapsed, creating the 30 × 100 km caldera imaged opposite, now filled with water to make Lake Toba. Samosir Island is a resurgent volcanic dome, a mound of rock uplifted by pressure from unerupted magma in the chamber beneath the volcano. The Pusukbukit Volcano on the western shore of the lake also formed after the catastrophic eruption.

Looking at the incredibly lush tropical vegetation that covers much of the landscape, it is difficult to picture the complete destruction of plant and animal life—including human populations—that would have resulted from the eruption. Very few creatures of any kind would have survived across a broad part of Indonesia. A 'volcanic winter', caused by the increase in sunlight-reflecting particles high in the atmosphere, probably lasted several years. The rapid global cooling trend would have had profound consequences for life around the globe.

Although there has been no eruption from Toba in historical times, the region, which lies close to the Sumatra Fracture Zone remains seismically active, and experienced a major earthquake as recently as 1987.

This image of Toba Caldera was captured by the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) on NASA's Terra satellite on January 28, 2006.

Image courtesy of NASA/GSFC/MITI/ERSDAC/JAROS, and the U.S./Japan ASTER Science Team.



Cloud Streets

Les Hamilton

The image opposite depicts a splendid example of a cloud phenomenon that is frequently observed in satellite images of the Arctic and the Antarctic. The parallel streamers of cloud, often stretching several hundreds of kilometres, are termed *Cloud Streets.* They arise where a flow of cold dry air moves from land across a neighbouring region of relatively warm sea or ocean. In this particular instance, viewed through the MODIS (**Mod**erate Resolution **I**maging **S**pectroradiometer) instrument aboard NASA's *Terra* satellite, high pressure over northern Canada is forcing cold, relatively dry surface winds to spread across the waters of Davis Strait between Baffin Island and Greenland, picking up moisture which forms cloud as it advects southward.

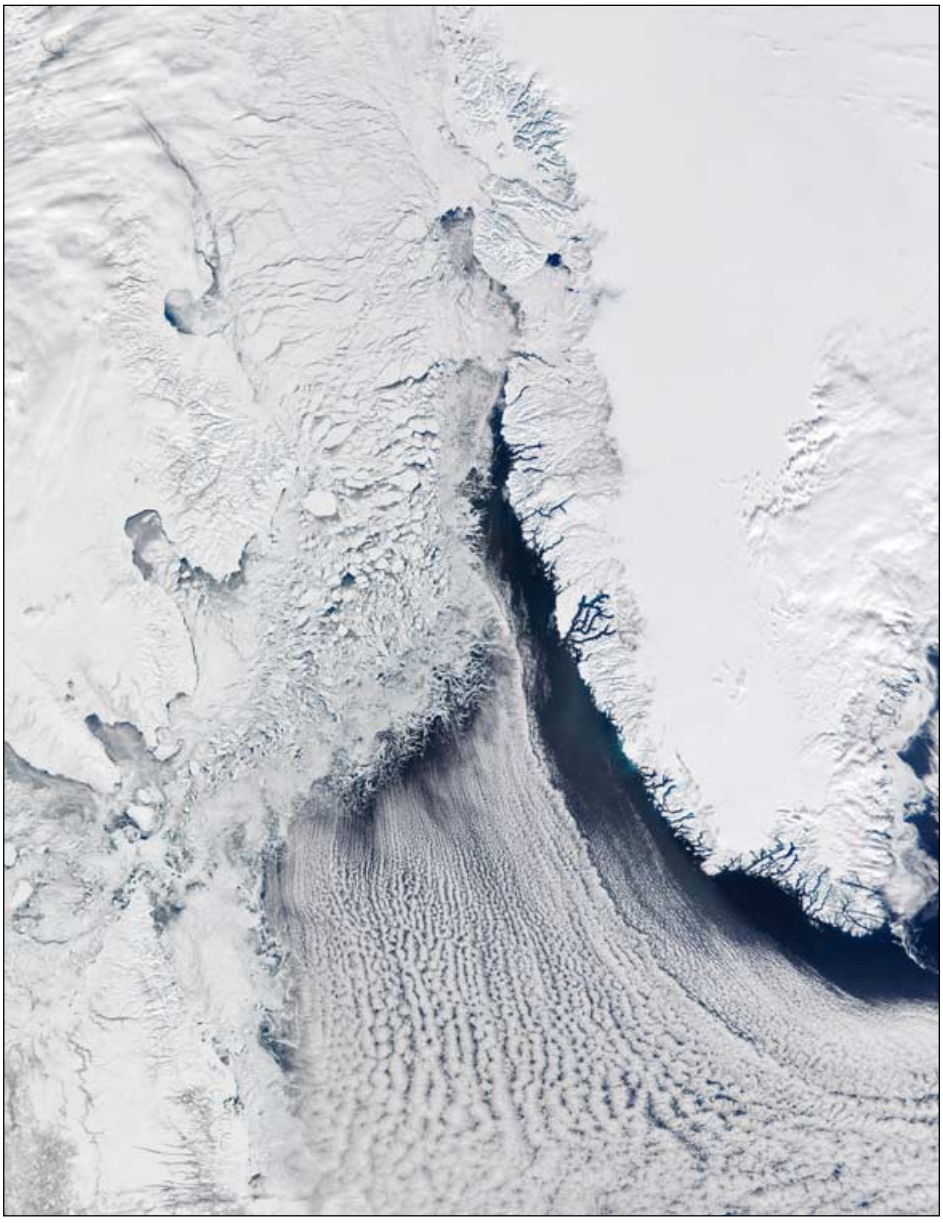


Figure 2 - Cloud Streets in the Labrador Sea - March 29, 2002
Image NASA's Terra satellite (MODIS)
Credit Jacques Descloitres, MODIS Land Rapid Response Team, NASA/GSFC

How and Why do Cloud Streets Form?

Cloud streets typically form along the path of low-level winds which are blowing over open water which is warmer than the wind itself. This flow of air often occurs behind a cold front and, as it leaves the land or ice surface, it becomes modified by the vertical transfer of heat and moisture from the underlying warmer water.

The air becomes warmed, picks up water vapour from the sea, then rises by convection as it is simultaneously swept along with the wind. The air is thus subject to two competing influences: vertical motion (convection) and lateral drift (advection with the prevailing wind). These two influences cause the rising air to roll and spin, creating horizontal roll vortices, all lined up with the wind direction. Alternate vortices rotate in the opposite sense as illustrated below.

Figure 1 - Roll Vortices in Cloud Streets

Where the air in adjacent vortices is rising there is uplift of moist, relatively warm air which condenses as clouds. Where the air in adjacent vortices is descending, warming takes place, causing the cloud to disperse to form lanes of cloud-free air. This transformation of the air mass eventually leads to the formation of cumulus clouds with flat bases and fluffy tops resembling giant heads of cauliflower, which take the form of cloud streets which develop parallel with the direction of the low level wind.

Cloud streets usually form within the *Planetary Boundary Layer,* that low-lying region of the atmosphere where its behaviour is directly affected by contact with the Earth's surface. When the wind direction is relatively constant with height, cloud streets form as a series of longitudinal roll vortices. The cloud-free region between each cloud street is typically about two or three times the depth of the convective layer itself.

The most favourable situation for the formation of cloud streets occurs when the lowermost layer of air is unstable but is capped by a stable inversion layer. This often occurs under anticyclonic conditions, when the upper air is subsiding, and is also frequently found after radiation fog has formed overnight. Convection occurs below this inversion, air rising in thermals beneath the clouds then sinking again in the air between the streets.

Cloud streets are usually more or less straight but can display vortex patterns should the wind driving the clouds become disturbed by an obstacle such as an island. The result can then be the development of cloud formations such as von Kármán vortex streets [1] or ship waves [2].

Cloud streets may also form over land if relatively unstable air streams over an obstacle and convection is initiated by friction or shear (figure 7).

References

1 GEO Quarterly No 2, page 46

2 GEO Quarterly No 11 page 10

Further Examples

Gulf of Alaska

Cloud streets streaking across the Bering Sea and Gulf of Alaska are captured in this true-colour MODIS image from NASA's *Aqua* satellite on March 14, 2003. The Aleutian islands interrupt the airflow, leaving a wake that can be seen at the right-hand side of the image (figure 3 - left).

image: MODIS Rapid Response Team at NASA/GSFC

Hudson Bay

Hudson Bay was suddenly covered by a spectacular set of cloud streets in this November 21, 2005 MODIS image acquired by NASA's *Terra* Earth observation satellite. Lines of clouds sweep off the surface of the ice along the bay's northwest edge and head southeast over the water, billowing out to form irregular lines of puffy clouds (figure 4 - upper right).

image: MODIS Rapid Response Team at NASA GSFC

Amery Ice Shelf

Antarctica is the coldest, windiest, and (on average) highest continent on Earth. Dry, frigid, katabatic (down-slope) winds can blow fiercely from the South Pole toward the Southern Ocean for days on end, setting up ideal conditions for cloud streets.

The Moderate Resolution Imaging Spectroradiometer (MODIS) flying onboard NASA's *Aqua* satellite took this picture on August 14, 2006. The image shows cloud streets rolling off the Amery Ice Shelf on the east coast of Antarctica. Immediately east of the ice shelf's edge is an area of relatively cloud-free air exposing the dark ocean surface. Winds flowing off the ice shelf rapidly pick up water vapour here and, just a little farther east, condensation within the rising, warmed airflow has produced an impressive regiment of cloud streets (figure 5 - lower right).

This NASA image was created by Jesse Allen, using data provided courtesy of the MODIS Rapid Response team.

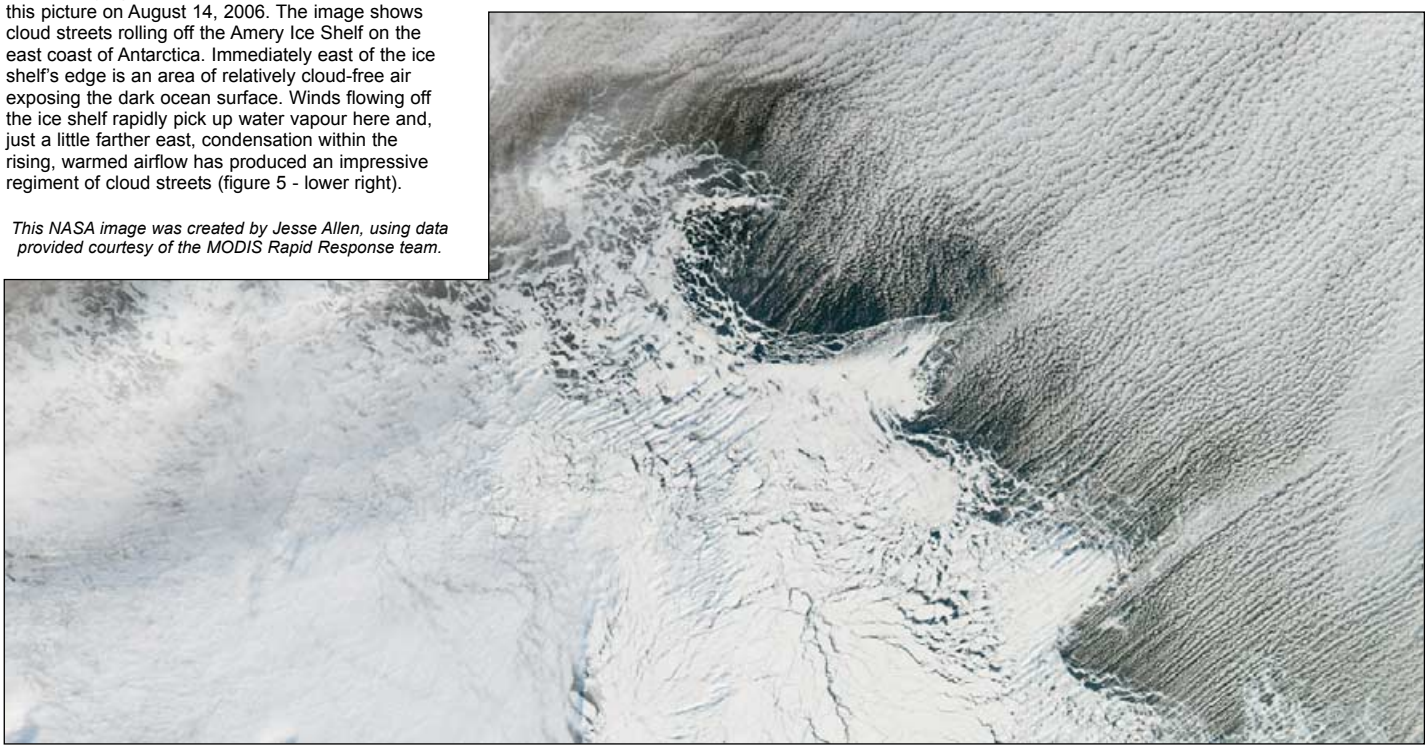


Figure 6 - Cloud Streets over Lake Superior

Like strokes from an artist's brush, the sky over Lake Superior and Lake Michigan was painted with long rows of white clouds on February 5, 2007 when frigid, dry air from the interior blew across the lake. The clouds follow the direction of the wind as it gusts over the water. The same process can also cause lake effect snow when the cold, moist air blows ashore on the lee side of the lake. Signs of lake effect snow can be seen along the southern shore of Lake Superior, which is bright white with little sign of darker vegetation poking through.

Figure 7 - Cloud streets over the UK
NOAA 16 at 12:43 UT on March 7, 2002.
Image: SMIS (http://smis.iki.rssi.ru)

Figure 8 - Cloud streets off Nova Scotia

In this image, acquired by the Moderate Resolution Imaging Spectroradiometer aboard NASA's *Terra* satellite on January 25, 2004, cold air flowing from northern Canada can be seen to generate cloud streets shortly after crossing the Atlantic coastline, where it encounters the warm waters of the Gulf Stream. The white circle in the top centre of the image is an ancient meteorite impact structure housing the Lake Manicouagan reservoir.

Credit Jacques Descloitres, MODIS Rapid Response Team, NASA/GSFC

Facing the next great challenge . . .

Building a successful EUMETCast System without using RAMdisk

Mike Stevens *(G4CFZ)* *email: Mikeg4cfz@tiscali.co.uk*

Here we are again with another new satellite from EUMETSAT—and what problems it has produced for the amateur fraternity. I have been following the bulletins on the *Yahoo Groups* website and it really has caused quite a stir—but one has to say the end results are stunning.

So what have I been up to? Well, with every type of virus that has descended on me in south Dorset, it's a wonder I have achieved anything. But we got through the winter and the worst of the Atlantic Gales and it was good to be able see them coming well before the weather forecasters got round to telling us.

I decided it was time to look at Metop-A. I almost called it the 'one that got away': it almost did, and it took a lot of concentration and thought before diving into the system to discover how far I could push my PCs to deliver all the information that was now being transmitted via *EUMETCast*.

I had already applied to David Taylor for the licence to run his *Metop Manager* software, so that was in and ready to go. The next part was to look into RAMdisk and, having read Arne van Belle's up-dated article [1], I decided to go ahead and join the *Yahoo* MSG-1 Group and download the *AR Soft Ramdisk* software. I did so and, following Arne's instructions to the letter, installed the RAMdisk. All seemed well. After setting up the system as per instructions I switched on all the programs and everything started up. Files were coming in from *EUMETCast* and the RAMdisk was running ok.

System Changes

It was then a case of looking into David Taylor's instruction sheet on *Metop Manager* to make sure that all the necessary changes within the *Tellicast* system were initiated. The required data was added to the 'recv-channels.ini' and 'recv.ini' files and I also followed the advice to increase the file database to 80 000 000 to accommodate the RAMdisk. I then worked through the *Setup4PC* data management files to check the PID's and also to add '510' to that sequence to ensure reception of Metop. You can refer to full details of these required operations in GEO Quarterly No 13 [2,3].

After all this was carried out I rechecked all the systems and files that I had modified before reactivating the *Tellicast* software for start up—and away it went! All the files were feeding into the RAMdisk (to its new position defined in the 'fsy' file) but on looking at the MSG-1 images I found that I now had gaps in reception that I did not have before; also, Metop was coming in with many chunks of information missing. Nevertheless, I allowed the system to continue running until the end of the day to see if it would settle.

Registry and System Restore Problems

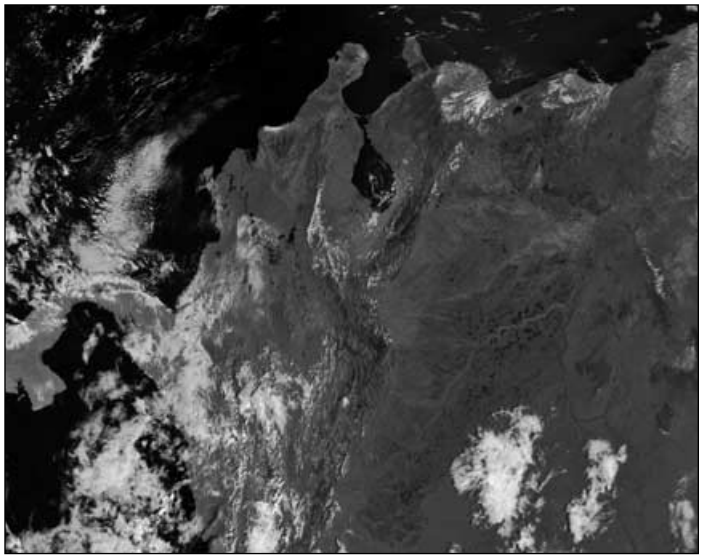
The next day I planned to go into the PC Registry to modify the settings for *System Restore* (as I am using Windows XP) before looking through all the settings within *Tellicast* and the rest of the system to see why I was getting so many gaps in the incoming information. As I had just updated the desktop PC to 1-GB of RAM, I felt that something was not quite right.

Then came the first blow. Switching on the next day, *Tellicast* would not start up at all. I looked into the system for any problems but could not find any, so decided to enter the Registry to modify *System Restore*. Just as I was about to carry out this operation the PC crashed completely and switched off. I was stunned by this, as I had never experienced anything like it before. I immediately switched the PC on again, only to find that **all my satellite programs were gone** and I was left with a basic PC—just as I had bought it two years before. It had been restored back to the configuration when it was manufactured by *E-Machines*.

You can imagine my horror at this! What had caused this to happen? My only conclusion was that the RAMdisk was to blame. In his article Arne does state that, unless *System Restore* is modified, it will cause a problem—and it certainly seemed to have done so most spectacularly.

Luckily, I have all my programs saved on disk along with their licence codes so it was a case of reloading them all back into the computer. However, I have changed the location of *Metop Manager* by placing it on to a separate hard drive just in case the problem happens again.

If RAMdisk was going to be a problem with Windows XP then it was too risky to reinstall it: so I replaced all my programs but did not install the RAMdisk into my PC at all. Now I had to work out an alternative method for receiving Metop, and this is where the fun starts.



This clip from a Metop-A pass over Venezuela on January 31, 2007 clearly shows Lake Maracaibo and the striking mountain relief of the Cordillera de Mérida and Cordillera Oriental.

Receiving EUMETCast without a RAMdisk.

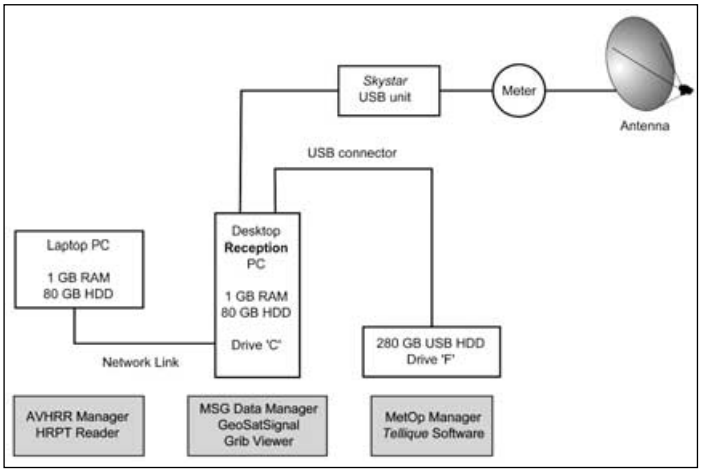
I contacted EUMETSAT regarding Metop reception and as usual they were full of help and advice. They sent me the latest version of their *Tellique* Software (version 5.0), which installs straight into the PC with no problems except for some software conflicts, which I removed.

My first experiment was to use two networked PCs, a desktop model for reception and a laptop for decoding and display. First I had to speed up all the ports by going into *Device Manager* and changing 'bits per second' to the highest setting, as Windows XP defaults to a slow speed. This proved fairly successful but I still had chunks missing from Metop pictures, so this was not as good as expected—time for another rethink.

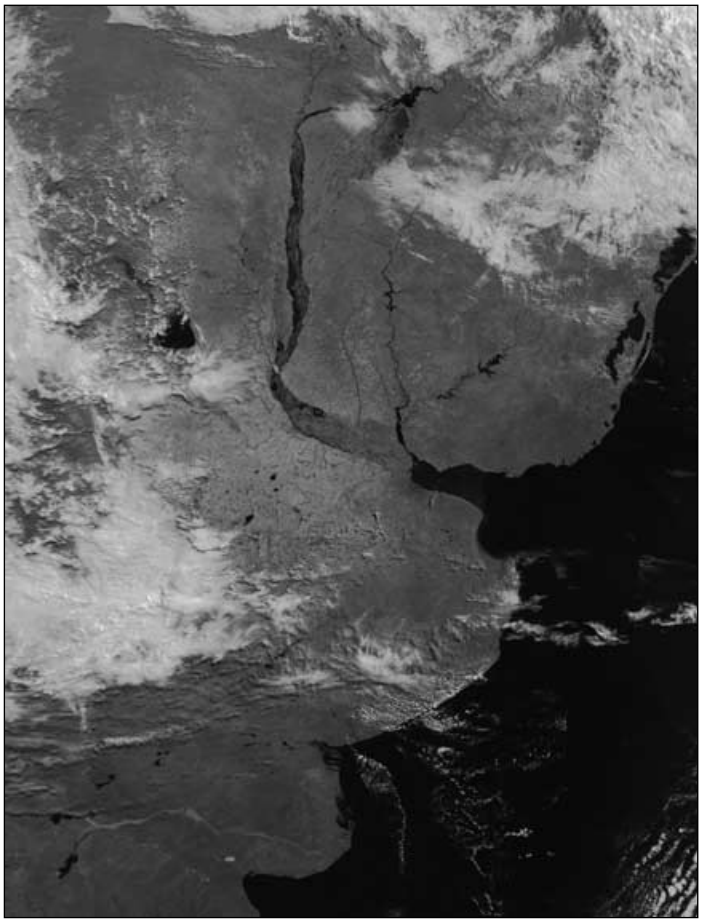
I then decided on a separate external 280 GB Hard Drive attached to the reception PC through a USB Port. Only the *Tellicast* and *Metop Manager* software were to be loaded on to this drive (drive 'F:\'), leaving *MSG Data Manager* and the other satellite programs on the main 'C:\' drive.

I proceeded to load up the separate system hard drives: on drive 'F:\' the *Tellicast* and *Metop Manager* software and on the main 'C:\' drive *Geosatsignal*, *Grib Viewer*, *MSG Animator* and *MSG-Data Manager*. *AVHRR Manager* was placed on the Laptop along with *HRPT Reader*. It was then a case of following all the instructions again to modify the 'receive-channels.ini' and the 'recv.ini' files but, as I now had the latest version 5.0 if the *Tellique* software, most were already present. But still check for any changes that are required.

With everything now loaded and rechecked, the PC was switched on and immediately all the *EUMETCast* files started to flood in, including the new Metop AVHRR stream. And guess what! No gaps in MSG or NOAA AVHRR data. Metop too was

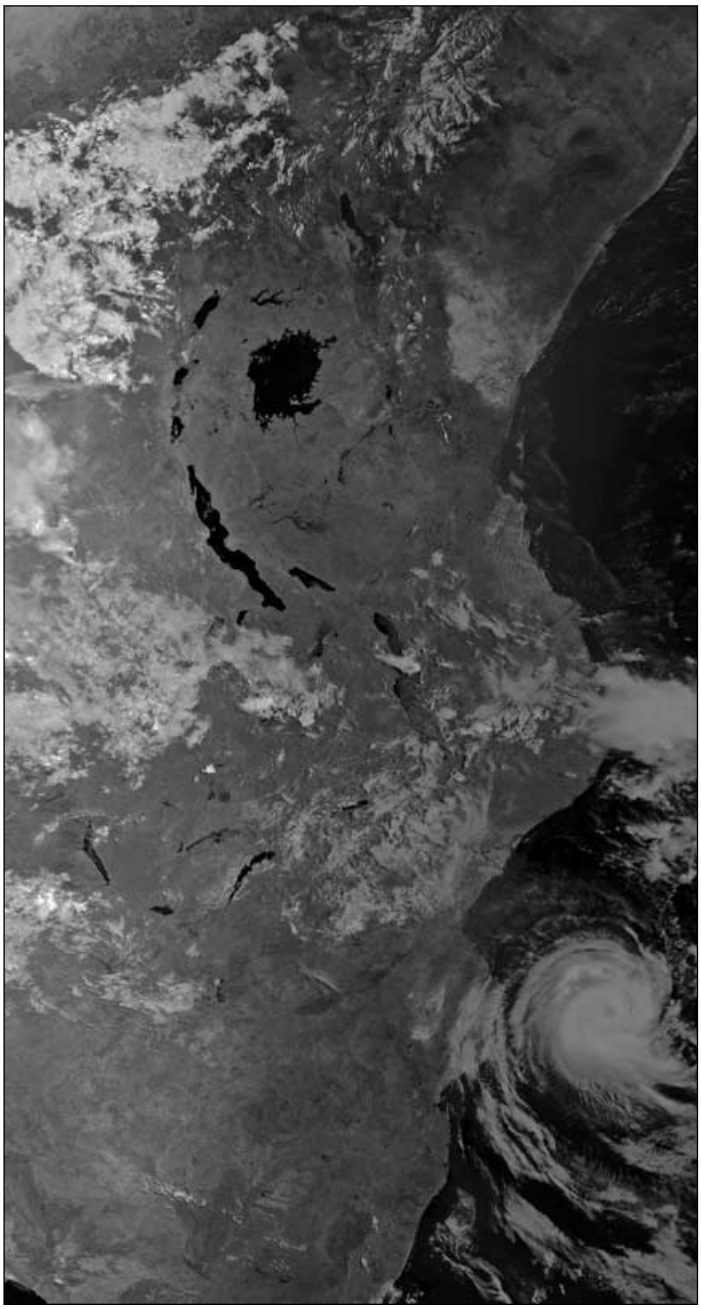


The EUMETCast reception system, with the software divided between two PCs and an additional external USB hard drive. The grey boxes below each devics details the software installed on each.



