



Inside this issue . .

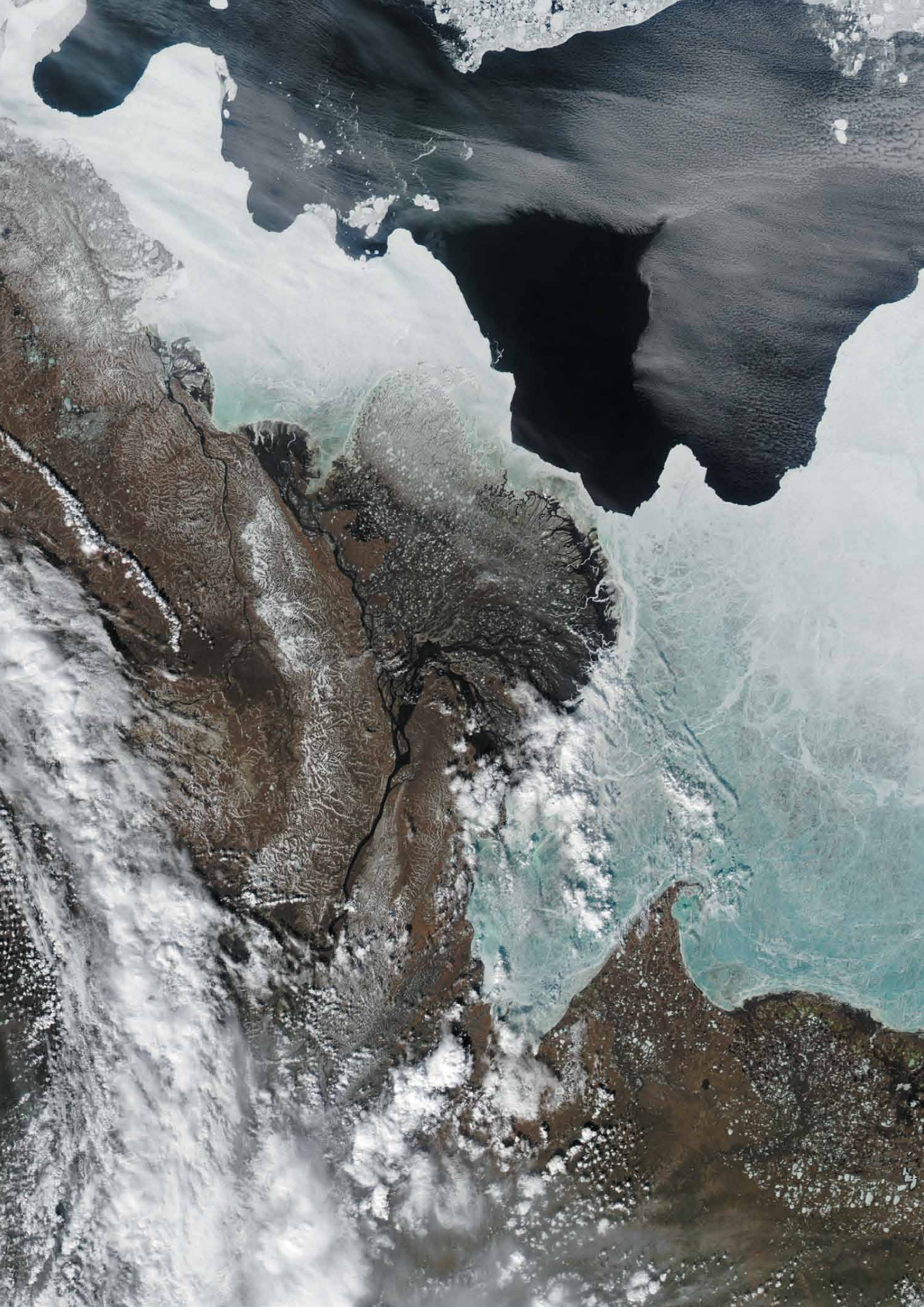
GEO Members have been steadfastly devoted to the Microsoft Windows operating system on their EUMETCast stations ever since GEO was established. But as Windows falls increasingly out of favour, an alternative is now being offered by Francis Greaves, who describes how to set up your EUMETCast station using Debian Linux.

As promised last time, Mike Stevens writes about the successful completion of his collaboration with the manufacturers of the budget priced TBS 6925 TV Tuner Card for reception of EUMETCast.

And for readers interested in a deeper insight to the DBV-S2 broadcast system, Alan Swards provides an introduction.

Finally, Les Hamilton investigates why, despite there having been a well-documented ozone hole above the Antarctic for decades, we never hear of a similar phenomenon afflicting the northern hemisphere.

Plus short features on pyrocumulous, the Proba-V satellite and North Sea haar.



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Editorial

Les Hamilton

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We have something radically different for readers in this issue. As computer users world-wide debate the disaster of *Windows 8*, and more and more of them switch from *Microsoft Windows* to a *Linux* operating system, Francis Greaves describes how he has established a *EUMETCast* station using *Debian Linux*.

I use Linux extensively myself: indeed, the only major need I still have for my *Windows 7* PC is to compile *GEO Quarterly*, as the software used (*Adobe InDesign*) cannot be run under *Linux*. All my other PC requirements are met nicely by *Linux Mint*. I am not a member of the *EUMETCast* community, nor do I use *Debian Linux*, but I had no trouble following Francis' instructions and setting up the operating system on a spare laptop. Francis also details how to instal the *Linux EKU* and *Tellicast* software from the *EUMETCast* CD.

There have been precious few signs of inventiveness or innovation from *GEO* Members for a long time now. Perhaps some of you may follow Francis Greaves' lead and break the tyranny of *Windows*. If so, do let us know of your experiences.

As promised in our previous issue, Mike Stevens provides a follow-up article on using the *TBS6925* Digital Satellite-TV Tuner Card for *EUMETCast* reception. Mike has spent the past few months testing the unit and advising the manufactures of problems. As you can read on page 13, following a series of software updates, this card—which is cheaper than many of the available alternatives—can now be used for flawless *EUMETCast* reception.

For readers interested in a more in-depth understanding of how the DVB-S2 system works, Alan Swards delves into the topic on page 21. This is way beyond my understanding, but will no doubt resonate with members operating at the cutting edge of *EUMETCast*.

And that's pretty well all we have for you this time. My pleas last issue for members involved in testing DVB-S2 receivers from other manufacturers to write in about their experiences have simply fallen on deaf ears. I'm extremely disheartened, and can see no future for *GEO Quarterly*. Apart from receiving the very occasional APT image on my *R2FZ* receiver, I'm not involved in *GEO*'s activities, and I find the continual need for me to plunder websites to create interesting pages for you to read very wearing. In short, if there is not going to be meaningful reader input and participation, my days as Editor are numbered. You have the December issue this year to convince me that there is a need for this magazine to air readers activities—but I'm not holding my breath. And of course, anyone who fancies taking on the Editor's mantle just has to say the word ...

Copy deadline for *GEO Quarterly 44* is Sunday, October 26.

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The GEO Report



Francis Bell

Again, GEO has experienced a busy three months: this time the prime focus of activities has been the change in transmission standard being introduced by *EUMETCast*. I think GEO is fortunate in having within the group members who are technically knowledgeable and practical, and who can guide us through the changes in the current *EUMETCast* transmission standards.

Since our last symposium there has been further testing of those receivers currently able to cope with the new DVB S2 VCM signal standard. Although expensive, the *Ayecka SR1* receiver has performed well, and the *GEO Shop* is currently stocking this receiver for any member now wishing to upgrade their system. However, this will not stop our ongoing research relating to other receivers, which in due course could prove to be equally acceptable but at a much lower price. Only time will tell here, but in the meantime, GEO will continue to evaluate *any* receiver which offers reliable reception of the new *EUMETCast* data stream.

As I write, several of our members are planning to attend the EUMETSAT conference this August, which will deal with practical experiences relating to the new DBV S2 VCM transmission standard which, by that time, would have been running for several weeks. Some of our members have been involved with pilot testing of these transmissions. I very much hope that this will be reported both in the December issue of *GEO Quarterly* and on our website.

Other events in the past three months have included GEO attending a *Space-Link* event at Broadwater School near Guildford. Ten schools attended this event for a day of space related activities. There were some high profile guests including Helen Sharman who is a supporter of GEO and a personal friend.

Another event attended by GEO was the *AMSAT-UK Symposium* weekend, also held in Guildford, where we fronted a stand throughout the two and a half days of the meeting. Our presence was appreciated by the delegates, nearly all of whom expressed interest in GEO's activities. During the weekend I bought a new APT antenna. I didn't specifically need a new antenna, but this one was well engineered and disassembled to a size that I could accommodate in a suitcase for my travels. I will give a report on the performance of this antenna, together with illustrated reports on both these events in the next issue of *GEO Quarterly*.

HDTV from the ISS

What has engaged some of my time over the past three months has been the new transmissions from the International Space Station (ISS). In April this year, an experiment was started sending live High Definition Television (HDTV) images from the ISS via *UStream* using the Internet.

Four cameras have been installed on the ISS with the intention of testing them for radiation and thermal tolerance. While the experiment is running, HDTV transmissions are available to anyone logging on to NASA's websites. A different view is provided by each camera because they look in different directions: one forward, one downward and two

backwards. There is switching between cameras and the ISS is not always in contact with a ground station able to cope with the HDTV data hence live transmission can be a little unpredictable. However, if you are patient, some of the images coming down from the ISS are stunning. When watching the live HDTV remember that half the Earth will be in darkness and that 70% of it is covered with water. But the compensation is that the ISS orbits the earth 14 times a day, so it is rarely long until there is something interesting to see. Some of the images I have received are shown on page 4

To receive these images yourself log onto one of the following sites:

<http://www.ustream.tv/channel/iss-hdev-payload>
http://www.nasa.gov/multimedia/nasatv/iss_ustream.html

Note that the second site listed also provides some audio access to the ISS's communications.

Note from NASA relating to the access to the ISS

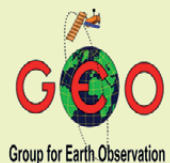
Live video from the International Space Station includes internal views when the crew is on-duty and Earth views at other times. The video is accompanied by audio of conversations between the crew and Mission Control. This video is only available when the space station is in contact with the ground. During 'loss of signal' periods, viewers will see a blue screen.

Since the ISS orbits the Earth once every 90 minutes, it experiences a sunrise or a sunset about every 45 minutes. When the station is in darkness, external camera video may appear black, but can sometimes provide spectacular views of lightning or city lights below.

Proposed GEO Visit to EUMETSAT HQ 2015

I am progressing members' wish to visit EUMETSAT's HQ in Darmstadt next year but no definitive plan with a date is available at the moment. As soon as a firm date is known, it will be intimated.