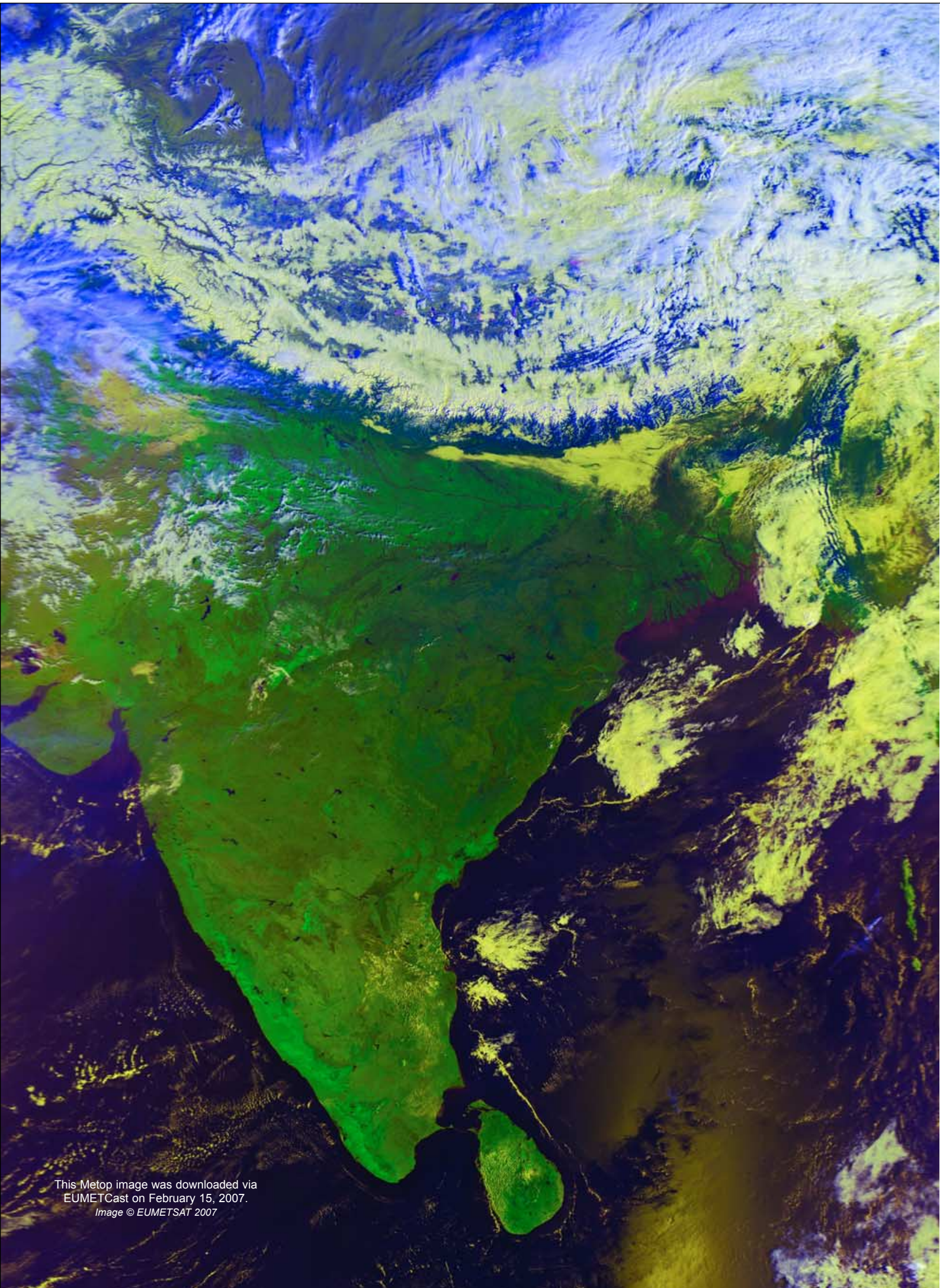
Detail of the Paraná and Uruguay rivers as they flow into their estuary (known as the Rio de la Plata) between Uruguay and Argentina. Metop-A channel-2 AVHRR image - February 20, 2007

Image © EUMETSAT 2007



The lakes of the East Africa Rift Valley are prominent in this Metop-A channel-2 AVHRR image dating from February 21, 2007 as a tropical cyclone bears down on Mozambique.

Image © EUMETSAT 2007



This Metop image was downloaded via EUMETCast on February 15, 2007.

operating well, and from a complete orbit dump there were only two chunks missing, and both these were over the sea. So I now had a single desktop PC, with an additional external hard disc, running my complete system for reception *and* data decoding for both *Metop Manager* and *MSG Data Manager*—and it works brilliantly. The auxiliary laptop PC runs *AVHRR Manager* and *HRPT Reader* and is my back-up for any failures in the system. Figure 2 above illustrates the system.

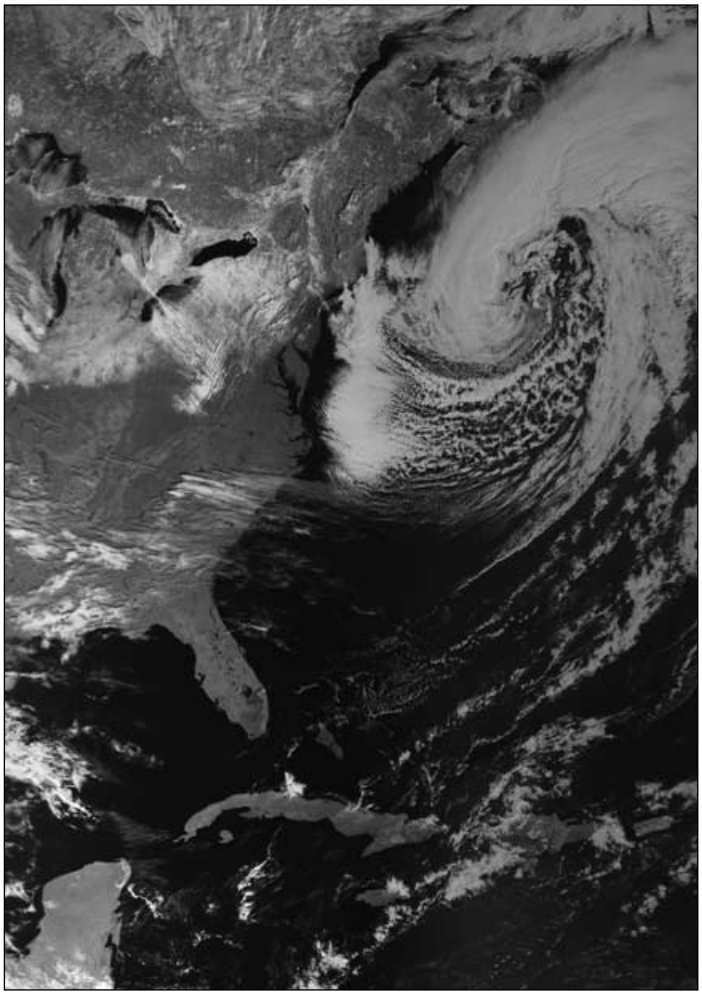
Further Points

When making modifications to the *Tellicast* files, take note that any line within the 'receive' files that starts with a hash (#) character is inactive. As EUMETCAST state, it is 'commented out'. This is also explained in David Taylor's information within the *Metop Manager* instructions.

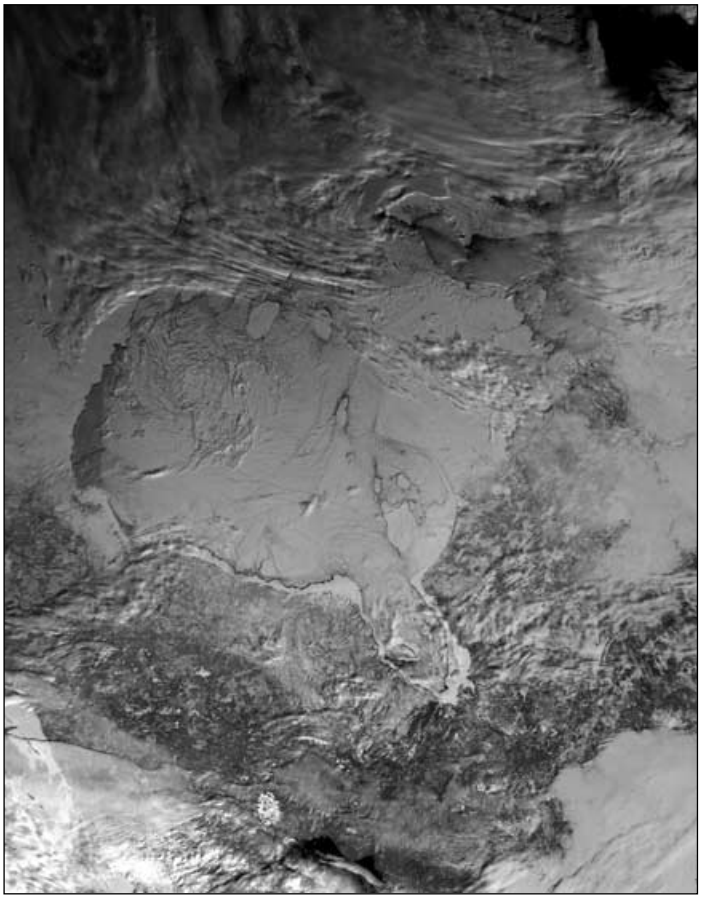
Also be aware that, having inserted the line '[EPS-10] target_directory=received-AVHRR', you do not have to generate the file 'received-AVHRR'. This will be created by *Tellicast* as soon as you start to receive the Metop files from EUMETCast. This separates the Metop information from the rest of the incoming data. You then direct your *Metop Manager* to look into this new folder for the data.

Required PIDs

The other part of the system that I looked at carefully was the number of operational PIDs that I required. I do believe that, as amateurs, we have to compromise on some things, especially as we do not all have equally powerful PCs to evaluate all the data that *EUMETCast* sends out. I removed those that I did not require. The operational PIDs that I am using are: 100, 300, 301, 500 and 510, which give me all the required data that I am looking for.



This channel-2 AVHRR image was captured by Metop-A during a pass down the eastern coastline of North America on February 23, 2007.
Image © EUMETSAT 2007



This channel-2 AVHRR image of ice-bound Hudson Bay, Canada was imaged by Metop-A on February 20, 2007.
Image © EUMETSAT 2007

Signal Strength

Another area to keep an eye on is the signal strength of the incoming data. I live in a windy region and am constantly checking to see if my signal level has dropped. Anything below 40% and gaps begin to appear in the MSG data. And at that signal level, really huge chunks of information go missing from the Metop data. To monitor this, I leave my signal meter in-circuit near the dish so that I can at least see if the level has deteriorated. The degree of attenuation caused by having the meter in circuit is minimal. Although this gives you some idea of the incoming signal level, a check on *SetUp4PC* will give you the full picture. My average signal level at this QTH is 70% but it does vary during winter storms. I have recently had to adjust the antenna as I had a signal loss of 15% which was caused by high gale force winds moving the satellite dish.

So there it is—the one that nearly got away. But I am now enjoying fantastic pictures using all David Taylor's software, and with very few gaps. If you are experiencing problems with RAMdisk this may be your alternative. It certainly works for me. Incidentally the cost of the external hard drive was £60.00.

My thanks to Arne van Belle for the excellent articles on RAMdisk (sorry it did not work) and to David Taylor for his help and assistance, plus his amazing satellite programs. Happy weather watch from Portland.

References

1 Using the ARSoft RAMdisk with Windows XP
Arne van Belle, GEO Quarterly No 11, page 39

2 EUMETCast and Metop Data
David Taylor, GEO Quarterly No 13, page 10

3 Modifying your PC to receive Metop Data
Peter Green, GEO Quarterly No 13, page 13

A Morning at the Met Office

David Taylor

I had the chance recently to spend a day at the UK Met Office. Being keen on photography, I took my camera and was allowed to take a few photos to share with you. The Met Office headquarters are now in Exeter, Devon, having moved there in 2004 from their previous location in Bracknell, Berkshire. They are located quite close to Exeter International Airport. Buses stop right outside their purpose-built premises, showing how important the Met Office now is as an employer in Exeter.

Figure 1 - Bus Destination Board

The Met Office supports a staff of about 1200 at their headquarters, having centralised staff from a number of field offices, which now take advantage of today's ability for remote operation to forward their data. The Headquarters Building is most impressive from a distance (figure 4, overleaf) and continues to impress as one gets closer (figures 5, 6).

Within the Met Office there is an organisational split—between data gathering and weather forecasting. This is, in part, because of today's business environment, where other commercial organisations may provide forecasts and have the right to the same base data as the Met Office forecasters. Well, it's something like that, and I'm not going to get into politics here! Forecasters work in teams and each team may work on one particular region. Data which is supplied to the forecasters can include observations from ground stations, rain radar data and satellite images, in addition to the output from the numerical weather prediction (NWP) model developed by the UK Met Office. Here, on a large screen, you can see both rain radar and an infrared satellite image in prominent view for all the forecasters (figure 7).

Collecting the data and processing it so that it can be meaningful to the forecasters (and subsequent processing for public consumption) requires quite a lot of kit, and there needs to be considerable redundancy so that the inevitable hardware failure does not disrupt the flow of data. Of course, conventional meteorological instruments are used, and the Met Office has an extensive testing area where instruments can be refined and new instruments developed. Figure 10 shows just a small part of that area where the familiar Stevenson screens can be seen.

However, GEO members will also be interested in the extensive antenna farm (figure 9) which shows, amongst others, tracking antennas for NOAA HRPT and MODIS data, direct reception antennas for the older geostationary satellites and Ku-band antennas for *EUMETCast*. It is no coincidence that there seem to be two of everything; the entire reception, processing and computing chain is duplicated to provide a high level of availability through redundancy, allowing maintenance and upgrades without interruption of the data flow.

There are two antennas for polar orbiter reception, one of which does not have a radome, and you can see the X-Y mounting quite clearly (figure 11). This style of mount provides better performance near the zenith, where an azimuth-elevation mount can have difficulty slewing the antenna fast enough on overhead passes. The Ku-band dishes come in sets of three (figure 12), and each dish carries a quad-output LNB (figure 10). The dishes not only receive *EUMETCast*, but also digital TV to monitor news and broadcast forecasts.

As you would expect, the rest of the facilities are built in a modern style, with open-plan offices and a central 'street' where you can meet up with folk and have the all-important social interaction. What better after a hard morning's work than lunch in the café? Well, you could always nip out to the adjacent hostelry – what excellent planning!


Figure 2 - Open Plan Offices


Figure 3 - The Nearby Hostelry

Other aspects of the headquarters show how it was built to be environmentally sound.

Their Web site lists:

- collecting rain water from the site, treating it with UV light and then reusing it to flush the toilets
- using the large amount of heat from the site's generators to warm or cool the rest of the building as the seasons and weather dictate

... continued on page44

Figure 4 - Met Office HQ in Exeter

Figure 5 - Met Office HQ in Exeter

Figure 6 - Met Office HQ in Exeter

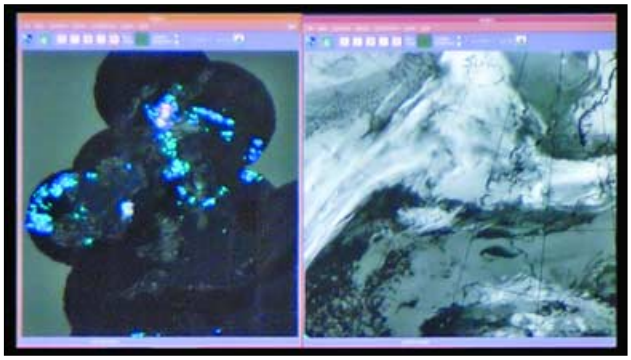


Figure 7 - Large screen display of rainfall radar and satellite IR

Figure 8 - Stevenson Screens

Figure 9 - The Met Office Antenna Farm

Figure 10 - A Quad LNB

Figure 11 - XY-mount Polar Orbiter Antennas

Figure 12 - Triplet Ku-band Dishes

Recent Tropical Cyclone Activity in the Southern Indian Ocean

Alan Banks

Following the record-breaking 2005 hurricane season, tropical storm activity in the Atlantic Basin was unexpectedly low during 2006; not a single hurricane made landfall in the United States. But as we explained in a previous issue (GEO Q11), tropical storm numbers world-wide remain remarkably constant from season to season. Recently, thanks to the full-Earth Metop coverage now available via *EUMETCast*, Alan Banks has been monitoring a recent surge in cyclonic activity in the Indian Ocean, impinging particularly on the island republic of Madagascar.

The southern Indian Ocean (SIO) has had a busy Tropical Cyclone season during our winter and Madagascar has born the brunt of many of the cyclones in the western SIO.

I became aware of this fairly late when Tropical Cyclone ***Favio*** developed between February 14-23, 2007. Favio tracked from 10°S, 70°E, travelling south west, close to Mauritius and La Reunion before rounding the southern tip of Madagascar and eventually making landfall on the coast of continental Africa close to Inharrosso in Mozambique. *Favio* brought very heavy rain to both Mozambique and Zimbabwe, countries that were already suffering from the effects of prolonged heavy rainfall. The Zambezi River had already broken its banks. An image I took from Metop-A as *Favio* made landfall (figure 1) shows the lower Zambezi as though it were a lake rather than a river. The full page image on page 18, sent in by David Taylor, shows Favio as an attractive spiral as it brushes past Madagascar on February 19.

Further study of the Australia Severe Weather website that monitors activity throughout the SIO showed that the area had already been struck by a number of storms.

Anita, Nov 29 - Dec 2, 2006

Anita was mainly a Tropical Depression but did reach typhoon status for a while. Anita tracked down the strait between Madagascar and the mainland of Africa.

Bondo, Dec 18-26, 2006

Bondo tracked westward from 9°S, 65°E around the north of Madagascar then moved southwest along the north west coast of the island bringing very heavy rain before making landfall close to Mahajanga.

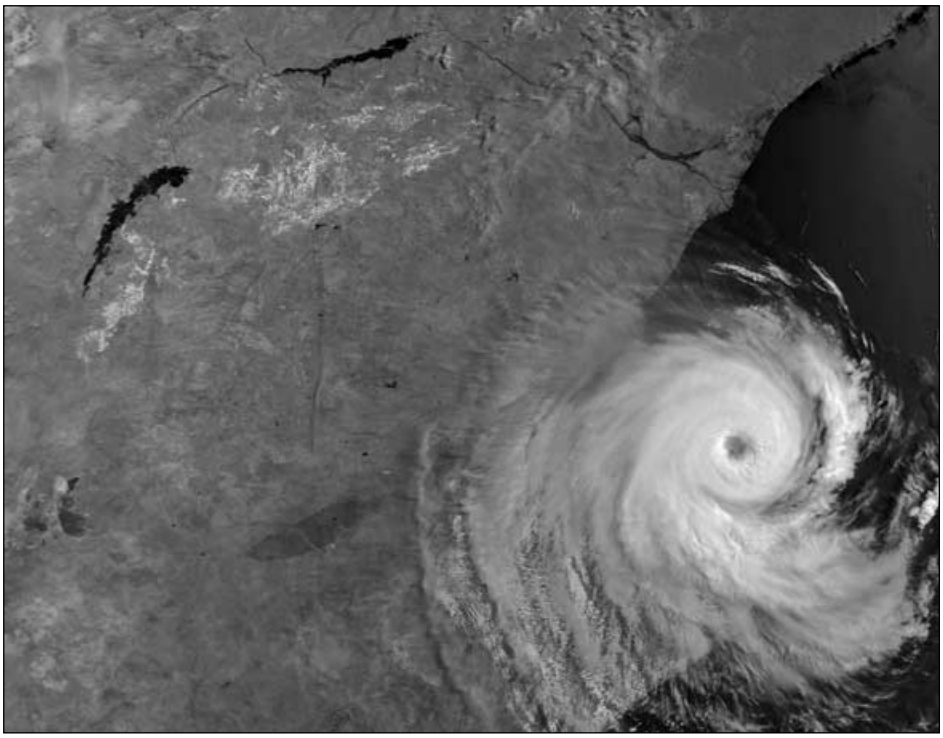


Figure 1 - Cyclone *Favio* makes landfall on February 22, 2007

Image © EUMETSAT 2007

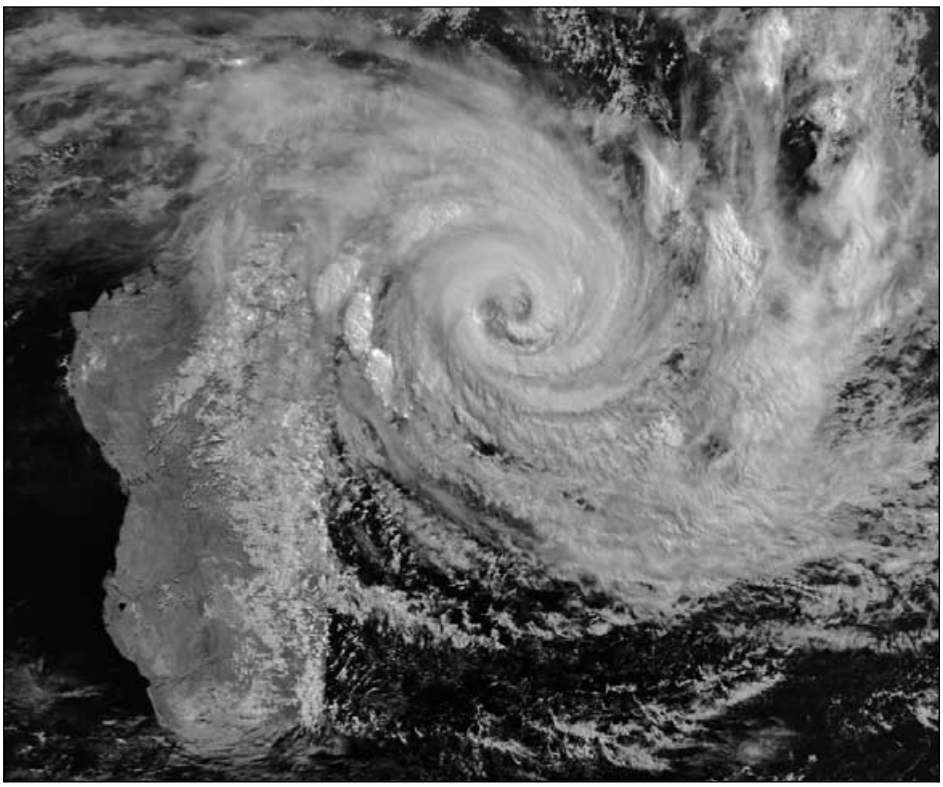
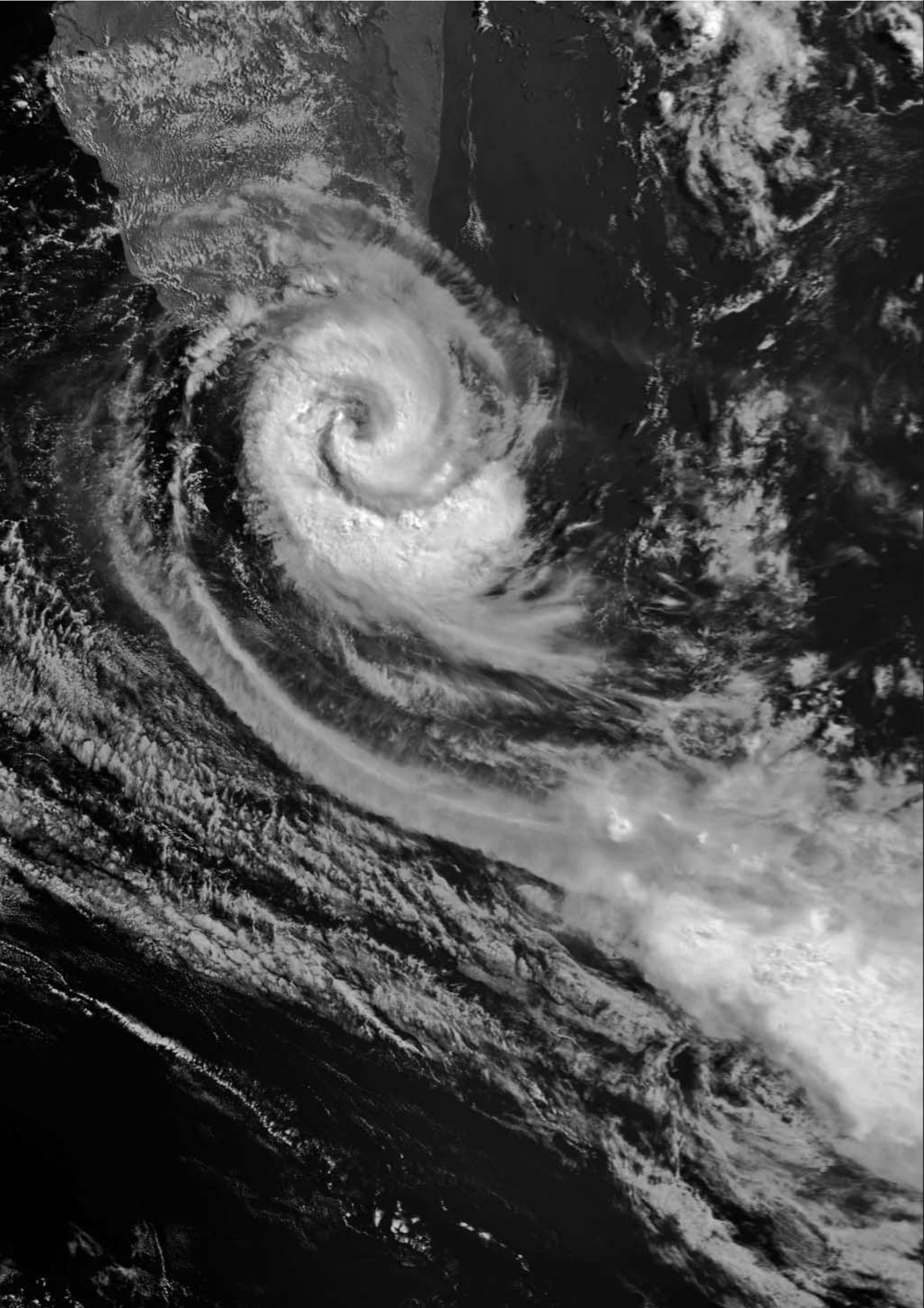


Figure 2 - Cyclone *Gamede*, which brought record rainfall to Madagascar

Image © EUMETSAT 2007



Clovis, Dec 31, 2006 to Jan 4, 2007

Clovis made landfall close to Mananjary on the east coast of Madagascar, bringing strong winds, heavy rains and flooding to the region of Vatovavy Fitovinany.