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<http://twitter.com/geowebuk>

<http://www.facebook.com/groupforearthobservation>





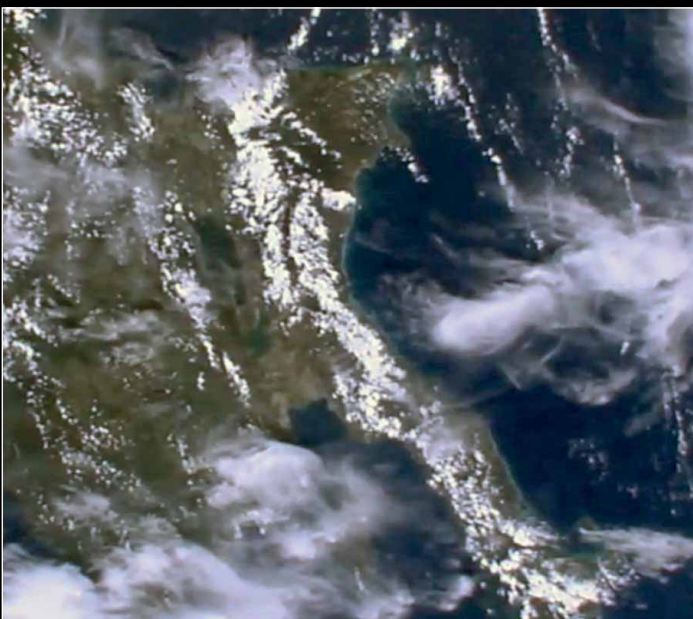
Cyprus



England/Wales



Italy



Panama



This ISS image shows the river estuary that is the subject of page 9's **Quarterly Question.**

Receiving EUMETCast using Debian Linux

... in just 90 minutes

Francis Greaves

I have been a *Linux* user for many years. The more I use *Windows*, the less I like it and, with support for *Windows XP* no longer being provided and the new DVB S2 reception from EUMETCast coming, I decided to start the process of getting rid of *Windows* altogether and receiving EUMETCast using *Linux*. And you do **not** need to be an expert with *Linux* to achieve this.

Now you may say that 90 minutes is a bit ambitious, but I did cheat a little. I got a working system up and running in a morning, but then decided to start over again so that there were no unnecessary programs installed or running on my nice clean *Debian* box. That fresh install, culminating with working EUMETCast reception, did take me only 90 minutes to set up.

Getting Started

I began by looking at the EUMETCast CD. In the *Linux* directory there is a *Readme_first.txt* file which lists the supported *Linux* distros. I am not too familiar with *Redhat*, *Fedora* or *OpenSuse*, and not too keen on *Ubuntu*. Personally I mainly use *Arch Linux* and *Gentoo Linux*. I finally decided to use *Debian Linux*, which is well known for its stability, and I was pretty sure it would work fine with the EUMETCast software. Debian is now at version 7, so to begin with I set up a very basic installation of *Debian 7* using the small *NetInst* image (280 MB) from their website. In *Debian 7*, the current kernel version is 3.2, much newer than the 2.4 or 2.6 kernels found in *Debian 4*, so more likely to have the correct drivers for your motherboard.

My PC is a fairly old 32-bit Pentium-M with a 1.7 MHz processor and 1 GB memory, and a Gigabit Ethernet Controller on the motherboard connected to my LAN. I added a D-Link Gigabit Ethernet Controller into a PCI slot for the Traffic link to the **Ayecka SR1** I had been fortunate to buy at the GEO Symposium, about which more later. I have two hard drives installed, a small 80 GB one for the operating system and another 160 GB drive for the EUMETCast received data. I do **not** plug in this second drive until **after** I have the operating system installed and working correctly. This is to avoid accidentally installing it on the wrong drive.

Installing Debian

I downloaded the *netinst.iso* file from the *Debian* website at

<http://www.debian.org/distrib/netinst>

and burned it to a CD. My PC was then booted using this CD, which installed a basic system (figure 1). Step-by-step details of how to do this are on my website ^[1] at

<http://www.themetman.net/content/install-debian-7>



Figure 1 - The Debian start-up screen, with *Advanced Options* selected.

My description is not exhaustive, and most of it is very simple, requiring only common sense. The process is driven by DOS-style menus where navigation through lists is achieved with the up/down arrows (figure 2), selection of multiple items by pressing the spacebar (figure 3), and toggling between 'Go Back' and 'Continue' buttons using the TAB key. Anyone with a working knowledge of *Linux* will feel perfectly at home running this installation, which is tailored to provide a minimalist installation: only what you need for EUMETCast will be installed.

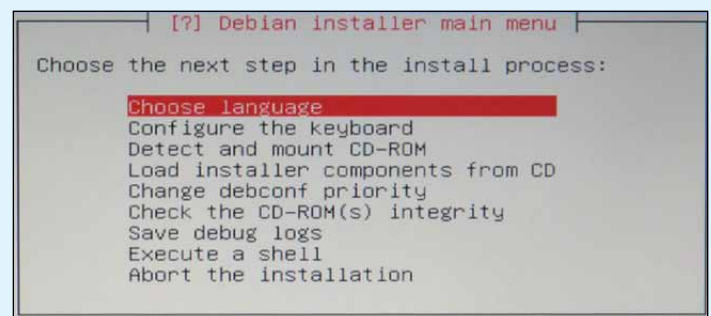


Figure 2 - Selecting your language from the Debian Installer Main Menu.

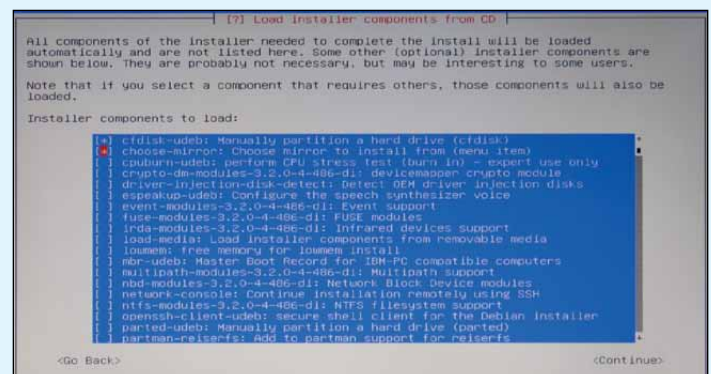


Figure 3 - Loading selected installer components from the CD.

Once your *Debian 7* system is up and running, you will be working from the command line (figure 4). This can be a bit scary to begin with but gets easier in time, and very soon you will see the flexibility and power offered by *Linux*, something which cannot be matched by *Windows*. For clarity, commands that you type into the Terminal, and file edits, are shown on a grey background on the following pages.

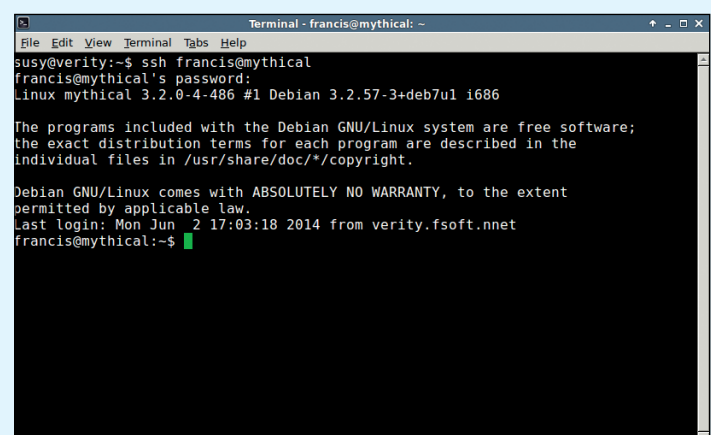


Figure 4 - The author's Debian Command Line Startup Screen

Apart from the very basic installation, I made sure during the install that I had the following services installed:

- ‘File Server’ which is **samba**, for sharing on a *Windows* workgroup
- ‘SSH server’ to allow logging into the server from another computer using **ssh** from a terminal in *Linux*, or using **PuTTY** in *Windows*. To log in from another computer in *Linux* you would type **ssh username@debian_machine_address_or_hostname**
- ‘Standard system utilities’, essential on any system.

After the *Debian* installation was complete, I also installed the following software:

- **NTP** service for accurate time. You can use a *Raspberry Pi* as the NTP server, and I have one working well on my network. David Taylor describes how to do this at <http://satsignal.eu/ntp/Raspberry-Pi-NTP.html>
- **Vim**, the text editor, which I prefer to the default **Nano** editor. It is worth learning from the excellent tutorial included with the installation.
- **Ssmtp**, a simple mail daemon to allow the computer to mail information to you.
- **Rsync**, to enable synchronising directories both local and remote, and also good for copying files.
- **Snmp**, for monitoring this PC using **mrtg**.

The Network for Ayecka SR1

The *Ayecka SR1* is a router and is not installed in the PC, which is excellent, as there’s no need to worry about DVB drivers on the computer. The *Ayecka SR1*, in addition to its USB/Serial port and twin RX ports, also has two network interfaces, one for Management and one for Traffic. I have the Management interface plugged into my home network and the Traffic interface plugged directly into the D-Link NIC (Network Interface Controller) on my PC. You do not need to use a crossover cable: a normal Cat 6 patch cable will do the job. The beauty of this is that traffic can pass uninterrupted to the PC, and any other PC on the home network can interrogate the management interface. The NICs on the PC are set up with static IP addresses. You can learn more on this on the Debian Install page of my website (see above).

Now for EUMETCast

First, you will need to connect up your second hard drive and format it. I will not show you how to do this as there is plenty material on the Internet explaining how to use *fdisk*. I have formatted the disc using the *reiserfs* system, because it is meant to be faster than the *ext4* file system.

Create a subfolder in your home folder with this command:

```
mkdir ~/EUMETCast/received
```

Note: In *Linux* the `~` symbol signifies your home directory, as in `/home/username/`, and is a useful way to avoid having to type the full pathname.

Next, set up the mount in your `/etc/fstab` by editing the file and adding a line to add the mount points. Here is mine. Remember, any line preceded by the `#` character is ignored and can be used for comments.

```
#Mount point for received files (all one continuous line)
UUID=3be8f58b-d995-4d07-a9f3-85008a2663de /home/USERNAME/
EUMETCast/received reiserfs defaults 0 1
```

You might as well add the **usbfs** as well whilst you are at it, as it is needed by the ECU setup.

```
# for usb key
usbfs /proc/bus/usb usbfs defaults 0 0
```

Now save the file.

Universally Unique Identifier (UUID)

Your UUID number will be different from mine, and you can find it with this command:

```
sudo ls -l /dev/disk/by-uuid
```

You can now copy and paste the long number, which relates to your partition mounted on `/home/USERNAME/EUMETCast/received` (it might be `/dev/sdb1`) into the correct place in your `/etc/fstab` file, and save it.

In *Linux*, you can select text in the terminal with the mouse: hold down Shift-Ctl-C to copy the text, move the cursor to where you want to paste it, and hold down Shift-Ctl-V. Very handy! You can now reboot.

ssh into the PC again, by typing

```
mount
```

and you should see all your mounts, including the `/home/USERNAME/EUMETCast/received`.

Setting up the RAM Disk

Now to set up the RAM Disk. My thanks to Ernst Lobsiger for this. Here is what he suggests:

“The kernel boot parameters are only used if your ramdrive is compiled into the kernel. Nowadays this is usually loaded as a module, and it’s name has changed from *rd* to *brd*. So I use the following line in `/etc/modules` to load an appropriate RAM drive:

```
brd rd_nr=1 rd_size=305000 max_part=0
```

“In `/etc/rcv.ini`, I have the line

```
file_database_size=300000000
```

which works fine, even if, in the startup scripts, EUMETSAT still uses the name *rd*.

“This next bit should be done after the *Tellicast* software is installed.

“When the partition is set up in the *Tellicast* client script `/etc/tellicast-client`, I changed line 149 to add ‘..... -m 0 ...’, so it becomes

```
/sbin/mkfs -t ext2 -m 0 $RAM_DISK_DEVICE > /dev/null 2>&1
```

meaning that I added ‘-m 0’ to prevent a reservation of 5% root-only blocks. If you do not add ‘-m 0’ on your ramdisk, 5% will be reserved for root-only, and if your *tc-recv* is running as a user other than root, these reserved blocks will not be accessible for the client and thus be wasted.”

Create a directory to mount the ramdrive with the command

```
mkdir ~/ramdrive
```

You will need to specify this in your `rcv.ini` file in order for *Tellicast* to mount.

File Sharing

Samba is used to share the received files across a *Windows* network so that David Taylor’s software can access it. **Samba** is already installed. Open **nano** to edit the configuration file, `/etc/samba/smb.conf`, to share the received files, with

```
sudo nano /etc/samba/smb.conf
```

Edit this line in the [global] section

```
workgroup = <YOUR_WORKGROUP>
```

and create a share by adding the following:

```
[EUMETCast]
comment = EUMETCast Directories
path=/home/USERNAME/EUMETCast
guest ok = yes
```



```
browseable = yes
create mask = 0777
directory mask = 0777
force create mode = 777
force directory mode = 777
force security mode = 777
force directory security mode = 777
read only = no
writable = yes
```

Then start **samba** with

```
sudo /etc/init.d/samba start
```

and at bootup

```
sudo update-rc.d samba enable
```

Finally, check from a *Windows* PC that you can read and write the share.

The EUMETCast CD

Place the EUMETCast CD in the drive of the receive PC and mount it by typing the following commands:

```
sudo mkdir /mnt/cdrom
sudo mount /dev/sr0 /mnt/cdrom
mkdir ~/EumetsatCD
```

This is where **rsync**, which you installed earlier, comes in handy. Use **rsync** to copy files from the CD to your `~/EumetsatCD` folder with the command

```
rsync -avr /mnt/cdrom/Linux ~/EumetsatCD/
```

The files and folders for a *Linux* install will now be copied on to the PC from the EUMETCast CD. Once this is complete, you can unmount the CD and eject it with

```
sudo umount /mnt/cdrom
sudo eject /dev/sr0
```

then move the CD to the computer you are **sshing** from and open the `Linux/readme_Installation.txt` file. I ignored the DVB section, going straight to Section 2 to install the EKU support because I am using the *Ayecka SR1* router.

The EKU software

Read the `Readme_debian_ubuntu.txt` file in the `Linux/EKU_software` folder and follow the instructions. The commands need to be run as the root user, so to save having to type **sudo** in front of everything, type

```
sudo -i
```

Enter your password and you will have a root prompt easily recognised as a **#** rather than the usual **\$**.

This is where copy and paste comes in handy. You can copy a command from the readme file, go to the *Terminal*, and paste it there using Shift-Ctl-V.

Now you need to follow instructions in the *Troubleshooting Guide* (which is found in the *Generic* folder), to fix a couple of problems.

(C9) EKU/USB Problems with new Linux Distributions

Edit the file `/etc/udev/rules.d/20-etoken.rules`, and add the following two lines:

```
ACTION=="add", SUBSYSTEM=="usb", SYSFS{idVendor}=="0529",
SYSFS{idProduct}=="0514", RUN="/etc/hotplug/usb/etoken"
```

```
ACTION=="remove", SUBSYSTEM=="usb", SYSFS{idVendor}=="0529",
SYSFS{idProduct}=="0514", RUN="/etc/hotplug/usb/etoken"
```

However, this syntax is **incorrect** for *Debian7*, and these lines should be edited to read as follows:

```
ACTION=="add", SUBSYSTEM=="usb", ATTR{idVendor}=="0529",
ATTR{idProduct}=="0514", RUN="/etc/hotplug/usb/etoken"
```

```
ACTION=="remove", SUBSYSTEM=="usb", ATTR{idVendor}=="0529",
ATTR{idProduct}=="0514", RUN="/etc/hotplug/usb/etoken"
```

C11) Missing Symbolic Link for Etoken Libraries

This file, `/usr/local/lib/aksifdh.so`, should be present on the system. Type the following command to check whether it is or not.

```
ls /usr/local/lib/aksifdh.so
```

Most likely, you will find that this file is missing, so you will need to create the soft link by typing

```
ln -sf /usr/local/lib/aksifdh.so.1.3-15.84 /usr/local/lib/aksifdh.so
```

Next, run **ldconfig** to be on the safe side, by entering

```
ls /usr/local/lib/aksifdh.so
```

and then reboot the station.

The Tellicast Software

Look up the `Readme_Tellicast_Linux.txt` in the `Linux/Tellicast` folder, go to Section 2a, and install the package. You will again need to be the root user. Once installed, you will need to modify the `/etc/tellicast-client` script to add Ernst's little fix, as described on the previous page.

The contents of the `/etc/recv.ini` and `recv-channels.ini` files will need to be set according to your own requirements. There is plenty about this on David Taylor's website ^[2]. I have also found Arne van Belle, Rob Alblas and Ernst Lobsiger's websites extremely informative and well worth a visit.

I use the `/etc/rc.local` file to start the services. To make sure these start in the correct order, add these lines to the `/etc/rc.local` file **before** 'exit 0'

```
/etc/init.d/etokend start
/etc/init.d/pcscd start
/etc/init.d/tellicast-client start
```

and issue these commands

```
/etc/init.d/etokend start
/etc/init.d/pcscd start
/etc/init.d/tellicast-client start
```

to remove the scripts from the bootup.

With the EKU plugged in you can monitor your *Tellicast* from any browser on the network using

```
http://IPADDRESS_DEBIAN_MACHINE:2517
```

and look at the license page to see if you have this

```
host_key_4: ****_****_****_****
```

over on the right side of the screen. If you do, then the EKU is working correctly.

I would hope by now you have a trouble free working system.

You can find more details about how I set up my EUMETCast system on my website ^[1], and any reader with queries, or requiring help setting up a EUMETCast station under *Linux*, is welcome to get in touch with me by email at

themetman@themetman.net

References

- 1 Install Debian 7 - <http://www.themetman.net/content/install-debian-7>
- 2 Using EUMETCast - <http://www.satsignal.eu/wxsat/atovs/index.html>

Massive Thunderstorms Wreak Havoc Across Germany

Les Hamilton

For three days between June 9 and June 11 this year, a series of deadly thunderstorms drenched northern France, Belgium, the Netherlands and northwest Germany. The event was initiated by a mass of exceptionally warm air from central Europe—with temperatures in the mid 30s—that tracked westwards, where it collided with a cold front, triggering a succession of violent thunderstorms that lasted for almost three whole days.

Immediately following a heat wave during the Whitsun weekend, when record temperatures up to 36°C were recorded, the strongest thunderstorms occurred over North Rhine-Westphalia in northwest Germany on the evening of June 9 (figure 1) when damaging winds, hail and blinding downpours cost six people their lives.

In the worst incident, three died in Düsseldorf when a tree crashed on to the garden shed where they had been sheltering. And falling trees killed cyclists in Cologne and Krefeld, and a man who was clearing a street in Essen.

The storms continued throughout Tuesday, when winds of up to 150 kph were recorded at Düsseldorf airport overnight. Streets in the city were blocked by fallen trees, damaging overhead power lines and knocking out the tram system. The damage resulted in 270 kilometres of traffic jams on roads in the region during the following morning's rush hour.

I'm indebted to David Taylor for alerting me to this event, and for providing copies of the Metop and NOAA-19 images below. Acquired less than three hours apart, these images illustrate just how rapidly these thunderstorms developed.

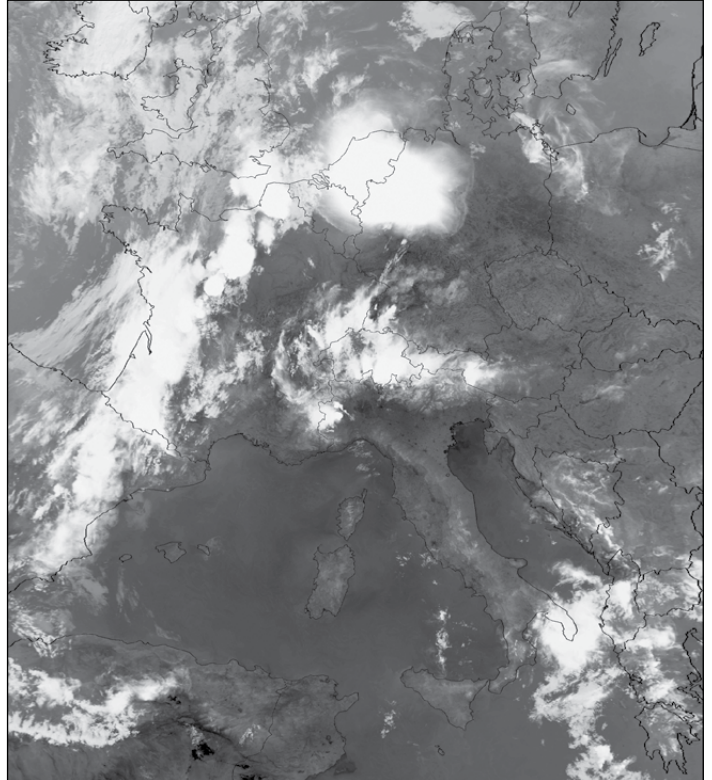


Figure 1
This Metop B channel-3 image acquired at 19:38 UT on June 9, 2014, shows the fatal thunderstorm located over northwest Germany.
Image: NOAA CLASS Archive

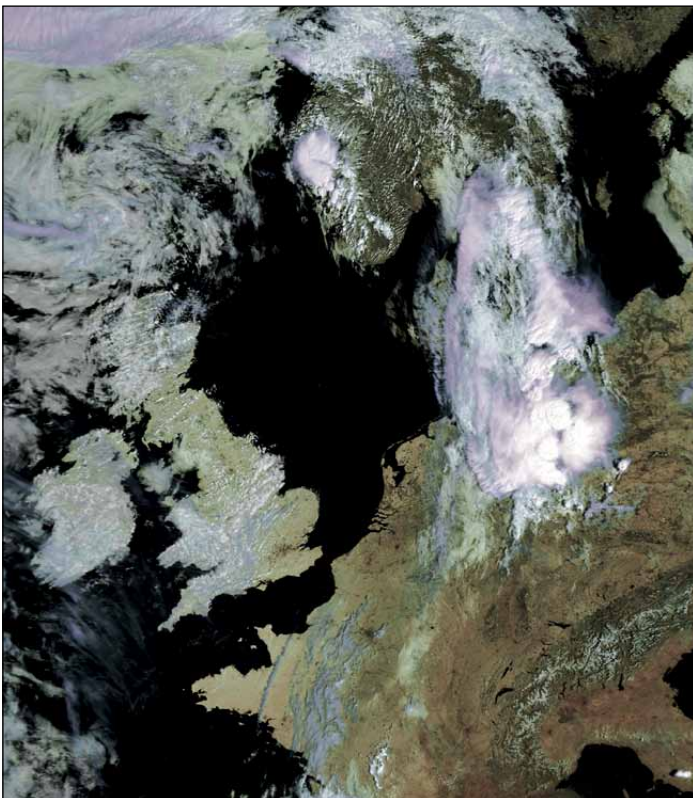


Figure 2
Metop B imaged this storm at 09:42 UT on June 11, 2014.
Image: NOAA CLASS Archive

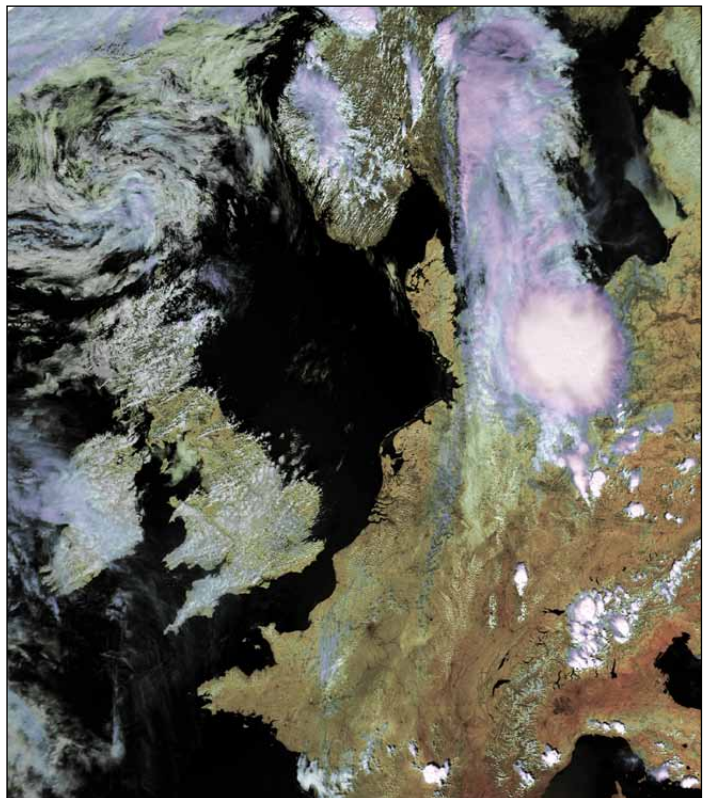


Figure 3
NOAA 19 imaged the same storm at 12:31 UT on June 11, 2014.
Image: NOAA CLASS Archive

QUARTERLY? QUESTION

Quarterly Question 42

My thanks to all those members who took the trouble to send in answers to the last Quarterly Question, which related to two satellite images of lakes, one in Africa and the other in South America. All the answers I received were correct by identifying the African lake as Lake Victoria and the South American lake as Lake Titicaca.