Enok - Feb 9-11, 2007

Enok didn't make landfall but again brought very heavy rain to the east coast of Madagascar.

Gamede, Feb 21 - March 2, 2007

This Tropical Cyclone was immense. It didn't make landfall but passed down the east coast of Madagascar and west of La Reunion. A Meteo France satellite weather station on the neighbouring island of La Reunion claimed: 'world records of precipitation have been beaten' by Gamede, which brought the heaviest rainfall in 27 years. One rainfall gauge on the island recorded 47 cm of precipitation over one 3-day period. Figure 2 shows TC Gamede northeast of Madagascar.

Indlala, March 12-16, 2007

Indlala became the sixth cyclone of the season to hit Madagascar when it formed off the northeast coast then tracked slowly west to make landfall south of Antalaha. It then tracked inland, bringing further misery to the people of that island before losing its energy. According to reports from the Joint Typhoon Warning Centre, Indlala had winds of 115 knots (210 kph), with gusts up to 140 knots (260 kph). Wave heights were estimated to be 11 metres. The island was still picking itself up after previous storms, with the government and relief agencies already overstretched. Large areas of the northwest, west and southeast had already been flooded by torrential rains, although harvests in the south had been devastated by drought. Indlala caused at least 69 fatalities and rendered 14 000 homeless not to mention the 200 000 whose lives have been affected by storm damage. More than 3600 buildings were totally destroyed while over 8000 hectares of rice paddies were ruined.

Jaya, April 2-4

Tropical Cyclone Jaya, which formed over the ocean on March 30, went through an explosive increase in power from tropical storm to Category-3 cyclone in just 36 hours. Fortunately, this cyclone had moderated considerably by the time it finally made landfall in the northeast of Madagascar in the early hours of April 2 ,with winds that still reached close to 150 kph, a marked change from the 200 kph just twelve hours earlier.

Summary

The 2006/7 rainy season was the first time that Madagascar had been hit by so many cyclones in such a short time and there has been almost continuous rain during the three months since late December 2006. 70% of the agricultural land on the island—mainly vanilla farms and rice paddies—has been flooded. Even before Indlala, the Malagasy government had launched an appeal to the international community. with the following assessment at the end of February:

- at least 7 deaths
- 32 000 victims of storm damage
- 8 thousand homeless
- 90 thousand hectares of agricultural land flooded
- 125 billion tonnes of rice harvest lost

... concluded on page 43

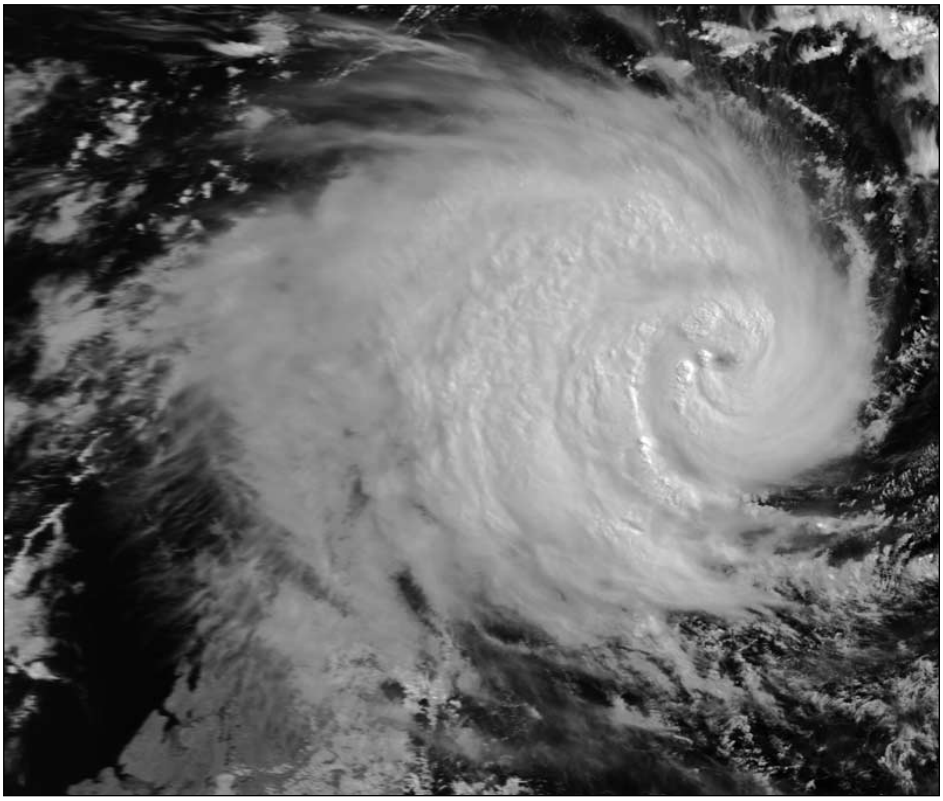


Figure 3 - TC Bondo makes landfall
Image © EUMETSAT 2007

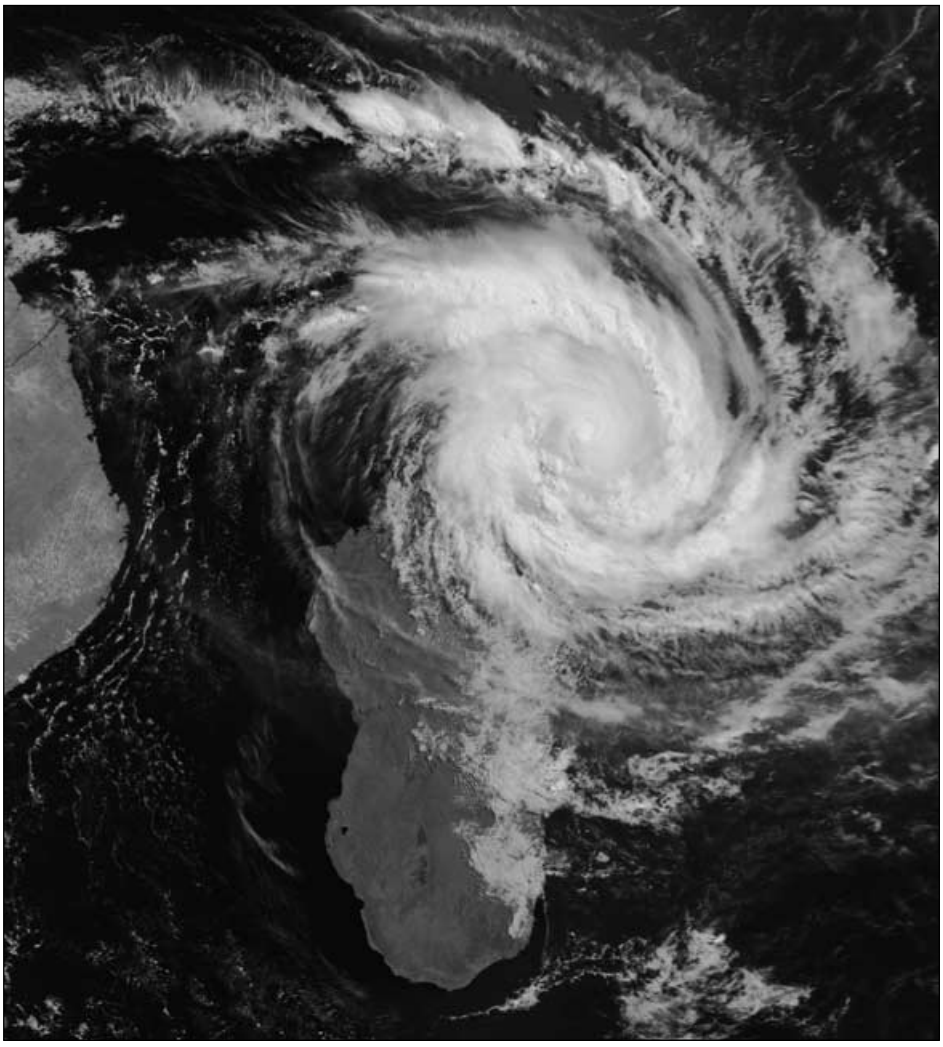


Figure 4 - TC Indlala makes landfall
Image © EUMETSAT 2007

Radar Satellites

Part 3 - Some Radar Imaging Programmes

Peter Wakelin

Thirty years ago NASA's Jet Propulsion Laboratory was developing the first non-military space-borne radar called *Seasat*. This third part in the series describes this and some later radar imaging spacecraft.

Seasat

Seasat was launched on June 27, 1978 into a 790 km circular, high inclination (108°) orbit and its synthetic aperture radar (SAR) was switched on a few days later. The 1.275 GHz radar frequency gave a theoretical maximum surface resolution of 25 m over a swath width of 100 km, displaced from the ground track by the antenna's fixed look-angle of 20° from the nadir.

Despite the fixed look-angle and the single polarisation available (horizontal transmit, horizontal receive), and the fact that only 42 hours of radar imagery were received before a massive short-circuit crippled the spacecraft 105 days after launch, the mission was regarded as a resounding success. Although, as the name suggests, *Seasat's* primary mission was oceanographic in nature with swell wave-length and direction and sea ice observations as the main objectives. Geographers, geologists, meteorologists and cartographers all realised the potential of this new observing technique. *Seasat* data were received at several locations around the world including RAF Oakhanger in southern England.

This early *Seasat* image of Alaska's southern coastline near Yakutat clearly shows several different sea states; the dark area of smooth sea near the centre, bright lines depicting long wave-length swell waves and much rougher seas in the lower left part of the image. Note also the prominent glaciers on land.

Figure 1 - Seasat Image of the southern coast of Alaska

Canada's Radarsat Programme

Canada was one of the first nations to spot the potential benefits of ice monitoring from space following the *Seasat* mission and the Canadian Space Agency (CSA) decided to develop its own series of Earth observation satellites incorporating SAR, primarily for ice observation. Unimaginatively named *Radarsat*, the first was launched in 1995 into a 798 km dawn/dusk sun-synchronous orbit and was highly successful (figure 2).

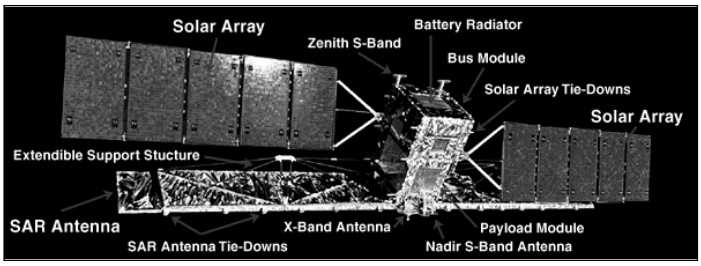


Figure 2 - Radarsat Instrumentation

Unlike *Seasat*, *Radarsat* could vary the nadir offset angle and could employ several scanning modes as depicted in figure 3. Also, it could scan either side of the ground track; normally operating at the right side at northern latitudes and switching over to the left side over Antarctica to image nearer to the south pole. Resolution varied with mode but ranged between 8 m in fine mode and 100 m in ScanSAR wide mode.

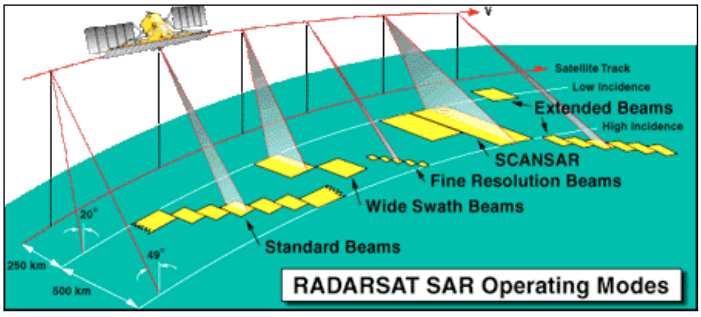


Figure 3 - Radarsat Operating Modes

In order to improve the interpretation of sea radar imagery, the Canada Centre for Remote Sensing (CCRS), in collaboration with several other organisations, conducted field experiments in the Gulf of St Lawrence, just north of Prince Edward Island, in March 1996. Ground photographs of several areas were taken to compare with the radar imagery. In figure 4, the areas marked A, B and C correspond to ground photographs of three different ice types. Area A (figure 5), shows new ice termed *nilas* which is fairly smooth and reflects radar energy away from the satellite, thus appearing quite dark in the image. Area B (figure 6) illustrates the next stage of ice development where moving pieces of ice strike each other resulting in predominantly circular slabs with raised edges termed *pancake* ice. Due to the surface roughness and high salinity this ice shows brightly in the *Radarsat* image. Area C (figure 7) shows a large conglomeration of *pancake* ice but with 'tears' caused by wind or tide which can also be seen on the *Radarsat* image.

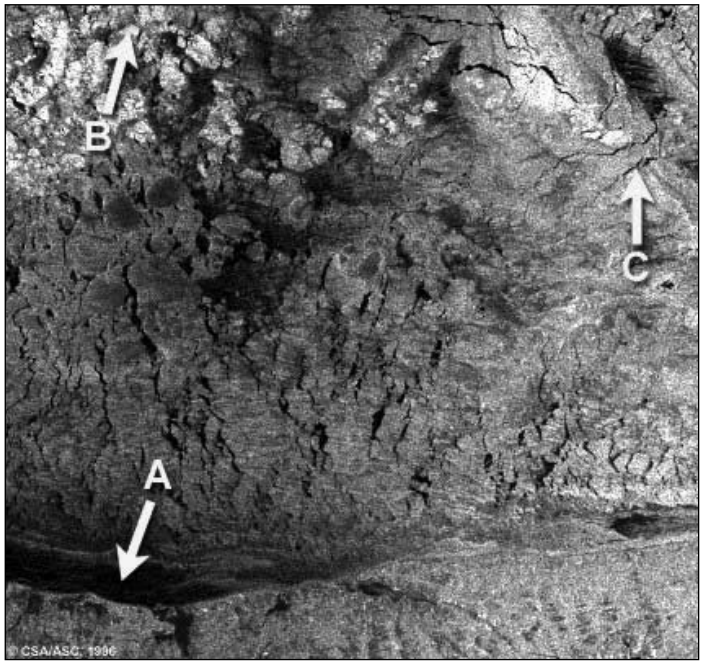


Figure 4 - Radarsat Ice Monitoring

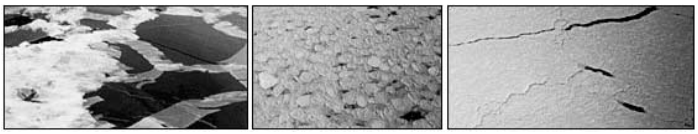


Figure 5 (left) - New Ice (smooth)
Figure 6 (centre) - Pancake Ice
Figure 7 (right) - Pancake Ice with 'Tears'

Radarsat's ability to switch from the usual right-looking SAR to left-looking SAR meant it could image right down to the south pole and the first Antarctic Mapping Mission, started on September 9, 1997, lasted for six weeks, during which time the entire continent was imaged. Ohio State University provided overall project and scientific direction and provided the final products. The main objective was to create the first radar image of the entire continent (figure 8) to serve as a benchmark for gauging future changes.

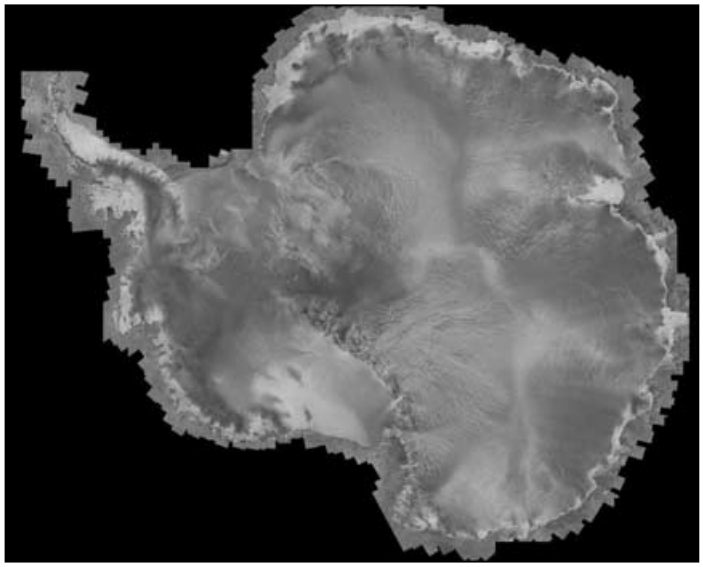


Figure 8 - Radarsat Antarctica Mosaic

Radarsat 2 is almost ready for launch. It is more advanced, with improved resolution, yet less massive than the first *Radarsat* and is now expected in orbit this summer.

Envisat

Envisat is Europe's latest environment-monitoring satellite and was launched on March 1, 2002 into the same orbit as its highly successful predecessor, *ERS-2*. Amongst its suite of instruments is the Advanced Synthetic Aperture Radar (ASAR).

Figure 9 - Artist's impression of Envisat in orbit (Image: ESA)

The main focus of the earlier missions was ocean and ice monitoring and this continues with *Envisat* but with improved resolution and more modes of operation of the ASAR. The five modes are as follows:

- *Image mode* generates high-spatial-resolution data products (30 m) selected from the seven available swaths with a range of incidence angles between 15 and 45 degrees.
- *Wave mode* generates 5 x 5 km vignettes spaced 100 km along-track. The position of the vignette can be selected to alternate between the centres of any two of the seven swaths.
- *Wide-Swath* and *Global-Monitoring* modes utilise the ScanSAR technique using five sub-swaths and each generates wide-swath products (400 km) with spatial resolutions of 150 m and 1000 m respectively.

These four modes may be operated in one of two polarisations, either HH or VV (in this two-letter code, the first indicates the polarisation of the transmit signal—H for horizontal, V for vertical—and the second indicates the polarity of the receive signal)

- *Alternating-Polarisation* mode provides two simultaneous images from the same area in HH and VV polarisations, HH and HV or VV and VH, with the same imaging geometry as in Image mode and similarly high spatial resolution.

The European Space Agency recently celebrated 15 years of near-real time data delivery in Earth Observation. The volume of data processed and disseminated to users has increased dramatically since ESA's *ERS-1* spacecraft completed its commissioning phase early in 1992. More recently, near-real time radar data has been in great demand and in the coming months scientists will get easy access to large amounts of radar data, particularly over Europe. The nominal five-year lifetime of *Envisat* expired recently but, given the overall excellent standing of the satellite, the ESA Member States have agreed to fund mission operations until 2010.

A radar mosaic of Europe using 143 images acquired by *Envisat's* ASAR instrument working in the wide swath medium resolution mode has been made available (figure 10) and a small part of it has been reproduced at full resolution (figure 11). The full image (30 MB) is available at:

http://www.esa.int/esaEO/SEM9QLQ08ZE_index_0.html

Figure 10 - Envisat Radar Map of Europe
Image: ESA

Figure 11 - Full resolution section showing cities in the Low Countries

ALOS

Japan's Advanced Land Observing Satellite (ALOS), also known as '*Daichi*', enhances land observation technologies acquired through the development and operation of its predecessors. These were the Japanese Earth Resources Satellite-1 (JERS-1, or Fuyo) and the Advanced Earth Observing Satellite (ADEOS, or Midori).

The instruments on board *ALOS* include the Phased Array type L-band Synthetic Aperture Radar (PALSAR) which has similar characteristics and operating modes to those of *Envisat's* ASAR. As the name suggests, *ALOS* was developed, not for ocean observation, but to contribute to the fields of mapping, land coverage observation, resource surveying and disaster monitoring.

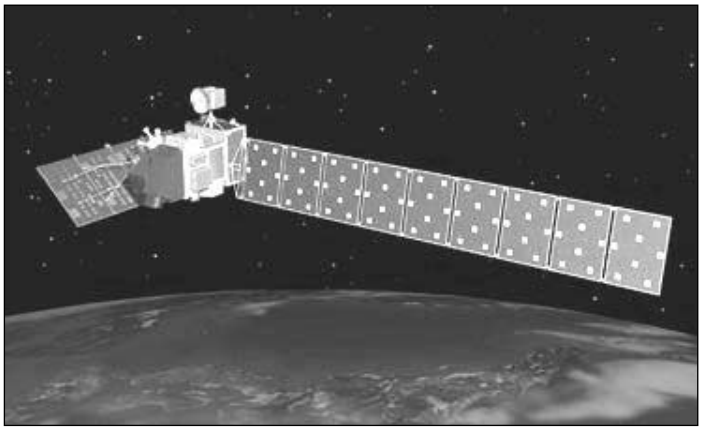


Figure 12 - Artist's impression of ALOS in orbit
Image: JAXA

Since its launch on January 24, 2006, *ALOS* has observed several areas in the Asia-Pacific region which have been affected by major earthquakes. Soon after dawn, local time, on April 2, 2007 a magnitude 8.1 'quake struck the Solomon Islands and ALOS's routine programme was immediately interrupted in order to image the area. Because of its ability to adjust the nadir offset angle, *ALOS's* PALSAR was able to image the affected area very soon after the earthquake.

Although other sensors on *ALOS* were able to show areas devastated by the tsunami created by the earthquake, PALSAR detected significant changes in land levels in the area. The larger scale image of the area (figure 13), approximately 70 km across, is centred just west of the obviously volcanic island of Kolombangara and was obtained shortly after the earthquake struck.

The delineated area, close to the epicentre just off the coast of Gizo Island, is enlarged (figure 14) and a pre-quake image received at almost identical tide levels (figure 15) is shown for comparison. Clearly, the land level in the encircled area 'A' was raised significantly by the earthquake (figure 15).

The subject of the final part of this series will be radar altimetry.

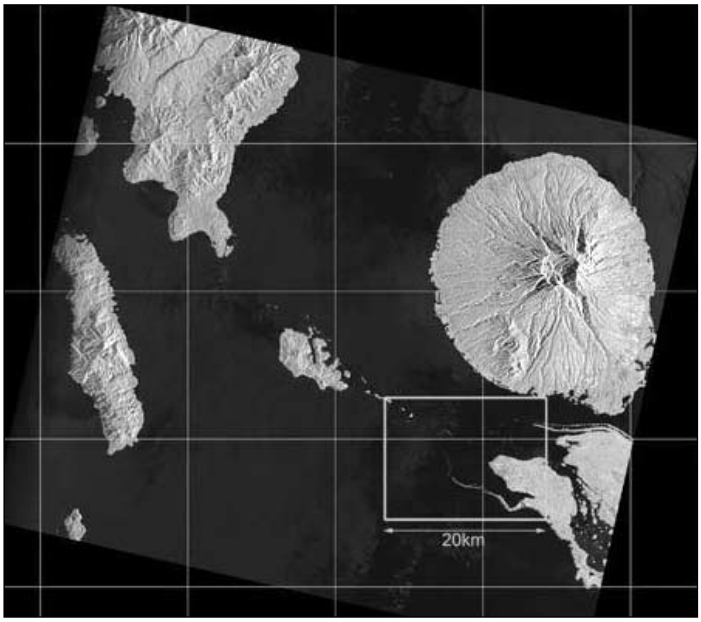
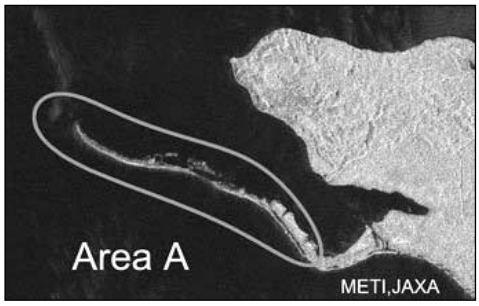


Figure 13 - Kolombangara in the Solomon Islands (Image: METI, JAXA)

Figure 14

Raised land level off Gizo Island following an earthquake (circled)
Image: METI, JAXA



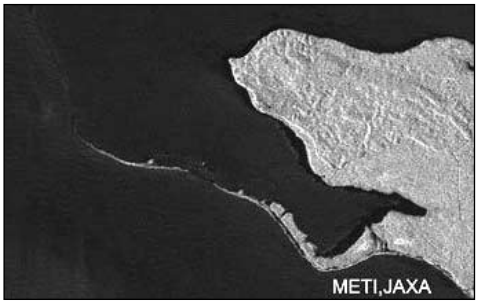


Figure 15

The same area off Gizo Island before the earthquake

Image: METI, JAXA

GEO Shop

Manager: Clive Finnis
e-mail: shop@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 - 159.00 **UK non-member's price - £173.00**

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 - £140.00 **UK non-member's price - £154.00**

R2FX Accessory Pack

This contains everything required to implement a complete APT receiving system when used with either the R2FX or R2ZX receiver. It comprises:

- 137 MHz Turnstile Antenna
- UK plug-in power supply
- PC audio lead + PC Serial 'computer control' lead
- Aerial lead (20 m with fitted connector)
- CD of PC shareware starter software
- Instructions

We do not normally ship outside the UK as this receiver should be available elsewhere more cheaply from the manufacturer. But contact the GEO Shop if you wish a quote.

UK member's price - £59.00 **UK non-member's price - £69.00**

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 - £15.00
UK non-members price - £19.00

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 - £29.50
UK non-members price - £33.50

Telestar Universal Ku-band 0.6 dB Universal LNB

(or similar model)

Digital satellite TV Universal LNB for use with the SkyStar receivers above or any DVB satellite TV receiver.

UK members price - £11.00
UK non-members price - £17.50

TechniSat SkyStar 2 PCI Card

This 'free-to-air' DVB satellite TV and data receiver card recommended by EUMETSAT must be installed inside your computer. It comes with comprehensive installation instructions and a CD-ROM of driver software.

UK members price - £55.00
UK non-members price - £61.00

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)	159.00	163.00	171.00	173.00	177.00	185.00
R2FX APT Receiver (no PSU)	140.00	144.00	152.00	154.00	158.00	166.00
R2FX Accessory Pack	59.00	-	-	69.00	-	-
BNC Lead (0.25 metre)	4.50	5.25	5.75	6.50	7.25	7.75
UK Power Supply Unit (12 volt)	7.50	-	-	10.00	-	-
Dartcom High Quality QFH Antenna	259.00	279.00	-	279.00	299.00	-
Turnstile APT antenna	42.50	-	-	47.50	-	-
John Silver Preamplifier (built)	29.50	30.00	31.00	33.50	34.00	35.00
Bias Tee	15.00	15.50	16.00	19.00	19.50	20.00
GEO-PIC 1.0	7.00	7.80	8.40	7.00	7.80	8.40
GEO/Dartcom EPROM v 1.3	10.00	10.75	11.25	10.00	10.75	11.25
Martelec MSR40 EPROM	10.00	10.75	11.25	10.00	10.75	11.25
EUMETCast Equipment						
TechniSat SkyStar 2 PCI Card	55.00	56.50	-	61.00	62.50	-
Telestar 80 cm dish with LNB	54.00	-	-	61.00	-	-
Telestar Ku band universal LNB	11.00	12.50	-	17.50	19.00	-
Technisat Satfinder Alignment Meter	21.50	24.50	-	24.50	27.50	-
Miscellaneous						
GEO Quarterly Back Issues (subject to availability)	3.50	4.20	5.10	n/a	n/a	n/a
GEO 2004 CD (PDF back issues)	8.00	8.80	9.30	n/a	n/a	n/a
GEO 2005 CD (PDF back issues)	8.00	8.80	9.30	n/a	n/a	n/a
GEO 2006 CD (PDF back issues)	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

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 - £21.50
UK non-member's price - £24.50

Telestar 80 cm dish and Universal 0.6 dB LNB

(or similar model)

A quality German made aluminium dish and LNB with an AZ/EL mount to fit onto a vertical pole. (Wall or patio mounts are available from local satellite TV dealers)

UK members price - £54.00
UK non-members price - £61.00

NOAA Satellite Predictions

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

	NOAA 12 137.50 MHz	NOAA 15 137.50 MHz	NOAA 17 137.62 MHz	NOAA 18 137.91 MHz
Jun 01	05:58 07:38 15:48 17:28	05:57 07:37 15:46 17:27	10:42 12:22 20:32 22:12	02:32 04:13 12:27 14:08
Jun 02	05:34 07:14 15:23 17:03	05:33 07:13 15:23 17:02	10:19 11:59 20:10 21:49	02:21 04:02 12:16 13:58
Jun 03	05:09 06:49 14:59 16:38	05:09 06:49 15:00 16:39	09:56 11:36 19:47 21:26	02:11 03:52 12:06 13:47
Jun 04	06:24 08:04 16:13 17:54	04:46 06:25 16:15 17:56	09:33 11:13 21:03 22:44	02:01 03:42 11:56 13:37
Jun 05	06:00 07:40 15:49 17:29	06:02 07:42 15:51 17:31	10:50 12:30 20:40 22:20	01:50 03:31 11:46 13:26
Jun 06	05:35 07:15 15:24 17:04	05:38 07:18 15:28 17:07	10:27 12:07 20:17 21:57	01:40 03:21 11:35 13:16
Jun 07	05:10 06:50 15:00 16:39	05:14 06:54 15:04 16:43	10:04 11:44 19:54 21:33	01:29 03:10 11:25 13:05
Jun 08	04:46 06:25 16:14 17:55	04:50 06:30 16:19 18:01	09:41 11:21 21:10 22:52	01:19 03:00 11:15 12:55
Jun 09	06:01 07:41 15:50 17:30	06:06 07:46 15:56 17:36	10:58 12:38 20:47 22:28	01:09 02:50 11:05 12:44
Jun 10	05:36 07:16 15:25 17:05	05:42 07:22 15:32 17:12	10:35 12:15 20:25 22:05	02:39 04:20 12:34 14:16
Jun 11	05:11 06:51 15:01 16:40	05:18 06:58 15:09 16:48	10:12 11:52 20:02 21:41	02:29 04:10 12:24 14:06
Jun 12	04:47 06:26 16:15 17:56	04:55 06:35 14:45 16:24	09:49 11:29 19:40 21:18	02:18 03:59 12:13 13:55
Jun 13	06:02 07:42 15:51 17:31	06:11 07:51 16:00 17:41	11:05 12:46 20:55 22:36	02:08 03:49 12:03 13:44
Jun 14	05:37 07:17 15:27 17:06	05:47 07:27 15:37 17:16	10:42 12:23 20:32 22:12	01:58 03:39 11:53 13:34
Jun 15	05:12 06:52 15:02 16:41	05:23 07:03 15:13 16:52	10:19 11:59 20:10 21:49	01:47 03:28 11:43 13:23
Jun 16	04:48 06:28 16:16 17:58	04:59 06:39 14:50 16:28	09:56 11:36 19:47 21:26	01:37 03:18 11:33 13:13
Jun 17	06:03 07:43 15:52 17:32	06:15 07:55 16:05 17:46	09:33 11:13 21:03 22:44	01:27 03:08 11:22 13:02
Jun 18	05:38 07:18 15:28 17:07	05:51 07:32 15:41 17:21	10:50 12:30 20:40 22:20	01:16 02:57 11:12 12:52
Jun 19	05:13 06:53 15:03 16:42	05:28 07:08 15:18 16:57	10:27 12:07 20:17 21:57	01:06 02:47 11:02 12:42
Jun 20	04:49 06:29 16:18 17:59	05:04 06:44 14:54 16:33	10:04 11:44 19:55 21:34	02:36 04:17 12:31 14:13
Jun 21	06:04 07:44 15:53 17:33	06:20 08:00 16:09 17:50	09:41 11:21 21:11 22:52	02:26 04:07 12:21 14:03
Jun 22	05:39 07:19 15:29 17:08	05:56 07:36 15:46 17:26	10:58 12:38 20:48 22:28	02:16 03:57 12:11 13:52
Jun 23	05:15 06:54 15:05 16:43	05:32 07:12 15:22 17:02	10:35 12:15 20:25 22:05	02:05 03:46 12:00 13:41
Jun 24	04:50 06:30 16:19 18:00	05:08 06:48 14:59 16:38	10:12 11:52 20:02 21:41	01:55 03:36 11:50 13:31
Jun 25	06:05 07:45 15:54 17:34	04:45 06:25 16:14 17:55	09:49 11:29 19:40 21:18	01:45 03:25 11:40 13:20
Jun 26	05:40 07:20 15:30 17:09	06:01 07:41 15:50 17:31	11:06 12:46 20:55 22:36	01:34 03:15 11:30 13:10
Jun 27	05:16 06:56 15:06 16:44	05:37 07:17 15:27 17:06	10:42 12:23 20:32 22:12	01:24 03:05 11:20 13:00
Jun 28	04:51 06:31 16:20 18:01	05:13 06:53 15:03 16:42	10:19 11:59 20:10 21:49	01:13 02:54 11:09 12:49
Jun 29	06:06 07:46 15:55 17:36	04:49 06:29 16:18 18:00	09:56 11:36 19:47 21:26	01:03 02:44 10:59 12:39
Jun 30	05:41 07:21 15:31 17:10	06:05 07:45 15:55 17:35	09:33 11:13 21:03 22:44	02:34 04:15 12:28 14:10
Jul 01	05:17 06:57 15:07 16:46	05:41 07:21 15:31 17:11	10:50 12:30 20:40 22:20	02:23 04:04 12:18 14:00
Jul 02	04:52 06:32 16:21 18:02	05:18 06:58 15:08 16:47	10:27 12:07 20:17 21:57	02:13 03:54 12:08 13:49
Jul 03	06:07 07:47 15:56 17:37	04:54 06:34 14:44 16:23	10:04 11:44 19:55 21:34	02:02 03:43 11:58 13:39
Jul 04	05:42 07:23 15:32 17:12	06:10 07:50 15:59 17:40	09:41 11:21 21:11 22:52	01:52 03:33 11:47 13:28
Jul 05	05:18 06:58 15:08 16:47	05:46 07:26 15:36 17:16	10:58 12:38 20:48 22:28	01:42 03:23 11:37 13:18
Jul 06	04:53 06:33 16:22 18:03	05:22 07:02 15:12 16:51	10:35 12:15 20:25 22:05	01:31 03:12 11:27 13:07
Jul 07	06:08 07:48 15:57 17:38	04:58 06:38 14:49 16:28	10:12 11:52 20:02 21:41	01:21 03:02 11:17 12:57
Jul 08	05:44 07:24 15:33 17:13	06:14 07:55 16:04 17:45	09:49 11:29 19:40 21:18	01:11 02:51 11:07 12:46
Jul 09	05:19 06:59 15:09 16:48	05:51 07:31 15:40 17:20	11:06 12:46 20:55 22:36	02:41 04:22 12:36 14:18
Jul 10	04:54 06:34 14:45 16:23	05:27 07:07 15:17 16:56	10:42 12:23 20:32 22:13	02:31 04:12 12:26 14:07
Jul 11	06:09 07:49 15:58 17:39	05:03 06:43 14:53 16:32	10:19 11:59 20:10 21:49	02:20 04:01 12:15 13:57
Jul 12	05:45 07:25 15:34 17:14	06:19 07:59 16:08 17:49	09:56 11:36 19:47 21:26	02:10 03:51 12:05 13:46
Jul 13	05:20 07:00 15:10 16:49	05:55 07:35 15:45 17:25	09:33 11:13 21:03 22:44	02:00 03:41 11:55 13:36
Jul 14	04:55 06:35 14:46 16:24	05:31 07:11 15:21 17:01	10:50 12:30 20:40 22:20	01:49 03:30 11:45 13:25
Jul 15	06:10 07:51 16:00 17:40	05:07 06:47 14:58 16:37	10:27 12:07 20:17 21:57	01:39 03:20 11:34 13:15
Jul 16	05:46 07:26 15:35 17:15	04:44 06:24 16:13 17:54	10:04 11:44 19:55 21:34	01:28 03:09 11:24 13:04
Jul 17	05:21 07:01 15:11 16:50	06:00 07:40 15:49 17:29	09:41 11:21 21:11 22:52	01:18 02:59 11:14 12:54
Jul 18	04:56 06:36 14:47 16:25	05:36 07:16 15:26 17:05	10:58 12:38 20:48 22:28	01:08 02:49 11:04 12:43
Jul 19	06:12 07:52 16:01 17:41	05:12 06:52 15:02 16:41	10:35 12:15 20:25 22:05	02:38 04:19 12:33 14:15
Jul 20	05:47 07:27 15:36 17:16	04:48 06:28 16:17 17:59	10:12 11:52 20:02 21:41	02:28 04:09 12:23 14:04
Jul 21	05:22 07:02 15:12 16:51	06:04 07:44 15:54 17:34	09:49 11:29 19:40 21:18	02:17 03:58 12:12 13:54
Jul 22	04:58 06:37 14:48 16:26	05:40 07:20 15:30 17:10	11:06 12:46 20:55 22:36	02:07 03:48 12:02 13:43
Jul 23	06:13 07:53 16:02 17:42	05:17 06:57 15:07 16:46	10:42 12:23 20:32 22:13	01:57 03:38 11:52 13:33
Jul 24	05:48 07:28 15:37 17:17	04:53 06:33 14:43 16:22	10:19 12:00 20:10 21:49	01:46 03:27 11:42 13:22
Jul 25	05:23 07:03 15:13 16:52	06:09 07:49 15:58 17:39	09:56 11:36 19:47 21:26	01:36 03:17 11:31 13:12
Jul 26	04:59 06:38 14:49 16:27	05:45 07:25 15:35 17:14	09:33 11:13 21:03 22:44	01:26 03:06 11:21 13:01
Jul 27	06:14 07:54 16:03 17:43	05:21 07:01 15:11 16:50	10:50 12:30 20:40 22:20	01:15 02:56 11:11 12:51
Jul 28	05:49 07:29 15:38 17:18	04:57 06:37 14:48 16:26	10:27 12:07 20:17 21:57	01:05 02:46 11:01 12:40
Jul 29	05:24 07:04 15:14 16:53	06:13 07:53 16:03 17:43	10:04 11:44 19:55 21:34	02:35 04:16 12:30 14:12
Jul 30	05:00 06:39 14:50 16:28	05:49 07:30 15:39 17:19	09:41 11:21 21:11 22:52	02:25 04:06 12:20 14:01
Jul 31	06:15 07:55 16:04 17:44	05:26 07:06 15:16 16:55	10:58 12:38 20:48 22:28	02:14 03:56 12:10 13:51

	NOAA 12 137.50 MHz	NOAA 15 137.50 MHz	NOAA 17 137.62 MHz	NOAA 18 137.91 MHz
Aug 01	05:50 07:30 15:39 17:19	05:02 06:42 14:52 16:31	10:35 12:15 20:25 22:05	02:04 03:45 11:59 13:40
Aug 02	05:25 07:05 15:15 16:54	06:18 07:58 16:07 17:48	10:12 11:52 20:02 21:41	01:54 03:35 11:49 13:30
Aug 03	05:01 06:41 14:51 16:29	05:54 07:34 15:43 17:24	09:49 11:29 19:40 21:18	01:43 03:24 11:39 13:19
Aug 04	06:16 07:56 16:05 17:45	05:30 07:10 15:20 16:59	11:06 12:46 20:55 22:36	01:33 03:14 11:29 13:09
Aug 05	05:51 07:31 15:40 17:20	05:06 06:46 14:57 16:35	10:42 12:23 20:32 22:13	01:23 03:04 11:18 12:58
Aug 06	05:26 07:06 15:16 16:55	04:43 06:22 16:12 17:53	10:19 12:00 20:10 21:49	01:12 02:53 11:08 12:48
Aug 07	05:02 06:42 14:52 16:31	05:59 07:39 15:48 17:28	09:56 11:36 19:47 21:26	01:02 02:43 10:58 12:38
Aug 08	06:17 07:57 16:06 17:47	05:35 07:15 15:24 17:04	09:33 11:13 21:03 22:44	02:32 04:13 12:27 14:09
Aug 09	05:52 07:32 15:42 17:21	05:11 06:51 15:01 16:40	10:50 12:30 20:40 22:20	02:22 04:03 12:17 13:58
Aug 10	05:28 07:07 15:17 16:56	04:47 06:27 16:16 17:57	10:27 12:07 20:17 21:57	02:12 03:53 12:07 13:48
Aug 11	05:03 06:43 14:53 16:32	06:03 07:43 15:52 17:33	10:04 11:44 19:55 21:34	02:01 03:42 11:56 13:37
Aug 12	06:18 07:58 16:07 17:48	05:39 07:19 15:29 17:09	09:41 11:21 19:32 21:11	01:51 03:32 11:46 13:27
Aug 13	05:53 07:33 15:43 17:22	05:15 06:55 15:05 16:45	10:58 12:38 20:48 22:28	01:40 03:21 11:36 13:16
Aug 14	05:29 07:09 15:18 16:57	04:52 06:31 14:42 16:21	10:35 12:15 20:25 22:05	01:30 03:11 11:26 13:06
Aug 15	05:04 06:44 14:54 16:33	06:08 07:48 15:57 17:38	10:12 11:52 20:02 21:41	01:20 03:01 11:16 12:55
Aug 16	06:19 07:59 16:08 17:49	05:44 07:24 15:33 17:13	09:49 11:29 19:40 21:18	01:09 02:50 11:05 12:45
Aug 17	05:54 07:34 15:44 17:24	05:20 07:00 15:10 16:49	11:06 12:46 20:55 22:36	02:40 04:21 12:35 14:17
Aug 18	05:30 07:10 15:19 16:59	04:56 06:36 14:47 16:25	10:43 12:23 20:32 22:13	02:29 04:10 12:24 14:06
Aug 19	05:05 06:45 14:55 16:34	06:12 07:52 16:01 17:42	10:19 12:00 20:10 21:49	02:19 04:00 12:14 13:55
Aug 20	06:20 08:00 16:09 17:50	05:48 07:28 15:38 17:18	09:56 11:36 19:47 21:26	02:09 03:50 12:04 13:45
Aug 21	05:55 07:35 15:45 17:25	05:24 07:04 15:14 16:54	09:33 11:13 21:03 22:44	01:58 03:39 11:53 13:34
Aug 22	05:31 07:11 15:20 17:00	05:01 06:40 14:51 16:30	10:50 12:30 20:40 22:20	01:48 03:29 11:43 13:24
Aug 23	05:06 06:46 14:56 16:35	06:17 07:57 16:06 17:47	10:27 12:07 20:17 21:57	01:37 03:18 11:33 13:13
Aug 24	06:21 08:01 16:10 17:51	05:53 07:33 15:42 17:22	10:04 11:44 19:55 21:34	01:27 03:08 11:23 13:03
Aug 25	05:57 07:37 15:46 17:26	05:29 07:09 15:19 16:58	09:41 11:21 19:32 21:11	01:17 02:58 11:13 12:52
Aug 26	05:32 07:12 15:21 17:01	05:05 06:45 14:55 16:34	10:58 12:38 20:48 22:28	01:06 02:47 11:03 12:42
Aug 27	05:07 06:47 14:57 16:36	04:41 06:21 16:10 17:51	10:35 12:15 20:25 22:05	02:37 04:18 12:32 14:14
Aug 28	06:22 08:02 16:11 17:52	05:57 07:37 15:47 17:27	10:12 11:52 20:02 21:41	02:26 04:07 12:21 14:03
Aug 29	05:58 07:38 15:47 17:27	05:33 07:13 15:23 17:03	09:49 11:29 19:40 21:18	02:16 03:57 12:11 13:52
Aug 30	05:33 07:13 15:23 17:02	05:09 06:49 15:00 16:39	11:06 12:46 20:55 22:36	02:06 03:47 12:01 13:42
Aug 31	05:08 06:48 14:58 16:37	04:46 06:26 16:15 17:56	10:43 12:23 20:32 22:13	01:55 03:36 11:50 13:31
Sep 01	06:23 08:03 16:12 17:53	06:02 07:42 15:51 17:32	10:19 12:00 20:10 21:49	01:45 03:26 11:40 13:21
Sep 02	05:59 07:39 15:48 17:28	05:38 07:18 15:28 17:07	09:56 11:36 19:47 21:26	01:34 03:15 11:30 13:10
Sep 03	05:34 07:14 15:24 17:03	05:14 06:54 15:04 16:43	09:33 11:13 21:03 22:44	01:24 03:05 11:20 13:00
Sep 04	05:09 06:49 14:59 16:38	04:50 06:30 14:41 16:19	10:50 12:30 20:40 22:20	01:14 02:54 11:10 12:49
Sep 05	06:24 08:05 16:13 17:54	06:06 07:46 15:56 17:36	10:27 12:07 20:17 21:57	01:03 02:44 11:00 12:39
Sep 06	06:00 07:40 15:49 17:29	05:42 07:22 15:32 17:12	10:04 11:44 19:55 21:34	02:34 04:15 12:29 14:11
Sep 07	05:35 07:15 15:25 17:04	05:18 06:58 15:08 16:48	09:41 11:21 19:32 21:11	02:23 04:04 12:18 14:00
Sep 08	05:10 06:50 15:00 16:39	04:55 06:35 14:45 16:24	10:58 12:38 20:48 22:28	02:13 03:54 12:08 13:49
Sep 09	06:26 08:06 16:14 17:55	06:11 07:51 16:00 17:41	10:35 12:15 20:25 22:05	02:02 03:43 11:58 13:39
Sep 10	06:01 07:41 15:50 17:30	05:47 07:27 15:36 17:16	10:12 11:52 20:02 21:41	01:52 03:33 11:47 13:28
Sep 11	05:36 07:16 15:26 17:05	05:23 07:03 15:13 16:52	09:49 11:29 19:40 21:18	01:42 03:23 11:37 13:18
Sep 12	05:12 06:51 15:02 16:40	04:59 06:39 14:50 16:28	11:06 12:46 20:55 22:36	01:31 03:12 11:27 13:07
Sep 13	06:27 08:07 16:16 17:56	06:15 07:55 16:04 17:45	10:43 12:23 20:32 22:13	01:21 03:02 11:17 12:57
Sep 14	06:02 07:42 15:51 17:31	05:51 07:31 15:41 17:21	10:19 12:00 20:10 21:49	01:11 02:51 11:07 12:46
Sep 15	05:37 07:17 15:27 17:06	05:27 07:07 15:17 16:57	09:56 11:36 19:47 21:26	02:41 04:22 10:57 12:36
Sep 16	05:13 06:52 15:03 16:41	05:03 06:43 14:54 16:33	09:33 11:13 21:03 22:44	02:31 04:12 12:26 14:07
Sep 17	06:28 08:08 16:17 17:57	04:40 06:20 16:09 17:50	10:50 12:30 20:40 22:20	02:20 04:01 12:15 13:57
Sep 18	06:03 07:43 15:52 17:32	05:56 07:36 15:45 17:25	10:27 12:07 20:17 21:57	02:10 03:51 12:05 13:46
Sep 19	05:38 07:18 15:28 17:07	05:32 07:12 15:22 17:01	10:04 11:44 19:55 21:34	01:59 03:40 11:55 13:36
Sep 20	05:14 06:54 15:04 16:42	05:08 06:48 14:58 16:37	09:41 11:21 19:32 21:11	01:49 03:30 11:44 13:25
Sep 21	06:29 08:09 16:18 17:59	04:44 06:24 16:13 17:54	10:58 12:38 20:48 22:28	01:39 03:20 11:34 13:15
Sep 22	06:04 07:44 15:53 17:33	06:00 07:40 15:50 17:30	10:35 12:15 20:25 22:05	01:28 03:09 11:24 13:04
Sep 23	05:39 07:19 15:29 17:08	05:36 07:16 15:26 17:06	10:12 11:52 20:02 21:41	01:18 02:59 11:14 12:54
Sep 24	05:15 06:55 15:05 16:43	05:12 06:52 15:03 16:42	09:49 11:29 19:40 21:18	01:08 02:48 11:04 12:43
Sep 25	06:30 08:10 16:19 18:00	04:49 06:28 14:39 16:18	11:06 12:46 20:55 22:36	02:38 04:19 12:33 14:15
Sep 26	06:05 07:45 15:54 17:34	06:05 07:45 15:54 17:35	10:42 12:23 20:32 22:13	02:28 04:09 12:23 14:04
Sep 27	05:40 07:20 15:30 17:09	05:41 07:21 15:30 17:10	10:19 12:00 20:10 21:49	02:17 03:58 12:12 13:54
Sep 28	05:16 06:56 15:06 16:44	05:17 06:57 15:07 16:46	09:56 11:36 19:47 21:26	02:07 03:48 12:02 13:43
Sep 29	06:31 08:11 16:20 18:01	04:53 06:33 14:44 16:22	09:33 11:13 21:03 22:44	01:56 03:37 11:52 13:32
Sep 30	06:06 07:46 15:55 17:35	06:09 07:49 15:58 17:39	10:50 12:30 20:40 22:20	01:46 03:27 11:41 13:22

You can download a PDF version of these predictions from: ***http://www.geo-web.org.uk/predictions.pdf***

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@tiscali.co.uk

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

Keith Holland
London, ENGLAND
Specifically, help for APT users (137 MHz band).
- e-mail: geo@koholland.plus.com

David Strickland
Truro, Cornwall, ENGLAND
David has set up his own wireless network system of three computers. He has interests in electronic design and prototyping, general computing, microchip processors with various facilities and of course MSG satellite imaging. He will be happy to discuss any of the above topics, and to help anyone local, including viewing his setup.
- e-mail: David@Strickland.uk.com

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
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Guy Martin G8NFU
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- agm@tonbridge-school.org

Hector Cintron
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- 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.

GEO-Subscribers

This is a group where GEO members can exchange information relating to either GEO itself or Earth observation satellites and related matters.

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

Satsignal

An end-user self help group for users of David Taylor's Satellite Software Tools including the orbit predictor WXtrack; the file decoders GeoSatSignal and SatSignal; the HRPT Reader and image creator program; the image remapper GroundMap; and software for the EUMETCast service—the MSG Data Manager, the 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 can share information about the EUMETCast reception hardware and software for the Meteosat geostationary satellites.

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. With 40 sounder channels (20 microwave, 19 thermal and 1 visible), there is a vast amount of data available. 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

A group providing 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://tech.groups.yahoo.com/group/wxtoimg/

Websites

There are numerous websites devoted to Earth observation and weather satellite images. Here are just a few of the best ones. Note that some of these are *Case Sensitive*.

NASA Earth Observation Newsroom

A high-resolution satellite image of an interesting area or weather event is posted each day. An archive of such images stretching back several years is available.

http://earthobservatory/nasa.gov/Newsroom/NewImages/images.php3

Earth Observatory Natural Hazards

Images of recent major hazards (severe storms, fires, volcanic eruptions, floods) are posted. A great site for images of tropical cyclones and hurricanes.

http://earthobservatory/nasa.gov/NaturalHazards/

MODIS Rapid Response System

Recent high-resolution imagery from NASA's Terra and Aqua satellites is posted here. There is also a gallery of near real-time current images.

http://rapidfire.sci.gsfc.nasa.gov/gallery/

The Copy Deadline for GEO Quarterly No 15 is Saturday, July 28

The Editor is always on the lookout for articles and images for inclusion in GEO Quarterly. These can relate to any aspect of Earth Imaging, especially:
- Technical articles concerning relevant hardware / 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). But of course we will also accept handwritten or 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, e.g. JPG, BMP, GIF, TIFF etc. Images in both monochrome and colour are welcomed for inclusion. 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 to illustrate an article.

If your article submission contains embedded images and diagrams, please note that it is essential that you **also submit the individual 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, Les Hamilton, 8 Deeside Place, Aberdeen, AB15 7PW, Scotland.

Materials may also be sent as attachments to the following e-mail address:

geoeditor@geo-web.org.uk

Larger attachments (1 Mb to 10 Mb) are best sent to:

editor.geo@googlemail.com

And finally . . . if you do have material ready for the next GEO Quarterly, please submit it as soon as it is ready—do not wait till the deadline before sending it in. This simply creates an editorial log-jam.

Group for Earth Observation

Membership Application Form

PayPal

Current Subscription Rates

United Kingdom ... £20 Europe .... £24 Rest of World £28

You can make your annual GEO Membership payment by any of the following means:

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2. **Credit/Debit card** - Complete your details below and mail/FAX this form to the Membership Secretary (details below)
3. UK residents may also pay by **personal cheque** or **Postal Order** made payable to Group for Earth Observation

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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.

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Earth Imaging News

Peter Wakelin

Two Small Imaging Satellites Launched

Kosmotras launched a multiple-payload Dnepr rocket on April 17 from Baikonur, Kazakhstan. Its 14-satellite cargo included two imaging satellites. *Egyptsat*, also known as *MisraSat*, was built for Egypt's National Authority for Remote Sensing and Space Sciences. *Saudisat-3* carries an imager and a data collection and relay payload for the King Abdulaziz City for Science and Technology Space Research Centre in Riyadh. The two are in similar 700 km sun-synchronous orbits.

NOAA, NASA Restore Climate Sensor to NPP Spacecraft

A key ozone layer sensor is to be restored to the National Polar-orbiting Operational Environmental Satellite System (NPOESS) programme. The earlier decision not to include the Ozone Mapping and Profiler Suite (OMPS) Limb sensor on the NPOESS Preparatory Project (NPP) spacecraft has been reversed and Northrop Grumman Space Technology will now include the instrument on the NPP satellite which is now expected to be launched in 2009. The first NPOESS is not expected in orbit before 2013.