Correct answers were received from Elmar Bogels (Netherlands), Nick T (Australia), Adrian Chamberlain (Coventry, UK) and Andreas Lubnow (Germany). A summary of information contained in the answers I received is set out below.

Lake Titicaca, on the border of Peru and Bolivia at an elevation of 3812 metres, is the highest navigable lake in the world: by volume it is the largest lake in South America, with an area of 8300 km² and a maximum depth of 280 metres. Ships up to 2000 tonnes and eighty metres in length ply the lake. At the other end of the scale, reed boats and floating island homes are still used by locals. In 1862, the first steamer to ply Titicaca was prefabricated in England and carried there in sections on the backs of mules. Today vessels make regular crossings from Puno, on the Peruvian shore, to the small Bolivian port of Guaqui.

Lake Titicaca is a great tourist destination, surrounded by snow capped peaks. Forty-one islands, some of them densely populated, rise from the lake's waters. Titicaca itself lies in a vast basin between the ranges that comprises most of the *Altiplano* of the central Andes. The snow-covered *Cordillera Real* on the northeastern shore contains some of the highest peaks rising to more than 6400 metres, some of the highest in the Andes.

Lake Victoria, the largest tropical lake in the world at an elevation of 1133 metres and a surface area of 68,800 km², is Africa's largest lake by area: it is also the 2nd largest freshwater lake (by surface area) on Earth, exceeded only by Lake Superior in North America. One of the sources of the White Nile, Lake Victoria abuts Uganda, Kenya and Tanzania, making this area the most densely populated in Africa with a population of some seven million living within 80 kilometres of its shores. Victoria's waters fill a shallow depression in the centre of the great plateau that stretches between the Western and Eastern Rift Valleys: its greatest ascertained depth is 82 metres. The lake contains many archipelagos and numerous reefs, often just below the surface of the clear waters, and is home to more than 200 species of fish, of which the *Tilapia* is the most economically important.

Plans for gradually raising the level of Lake Victoria's waters were completed in 1954 with the construction of the *Owen Falls Dam* (now the *Nalubaale Dam*) on the Victoria Nile at Jinja, Uganda. This provides hydroelectric power on a large scale and converted the lake into a vast reservoir.

Quarterly Question 43

This Quarterly Question was prompted by my recent reception of a series of HDTV images, currently being transmitted by the International Spaces Station (ISS). I recognised the location of one of the images because I had visited the area in 2011. I had also recorded an APT image of the same area while on a cruise ship just north of the Falkland Islands. Additionally, I also remembered an *Envisat* image of this region, received at home about three years ago using the *Envi-Ham* dissemination programme. Very sadly, this programme has finished when contact was lost with *Envisat* a little over two years ago, the satellite subsequently being abandoned. However, I still have a small library of interesting *Envisat* images, including the one shown below. The image, as received from the ISS is reproduced at lower right on page 4.

Quarterly Question 43 relates to the large river estuary visible in all three images. Although the surface area of this estuary is very large, it is for the most part surprisingly shallow, and large ships are confined to defined shipping lanes. There are two capital cities on the shores of this estuary both of which I visited in 2011.

This Quarterly Question has a number of parts:

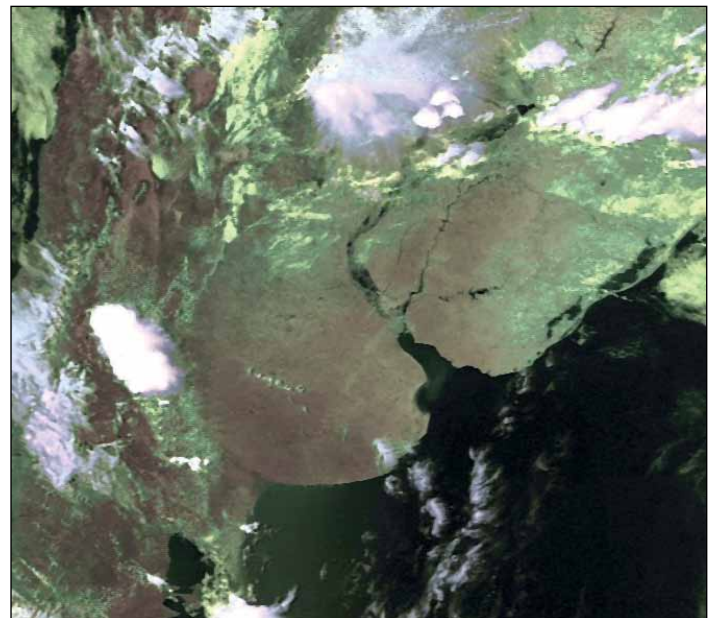
- What is the name of this river estuary?
- What are the names of the two capital cities on the shores of the estuary? Just to help, note that one capital is on the north of the estuary, the other on the south side.
- What was the name of the pocket battleship which sank in the estuary in December 1939?

Any other background information you can provide will be worthwhile. It may be of interest to note that GEO does have a member who lives on the southern shores of this estuary.

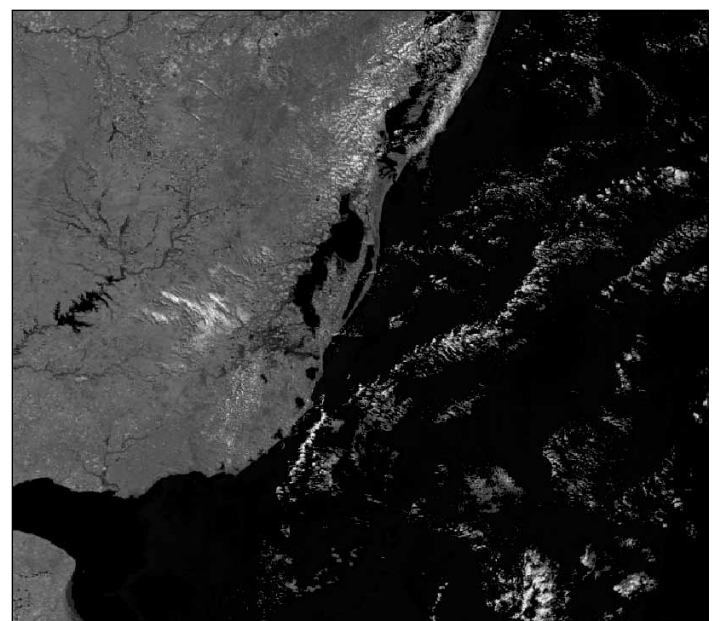
Please send you answers, together with any of your own images, by email to

francis@geo-web.co.uk

at least a week before the copy deadline for our next Quarterly.



The APT image



The Envisat image

Why do we rarely hear about an Arctic Ozone Hole?

Les Hamilton

The existence of a so-called *Ozone Hole* over Antarctica is well documented, and has featured in our pages several times over the years ^[1,2,3]. But aren't both of Earth's poles equally affected by ozone depletion? Doesn't the Arctic suffer from an annual *Ozone Hole* too? Three years ago, John Tellick reported on how, during the particularly cold northern hemisphere winter of 2010-11, when an unusually strong and long-lived polar vortex was in place over the Arctic, the *Envisat* orbiting observatory ^[4] detected uniquely low levels of ozone. This was, in fact, the only occasion on record so far when ozone depletion over the Arctic has become sufficiently severe to warrant the use of the term *Ozone Hole* ^[5,6]. Why is it then, that an *Ozone Hole* is such a rarity over the Arctic?

Defining an Ozone Hole

To understand what takes place in the polar stratosphere, it is necessary to be able to quantify the concentration of ozone in Earth's atmospheric column. The yardstick used is the *Dobson Unit*. If all the atmospheric ozone could be concentrated at Earth's surface (at 0°C and atmospheric pressure), it would form a layer just three millimetres deep! To avoid repeated reference to tiny fractions, this quantity of ozone is defined to have an atmospheric columnar density of 300 DU (Dobson Units). The base column density of ozone at which an *Ozone Hole* is considered to be present is defined to be 220 DU.

Measuring and Mapping Ozone Concentration

NASA's *Aura* satellite carries the *Ozone Monitoring Instrument* (OMI), which makes observations of atmospheric ozone over Earth's poles. These data allow scientists to assess how much ozone is present at various altitudes, particularly in the stratosphere, by measuring the quantity of sunlight scattered by Earth's atmosphere and surface. This information can be used to create maps visualising the ozone distribution. Figure 1 shows last year's Antarctic *Ozone Hole* when at its most severe, on September 29, 2013, with an ozone concentration of just 116 DU.

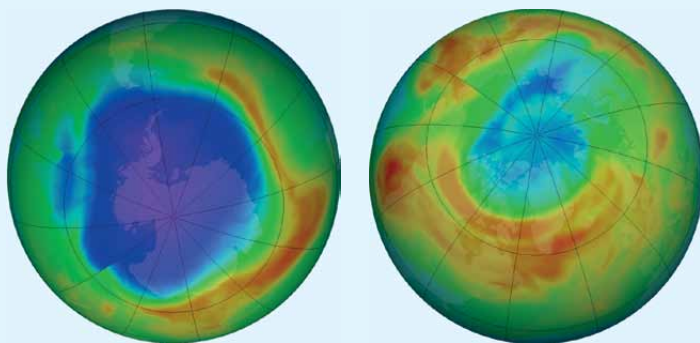


Figure 1
The Antarctic ozone hole on
September 23, 2013

Figure 2
The Arctic ozone hole on
March 15, 2011

Total Ozone (Dobson Units)
0 100 200 300 400 500 600 700

By contrast, the Arctic *Ozone Hole*, which reached its maximum depth on March 15, 2011 is mapped in figure 2. Reference to the colour palette beneath these two maps shows that, while ozone depletion over the South Pole is represented by a large area of dark blue and magenta colouration, indicating ozone concentrations well below the

220 DU threshold for an *Ozone Hole*, over the North Pole there is no magenta, and very little dark blue, on the map.

For comparison, figure 3 shows the Arctic ozone map for March 15, 2014: very much a 'normal' year. Over much of the Arctic, ozone concentrations are actually above average (reds and yellows), and there are only a few small regions (cyan) where appreciable depletion is observed.