AIM Successfully Launched

NASA's *Aeronomy of Ice in the Mesosphere* (AIM) mission led by Hampton University in Hampton, Virginia, USA, was successfully launched on April 25. Strapped beneath an aircraft flying out of Vandenberg Air Force Base in California, the Orbital Science's Pegasus XL rocket was carried out over the Pacific Ocean and released to begin its flight to orbit.

Pegasus rocket ignites sending AIM on its way to orbit
Credit: NASA

This is NASA's first mission dedicated to the exploration of polar mesospheric clouds (PMCs). 'The occurrence of these clouds at the edge of space and what causes them to vary is not understood' said Dr James M Russell, III, AIM's principal investigator at Hampton University's Center for Atmospheric Sciences. 'AIM will provide the comprehensive data needed to confirm current theories for cloud formation or develop new ones and allow researchers to build computer simulations that reproduce the observed changes in these clouds.'

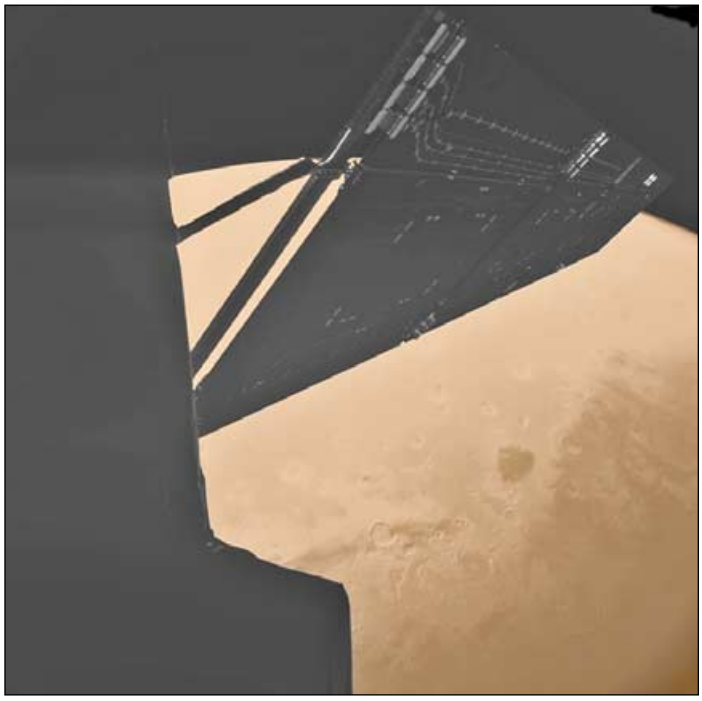
These clouds, which are more than 80 km above the Earth's surface, form only at high latitudes in both hemispheres and only during the summer months. They have grown brighter and become more widespread in recent years and some scientists suggest that this may be the result of climate change.

China Launches Oceanographic Satellite

China's second oceanographic satellite, *Haiyang-1B*, was launched into an 800 km sun-synchronous orbit on April 11, on a CZ-2C rocket from the Taiyuan Space Centre. It replaces *Haiyang-1A* which failed in 2004 after operating for two years. Designed to perform ocean research, monitor ocean conditions and support the utilisation of ocean resources, it carries a 10-band ocean colour scanner, a 250 m-resolution CCD imager and an infrared water profile radiometer. This was China's second launch this year and was followed by a third the next day when a satellite was launched to a 12-hour, circular GPS-type orbit.

Another Spacecraft Images Mars

This stunning view, showing portions of the *Rosetta* spacecraft with Mars in the background, was taken by the Rosetta Lander Imaging System (CIVA) on board Rosetta's *Philae* lander as it sped past Mars recently, barely 1 000 km above the surface.



Rosetta swings by Mars
Image: ESA

This was the first time that the *Philae* lander has operated in a totally autonomous mode and relying solely on its batteries for power—as will be the case when it reaches its final destination in 2014. After gaining energy from the Mars fly-by, *Rosetta* will gain further speed in November when it swings past Earth on the way to a landing on comet 67P Churyumov-Gerasimenko.

Japanese Radar Satellite Fails

One of a pair of imaging spacecraft launched by Japan in 2003 has failed due to a power supply problem, according to an official with Japan's Cabinet Satellite Intelligence Centre. Two pairs, each comprising an optical and a radar imager, are in orbit and are believed to be gathering information when passing over North Korea.

Landsat 7 Map of Antarctica Created

As part of its contribution to the International Polar Year, 2007-2008, NASA and the US Geological Survey (USGS) in Golden,

... concluded on page 42

GEO Shop Update

Clive Finnis

PayPal

The PayPal on-line payment system championed by Ray Godden and introduced by him about six months ago has proved to be extremely popular. I would estimate that over 80% of all orders received at the GEO Shop now use this system, with cheque payments becoming something of a rarity. Thanks to Ray for his work in setting up and refining this system.

R2ZX

The popularity of R2ZX 'pager hardened' version of Holger Eckardt's established R2FX APT receiver has totally surprised us! We expected that the first batch would take around a year to sell but all have disappeared within just two months! It certainly is a great receiver for use in the UK, all but eliminating pager interference except in the very worst 'pager hell' hot-spots.

At the time of writing another batch is on order, so hopefully we will only be out of stock for a few weeks. Thank you all for your patience if you are one of the unlucky ones waiting for your R2ZX to arrive. The original R2FX is still selling well to overseas locations.

Shop Prices

We have managed to hold *GEO Shop* prices stable for quite a time now but, unfortunately, we have recently seen quite significant cost increases from several sources. This means that we have reluctantly decided to raise some of the Shop prices. The UK Post Office has changed its pricing policy from one based on weight only to one which takes into account both weight and size of parcels. As all Shop prices include postage this has a direct impact on our costs of shipping. In January Germany raised its VAT from 16% to 19%, which affects the costs of the German built R2FX and R2ZX receivers, while the world-wide rocketing of the price of copper has wide-spread implications for us in terms of the cost of wires, cables and power supplies. We have also experienced general increases from our suppliers for MSG equipment and APT antennas.

The Shop's main goal is to provide carefully selected and tested equipment and items at very competitive prices as a service to GEO members, but we have to pay our way as well: hence the decision to finally raise some prices.

The R2FX receiver has been increased from £135 to £140 for members to reflect the German VAT increase (the R2ZX is unchanged as the increased VAT rate was already established when we started selling them in February), the APT turnstile antenna has increased from £ 37.50 to £42.50 due to increased prices from our supplier, and we have also had to pass on some increases on the Dish and LNB, and PCI cards.

I hope that everyone will appreciate the reasons for these rises and, hopefully, recognise that we still offer very good value for money—and that we do our best to provide a good service. Of course, it goes without saying that all money made goes directly to GEO—everyone involved gives their time free of charge and no-one receives any personal 'expenses'.

New Shop Items

We are very pleased to be holding stocks of John Silver's impressive APT masthead preamplifier. You can read about it in John's article in GEO Quarterly 12. These units are fully built and tested by John and come fitted in a rugged metal case—so they are ready for you to fit as soon as they arrive. Preamplifiers are generally only needed to overcome signal losses in long cable runs and will probably not improve signals on shorter lengths of antenna lead.

Indeed, if used with short cable lengths, it is possible that your reception may actually be degraded; so only consider these if you feel that they may help with your particular set-up. If you do need an APT preamp, then John's is certainly one of the best designs available.

If you use a preamp with the R2FX or R2ZX then do not forget to short out the two pins on the respective receiver's printed circuit board labelled JP1, just behind the 'AF-OUT' connector. This will route 12 Volts up the co-axial downlead connected to the '*Antenna 1*' connector, to power the remote preamp.

The GEO Bias-Tee

But what if you want to use the 'Antenna Diversity' function built into the R2FX and R2ZX? If both antennas are connected through long cable lengths you will certainly need two preamps, but JP1 only supplies power to the '*Antenna 1*' connector: no power is available for a preamp attached to the '*Antenna 2*' connector.

The answer is the new GEO Bias-Tee. This is a small box which is connected into the Antenna 2 lead and connects 12 Volts from an attached Power Supply to the remote preamp without degrading the all-important signal from the antenna. The GEO Bias-Tee has several advanced features, such as an internal electronic self-resetting fuse and reverse polarity protection to ensure foolproof operation. Of course a separate GEO Bias-Tee can be used on the '*Antenna 1*' connection if you do not feel confident about opening the R2FX/R2ZX and shorting the internal JP1 jumper pins. The GEO Bias-Tee comes fully built and tested in a metal case, so is ready to use straight from the box. Incidentally, although specifically designed for APT use at 137-138 MHz, it has been tested to over 500 MHz, so might well prove to be useful to amateur radio or scanner enthusiasts.

We have also stocked an optional short coaxial connecting cable to connect the GEO Bias-Tee to the R2FX/R2ZX. This cable is 25 cm long and is fitted with the correct BNC connectors.

UK Plugtop PSU

After several requests, we are also listing the UK plugged 12 volt regulated power supply which is ideal for powering the R2FX, R2ZX or the Bias-Tee. This has only been available before as part of the R2FX/R2ZX Accessory Pack.

Skystar USB Box

It has been necessary to withdraw from sale the Technisat Skystar 2 USB Box used for MSG reception as it is no longer available from the manufacturers. We are hoping to have a new improved version available shortly which will utilise the far faster USB 2.0 interface. USB 2.0 will have a much greater capability to handle the ever-increasing data rates as the *EUMETCast* system expands with more and more services becoming available. Currently tests are under way both at EUMETSAT and amongst the GEO Management Team to ensure that any new USB box will be 100% compatible and reliable in operation. Watch this space!

Finally can I say thank you to you all for your continued support of the GEO Shop and for your kind words of thanks. It is much appreciated by the hard working volunteer staff!

Contacting the Editor

Please note the
new email address
for contacting the editor

geoeditor@geo-web.org.uk

Earth Observation from a Highly Eccentric Orbit

Peter Wakelin

Useful Orbits

We are all aware of spacecraft observing the Earth from near-circular polar orbits, typically 600 to 1000 km above the surface, and the much higher geostationary satellites orbiting above the equator—but there is a less familiar orbit which has some useful properties.

Our near-polar weather satellites cross the equator northbound at an angle of about 98° from due east; that is, the orbit inclination is 98°. It is at this inclination that the Earth's oblateness perturbs the orbit sufficiently to cause the orbital plane to precess eastwards at about one degree per day, or one complete revolution in exactly one year. The result is an orbital plane that maintains a constant orientation relative to the sun: the sun-synchronous orbit.

Another effect of the Earth's equatorial bulge is to cause the perigee, the point where the satellite is nearest to the centre of the Earth, to constantly move around the orbit. This is of little consequence for near-circular orbits with similar perigee and apogee altitudes but can be troublesome for the more eccentric orbits. For example, the classified US '*Keyhole*' high-resolution imaging satellites are typically in sun-synchronous orbits ranging between 300 and 1000 km. The low perigee is advantageous for improved ground resolution but the high apogee saves propellant by confining atmospheric drag to a small portion of the orbit. As it takes several weeks for the perigee to move right around the orbit, it could be a while before a particular target can be imaged at the highest resolution.

The mathematical term to derive the rate of motion of the perigee includes the multiplier $(1\text{-}5\cos^2 i)$ where i is the orbit's inclination. This is zero for an inclination of 63.435 degrees so an orbit with this inclination, whatever its size or shape, would keep its perigee constantly over the same latitude. The Russians put this inclination to good use more than 40 years ago.

The Molniya Orbit

On August 22, 1964, the USSR launched *Cosmos 41* into a highly eccentric orbit of inclination 66°, perigee 426 km and apogee just above 39 000 km, having a period of just under 12 hours (figure 1). This was an engineering test flight of a new communications satellite system called '*Molniya*', the Russian word for 'lightning'. Not only does this 12-hour orbit take less energy to reach than a geostationary one, it also means that a spacecraft could remain very high in the sky over the USSR for at least 8 hours in every 12 as long as the perigee was far south. Just three spacecraft, correctly positioned, would ensure USSR-wide communications coverage. With much of the USSR at high latitudes, geostationary satellites are at low elevations, so the Molniya orbit permits a much shorter signal path through the atmosphere. The first operational *Molniya* was launched on April 23, 1965. To this day, this 12-hour, eccentric orbit inclined at 63.4° is usually referred to as the Molniya orbit.

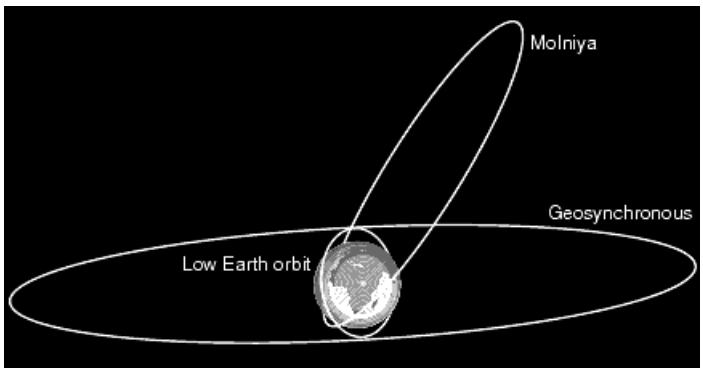


Figure 1 - The 'Molniya' Orbit

Soon after the *Molniya* system was established, *Cosmos* satellites started to appear in similar orbits but with the perigee slightly displaced from the usual position for communications satellites. These were 'Early Warning' satellites with one of the two daily apogees well positioned to observe the Atlantic Ocean and North America. They probably carried infrared sensors to detect the heat generated by missile launches.

Meteorological Sensors in the Molniya Orbit

The continually changing height of satellites in the Molniya orbit creates problems for routine meteorological observations but it has been suggested as a way to maintain the flow of wind data from high latitudes. Winds derived from the movement of atmospheric features in the often-cloudy polar regions are best obtained from the 6.7 micrometre water-vapour channel which is not carried on current polar-orbiting weather satellites. This channel will be incorporated into the later NPOESS satellites after about 2015 but, meanwhile, only the MODIS instruments on the *Terra* and *Aqua* satellites can be used to derive polar wind information and both are approaching the end of their designed lifetimes.

US Use of the Molniya Orbit

American military satellites have been using the *Molniya* orbit for communications and early warning sensors for some time now, taking advantage of the long dwell times over high latitudes that this orbit offers. The latest American spacecraft to use this orbit is code-named USA 184 and was launched on June 28, 2006. Its orbital parameters are used here to better illustrate this useful orbit. A recent two-line elements set for this object, derived from hobbyist observations as 'official' orbital data are not released, is as follows:

USA 184
1 29249U 06027A 07109.57937305 0.00000623 00000-0 00000-0 0 01
2 29249 63.3450 006.3480 7203746 269.5541 090.4459 2.00588141 01

The mean motion close to 2.006 ensures that the ground track repeats precisely day after day and the argument of perigee

... concluded on page 42

How I Built a Simplified Tall, Narrow QFH Antenna for 'diversity' reception using my R2FX APT receiver

Anders Höök

For a little more than a year now, I have been receiving APT images from the NOAA 12, 15, 17 and 18 satellites. My first attempt was with a discone antenna and my *Fairhaven RD500* receiver. I then replaced the discone with a QFH antenna, which of course gave better images, and in January 2006 I got the *R2FX* receiver, which gave a tremendous increase in image quality.

However, I still wanted to see if a better reception of low satellite elevations was possible and, on Steve Blackmore's site, I found something that looked interesting: the *Tall Narrow Quadrifilar Helix Antenna* design. This promised to give better gain at the horizon. I also wanted to test the diversity facility of the *R2FX* receiver, as I intended to continue using my old 'fat' QFH antenna (Paul Hayes' design). These two topics are the purpose of this text.

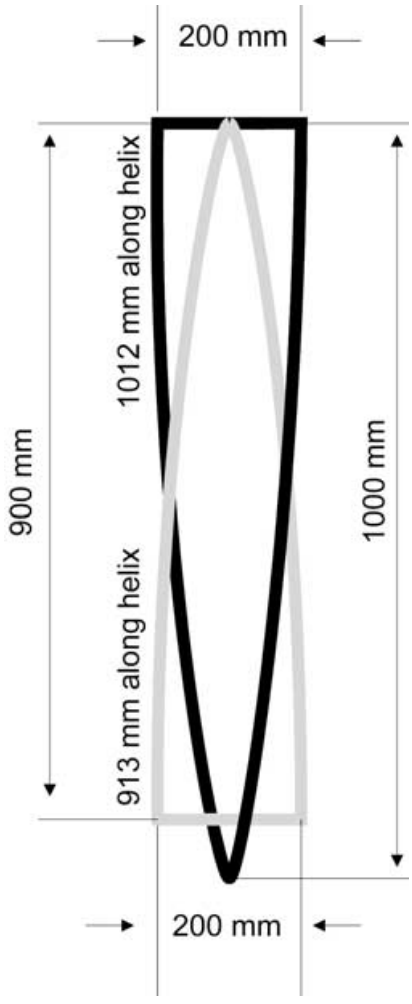


Figure 1 - Dimensions

Tall Narrow QFH

Steve Blackmore's site does not seem to exist any more, but on of Bob Cash's site

www.qsl.net/n8imo/qha.html

there is a description of Bob's own modifications of Steve's design. I also studied carefully the description of the PADAT 137 in GEO Quarterlies 9/10 but decided that it was a bit too complicated to build. All those construction proposals were, however, very helpful in trying to do my own modification. I believe it is unnecessary to stress that this is a very simple design compared with the PADAT 137.

My modification keep closely to Steve Blackmore's dimensions (figure 1) but the practical construction differs depending on what materials my friend Hed Sintorn (who has a very good hobby workshop) and I had in our 'junk boxes'. The antenna is constructed around a 2-metre length of 32 mm PVC waste pipe using 8 mm copper tube. But I never understood Steve's solution for the top of the antenna and Bob Cash's photos of his construction were quite helpful in this respect.

Hed and I used an old 10 mm thick cutting-board for the top of the antenna, probably of a material similar to polyoxymethylene (POM or Delrin). We cut this board in suitable square pieces, which we screwed together. In the four lowest squares we drilled a 32 mm hole for the waste tube at the top of the mast (figure 2).

Figure 2 - The top of the QFH, showing the balun

On top of those four pieces we placed a slightly larger square (a 'bottom board') on which we laid the horizontal parts of the antenna (figure 3). As, hopefully, may be seen from the figure, we cut out four triangular pieces from the cutting-board in order to keep the horizontal copper tubes in place: these we screwed to the bottom board. In the bottom-board there also is a drilled hole for the co-axial cable. Above this we screwed a 'roof', another square from the cutting-board. As may be guessed from figures 2 and 3, we had to cut out notches in the bottom-board in order to get sufficient room for the horizontal parts of the antenna.

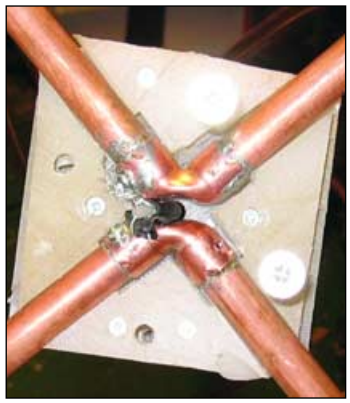


Figure 3 - Connecting the co-ax to the QFH

Dimensions

Steve Blackmore's description states that the lengths of the four top horizontal copper tubes should each be 90 mm. When Hed and I constructed our antenna, however, we judged the important thing was that the *total* length of each pair of tubes, including the elbows, must be 200 mm to the centres of the filar elements. We got this length more or less through 'trial and error' when measuring and soldering. Of course we calculated how far the tubes could be pushed into the elbows during this process. The lengths of the two lower

horizontal copper tubes was similarly 200 mm in total, including the elbows, measured to the centres of the vertical elements.

The total lengths of the vertical tubes (filars) were 915 mm for the short helix elements and 1012 mm for the long helix elements. In both cases, this included the elbows, here measured to the centres of the horizontal elements (and before bending them). The measurements 900 mm and 1000 mm shown in figure 1 are the vertical heights of the respective loops of the antenna after the vertical tubes had been bent.

As far as bending the vertical tubes was concerned, we didn't use any special equipment. These tubes are made of 8 mm soft copper, which is easy to bend by hand, and the amount of curving was simply 'judged by the eye'. It may be seen from the photos that the curvature is not completely symmetrical.

We had some difficulty in finding 8 mm elbows, so we used instead the nearest that we could obtain, 10 mm. Consequently, we used 10 mm copper tube for the horizontal parts of the antenna. To improve the fitting between the elbows and the 8 mm vertical (helical) parts of the antenna, we inserted small pieces of 10 mm tube before soldering it all together (visible in figure 2). The somewhat untidy connection of the coaxial cable (RG 58) can also be seen in figure 3.

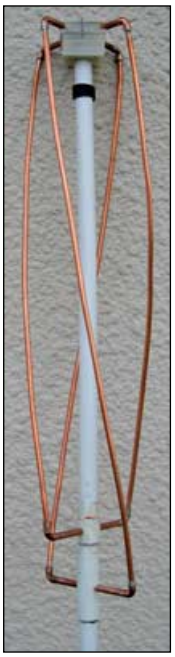


Figure 4
The finished QFH

The lower parts of the antenna also use 10 mm tube for the horizontal parts. Drilling 10 mm holes through the mast was bound to weaken it, so we glued strips of 40 mm waste pipe over the 32 mm tube with epoxy resin before drilling (figure 4 which also shows the whole assembled construction).

It turned out later that the stability seemed insufficient for the whole construction so we slipped a 40 mm waste pipe over the 32 mm pipe as far as was possible (in view of the already glued pieces of pipe). Before this, we wrapped a suitable amount of textile tape around the 32 mm pipe so it was only just possible to slip the 40 mm pipe over it. We also wanted to further reinforce the part of the mast where the lower horizontal parts of the antenna passed through the mast. This was done with 50 mm waste pipe: this we cut in two halves, carved away parts of the material, cut out notches for the vertical rods, placed them over the joint then wired them together. This should be visible from figure 5, taken from the roof. Finally the top part of the antenna was covered with weatherproof paste.

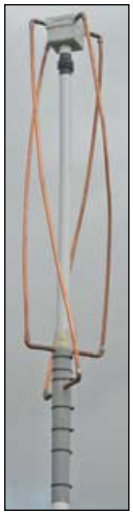


Figure 5

As can be seen from several of the photos, the balun consists of four turns of co-axial cable around the mast. According to Ruud Jansen (GEO Q9 p 10) this is not the best solution, but it is simple, so we chose it anyway, thinking that, if required, it could be changed to something better later.

However, the initial tests of the antenna showed that it worked very well, and so the simple balun is still there.

Diversity Reception

The next step was to climb to the roof, fix the new antenna to the chimney stack, and connect it to the R2FX receiver to which the old 'fat' QFH antenna was already connected. I was quite curious about how the receiver would choose between the two antennas.

The result was quite satisfying. On the whole the receiver chose the 'fat' antenna at high satellite elevations, and the 'tall narrow' antenna at low ones, as expected. I had feared to get lines over the image and maybe shifting colour intensity when the receiver switched between the antennas but so far this has not occurred. Noise lines over the image, owing to nearby trees and a power line, seem to have disappeared or at least decreased. This could be an effect of the distance between the antennas, some six metres. I have to admit, however, that I don't always understand the choice of antenna selected by the receiver.

The receiver seems to have a tendency to choose the 'tall narrow' antenna even at somewhat higher elevations than expected (say some 15° in azimuth) around southeast and also around northwest. I guess that this could be due to the fact that one (or both) of the antennas is slightly directional, or to the location of trees in the neighbourhood.

Figure 6 - Twin antennas for 'diversity' reception

It is quite fun to look at the two LEDs of the receiver showing which antenna is chosen. As might be guessed from the different radiation patterns of the two antennas, the old 'fat' antenna is used much more than the 'tall narrow' one. But as far as I can see the two antennas work quite well together.

It seems that I can now take lower elevations to the south than to the north. To the south I normally get good images down to about 3°, but to the north I usually already get some noise below 6°. I originally thought that this might have been be due to the fact that I didn't get the two masts entirely vertical. However, I have now corrected the alignment of the masts and still have the same noise below 6°. So it looks as if this is due to the presence of the trees to the north.

Finally, figure 6 gives an overall view of the antenna arrangement and the surroundings (looking to some 10° east of north).

Steve Blackmore's QFH

For the benefit of readers who may wish to adhere precisely to Steve Blackmore's version of the QFH, precise measurements and some hints are listed below.

Mast

1.5 m of 32 mm PVC waste pipe

QFH Elements

Use 8 mm mini-bore soft copper tube plus 8 copper elbows for the corners

- 2 × 190 mm lengths for the lower horizontal tubes
- 4 × 90 mm lengths for the top horizontal elements
- 2 × 903 mm lengths for the short helix elements
- 2 × 1002 mm lengths for the long helix elements
- 4 self-tapping screws for the feed.
- A suitable length of RG58 or UR43 for balun and feed
- A 32 mm cap to plug top end of mast

Notes

The lengths given for the copper tubing are cutting lengths, which assume that 90° elbows are used (not bending the copper tubes themselves).

Drill four 8 mm holes at 90° to each other and 25 mm from the top of the mast—these must be square and in the same plane.

Mark and drill the lower holes remembering that they are in opposing pairs spaced 100 mm apart.

R2ZX

by Les Hamilton

The New Pager-Resistant APT Weather Satellite Receiver

Is this the answer to the NOAA-18 Pager Problem?

Late last August I was fortunate to be allowed to test the prototype of a new enhanced R2FX APT weather satellite receiver. Poor performance on the NOAA-18 upper frequency of 137.91 MHz caused by in-band pager transmissions had always been a contentious issue with most APT receivers—and the R2FX proved no different. After all, it was designed for pager-free conditions in continental Europe.

However, since the R2FX consistently produced such crisp satellite images on the other APT channels, Clive Finnis instigated a dialogue with designer Holger Eckardt on the feasibility of constructing a '*pager hardened*' version specifically for the UK market. As a result, a prototype was produced, which was passed round several members of the GEO Management Team for testing in a number of known pager black spots. I tested the receiver in Aberdeen, where bursts of pager activity are almost continuous. I set up my own R2FX and the prototype side by side, allocating my outdoor QFH antenna to the R2FX and the loft-mounted turnstile to the prototype.

On any receiver capable of imaging reasonably successfully from NOAA-18 (such as my RX2), I found that pager intrusion was always at its worst when using the indoor turnstile: the outdoor QFH coped much better. But now, when as expected, the R2FX/QFH combination failed miserably on 137.91 MHz (upper image, right), the prototype/turnstile system produced a highly acceptable one (lower image, right). The entire pass is included here, including slight pager banding, but the difference was a revelation.

The prototype then made its way to Surbiton where John Tellick—who gave up APT a decade and a half ago because pagers had rendered imaging impossible—was amazed to find that he too was obtaining long, pager free NOAA-18 images using an outdoor turnstile where other receivers like the *Proscan*, *Martelec MSR50* and *RX2* totally failed to cope with the pagers.

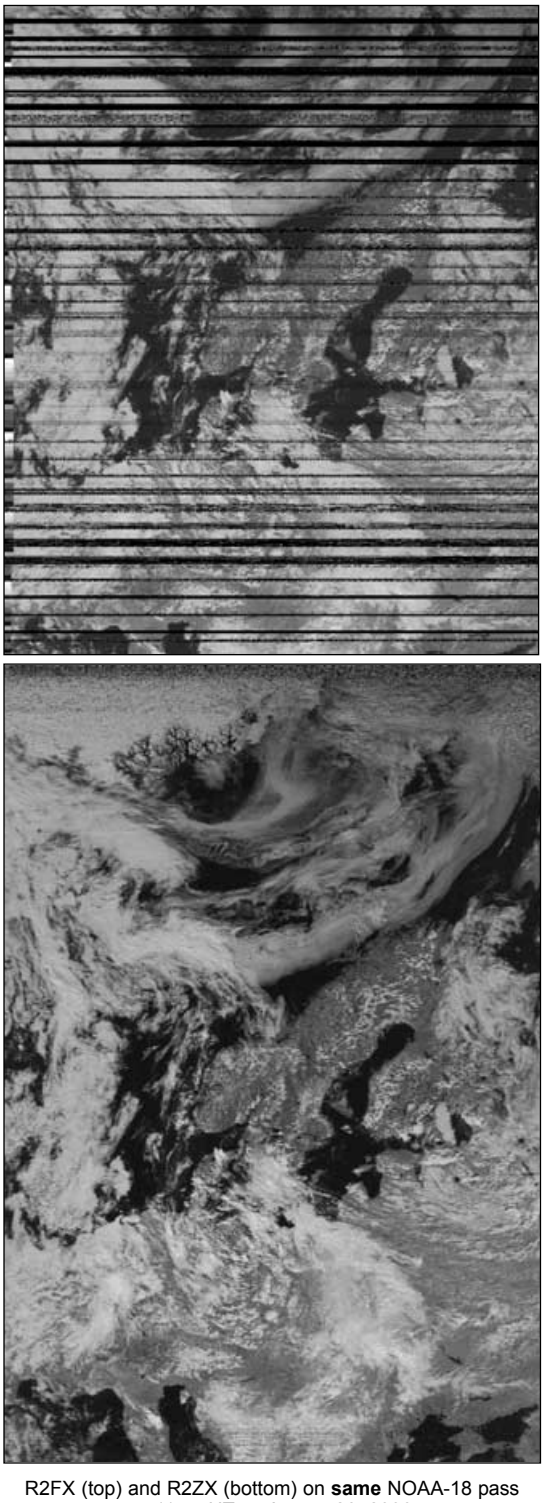
Results were so good that GEO took the plunge and commissioned a batch of the new receivers, which now see the light of day as the rebadged R2ZX. This improved version of the receiver retains all the great features of the R2FX but adds superb immunity to pager interference! Holger Eckardt has designed the R2ZX specifically for the UK market—*and the only outlet from which the R2ZX can be purchased is the GEO Shop.*

Just How Good is the R2ZX?

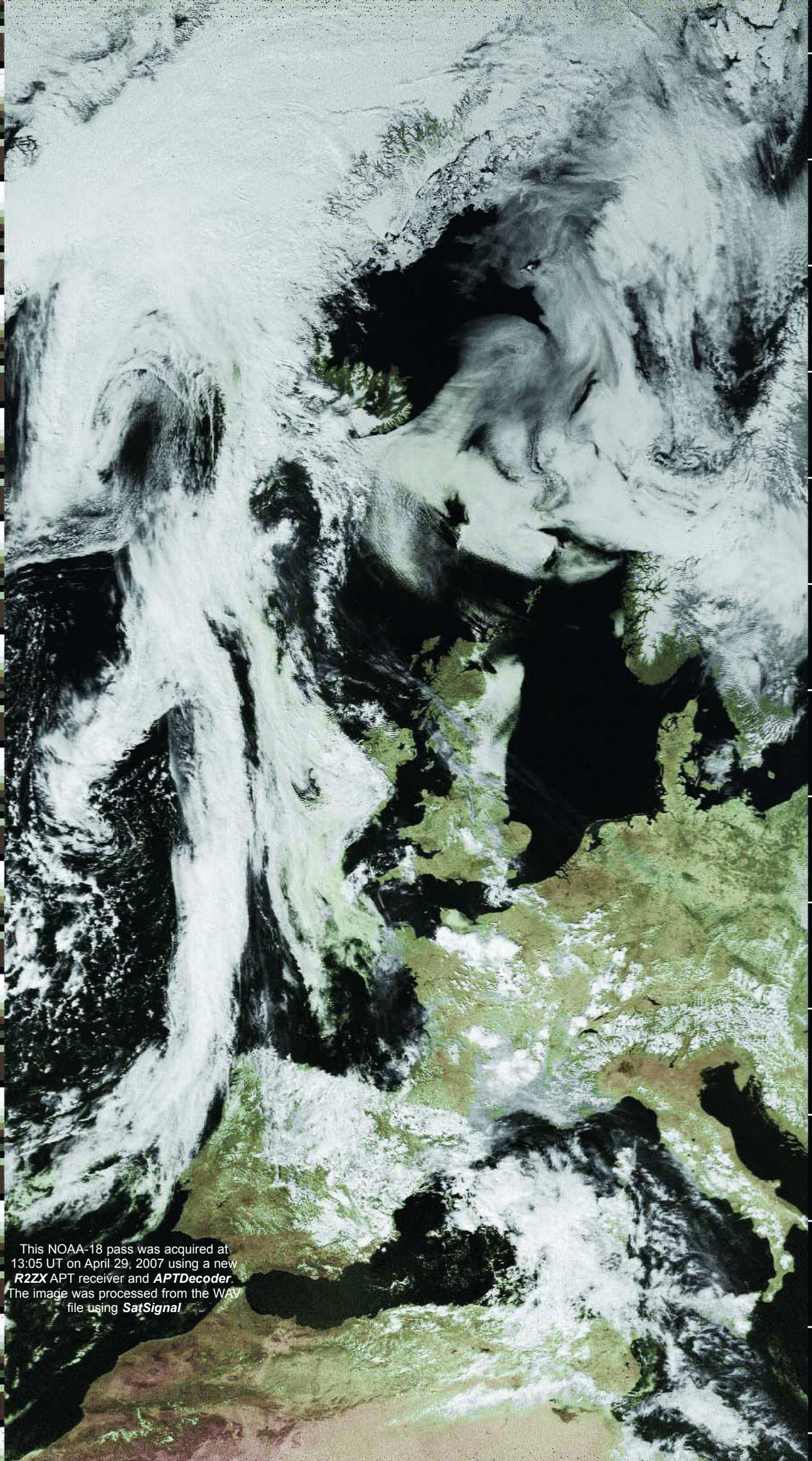
When I started receiving NOAA APT images in the good old days of NOAA-9 and NOAA-10 (the late 1980s) I had excellent horizons and obtained images that stretched from deep into the Sahara to the north of Greenland (Don't scoff! Remember that I live in Aberdeen, hundreds of miles north of the majority of British GEO readers). Over the years, neighbours on both sides have been allowing ornamental trees to flourish to such an extent that they are now almost as tall as the roof ridge on my house, while my outdoor QFH is mounted just 6-metres high on the garage roof. In recent years, particularly southward, I have suffered a shrinking horizon that rarely gives much imagery south of Gibraltar.

The R2ZX is considerably more sensitive than its predecessor and can maintain an exceptionally high quality of imaging even when the signal level is significantly (but obviously not totally) attenuated by obstructions. As the false-colour NOAA-18 image opposite (dating from April 29) indicates, I am once again enjoying wider horizons. This is not a one-off 'lucky hit' as all my images, whether NOAA-17 or NOAA-18, now show this new-found length. Near overhead passes now rarely provide less than 13-14 minutes of good quality signal from the satellites. A NOAA-17 image acquired by Maurice Elwell on March 4 is featured on the inside front cover.

I mentioned this to Adrian Chamberlain, who responded: 'I have noticed that as well. I only got the unit a few days ago and now I can see all the Canaries! No



R2FX (top) and R2ZX (bottom) on **same** NOAA-18 pass at 11:44 UT on August 26, 2006



This NOAA-18 pass was acquired at 13:05 UT on April 29, 2007 using a new ***R2ZX*** APT receiver and ***APTDecoder***. The image was processed from the WAV file using ***SatSignal***

alteration on the feeder or antenna, but the signal is stronger with no noise. Now I can set my minimum elevation to just 1° rather the 12° I needed before (using the *WXtoImg* program to control the RX). Well chuffed! A dinky unit with *big* performance.'

Initial Configuration

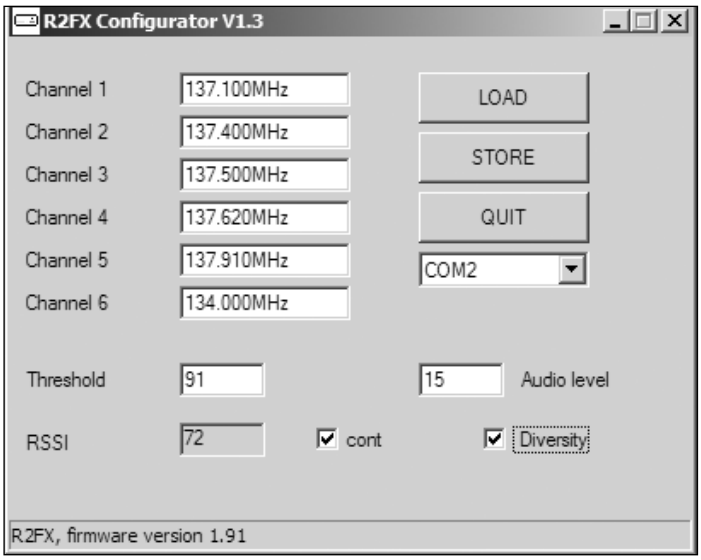
I did experience one problem when I started using my R2ZX. Although I could select the channels by hand the unit refused to enter scan mode. A quick exchange of emails with the GEO Shop solved the problem.

Like its predecessor [1] the R2ZX comes pre-programmed with the various satellite frequencies but also with a default value for the received signal strength. If the ***RSSI*** (Received Signal Strength Indicator)turns out to be greater than the ***Threshold*** level of an inactive channel (see figure opposite), the R2ZX interprets this as a valid satellite signal and locks on to the channel. You must connect the R2ZX to a PC serial port using a 9-pin D-type connector and make sure that *Threshold* setting is greater than the *RSSI* value. Scanning will now take place as expected.

Note

If using *WXtoImg* for controlling the receiver, close the program down before using the configuration utility program *R2FX-config.exe*. When you have finished configuring the receiver, close *R2FX-config.exe before* re-starting *WXtoImg*. The reason for this is simply that both programs use the same COM port on the PC and conflict with each other, which may result in unexpected behaviour.

In general, configuration is identical with that for the R2FX [1]. One difference of note is that the ***Antenna Diversity*** function is now inactive by default and is activated by software (instead of a hardware jumper).



The R2ZX configuration screen

Also, the audio level to the PC can now be controlled via software: just enter a value between 0 and 31 in the ***Audio level*** field. This increments in steps of 10 mV to a maximum of 310 mV).

Reference

1 The R2FX APT Receiver
GEO Q7, September 2005, page 19

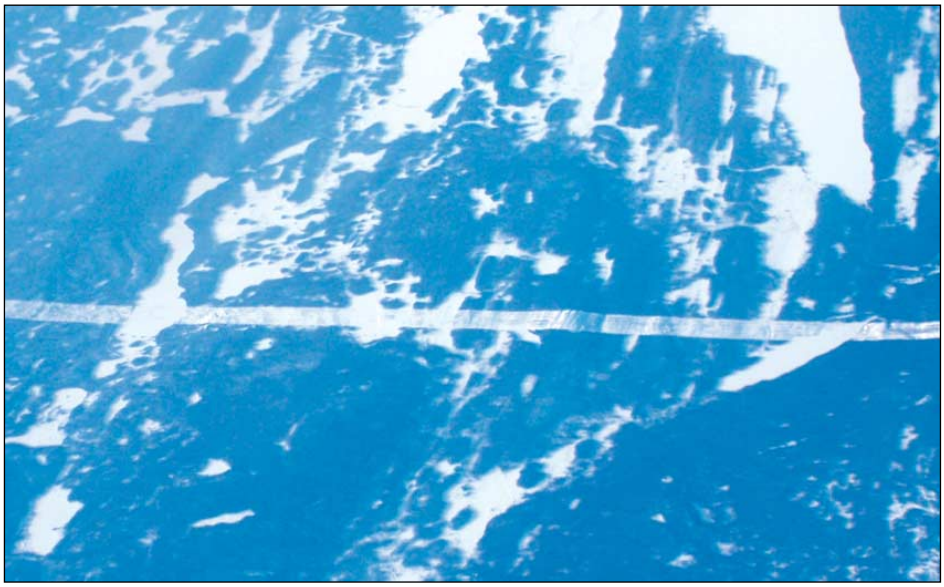
Mysterious Feature seen while Flying over Canada

Francis Bell

Can anybody help to identify a feature on this photograph which I took while flying over Canada on December 5 last year? It was the unusual linear feature on the ground which caught my eye.

The aircraft was flying at about 10,000 metres and the atmosphere was particularly clear, giving me a clear view of the ground. At the time we were approximately 53°N 62°W and heading SSW, close to the boundary of the Canadian provinces of Quebec and Labrador. The camera setting I used was a slight zoom which would have given a focal length of about 70 mm: a slightly longer focus than the human eye, but not by much, so the photograph looks quite natural.

The feature which had caught my eye was a white band which stretched for perhaps 100 miles. When I first saw the feature I thought it was a local cleared approach to an airport, but it just went on and on... The feature looked white and my guess here is that trees were absent, allowing the ground to show up white because of a recent snowfall. The adjacent forested areas appeared very dark by comparison. My estimate of the width of the white band was about 100 metres.



I just couldn't understand what I was looking at. It didn't seem to start or finish anywhere significant which I could identify. Some thoughts went through my mind. Was it a route for electricity supply, an oil pipeline, a fire break, a major road, a political boundary or a geological feature? I just couldn't quite understand what I was seeing. I think from the scale of what I saw that it is unlikely to be visible using weather satellite images but other Earth imaging satellites should be able to show the feature. Can anybody suggest from the above description, what I was looking at?

Replies to myself or the editor, please.

Powerless Revisited

Standby Mode: perhaps not such a bad idea after all

Geoff Darby

I was interested to read of Francis Bell's research into the power consumption of some of his household electronic items. However, I would urge caution in terms of interpreting the results too literally in all cases.

In recent years, under pressure from the environmental lobby, most reputable manufacturers have gone to great lengths to reduce both the active and standby power consumption of their equipment. A large contribution to the success of this initiative has been the replacement of inefficient linear power supplies with switch-mode types boasting much higher efficiency levels. However, there are a number of aspects of switchers that make them rather different from linears and more difficult to measure.

Waveform Considerations

The first of these is the current waveform drawn from the mains, which tends not to be sinusoidal, and can be quite asymmetric and 'pulsy'. Secondly, it is hard to efficiently reduce the output of a switcher for standby purposes without compromising its regulation and stability. To this end, some equipment uses a chopper transistor standby drive scheme which regularly pulses the supply up to full operation for a very brief period—long enough to keep the capacitors supplying the rail to the system control micro and infrared receiver charged. So when a 'keep alive' cycle is active, the power supply will draw virtually a normal amount of power from the mains but, in between each cycle, almost nothing. If you integrate the power consumed over an entire cycle the final result is equivalent to a very low average consumption indeed.

I had a quick look on the Internet at power consumption for assorted Philips monitors, and standby is quoted at just one watt for a number of them.

How the power meter does its sampling (and how well the algorithm that its software uses to calculate power performs) when the power draw is not sinusoidal, or even further departed from the norm by being both non-sinusoidal and briefly pulsed, are both factors which *could* lead to substantially inaccurate, and thus misleading results. I'm not saying that the power meter Francis used cannot handle these unusual conditions, but if it is primarily designed to measure the power consumption of 'traditional' loads, then one should not set too much store by its displayed results when measuring equipment which utilises a switch-mode power supply.

Standby Mode in Context

As well as the figures possibly being misleading, I would also warn against standby modes being considered a bad thing in all cases. Manufacturers don't put standby modes in their equipment just as an effort to '*jump on the bandwagon*' as it were. With most modern equipment there is nothing that needs to 'warm up' or stabilise—so you might wonder why a standby mode is needed at all.

The answer to this is twofold. Firstly, most people want to be able to switch equipment on from the comfort of their armchairs, using a remote control. This means that the system control micro and the infrared receiver module both need to be kept powered. The power consumption of these two items (with the micro idling in sleep mode) is very small, which is why manufacturers have been able to develop the power supply pulse mode. The second is that the standby mode may in fact be a 'mask' for important housekeeping tasks that need to go on in the background.

The Sky Box

The Sky box is a good example of this. It has to be available to receive, in order that its software is kept up to date by automatic downloads from the satellite. Also, its modem and system need to be able to communicate with Sky's control centre in order to fulfil the terms of some of their customer contracts: for example, where a box has been supplied at a very large discount as part of a viewing package, there is a requirement to have it connected to a phone line and be available for interrogation by Sky. Likewise, with Sky+ multi-room packages, the box has to be connected to a phone line and available for interrogation to stop you doing a deal with your next door neighbour. If for any reason you do not allow this to happen you receive a letter from them warning of the consequences, in very short order.

Older Equipment

Older equipment may also have a standby mode for less than obvious reasons. An example of this might be a VCR. Obviously, it has a clock on it to allow for timer recordings; but you might say, 'well hang on a minute, I don't use the thing to timer record, so I'll just turn it right off when I'm not using it'. Bad decision! The head drum usually has a low power heater in it to prevent any moisture build up with changes in room temperature and humidity. If any moisture does form on the head drum, the next tape you try to play is very likely to stick to the drum and become totally wrapped around it. This wrecks the tape, jams the VCR and almost invariably totally clogs the heads, requiring professional cleaning, or in extreme cases, even replacement.

Further, many items of older equipment store their operational and set up parameters—channel tuning, brightness, contrast and colour settings etc—in a volatile memory that requires backup power. This is normally supplied by the standby power condition. If the unit is switched off a small rechargeable battery takes over, but is only designed to last for a couple of hours at most (to allow for general power failures or moving the equipment). If you leave the item for too long without power all of the tuning and setup data will be lost. As the backup components age their ability to store power degrades, and the backup time for which they can sustain the memory decreases to further worsen the situation. This is not the case with more modern equipment which tends to use EEPROM non volatile storage.

Reliability

Finally, another little spanner in the equation is reliability. Whilst the design of switch-mode power supplies has advanced significantly during the past two to three years, they remain at best highly stressed units, operating as they do directly from the mains with no intervening voltage reduction devices such as transformers. This makes them very fickle, and probably the one item responsible for the greatest number of failures of modern electronic equipment.

One thing that these stresses do cause is progressive degradation of certain components, particularly on cheaper quality equipment. These degradations may have absolutely no effect on the operation of the supply as long as it remains powered. However, when power is removed and then reapplied some days (or even just hours) later, these failing components may well cause the supply to refuse to start up again if you're lucky—and may even result in total failure of the supply if you're not.

Ask anyone who repairs these items for a living as I do, and they will tell you that the commonest time for switchers to fail is at power up, particularly after the owner has been on holiday for a couple of weeks and the entire domestic supply has been switched off. Sometimes these failures can be so spectacular and devastating that the supply becomes uneconomic to repair, making otherwise perfectly functional equipment yet more landfill. A lot less green than leaving it running, I think you'll agree.

In Conclusion

So whilst, overall, Francis Bell's concerns and investigations are valid, anyone reading his article should be aware that there are potentially wider issues to be considered. Everything in the realm of the great god *Green* is not necessarily made rosier by efforts to save power above and beyond what the (generally responsible) manufacturers have determined is right and proper for reliable operation of their equipment.

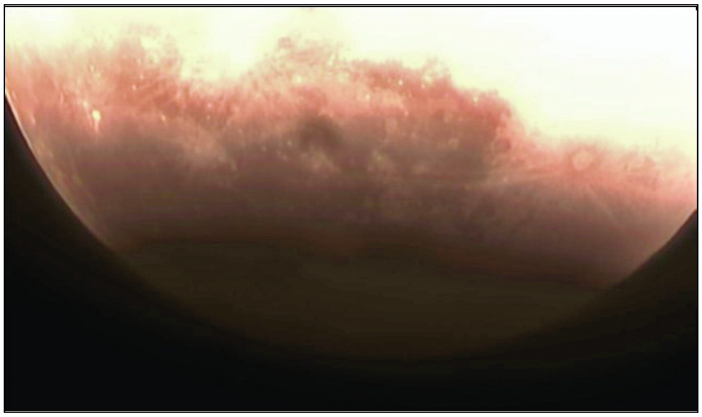


Figure 1 - Lunar eclipse at 2140 UTC
(80 mm refractor and *Toucam Pro* webcam)

Figure 2 - Lunar eclipse at 2152 UTC

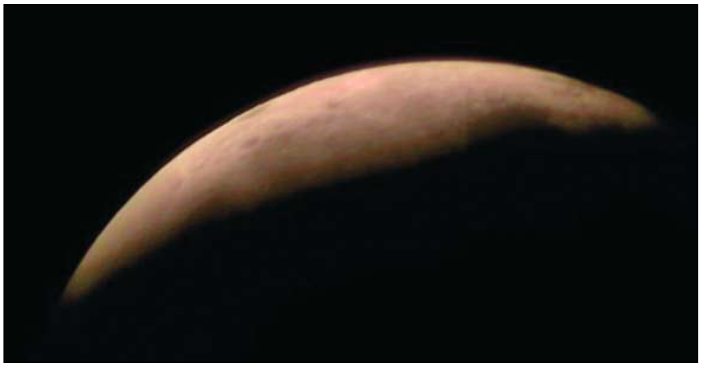


Figure 3 - Lunar eclipse, near totality, at 2233 UTC

The Lunar Eclipse of March 3, 2007

Lawrence Harris

February was a busy month, with telescope testing and literary efforts, and it was into the third week before I saw a reference to the forthcoming eclipse of the moon. It took me by surprise, having forgotten about eclipses for some time, so I checked out the details. A total eclipse of the moon can be spectacular—as long as the weather is OK! The last two partial eclipses have seen poor weather in southern England, but the forecast was more encouraging this time.

I have my main telescope, a 30 cm Meade RCX400, set up in a garden observatory and a couple of smaller telescopes (60 mm and 80 mm) available for wider field imaging or viewing. For an eclipse, the smaller telescopes are much preferred because one can see the whole spectacle rather than the far more detailed view seen with a large telescope.

So I decided to mount my 80 mm refractor on its mount next to the observatory. I am able to set this up fairly quickly and have ground marks to allow quick aligning for imaging. During the afternoon of March 3 I set the scope up, re-charged the battery and fitted my *Toucam-Pro* webcam. This combination is not really very good because the field of view of the tiny chip is so small. I would normally use my colour CCD camera to obtain much wider fields, but I was doing some specialised tests of a new, highly state-of-the-art telescope guiding system called active optics and did not want to remove the camera even for the eclipse.

My reasoning also included the fact that millions of photographers would be taking thousands of pictures of the same eclipse, so I was happy to do it my way. In fact, during the eclipse, I was aware that I could actually resume imaging close to the full moon because it would be dark! Two birds with one stone!

Meanwhile, my EUMETCast Meteosat imaging animation system provided me with a first-class view of the entire weather situation. I could see the cloud front over the southwest and the clear, if a little misty, skies. We were going to get clear enough skies for at least the first half of the eclipse, including totality.

When the moon entered the penumbra—the outer part of the earth's shadow—there was little change that I could see. By the time that we were near the start of totality the change in brightness was becoming obvious, so I started to take some images. The small field of view (FOV) was disappointing (figure 1) and I again wondered about changing over to the colour camera but decided not to. In fact the moon was almost dark enough for me to start 'real' imaging! I took some more eclipse images and then got under way with the main telescope. I took a series of images of the Messier galaxies in Leo—just above the eclipsed moon! I was really pleased with these 10-minute images, knowing that few people would think of doing this during an eclipse.

Meanwhile, the mist increased, and there was cloud slowly approaching. With the channel-9 infrared images coming every 15 minutes from MSG/Hot Bird we have a monitoring facility that could only have been dreamt about a few decades ago. I remember many wasted sessions as an astronomer, seeing a television forecast and then, later, realising the difference between their use of the term 'clear sky' and mine!

During the second part of the eclipse viewing conditions deteriorated to the extent that I gave up imaging and closed down the equipment. It had been very successful so I sent an image (figure 3) to *BBC South Today*, which was shown on the Monday evening after all the digital camera pictures had been shown. Today's camera technology enables the lay person to capture eclipses with ease. I wondered why I had forgotten to use mine! However, with two telescopes on the go, I think that that was enough!

A Novel Approach to Erecting New Antennas

Fred van den Bosch

My antennas have been assembled on a 7 cm wide cylindrical mast approximately 6 metres tall, which is attached to the side of the house. When I picked up my new PADAT antenna [1] at the January werkgroep meeting I was faced with a small problem: how to get it up to the top of my mast. My previous APT antenna, a coax-QFH type, had been mounted on top of the mast before a number of friends helped me to raise it into position. Unfortunately, I didn't know anyone with a sufficiently long ladder to replace the antenna on my own, and it was too much to expect to be able to summon sufficient helpers, on a day that was calm, dry and not too cold, to help me to bring it down and up again; so I decided to do it myself by climbing the mast itself.

I had two old, disused pylon masts three metres tall (bottom left, page 33) which I attached to the antenna mast using cross-links at both bottom and top. I had already dug out my rock-climbing gear, so I put on my climbing belt and selected a couple of slings with which to secure myself to the mast and a climbing rope to hang from. From the top of the mast the rope was let down through a carabiner so that Minh could hoist the PADAT up. Assembly was pretty awkward: I had to hold the antenna upright with one hand while doing all the assembling and tightening with the other. In this situation it is absolutely essential to secure yourself well (centre-left, page 33). With the PADAT in position, my weather-station anemometer was secured on top of it.