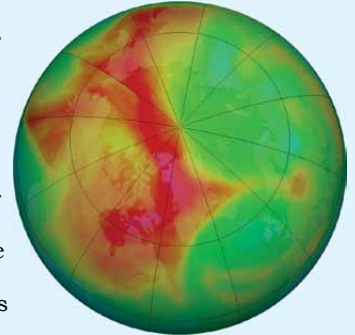


Figure 3
Arctic ozone depletion on
March 15, 2014

What Causes Ozone Depletion over the Poles?

Ozone depletion in the atmosphere, whether over the north or south polar regions, is confined to a relatively short period after sunlight has returned to these regions following months of winter darkness. The phenomenon is highly dependent on the presence of polar stratospheric clouds (PSCs), also known as nacreous clouds, which can form at altitudes as high as 25 kilometres in the stratosphere—provided that the temperature has fallen to -78°C or less.

These clouds are much more common over the Antarctic, where temperatures tend to be lower than over the Arctic, but they are occasionally seen, even at lower latitudes, in the northern hemisphere. Figure 4 was photographed from Aberdeen during a particularly fine PSC display, observed over much of Scotland shortly after sunset on December 9, 2012. Due to the great altitude of these PSCs, the same cloud pattern was visible from locations as much as 100 kilometres apart, illuminated by sunlight from below the horizon.



Figure 1
This PSC display was observed over a
large part of Scotland in late 2012.

The main agents responsible for the depletion of stratospheric ozone are chlorine atoms, derived from CFCs (chlorofluorocarbon compounds) that have been emitted into Earth's atmosphere following the escape of fluids formerly used as refrigerants and propellants. CFCs pose no problem when in the lower atmosphere, where they are chemically very stable. But as they diffuse into the stratosphere, the more intense UV radiation that they experience splits off free chlorine atoms, and it is these that are capable of interacting with, and destroying, ozone. However, a fact much less well known is that, during most of the year, these chlorine atoms are rapidly mopped up by nitrogen oxides to form stable 'reservoir compounds', principally hydrogen chloride and chlorine nitrate. Thus, very little of the chlorine survives long enough to interact with ozone to cause significant depletion.

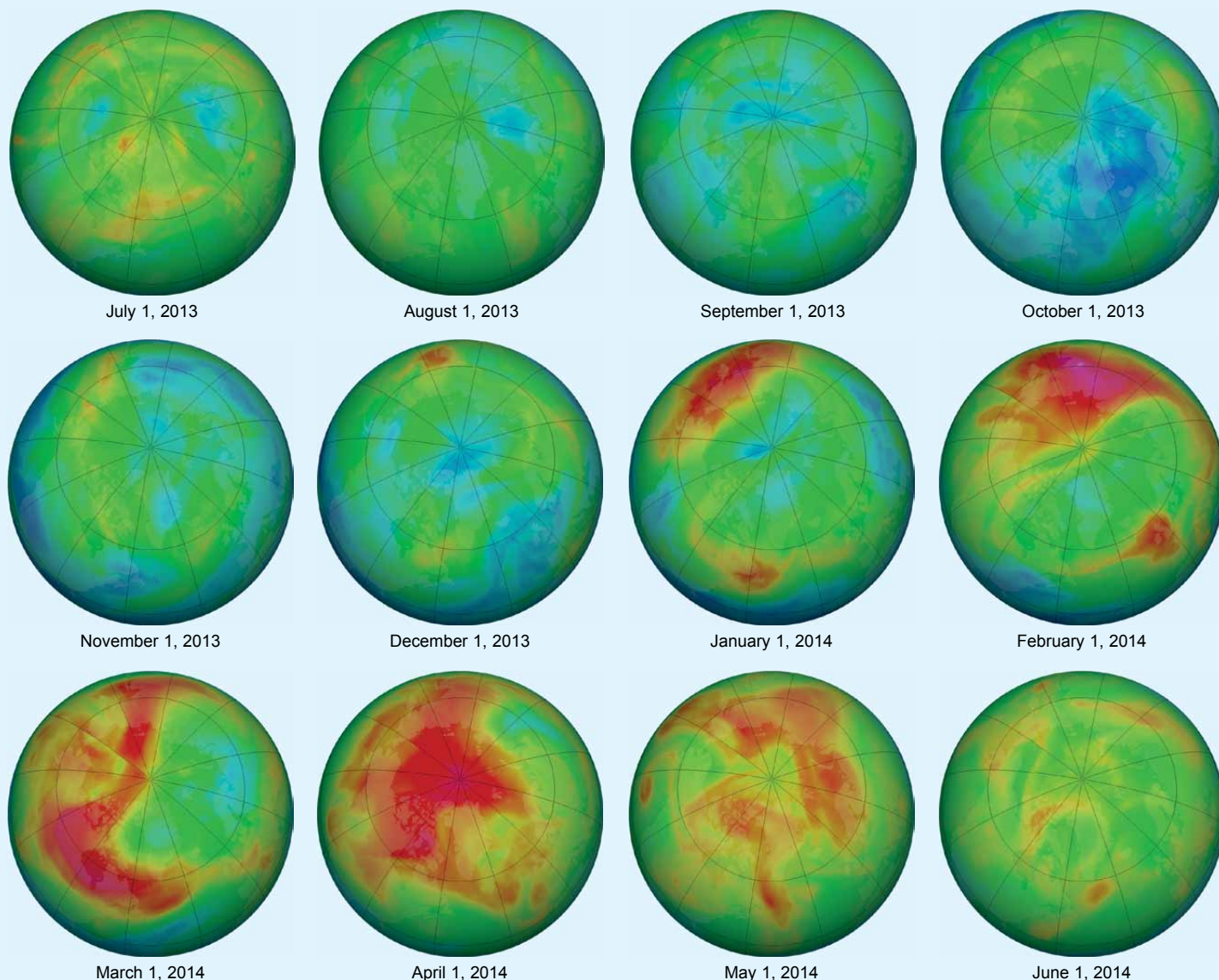


Figure 5 - Arctic ozone distribution, month by month, during a calendar year.

This is where the PSCs come in. At the exceptionally low winter time temperatures under which they form, the surfaces of ice crystals in these clouds catalyse a number of chemical reactions^[7] that would be impossible at higher temperatures. The two most significant outcomes are that:

- chlorine from the reservoir compounds becomes released as chlorine molecules, and
- nitrogen oxides are removed from the surrounding atmosphere by reaction with water to form nitric acid.

Even so, it is not till the return of sunlight during early spring that ozone depletion starts to take place. The key factor is the action of sunlight on the chlorine molecules, splitting them into highly active radicals (single chlorine atoms). Due to the reduced concentration of nitrogen oxides at this time (which otherwise mop up chlorine atoms), the likelihood of chlorine atoms and ozone molecules interacting increases, and ozone depletion accelerates.

Why do the Arctic and Antarctic Differ?

The degree of ozone depletion at Earth's poles is largely determined by geographical considerations. In the southern hemisphere, an ice-covered continent is surrounded by the cold waters of the Southern Ocean while its atmosphere is dominated by a polar vortex. These factors promote the formation of a large mass of very cold air and, importantly, act as a barrier to atmospheric mixing with warmer mid

latitudes: this greatly inhibits the transport from these regions of ozone which could offset the ongoing depletion over Antarctica. Effectively isolated from the rest of Earth's atmosphere, the stratosphere above Antarctica therefore regularly experiences the coldest temperatures on the planet during the darkness of winter, creating conditions that are extremely favourable for the formation of PSCs, and hence eventual ozone depletion.

In contrast, conditions throughout the Arctic are very different. Instead of land surrounded by water, the Arctic consists of an ocean surrounded by land: land that varies considerably both in shape and topography. This creates variable wind patterns that mix the Arctic air more effectively, not only between different layers within the atmosphere, but also between the Arctic and mid latitudes. This not only produces more variable and less extreme temperatures, it also means that it is much easier for lower latitude ozone to migrate into the Arctic stratosphere to replenish any deficit. Indeed, most of the ozone present in the Arctic stratosphere is produced in, and transported from, the tropics. And while polar vortices do form in the Arctic, as happened in March 2011, to block this resupply of ozone, they do not tend to last so long—or remain as stationary—as their southern hemisphere counterparts. And once the vortex had broken down and transport from the tropics was resumed, the ozone concentration rapidly rose back to normal during April 2011.

Whereas a large *Ozone Hole* is a regular feature in the southern hemisphere, ozone depletion over the Arctic tends to be irregular and patchy, and rarely extends over a well-defined area. Figure 5 maps ozone column density for the first day of each month between July 2013 and June this year. Reaching 470 DU, April 1 marked the highest average concentration of ozone over the region for 2014.

The concentration of ozone over the Arctic varies greatly from year-to-year, and *Ozone Holes* do not form consistently as they do in Antarctica. In fact, ozone concentrations over the Arctic have been relatively higher during the three winters following the exceptional 2011 low. It is possible that generally warmer weather over the Arctic this past winter, when polar vortices wandered down to lower latitudes, led to less ozone depletion in the Arctic this winter.

Recent NASA Study on the 2011 Arctic Winter

A recent NASA study has shown that a combination of extremely cold temperatures, man-made chemicals and a stagnant atmosphere were behind what was dubbed the Arctic *Ozone Hole* of 2011 [5,8].

Even when both poles of the planet undergo ozone losses during the winter, ozone depletion in the Arctic is generally milder and shorter-lived than in the Antarctic. This is because the three key ingredients needed for ozone-destroying chemical reactions—chlorine from man-made CFCs, frigid temperatures and sunlight—are not usually present in the Arctic at the same time. In particular, the northernmost latitudes are generally not cold enough when the sun reappears in the sky in early spring. Also, uncommon atmospheric conditions blocked wind-driven transport of ozone from the tropics, halting the seasonal ozone resupply until the following April.

Although Arctic ozone levels were possibly the lowest ever recorded, they were still significantly higher than those of the Antarctic, and levels actually remained well above the 220 DU threshold for defining the ozone loss as a 'hole': so the Arctic ozone loss of 2011 did not, after all, truly constitute an *Ozone Hole*.

Video

An excellent video shows the variations on Arctic ozone over an 18-month period from November 2013. Unfortunately, you will have to download the video from this rather lengthy URL, and run it on your computer.

http://eoimages.gsfc.nasa.gov/images/imagerecords/83000/83831/arcticozone_omi_2014_lrg.mp4

Alternatively, there is a download link for this animation below the image, at this URL

<http://earthobservatory.nasa.gov/IOTD/view.php?id=83831>

References

- 1 The Expanding Ozone Hole - GEOQ 13 (2007), p4
- 2 Montreal Protocol and the Ozone Hole - GEOQ 36 (2012), p18
- 3 Antarctic Ozone Hole's Gradual Recovery - GEOQ 41 (2014), p 38
- 4 Record Loss of Ozone over the Arctic - GEOQ 30 (2011), p 37
- 5 NASA Pinpoints Causes of 2011 Arctic Ozone Hole
<http://www.nasa.gov/topics/earth/features/2011-ozone-hole.html>
- 6 Arctic Ozone Hole
http://en.wikipedia.org/wiki/Ozone_depletion#Arctic_ozone_hole
- 7 The Science of the Ozone Hole
<http://www.atm.ch.cam.ac.uk/tour/part3.html>
- 8 Long Cold Spell Leads to Arctic Ozone Hole
<http://earthobservatory.nasa.gov/IOTD/view.php?id=60598>

Cover and Full Page Image Details

Front Cover

Although it was June 26 when NASA's *Aqua* satellite acquired this image of Russia's Kara Sea coastline, ice is still very much in evidence. The waters of the Kara Sea and the northern stretch of the Gulf of Ob, though strewn with icebergs, are largely open water. But the southern reaches of the gulf, like the Gulf of Yenise to the far right of the image, remain locked in ice, as does the Ob River seen stretching south down the centre of the image.

Image: LANCE-MODIS/NASA/GSFC

Inside Front Cover

NASA's *Aqua* satellite captured this image of the Lena Delta on Russia's Arctic Ocean coastline on June 8, 2014. This delta, with its myriad channels, covers an area of some thirty thousand square kilometres, one of the largest river deltas on Earth. Although it is now June, ice shelves still hug the coastline, although over the Laptev Sea to its north, to the north there are large expanses of open water.

Image LANCE-MOIS/NASA/GSFC

Inside Back Cover

This MODIS image from NASA's *Terra* satellite shows *Arthur*, the first hurricane of the 2014 season, on July 2, 2014. Too far offshore to be a major threat, *Hurricane Arthur* nevertheless guaranteed a soggy and windy July 4 for coastal regions of the Carolinas.

Image: Jeff Schmaltz, LANCE/EOSDIS MODIS
Rapid Response Team at NASA GSFC

Back Cover

NASA's *Terra* satellite captured this striking scene around the arctic archipelago of Novaya Zemlya on May 29, 2014. The ice has already retreated from the eastern coastlines and an armada of ice floes is in the process of breaking off the ice front. A series of lee waves has formed to the west of the two main islands' mountainous interiors, and a tongue of these waves has broken through the Matochkin Strait between them into the Kara Sea.

Image LANCE-MOIS/NASA/GSFC

Page 3

The remnants of Hurricane Bertha obliterate almost the entire British Isles in this *Metop-A* channel -2 image acquired at 10.48 UT on August 10, 2014.

Image: NOAA CLASS Archive

Pages 16/17

Mike Stevens received his first *Meteosat* image transmitted under the trial transmission of new DVB-S2 dissemination format, on June 24 this year.

Image © EUMETSAT 2014

Page 18

This is a section from a composite of *NOAA-15* and *NOAA-18* images created by Andre T'Kindt, dating from June 26, showing a rash of thunderstorms active over central Europe.

Page 22

This is a wider view from the June 26 *Aqua* image featured on the front cover, which shows broken pack ice still lingering to the east of Novaya Zemlya, where it is sheltered from the warming influence of the North Atlantic Drift.

Image LANCE-MOIS/NASA/GSFC

Page 23

Anthony Lowe captured this excellent *NOAA-19* APT image showing western Europe, Great Britain and Ireland enjoying marvellous sunny summer conditions on July 23 this year. Parts of the eastern coast of Britain missed out, however, as huge swathes of haar encroached on to the land (see also page 29).

Page 26

With news of the final decommissioning of the *NOAA-16* satellite, here is an early channel-2 APT image, acquired on September 23, 2000, just two days following its launch.

Installing and Setting up the TBS6925 Digital Satellite TV Tuner Card for receiving EUMETCast DVB-S2 Transmissions

Mike Stevens - G4CFZ

With the imminent changeover of EUMETCast dissemination to the DVB-S2 standard, we face another update to our weather satellite systems. This time, the changeover is slightly more complicated, but we have been here before and managed to overcome all the obstacles—and we shall again.

In the previous issue I explained that the TBS6925 worked perfectly with the old DVB-S Mode, but unfortunately, due to the chip/demodulator, the tuner would not stay locked on to a DVB-S2 signal, resulting in severe packet loss, and thus totally unsuitable for the new EUMETCast transmissions.

On reporting this to *TBS Support*, they confirmed the problem, which they had experienced during their own testing procedures. But all is not lost: they have now developed a new set of drivers that allow the chip to lock into the DVB-S2/VCM Coding, and this was released on July 25, in plenty of time to set everything up for the final changeover to the new standard on December 31 this year.

I installed the new software and immediately found that my EUMETCast reception started to work perfectly: I was able to receive the Basic Service without any Packet Loss at all. Although the High Volume service does not start until 2015, the new software does allow me to receive the test data that is currently being transmitted. *TBS Support* have given us new software and, considering the relatively small market represented by EUMETCast, have really gone the extra mile for us. GEO members now have a real choice of tuners, at lower cost and with an easier set-up.

Setting up the TBS6926 Tuner Card in Windows XP

This receiver, to give it its full title, is the **TBS6925 DVB-S2 Professional TV Tuner PCIe Card**, which is internally fitted to the PC. If you have never been into the workings of your PC and do not feel qualified to do so, then I advise you to seek help from another member or friend to help you with this operation. Another point to make is that all the equipment within the PC is sensitive to static electricity, so I advise an anti-static wrist band to ground yourself to the PC chassis and this should prevent any problems occurring.

I'll start by describing the set-up for Windows XP. Windows 7 is much the same, but there are extra parameters to deal with, and I'll explain this later.

First, select the PC you want to fit the card in and remove all cables, especially the mains. Lay the unit on a soft sheet and remove the side cover: it's usually on the right hand side. Locate the twin socket on the motherboard that matches the TBS PCIe card, and to the rear of that you will see a back-plate, either held with a screw or clip (figure 1). Remove the plate as this is where the PCIe card will be inserted. Once the plate has been removed locate the card into the socket by pushing it firmly in place, but carefully taking care not to touch the board components. You will feel when the card is correctly located as the twin connector sockets on its rear will be lined up with the back of the PC, one of these being your LNB connection. You can now refit the side cover on the PC and reconnect all the cables: power, mouse, keyboard etc. You are now ready to set up and test the system.



Figure 1 - The TBS PCIe card seated in its PC socket.

Loading and Installing the Software

First, visit the TBS download page at

www.tbsdtv.com/download

and download the following files:

- the Windows Driver (tbs6925-windows-driver_v1.0.1.23.zip)
- IP Tool (TBS IP Tool V3.0.4.0 for TBS6925)
- TS Recorder (TBS6925 TS Recorder V3.0.0.8)

Now switch on the PC and load in the software. I copied the installation software on to a USB flash drive and installed it into the PC from there.

First, install the **TBS6925 Driver v1.0.1.23**, and then the **TPS-IP Tool v3.0.4.0**; these are the only items you actually require for EUMETCast reception. You can also install **TS Recorder**, which is test software and very handy to have. Once all this software is installed, you will see two new icons appear on the Desktop: one is 'TBS-IP data' and the other is 'TS Recorder'. But I advise checking the TBS Website from time to time for any updates, as new releases will occur as things evolve. You will note that any updates that you carry out will require you to reinstall all the relevant information and reboot the PC.

This is the point where you will probably need to reset your dish towards the new satellite, **Eutelsat 10A** at 10.0°E. It's possible that some users will be able to receive both 'old' and 'new' satellites without moving their dish but, for receiving the best possible signal, I would recommend realigning the dish to *Eutelsat 10A*. You can carry out this operation quite easily if you remember how we aligned our dish when receiving Envisat Data ^[1]. The amount of movement towards the east is very small: for a 1° difference it's about 15-17 mm on the end of the LNB arm, so don't get carried away and start waving the dish all over the place. Also, within the *TBS Tuner* screen you have an excellent Signal Strength and Quality Indicator which you can use to fine-tune the system for Maximum Signal and Quality: and you have SNR and BER readings to help as well.

Remember that David Taylor's *WXtrack* software can be used to help with the alignment of your dish by giving you the bearings etc.

Another point to consider is that, in some areas of the country, the smaller satellite dishes may need to be upgraded to a larger size. I am using a 1 m dish and I am located on the extreme south coast of England, which gives me a fairly clear line of sight to the satellite. And I do not suffer from any 'rain fade'. But not everyone has that advantage as reception does vary somewhat around the country. If you are upgrading the dish, I would advise that you also take the opportunity to renew your cabling (CT100 or WF100 are the best) and LNB as well.

I have recently installed a new low noise *Gold Technomate* LNB, which has made quite a difference. There are some very good suppliers on-line who will supply by return with excellent quality cables. I am also very lucky in that the beamwidth of my dish allows me to receive both satellites, so I am able to watch both 'old' and 'new' transmissions with just the one dish.

Setting up the Receiver

You are now ready to set up the receiver within the **TBS Tuner Panel**. Run this software by clicking on the *TBS-IP Data* icon and on the opening screen (figure 2) you will see the main information panels.

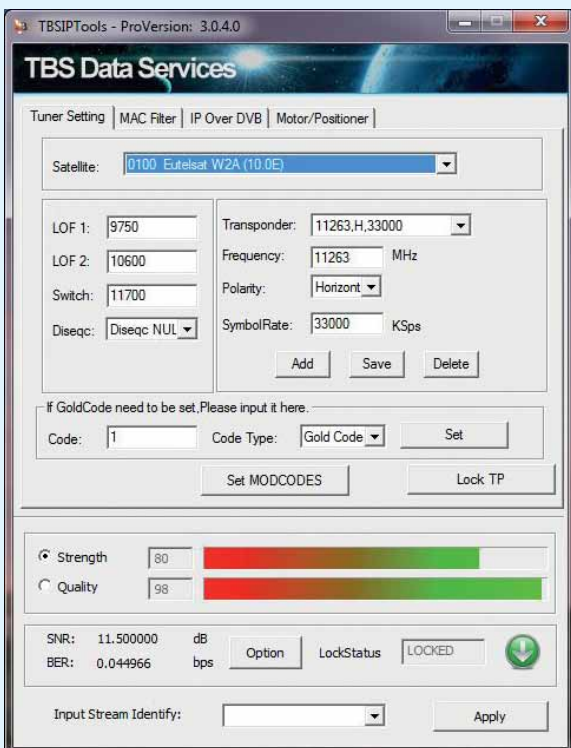


Figure 2 - The opening screen of the TBS Tuner software

First you need to enter the correct values for *Frequency* (11263 MHz) and *Symbol Rate* (33000 kspS), then click the 'Add' and 'Save' buttons.

Next, click the 'Set MODCODES' button to open the panel illustrated in figure 3. Which items you select depends on which service you are going to take but, assuming you are going for the Basic EUMETCast Service, tick box *8PSK 3/5* then click 'OK' to close the panel.

Back in figure 2, click on the box 'Lock TP'. You then go to the top of the **TBS Tuner Panel** and open the 'IP over DVB' tab to reveal the panel where you must enter the EUMETCast PIDs (figure 4). The PID values for DVB-S2 differ from those you have been using, so you will have to consult the EUMETSAT

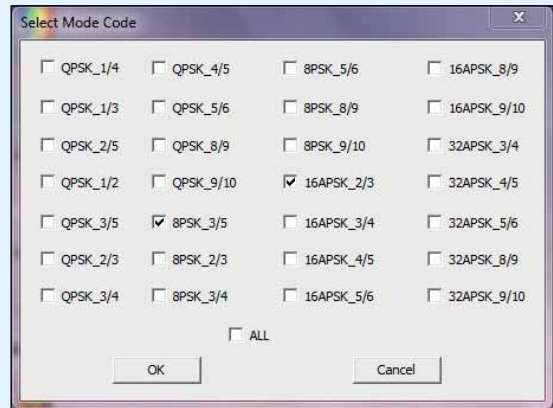


Figure 3 - The MODCODES Panel

website to find the PIDs you require. This involves a rather convoluted path through several layers of menus, thus:

- Direct your browser to www.eumetsat.int
- Select 'DATA DELIVERY'
- Select 'EUMETCAST'
- Select 'RECEPTION STATION SETUP'
- Select 'CHANNELS & PIDS'

Here you will find a lengthy listing of all the PIDs in use for the new DVB-S2 service. Once these are all entered, you must switch off the tuner and reboot your PC.