I also mounted a second dish antenna. This was a bit harder to mount because the clamps were a tight fit and the dish kept moving from side to side. But that too was eventually mounted successfully, whereupon it was time to give my poor RSI-arms a rest. For this reason I waited till the following day before mounting the antennas for HF and VHF. Although the climbing itself was actually quite enjoyable, all this took a lot of effort but the final result was well worth it.

With the old APT antenna I used to receive signals from halfway up Norway. Now they are already starting to record when the satellites are well north of Norway. Also, MSG reception is a bit better: before signal quality was 28% and now it is above 50%.

To summarise, I am very satisfied with my new antennas, which you can see in the photograph at the bottom-right on page 33.

Reference

1 Developing the PADAT 137 by Ruud Jansen - GEO Q9 p 6, GEO Q10, p 12.

TQchanSel

New Software to control EUMETCast Channel Selection 'on the fly'

Rob Alblas

In the past few years the amount of data broadcast by *EUMETCast* has grown a lot. Without changing the default settings which come with the *Tellique-software*, the files of all receiveable channels are dumped on the hard disc. This is, in most, if not all cases, not desired. Channels that are not needed may be filtered out by changing the *recv-channels.ini* file, and for a once-only setting this is fine. But if you want to change channels periodically, editing the *recv-channels.ini* file is not very handy. It is easy to make an error, which may result in you not receiving the requested data.

To simplify the changing of received channels I have written the program *TQchanSel*, which allows each channel to be switched on or off by means of a simple mouse click.

Selecting Channels

There are three places where received *EUMETCast* data is filtered before reaching the hard disc:

- In the receiver, where the PID-codes determine which data are to be processed. These codes must be entered in the *Skystar* software. Each PID-code activates a group of channels, so this is a rather rough way of selecting channels.
- By the EKU, where EUMETSAT determines what may be received (this depends on which channels you requested to receive).
- By the *Tellique* software, which uses the *recv-channels.ini* file to filter the data. This is the best place for users to decide what data should reach the hard disc. This is also the file used by *TQchanSel* to change channel selection.

This arrangement is illustrated diagrammatically in figure 1.

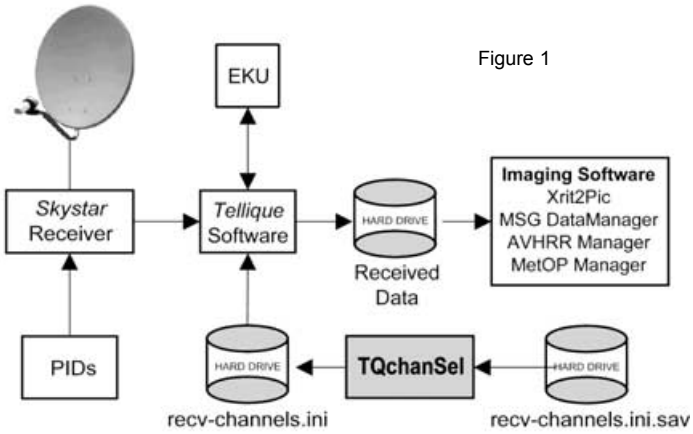


Figure 1

Initialising TQchanSel

The first time *TQchanSel* is run, the *recv-channels.ini* file will be renamed to *recv-channels.ini.sav*. This latter file is now used as a template from which, in combination with the channels selected in *TQchanSel*, new versions of *recv-channels.ini* can be generated. Once *recv-channels.ini.sav* has been created it will not be overwritten, so your original settings will not get lost.

Updated versions of *recv-channels.ini* are created by copying the contents of *recv-channels.ini.sav* back to *recv-channels.ini*. All lines in the file which relate to channels that have been deselected by means of the channel buttons in the *TQchanSel* window will be commented out (i.e. prefixed with the hash character, '#') and therefore switched off.

So all remaining settings, including comment lines in what is now *recv-channels.ini.sav*, will be copied unchanged. If any of these settings has to be changed again, then this must be done by editing *recv-channels.ini.sav* itself!

There are three ways to use the channel selector program, depending on the contents of the original *recv-channels.ini* file.

Assigning Channels and Target Directories

1. Use only the channels and target-directories listed in the original version of *recv-channels.ini*
2. Use an internal table for channel selection, but retain any target-directories listed in the original *recv-channels.ini* file
3. Ignore all information in the *recv-channels.ini* file and use the built-in table to set up all channels and target-directories

This built-in table contains the following items for each channel:

- full channel name
- short channel name
- target directory

These short channel names are included to provide clear labelling of the buttons in *TQchanSel*. For example, '[EUMETSAT Data Channel 2]' will be shown as 'HRIT' (figure 2).

Method 1

This approach uses the information that was present in the original *recv-channels.ini* file that existed **before** *TQchanSel* was run for the first time. Consider the example below.

```
[EUMETSAT Data Channel 1]
target_directory=received_avhrr

[EUMETSAT Data Channel 2]
target_directory=received

#[EUMETSAT Data Channel 3]
#target_directory=received
```

Figure 2 - recv-channels.ini file and the TQchanSel display it produces

These data lines mean that:

- Data from Channel 1 (which includes NOAA) will be dumped in the directory 'received_avhrr'
- Data from Channel 2 (HRIT) will be dumped into the directory 'received'
- Data from Channel 3 (LRIT) is deselected (the '#' comments these lines out) and will not appear in the *TQchanSel* window.

TQchanSel first backs up the information within this file to *recv-channels.ini.sav* and will from now on use this backup version of the file when updating *recv-channels.ini*. A window will pop up containing buttons for (in this example) channels 1 and 2. Channel 3 (LRIT) is not shown because it was commented out in the original file (figure 2) . You can now use these buttons to choose whether to store NOAA, HRIT or both to your hard drive.

If the NOAA button is clicked, *recv-channels.ini* will be updated as follows (**Note**: the raised button means that NOAA is deselected).

```
#[EUMETSAT Data Channel 1]
#target_directory=received_avhrr

[EUMETSAT Data Channel 2]
target_directory=received

#[EUMETSAT Data Channel 3]
#target_directory=received
```

Figure 3 - Modified recv-channels.ini file and TQchanSel display

The only difference between the original and updated files is that comment characters have been placed before the first two lines of the file in order to deselect NOAA. Only HRIT files will now be stored on your hard drive.

Note that the lines for channel 3, which were already commented out, have not changed.

Method 2

The original *recv-channels.ini* must consist of the following two lines before *TQchanSel* is run for the first time:

```
[*]
target_directory=received
```

This means: 'Receive all channels' and store all the data into the directory called 'received'. This is the default version of the file which comes with the *Tellique* software.

TQchanSel will now use the internal table (which currently contains 33 channels) to generated a *recv-channels.ini* file containing data for all 33 channels. To show buttons for all these channels is a bit too much, and in most cases not desired, so only the first six are shown by default. The remaining buttons can be made visible from the 'Show' menu.

Figure 4 shows the *TQchanSel* window with its six buttons, alongside the corresponding entries from *recv-channels.ini*.

```
[EUMETSAT Data Channel 1]
target_directory=received

[EPS-10]
target_directory=received

[EUMETSAT Data Channel 2]
target_directory=received

#[EUMETSAT Data Channel 3]
#target_directory=received

[DWDSAT]
target_directory=received

[TSL Announcement channel]
target_directory=received
```

Figure 4 - recv-channels.ini file and the TQchanSel display it produces

The target directory for all channels has been set to 'received'. In the example above, the LRIT channel is commented out, as will be the remaining 28 channels if they are not selected for reception.

Method 3

In this method, all the channel and target directories are assigned using the internal table. To effect this, *TQchanSel* must be run using a batch file containing the line

tqchansel.exe -use_tbl

All the data in the existing *recv-channels.ini* file is transferred to *recv-channels.ini.sav* and a completely new *recv-channels.ini* file is generated containing data for all 33 channels as listed in the internal table.

Note that, compared with method 2, only the target-directories are different. These directories conform with the 'unified *EUMETCast* installation' as proposed by Arne van Belle.

The first six entries in the new *recv-channels.ini* file are shown in figure 5 along with the *TQchanSel* window. In this example, the top three entries have been selected and the final three deselected.

Some Startup Options

- The number of channel buttons that are visible can be changed by means of option **-n**. E.g.: -n 12 (default is 6)

```
[EUMETSAT Data Channel 1]
target_directory=Ecast\Data Channel 1

[EPS-10]
target_directory=Ecast\EPS-10

[EUMETSAT Data Channel 2]
target_directory=Ecast\Data Channel 2

#[EUMETSAT Data Channel 3]
#target_directory=Ecast\Data Channel 3

#[DWDSAT]
#target_directory=Ecast\MSG

#[TSL Announcement channel]
#target_directory=Ecast\MSG
...
```

Figure 5 - recv-channels.ini file created with the -use_tbl option

- **-sb_off**: Don't show selection buttons at start. Just the menu is visible, so *TQchanSel* occupies just a very small part of your screen. Using the menu or hot key 's', the buttons become visible, so you can make a channel change
- **-chanloc <path>**: to define the location of *recv-channels.ini* (default: C:\Program Files\T-Systems\BusinessTV-IP)
- **-no_menu**: don't show the menu. Note that all menu items have hotkey replacements.

If you want to use a shortcut icon to start *TQchanSel* and you need to employ one or more of these startup options, you need to make a batch file. Make a file called '*tqchansel.bat*' in the same directory as *tqchansel.exe*, containing 'tqchansel.exe -sb_off' (or whatever startup command you want). You can now run *TQchanSel* with the startup option by double-clicking on the batch file.

An example batch file is available on my website.

Hotkeys

TQchanSel supports the following hot keys (which are also duplicated on the 'Show' menu).

- **s** show or hide buttons (see also -sb_off)
- **a** show all channels or jut the first 6 (or as many as defined with the -n option)
- **t** show content of built-in table
- **r** show current selected channels
- **h** help-text

How to use TQchanSel

- Select the channels to receive.
- Click on ***Set*** to make the selection active. At this moment a new *recv-channels.ini* file is generated.
- Click on ***Get*** to set the buttons in the state conform the *recv-channels.ini*. This may be handy if buttons are pushed on and off without clicking ***Set***, to restore the original setting.

Note:

- You only need to run *TQchanSel* if a channel change has to be made. But the program doesn't consume CPU time at rest, and nearly no memory, so keeping it on does no harm. (On my PC the program is always started at boot-time with option -sb_off, to keep it as small as possible.)
- *Tellique* reacts immediately to a changed channel selection so there is no need to restart the PC.

The order of channel buttons is the same as in your original *recv-channels.ini* file. When you use the built-in table, the table order will be used. I have added the most interesting channels at the top—first those containing AVHRR from the two polar satellites (NOAA and Metop) and then HRIT and LRIT from Meteosat.

If you wish to change this order, here's how to do it.

- Start *TQchanSel* with the -use_tbl option
- Switch on all channels you might want to use 'once'
- Click on ***Set***. This will generate *recv-channels.ini*

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Controling Multiple PCs

via a single keyboard and monitor

Giuseppe Cico

I originally started receiving weather satellite images in the 1990s using an APT/WEFAX receiver and one of my first XT-type PCs. Reception was just 'on demand' while attempting some other hobbies and the system was dismantled while changing home.

In 2005 I decided to resume my interest in weather satellites, being aware of the new digital service on EUMETCast. I set a new dish on the roof and made some tests using my standard PC: the same one I used for email, web browsing and so on ...

One of issues while setting up a new PC for 24/7 reception was to avoid starting a 'control room' in the computer corner of my living room. I had some spare shelf space, so I built a small, minimal PC (using a micro ATX motherboard in an *Antec-Aria* case) that looks just like a cube. This works as an unattended machine, so a keyboard and mouse are not really necessary other than for maintenance: and that is achieved with a simple solution named 'KVM'.

KVM is an acronym for Keyboard-Video-Mouse and is a hardware interface used for sharing these three devices on more than one PC. The KVM set is connected to a box and then three cables are connected to each PC. Switching can be done by turning a switch in older models, or with 'hot keys' on a keyboard on up-to-date ones like mine. A quick press of the 'ScrollLock-ScrollLock-Up' keys on the keyboard does the job for me, and I'm now switched to the other PC.

The receiving PC runs the entire software suite, including *Tellicast*, *MSG Data Manager* and so on. I have a LAN connecting the PCs, and destination folders are shared with my main PC through this LAN (which is also used for other computing tasks). It is useful to use this LAN to have a look at the receiving PC while attempting other jobs without switching the keyboard and so on. This can be done using VNC, a virtual KVM-over-IP. See

http://www.vnc.com/what.html

where you can download the free version of VNC software.

Just open MSExplorer, connect with the remote PC and you see the remote screen. When the web page is active and your mouse is over there, then your keyboard and mouse are virtually switched to remote system.

The free version of VNC has limited colour resolution and speed is limited by the LAN, so I find it useful just for one-shot monitoring while KVM switching is for extensive use. The receiving PC also has an Internet connection for scheduled website updating.

Figure 1 shows a simple drawing of my configuration, where the third PC was added during the past few months months while waiting for Metop. When setting up this new PC I had to decide how to accommodate it using free space on the shelf. (figure 2).

Upgrading KVM from a 2-PC to a 3-PC configuration was one way, but expensive because a new KVM was needed. So I decided to set this new PC up as VNC-only. I installed Windows XP, VNC and the basic receiving software using a spare keyboard, mouse and monitor—then set the BIOS to a 'keyboardless-server' configuration. I would need external

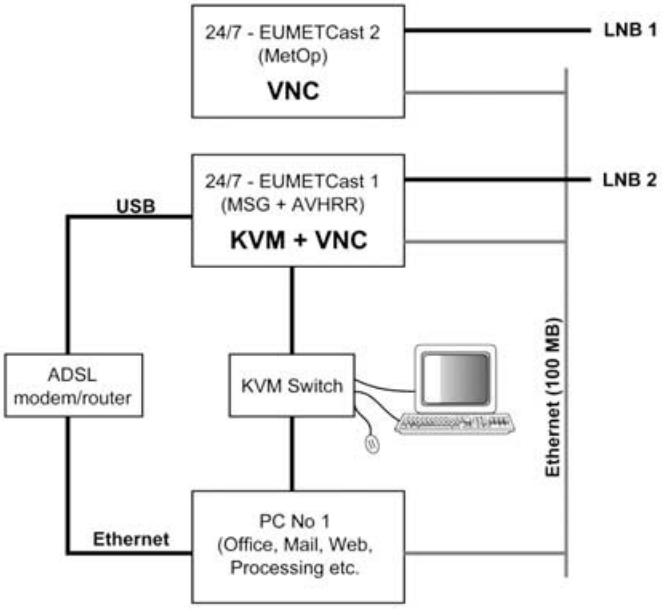


Figure 1 - Configuration layout schematic

Figure 2 - PCs and equipment on the shelf

Included are my old APT/WEFAX equipment, 2x400 GB USB backup devices, my METOP receiving PC, modem/fax, ADSL modem/router, Ethernet HUB, MSG receiving PC, film scanner, main PC with 19" LCD display and printer/scanner

devices to be connected only if a major fault should occur.

My third PC has been running since October 2006, in the first instance receiving MSG just for test purposes—and then Metop from its first day. I can fully manage running and upgrading the software, primarily *Metop Manager* from David Taylor, using VNC, with just a few tricks.

Tips for using VNC

First of all, I have to work more slowly than with directly connected PCs because sometimes a double-click acts like a no-click ... so just don't be in too great a hurry.

Use less colour and, for stick with the default background in Metop Manager (although I use a personal background from NASA BlueMarble for WXtrack on other systems).

Anyway, using *Metop Manager*, and selecting and combining chunks, is easy and results are placed in shared folders ready to be opened by *HRPT Reader* on the main PC. Configuring VNC is quite easy, following manuals, and in only a few minutes one can connect from another PC simply by opening MSExplorer—with Java enabled—and writing something like:

http://<pc-name>:5800

as the target address. '5800' is the default VNC port, a method of IP sub-addressing, which identifies services from the IP-system.

On my main PC's MSExplorer I enter

http://192.168.111.112:5800

to connect the MSG system and

http://192.168.111.113:5800

for the Metop-A. In the same way, I can view the *Tellicast* pages using

http://192.168.111.11x:2517

I chose to use the '192.168.111.xxx' addresses for the LAN as these are defined as private addresses. Your router may determine which of the three private Internet address ranges you use. As they are not used by the Internet, you can use

192.168.aaa.bbb or 10.aaa.bbb.ccc

Figure 3 is a screenshots showing my main PC (1280 x 1024 resolution) working with the MSG PC connected. Figure 4 is another screenshot showing how I can monitor both of the *EUMETCast* PCs from my main processing PC.

I have shown two different ways of controlling PCs remotely, one with a KVM switch and physical connections and another using the network and software. I have been using this for several months now, and not only am I being 'green' by using less energy, I actually have some desk space back!

Appendix - Configuring VNC

VNC can be run either in program mode or service mode. I chose the second option and modified some of the default settings.

I disabled the 'Disconnect option by setting it to '0' (figure 5) , and set some of the protection options. External IP addresses can be filtered to allow or

... continued on page 43

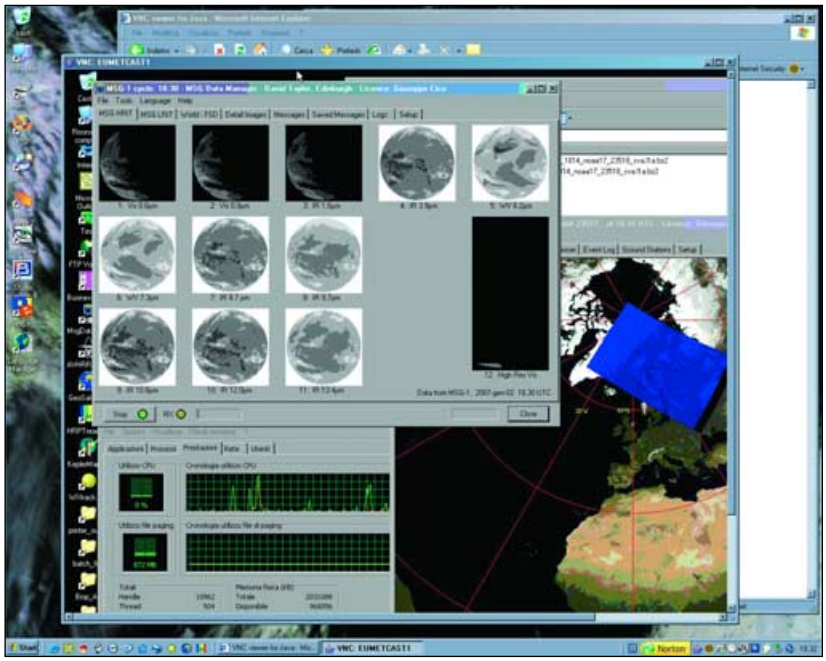


Figure 3 - A VNC session from the MSG PC viewed on my main PC

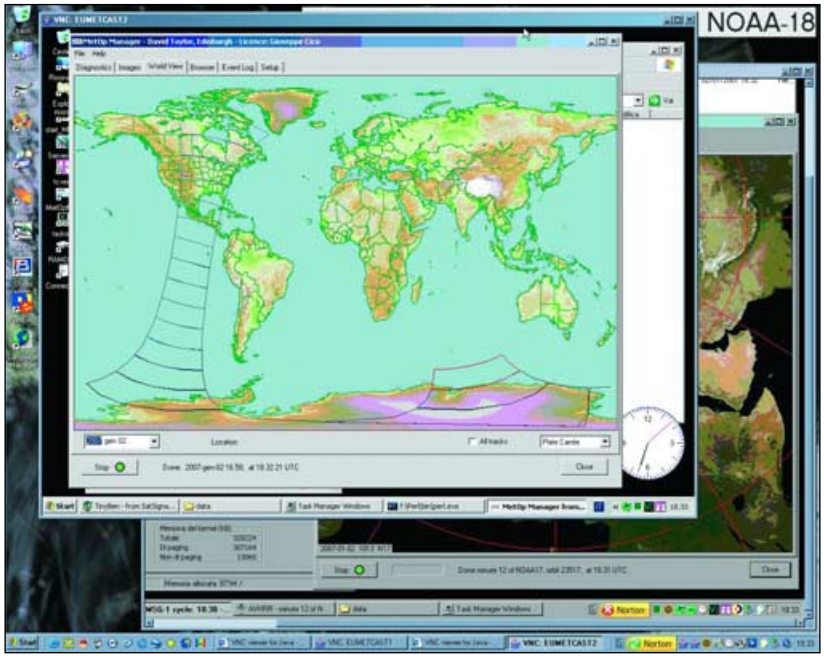


Figure 4 - VNC sessions from both the MSG and MetrOp PCs viewed on my main PC

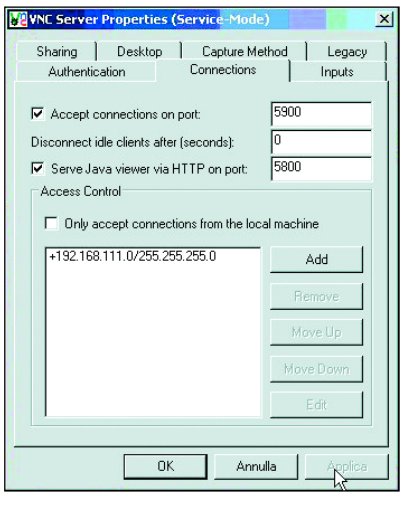


Figure 5 - VNC connections

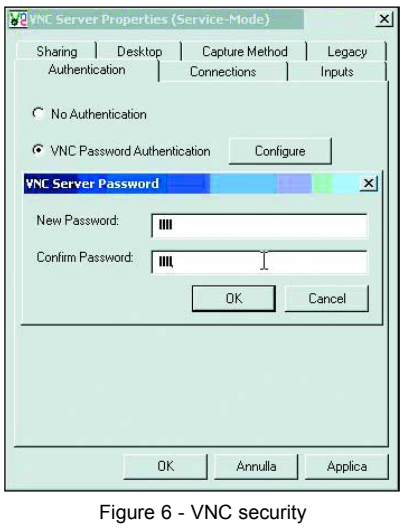
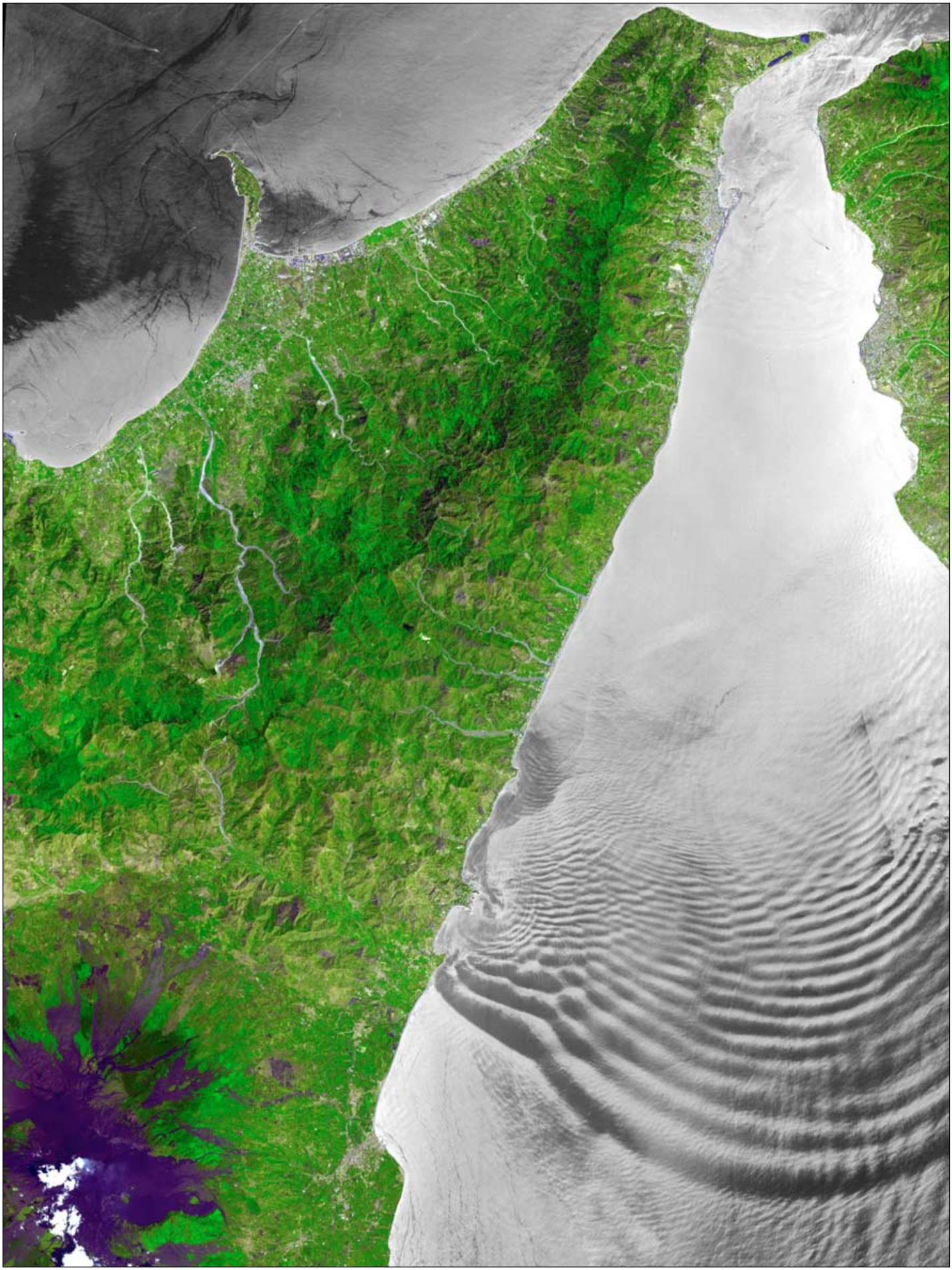
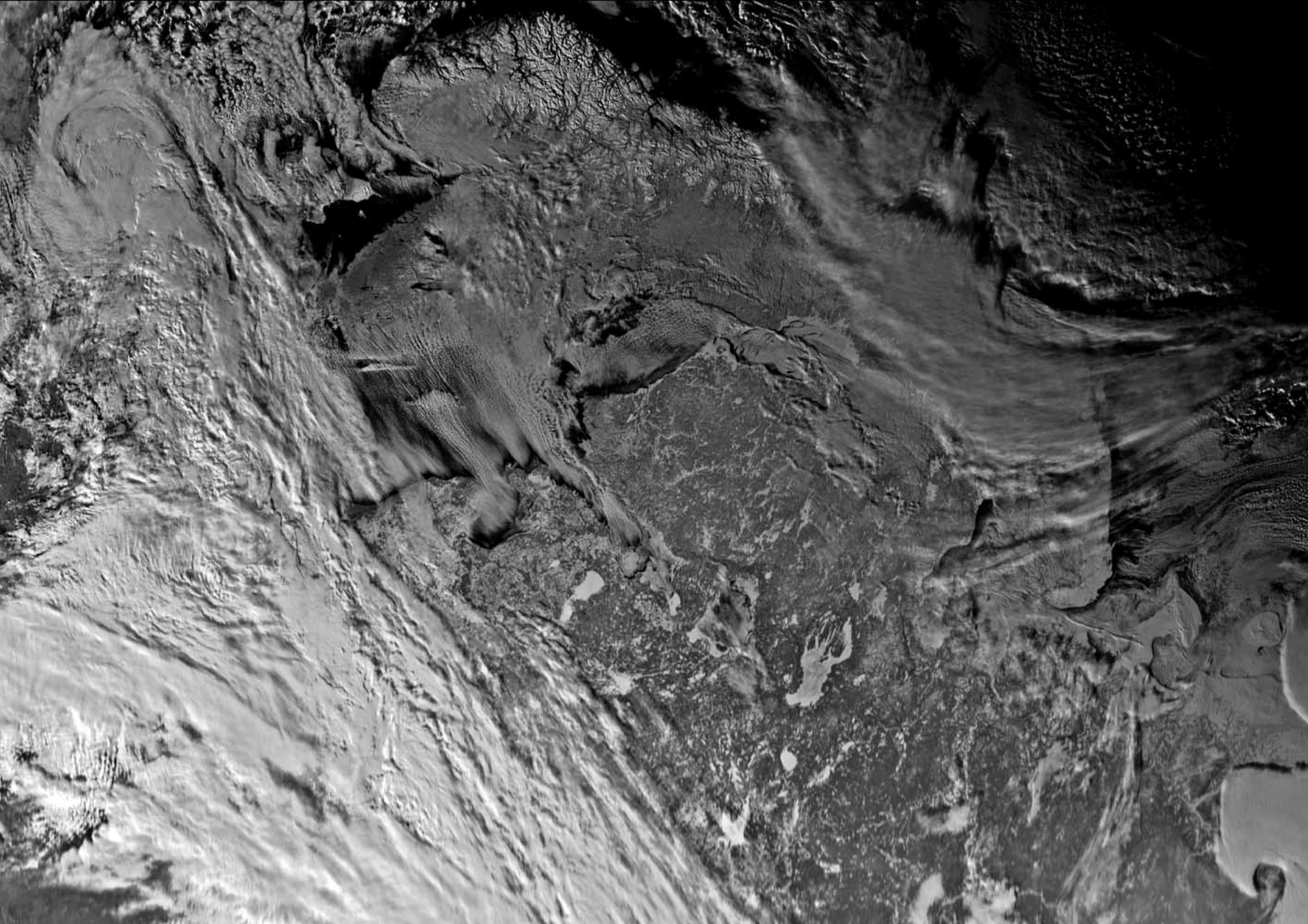


Figure 6 - VNC security



Powerful currents in the Strait of Messina between Sicily and Italy were imaged by the ASTER instrument aboard NASA's *Terra* satellite in 2003. Read more about this phenomenon in the note on page 4.