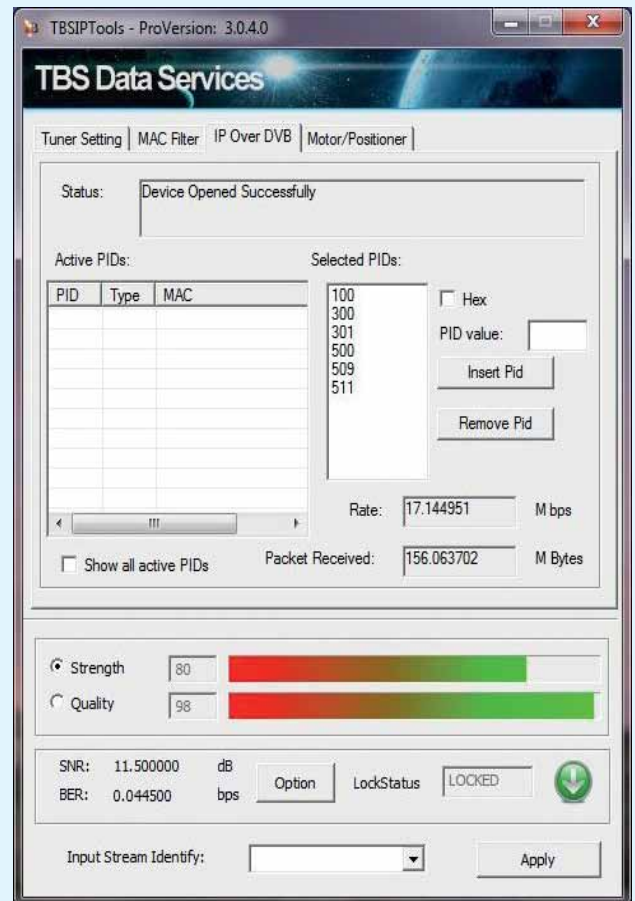


Figure 4 - The 'IP over DVB' panel for entering PID values

Your next operation is to make sure that the incoming data is going to be processed by the *Tellicast* software, so you must match the Interface Address between *Tellicast* and TBS-IP data. First, open the *recv.ini* file in your *Tellicast* folder and, under 'Parameters', change the 'Interface Address' to 10.100.10.10, then save it. You can only use the **Default IP** which is within the TBS Software Screen (do **not** attempt to change this IP, otherwise your system will not work).

To enter this value, follow the following steps:

- Open 'Control Panel' and locate 'Network Connections'
- Find 'MPE Decoder Adaptor'
- Right-click on this and open 'Properties'
- Move down to 'Internet Protocol Version 4 (TCP/IPv4)'
- Open 'Properties' and insert the Interface Address: 10.100.10.10
- Move down to the next box and insert 255.255.255.0 (You may have to do this operation manually) then click 'OK'.

During this procedure, your **Tellicast Icon** should have changed from Red/Black to Yellow/Black and finally to a White Square with a Pink 'T'. Now go to the files folder and check for incoming data.

Additional Points to Note for Windows 7 Users

Windows 7 needs to be looked at slightly differently, and the first thing you must do is adjust your firewall settings to allow the new software to function correctly. Open 'Allow a program through Windows Firewall': you can access this by typing 'Firewall' into the 'Search programs and files' input box under the 'Start' button. Add in 'TBS-IP Data', and click 'OK'.

Next, enter **All Programs—Accessories—Command Prompt**, then Right Click 'Run as Administrator' to bring up the *Command Prompt* box. Enter the following code complete with spaces:

```
Route -p -4 ADD 224.0.0.0 mask 240.0.0.0 10.100.10.10
```

then press 'Enter' (figure 5). It should then read 'OK'. You may need to do that or you may find everything works fine without it. My system would not work without this Command Line input, but once that was carried out everything came on-line immediately and the *Tellicast 'T'* Icon changed to Pink on a White Square. As always with Windows 7, we do have many variants.

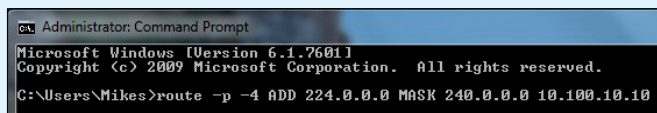


Figure 5 - The Command Prompt Box

And of course the other feature to remember is to install all the software into a subfolder inside the 'Tools' folder. I made a folder called 'TBS Software' and installed into there.

Another parameter you may have to change is within the 'Interface Address' regarding the 'Internet Protocol Version 6 (TCP/IPv6)': in my system I had to untick this item as otherwise it would not work. But again, you may find that you don't have to do that operation. I would suggest at this point that you reboot your computer to enable the software and changes to take effect more easily.

When your Computer restarts, you should see an on-screen box displaying the selected Tuner: click 'OK', and the *TBS Tuner* box will appear on screen (figure 1). If all data entered is correct you should have green bars showing in both the *Strength* and *Quality* displays. If not, you may have to re-enter MODCODE or check the PIDs but, all being well, the EUMETCast data should be seen coming into the 'Packet Received' box in the 'IP Over DVB' tab. The *Meteosat* image on pages 16/17 came from the trial DVB-S2 *EUMETCast* stream on June 24 this year.

So now you have incoming data from the new system and satellite within your *Tellicast* files, and you will recognise them as they are familiar files. You can open the *SatSignal* software and start to enjoy the new images on the DVB-S2 Transmissions with *MSG Data Manager* and *Metop Manager*, plus whatever else you are looking for. *TSRecorder* is a very useful tool which will show all the details of your received

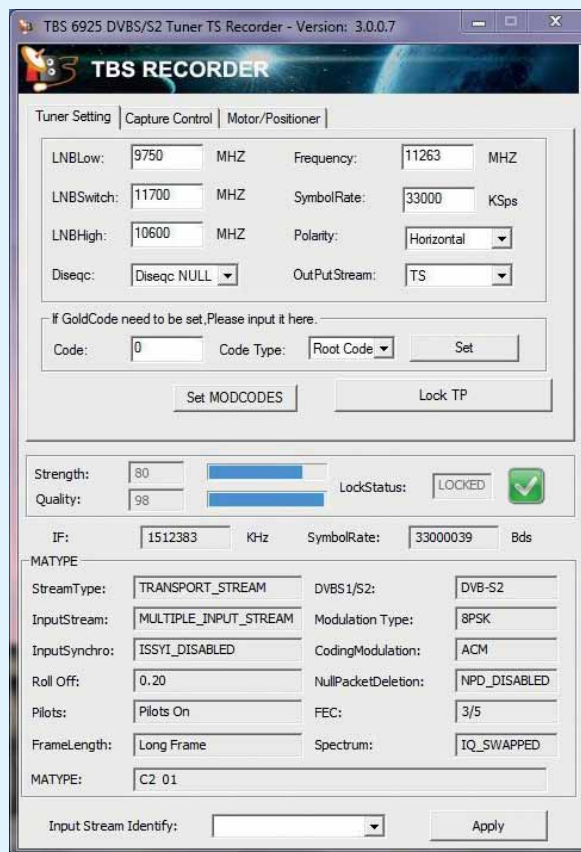


Figure 6 - TBS Recorder

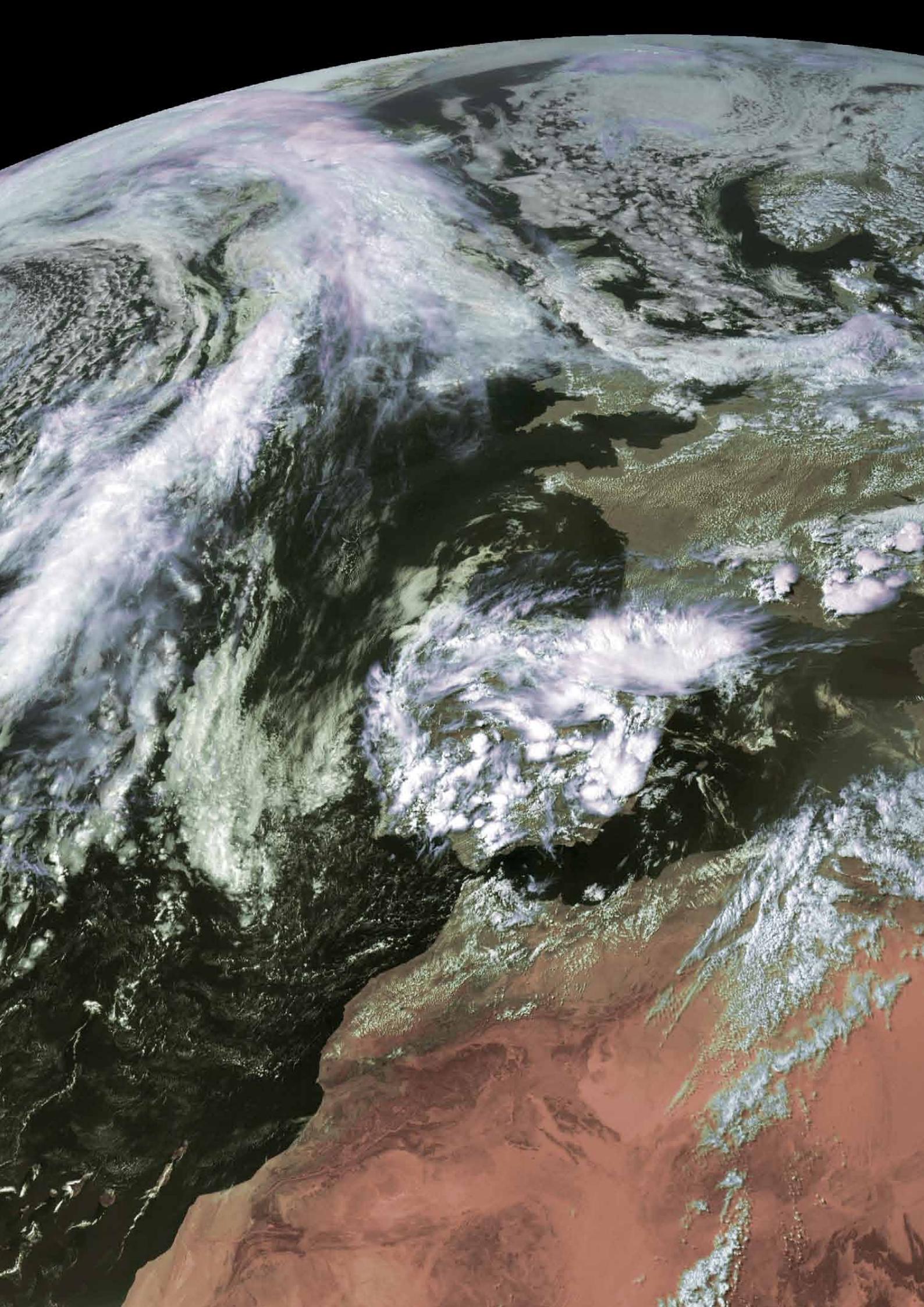
signal (figure 6). It basically allows you to check the incoming signal and set parameters, handy if there is a break in transmission, as it will allow you to see if its origin lies with you or EUMETCast. But one thing to remember: you cannot run *TBS-IP Data* while *TSRecorder* is active—you must switch off *TSRecorder* first. Figure 7 shows details for my *Tellicast* files following a four-hour run of my system with the latest software: zero on both *Missed Packets* and *Recovered Packets*.