NASA image created by Jesse Allen, using data provided courtesy of the NASA/GSFC/MITI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team



This beautiful NOAA-18 segment downloaded via EUMETCast by **David Taylor** on March 15 this year shows superlative details of the peaks and valleys of the Alps. The image also underlines just how little snow has fallen in this part of the world this winter. So fine is the detail that the course of the River Po across the Plain of Lombardy is clearly visible.

Image © EUMETSAT 2007 - Processing: AVHRR Manager and HRPT Reader software

George Newport sent us a the beautiful NOAA-17 colour composite image at left, depicting high pressure over Great Britain, the North Sea, Denmark and the Low Countries. Prominent features of the image are extensive banks of fog over east and southeast Scotland, and the Midlands of England.

George employs *WXtoImg* as his APT capture software and received this pass using his RX2 receiver and a Paul Hayes QFH antenna.

Final image adjustments were made using Paint Shop Pro.

Details
NOAA-17 at 10:57 UT on March 27, 2007.

SOFTWARE SHOWCASE

Douglas Deans - *dsdeans@tiscali.co.uk*

The talking point amongst the weather satellite fraternity continues to be the outstanding global AVHRR data being provided from Metop-A through the EUMETCast system. We can view anywhere in the world, in five different wavelengths at 1-km resolution. Quite remarkable! As expected, David Taylor's *MetOp Manager* has developed further since my column and full review article last quarter, and there is some updated information about this. In addition, I have some news about completely free software written by Rob Alblas to decode and view not only Meteosat HRIT/LRIT images and some associated data, but also the Metop global AVHRR files. More about that below.

As readers will note from this column, I normally strive to send out GEO CDs on the same day as receipt of order. However, the new postal arrangements have made life a little more difficult, and I now have to use the local Post Office for weighing and to have odd value stamps put on the Jiffy bags (even an empty Jiffy bag will not comply with the 5 mm thickness rule). So perhaps on some occasions there will be a minor delay of a day or two. Nevertheless, and perhaps more importantly, the cost of the CDs remains the same.

Xrit2pic v 2007.03

Rob Alblas has written this program which is freely available to all users. The program reads HRIT and LRIT files from the MSG satellites and converts the data into images. There is also some limited support for other services such as DWDSAT, Metop and certain meteorological products.

For those, including myself, who are used to the usual visual advantages of GUI operating systems, this program may take a little getting used to. Nevertheless, it is completely free and Rob has to be applauded for providing the software. The program allows you to preview images with zooming and panning, and movies can also be generated—either using the built in AVI generator or external software.

There are a number of save format options. The software is available for both *Linux* and *Windows* and you can also request it for *Sun/Solaris*. There are some notes to give guidance on installation and they are well worth a read.

Xrit2pic v 2007.03 is available on GEO software CD, GS2 in both Windows and Linux formats. For further information or to download the program go to Rob's web page at:

http://www.alblas.demon.nl/wsat/software/soft_msg.html

MetOp Manager V 1.1.0

In the previous issue of the Quarterly there was a full review of this new software (version 1.0.2), and for those new to the program this is well worth a read. The fundamentals of the software remain unchanged but, as anticipated at the time of writing, there have been a number of useful additions and refinements.

There are too many new options to list them all here but let me briefly summarise the more useful of them.

GS1

All David Taylor's weather satellite programs and libraries, including the current releases of WXtrack, Satsignal, HRPT Reader, GeoSatsignal, GroundMap, RX2 PassControl and many other program extras. This disc also contains a large quantity of sample files, many of high-resolution data, for use with these programs.		
AVHRR Manager	Processes and manages the files for HRPT via EUMETCast	v 1.3.4
GeoSatSignal	Manipulates Geostationary weather satellite images	v 6.0.8
GRIB Viewer	Viewer for GRIB format files	v 2.1.2
GroundMap	Rescales satellite images	v 2.0.6
HRPT Reader	Converts raw HRPT data files into images	v 2.6.8
Kepler Manager	Organises files of 2-line element data	v 1.2.8
MetOp Manager	Processes and manages AVHRR files from MetOp satellites	v 1.1.0
MSG Animator	Automatic animation of MSG images following reception	v 2.5.6
MSG Data Manager	Processes and manages the files received from MSG satellites	v 2.5.4
RX2 PassControl	Computer control program for the RX2 receiver	v 3.1.0
SatSignal	Creates images from wave files	v 5.0.4
WXtrack	Satellite Tracking Program	v 3.6.4

GS2

A wide range of software for all aspects of weather satellite reception, including tracking, receiving, monitoring and image manipulation. Content is detailed below but many other extras are provided. Titles correspond with folder names. * implies a DOS program.		
Collection D02	Recall (wave file recorder), Palette (modifies Wxsat colour palettes).	
Collection D03	Scanner recorder v 1.8 (wave file recorder), *NOAA95/*FENG99 (software for the NOAA 95 HRPT project)	
Collection D04	Wxsat (wave file recorder/decoder), Satmon (wave file recorder).	v 2.59
AGSatTrack	Satellite tracking program	v 1.33
APTDecoder	Program for capturing APT audio and processing images	v 1.0.3.72
Cirkit	Documents for the Cirkit Wxsat receiver and the UOSat receiver (PDF format)	
Element Manager	2-line element manager	v 1.59
Footprint	Satellite tracking program	v 2.24
Irfan View	Image/slideshow viewer	v 3.80
JVcomm32	Evaluation version (APT/FAX/SSTV decoder)	v 1.40 pre
Macintosh kepler editor	Edits verbose AMSAT format elements. Mac OS X and OS9 only.	
NeoPaint	Image processing program (30 day evaluation)	v 4.60
Orbitron	Satellite Tracking Program	v 3.70
Paintshop Pro	Image processing program (30-day evaluation)	
PhotoFiltre	Image retouching program with many extras	v 6.1.5
Satscape	Satellite tracker and wave file recorder	v 2.02
Space-Track TLE Retriever	Generates TLE files in 'Celestrak' style from data sets recovered from Space Track	
Xrit2Pic	Processes MSG and Metop data	v 2007.03
Splitter	Utility program for splitting and reuniting large files	
WXtoImg	WAV file recording and decoding program with many options.	v 2.7.3

GS3

3DEM Package for 3D Terrain Visualisation
This CD includes the full set of GLOBE Tiles to allow you to produce excellent images and flybys from HRPT inages. Also included is a selection of Mars MOLA files, sample images and helpful guides by Ed Murashie.

GS4

Image CD
A wide selection of high-resolution remote images from a range of satellites, including stunning imagery from the Space Shuttle missions. A full description and source if provided for each image.

GS5

Mars Rover Panoramics
A chronological account, in panoramic images, of the NASA Mars Rovers' progress across the Martian Terrain

Instead of a simple background comprising geographical outlines, it is now possible to use your own background display, and indeed one is provided with the software. This is similar to the options provided for *WXtrack* and is particularly helpful for the *Browser* and *World View* tabs.

There is now an auto-daylight option for the images tab.

Comprehensive language support including French, Italian and Spanish is now provided, as has a new tab for messages, including weekly reports and individual updates and news for each of the instrument's data. This utilises data provided from EUMETCast channel EPS-18.

Support has now been added for the other Metop data such as ASCAT, IASI, ATOVS, GOME etc. This allows the files to be moved from the 'receive' folder into a structured file system and also offers data retention control. For users interested in some of the other Metop data sets this is extremely useful.

A right click *Google Earth* function has also been provided. There has been a number of bug fixes and, as with all David's programs, work has started in providing full *Vista* support. As I said, there are many other minor additions and improvements too numerous to mention but they all add to the general usefulness of the program.

MetOpManager v 1.1.0 is available on GEO software CD, GS1. For further information or to download the program go to :-

http://www.satsignal.eu/

How to Purchase CDs

Write to the address below requesting GS1, GS2, GS3, GS4 or GS5. Prices are £5 for any single CD, 2 for £8, 3 for £11, 4 for £14 or all 5 for £17. Please enclose cash or cheque (made payable to Douglas Deans - not GEO please) for the appropriate amount. Nothing else is required.

The cost includes CDs, packaging, posting and a small donation towards the cost of overheads. No fee is asked from overseas members although an exchange of software or interesting satellite images is always welcome.

Orders are normally dispatched on the day of receipt.

Order your CDs from:
Douglas Deans, 17 Montrose Way, Dunblane, Perthshire FK15 9JL, Scotland.

Earth Imaging News

... continued from p-age 23

Colorado, have woven together more than a thousand images from the *Landsat-7* satellite to create the most detailed, high-resolution map of Antarctica ever created. Researchers at NASA, USGS and the British Antarctic Survey (BAS) have launched a web site, with support from the National Science Foundation, to offer public access to the image mosaic called LIMA (Landsat Image Mosaic of Antarctica).

Images will be added over the coming months but the files are typically around 100 MB in size so require a broadband connection. More details of the project and image files can be found at:

http://lima.usgs.gov

GeoEye-1's Camera Delivered for Integration

Built by ITT of Rochester, New York, the sensor for *GeoEye-1's* camera has been delivered to General Dynamics Advanced Information Systems in Gilbert, Arizona for integration into the satellite. When operational, *GeoEye-1* will be the world's highest resolution commercial imaging satellite. Launch is scheduled for later this year. GeoEye, headquartered in Dulles, Virginia, was formed last year when *Orbimage* acquired *Space Imaging* to create the largest commercial satellite imagery company in the world.

Earth Observation from a Highly Eccentric Orbit

... continued from p-age 25

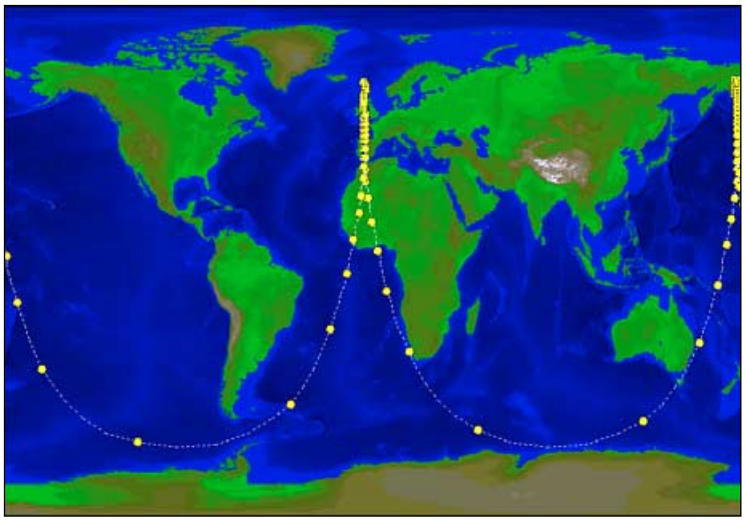
(269.5541) shows that the perigee is almost exactly at the most southerly point of its track. From the mean motion and eccentricity, the perigee and apogee heights are found to be about 1050 km and 39 300 km respectively.

The plotted ground track (figure 2) shows two orbits with time marks spaced at approximately 10-minute intervals along it. Few marks appear in the southern hemisphere as the spacecraft speeds around this half of the Earth in 60 minutes; but it then slows down as it recedes from Earth, in accordance with Kepler's second law, to spend 11 hours over the northern hemisphere.

One apogee is spent above western Europe whilst the other is high above the north Pacific Ocean.

USA 184 is believed to carry the first Space Based Infrared System payload.

'SBIRS presents a new era of global surveillance with the ability to detect and report events that were previously beyond our capabilities, providing greatly improved support to our combatant commanders,' said General Kevin Chilton, commander of Air Force Space Command last November, on the completion of the spacecraft's initial on-orbit checkout.

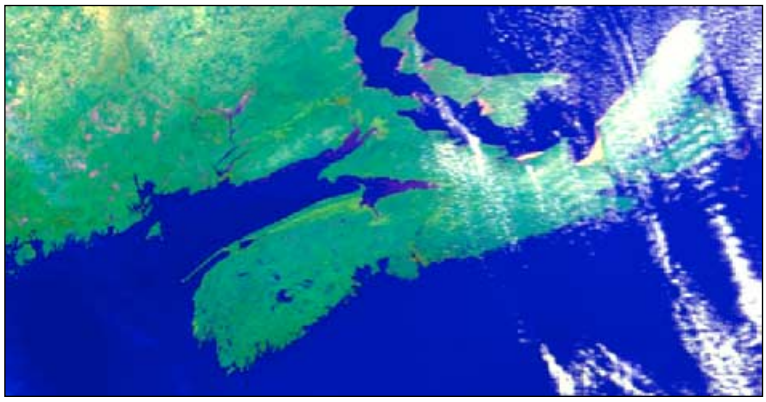


The ground track of *USA 184*, illustrating its twin apogees above the northern hemisphere

IN TRAY

The Column for Readers' Letters and Queries

email: geoeditor@geo-web.org.uk



Lightning Strike

It was two and a half years ago that the lightning strike destroyed my HRPT, APT, and GOES weather satellite stations, along with three computers, numerous antennas and rotators, and virtually every piece of ham radio gear that I owned.
As astronomers say of a new telescope when it's brought on line, today my rebuilt HRPT station saw first light. I captured horizon-to-horizon images on several passes of NOAA-18.

It's been a long, hard, frustrating road, and I still have a few details to resolve in order to smooth out the operation, but I was stunned by the clarity and detail of the images. With the passage of time, I guess I had forgotten how beautiful they are.

I still have some significant problems to resolve in my system, the most irksome of which is that the azimuth rotator loses track of where it is, forcing me to recalibrate its position after every few satellite passes. The controller was destroyed and the rotator damaged in the lightning strike, and it appears that the pulse generating magnetic reed switch in the rotator is either losing or gaining counts. At this point it looks like it's going to be a difficult problem to resolve.

Notwithstanding the work remaining to be done, I've been steadily improving the performance of the system as I work out the bugs. Today I tracked a very low, very short pass of NOAA-18, for instance; the satellite never reached even as high as 1° elevation (about 0.9° degree at max). The result , part of which is reproduced above, was that I captured one of the best, if not the best, images I've ever managed of Nova Scotia and Prince Edward Island in the Maritime Provinces.

Bill Johnston
New Mexico, USA.

GEO Quarterly

I just got the new GEO quarterly and I wanted to congratulate you on what I think is a particularly fascinating edition with some truly stunning imagery. Of course, I most appreciated the Metop feature....

Just one piece of information in this context— it has been decided that the name will be Metop-A, with no capital 'O', and we have implemented that change in our next *IMAGE* edition. No issue really, just for your information.

Very best wishes,

Claudia Ritsert-Clark
(Head of Communication and Information Services)
EUMETSAT

Controlling Multiple PCs

... continued from page 37

deny access, and further security can be set with a password (figure 6).

An IP filter can be set by defining rules (figure 5) like

+192.168.111.111/255.255.255.255

which means 'permit 192.168.111.111 host',

?192.168.111.0/255.255.255.0

which means 'local user has to approve connection from network 192.168.111.0' and

- 0.0.0.0/0.0.0.0

which means 'deny any other IP address'.

These are just examples, since in my real configuration both PCs connected to the Internet are protected using *Norton Internet Security*.

I set just one simple rule to enhance my entire security :

+192.168.111.0/255.255.255.0

which means 'permit 192.168.111.0 network'

I have some skill about security on IP networks so I'm a little paranoid, and one of my basic rules is to set more filtering, even if some measures overlap each other.

Tropical Cyclone Activity

... continued from page 19

References

- Australian Severe Weather Forum
  http://australiansevereweather.com.au/cyclones/index.html
- Joint Typhoon Warning Centre, Meteo France (La Reunion)
  http://www.meteo.fr/temps/domtom/La_Reunion/

Further Reading

Tropical Cyclones Ferdinand Valk, GEO Q11 Sept 2006

TQchanSel

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- Stop *TQchanSel*
- Edit *recv-channels.ini* by placing the channels in the desired order. (You may also change the target directories, if desired.)
- Copy *recv-channels.ini* back to *recv-channels.ini.sav* (or remove the existing *recv-channels.ini.sav*)
- Restart *TQchanSel*, without the -use_tbl option.

Latest Developments

The most recent version of *TQcanSel* features an installation package that allows the user to select any folder of choice as the program destination and also, optionally, allows the creation of a desktop shortcut icon.

All the start-up features described above, which formerly could only be carried out by means of a batch file, can now be implemented from within the program itself using the new **<Show → Preferences>** menu. Note that you do, however, have to close then restart TQchanSel after any such adjustment to make the change take effect.

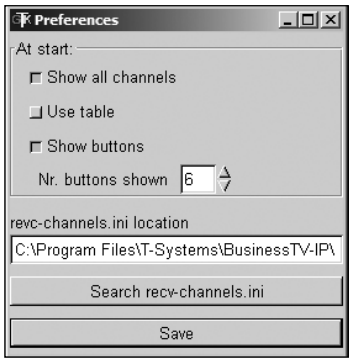


Figure 6 - The Preferences Window

Linux

For Linux users there was already a program called *MSGreceive*, which can be used to start and stop *Tellique*, and which shows signal strength etc. *TQchanSel* is now a part of *MSGreceive*.

TQchanSel and *MSGreceive* can be found at:

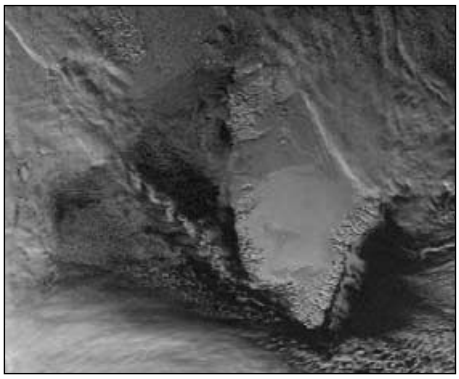
http://www.alblas.demon.nl/wsat/software/soft_msgsup.html

where you will also find a manual and installation instructions.

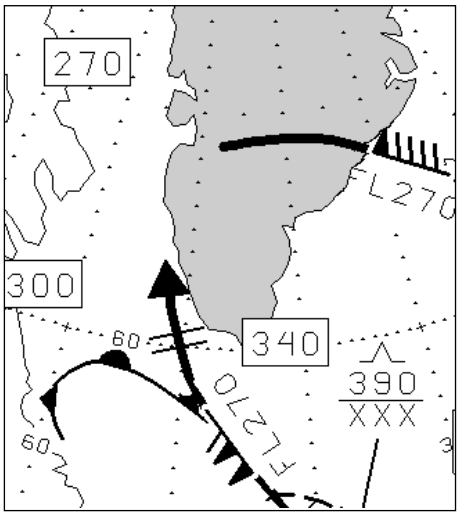
An Intriguing Cloud Phenomenon off Cape Farewell

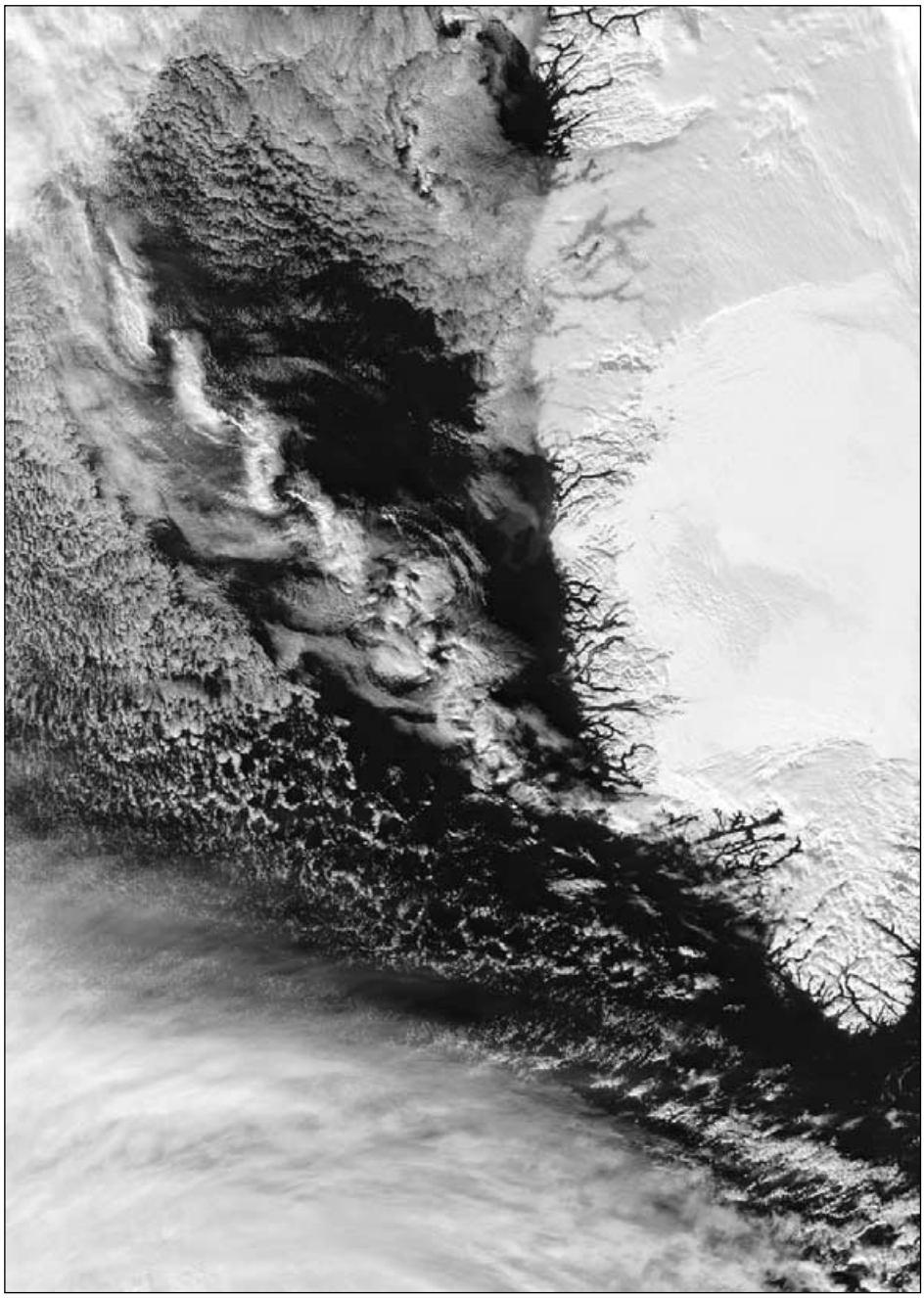
Keith Fraser KC2JC sent us this NOAA-18 APT image showing what appears to be a cloud vortex feature, apparently emanating from Cape Farewell at the south of Greenland.

Keith wrote: 'I saw these strange cloud swirls in the Davis Strait, sweeping north west from Cape Farewell at 16.10 GMT, this morning (February 3). They look like von Kármán vortices. I also attach a National Weather Service fax showing NW winds of 110 knots, from a low just to the north of Newfoundland.



NOAA-18 APT image showing the vortices west of Greenland on February 3, 2007.





MODIS detail from NASA's Aqua satellite at 15:50 UT on February 3, 2007
Image:MODIS Rapid Response Team

Met Office Visit

... continued from page 15

- a fully automatic lighting system that responds to occupancy and natural light levels
- providing recycling points across all of our sites
- increasing the use of recycled paper, especially in our printed material such as brochures and Christmas cards
- reducing business travel by encouraging staff to utilise video-conferencing equipment provided at the majority of our sites
- encouraging green transport usage, by operating a car-sharing scheme and providing pool bicycles.

Acknowledgement

I would like to thank the UK Met Office for permission to publish this article.