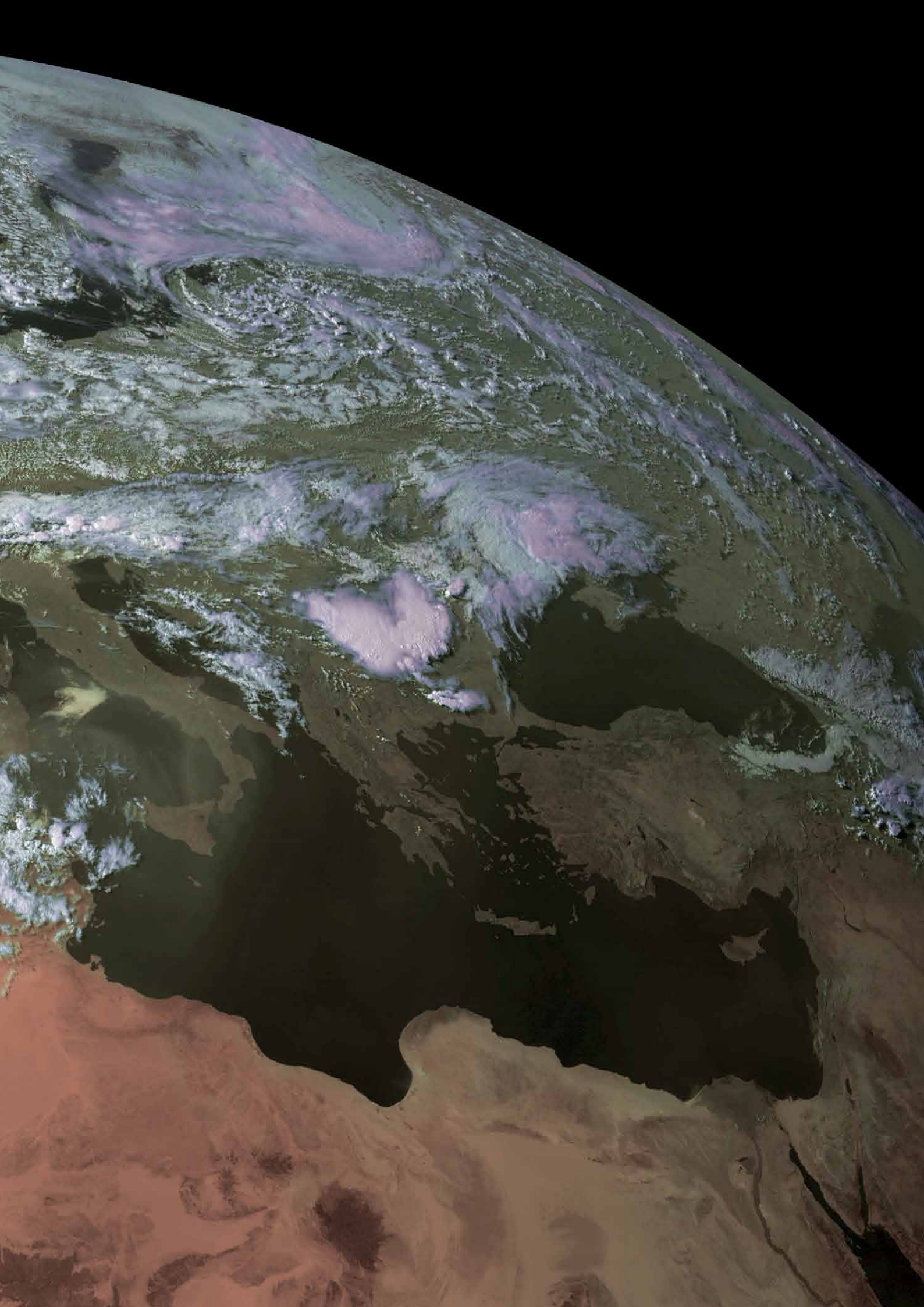
TELLICAST Statistics	
Recipient:	MichaelStevens
Active Announcement Channels:	1
Active Data Channels:	2
Connecting Channels:	0
Disconnecting Channels:	0
Blocked Channels:	0
Maximum Bandwidth:	100000000
Assigned Bandwidth:	12679400
Server Address:	10.90.43.51
Announcement Channel Name:	TSL Announcement Channel
Announcement Channel Address:	224.223.222.223:4711
Received Packets on Data Channel:	1594025
Missed Packets before FEC:	0
FEC Recovered Packets:	0
Received Bytes on Data Channel:	1861973597
Reset Statistics	

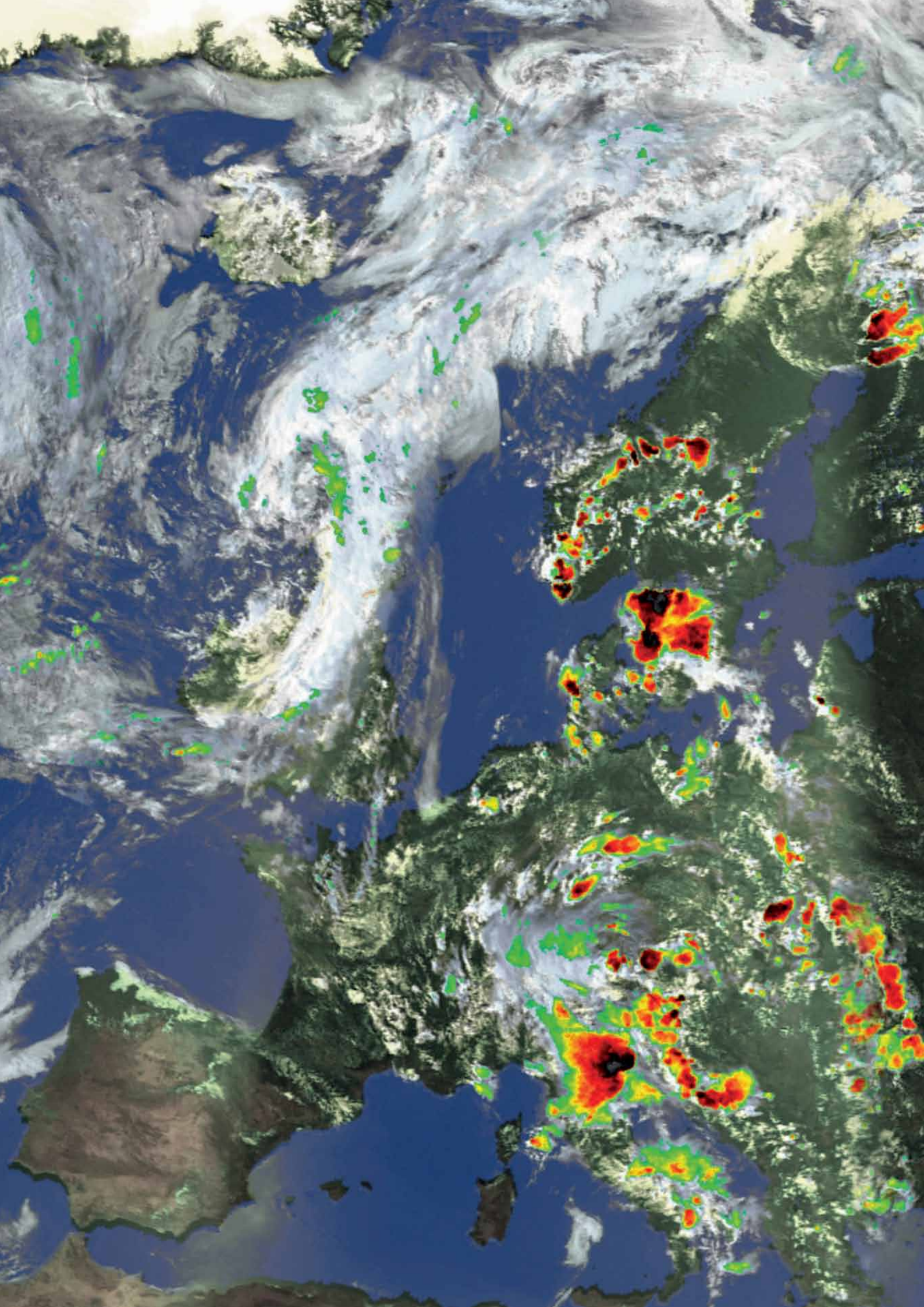
Figure 7 - Tellicast Statistics

I have not dwelled to much on *High Volume Data* as that does not start until some time in 2015; and that will, I am sure, create another article on its own. I hope this article

Continued on page 24







Pyrocumulous Cloud over California

A NASA Earth Observatory Report

With much of California experiencing exceptional drought, vegetation in the Golden State is drier than normal and primed to burn. And burning is exactly what happened in August 2014 when lightning ignited several fast-moving fires. More than 400 km² were charred as fires raged through forests and grasslands in northern California.

The MODIS instrument aboard NASA's *Terra* satellite captured the image shown in figure 1 at 19:45 UT on August 2, 2014. Figure 2, from the *Aqua* satellite, followed about two hours later. Red outlines show where MODIS detected high surface temperatures associated with active burning.

The pair of natural colour images documents the evolution and rapid expansion of the fires. Many areas of active burning expanded significantly between the two satellite passes, as smoke plumes blossomed into towering pyrocumulous clouds. The change was most dramatic over the Beaver Complex fire along the border of California and Oregon.

Pyrocumulous clouds—sometimes called 'fire clouds'—are tall and cauliflower-shaped: they appear as opaque white patches hovering over darker smoke in satellite imagery. Pyrocumulous clouds are similar to cumulus clouds, but the heat that forces the air to rise (leading to cooling and thus condensation of water vapour) comes from fire instead of sun-warmed ground. Under certain circumstances, pyrocumulous clouds can produce full-fledged thunderstorms, making them pyrocumulonimbus clouds.

Scientists monitor pyrocumulous clouds closely because they can inject smoke and pollutants high into the atmosphere. As pollutants are dispersed by wind, they can affect air quality over a broad area. In this case, the outburst of pyrocumulous activity lofted a large quantity of smoke high into the atmosphere, and winds pushed it north and east over Oregon.

Figure 3 is a photograph taken from an Oregon Air National Guard F-15C by James Haseltine on July 31, 2014, at 16:20 UT, showing a much closer view of a developing pyrocumulous cloud.



Figure 3
An Oregon Air National Guard F-15C flies past a developing Pyrocumulous Cloud.

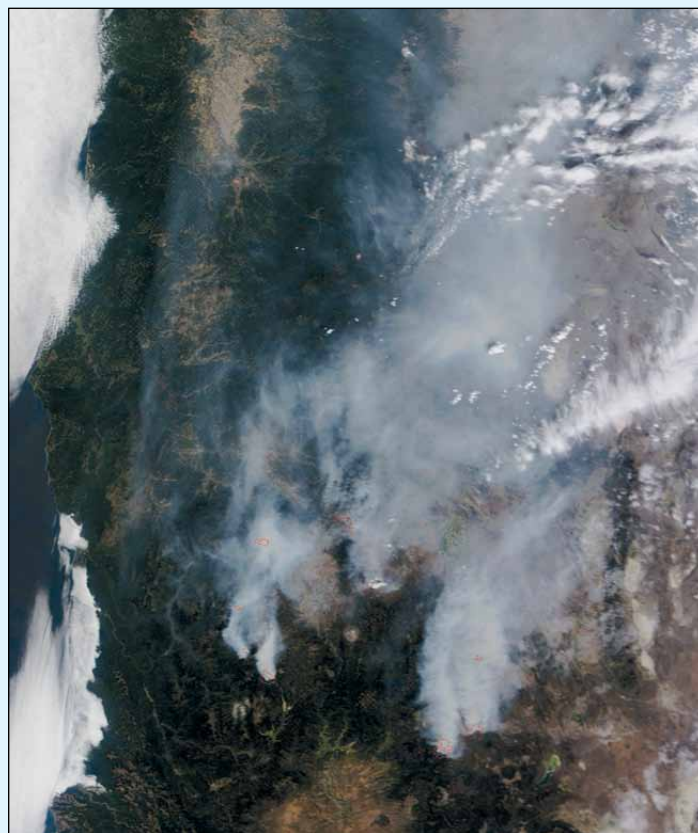


Figure 1 - Imaged by *Terra* at 19:45 UT on August 2, 2014



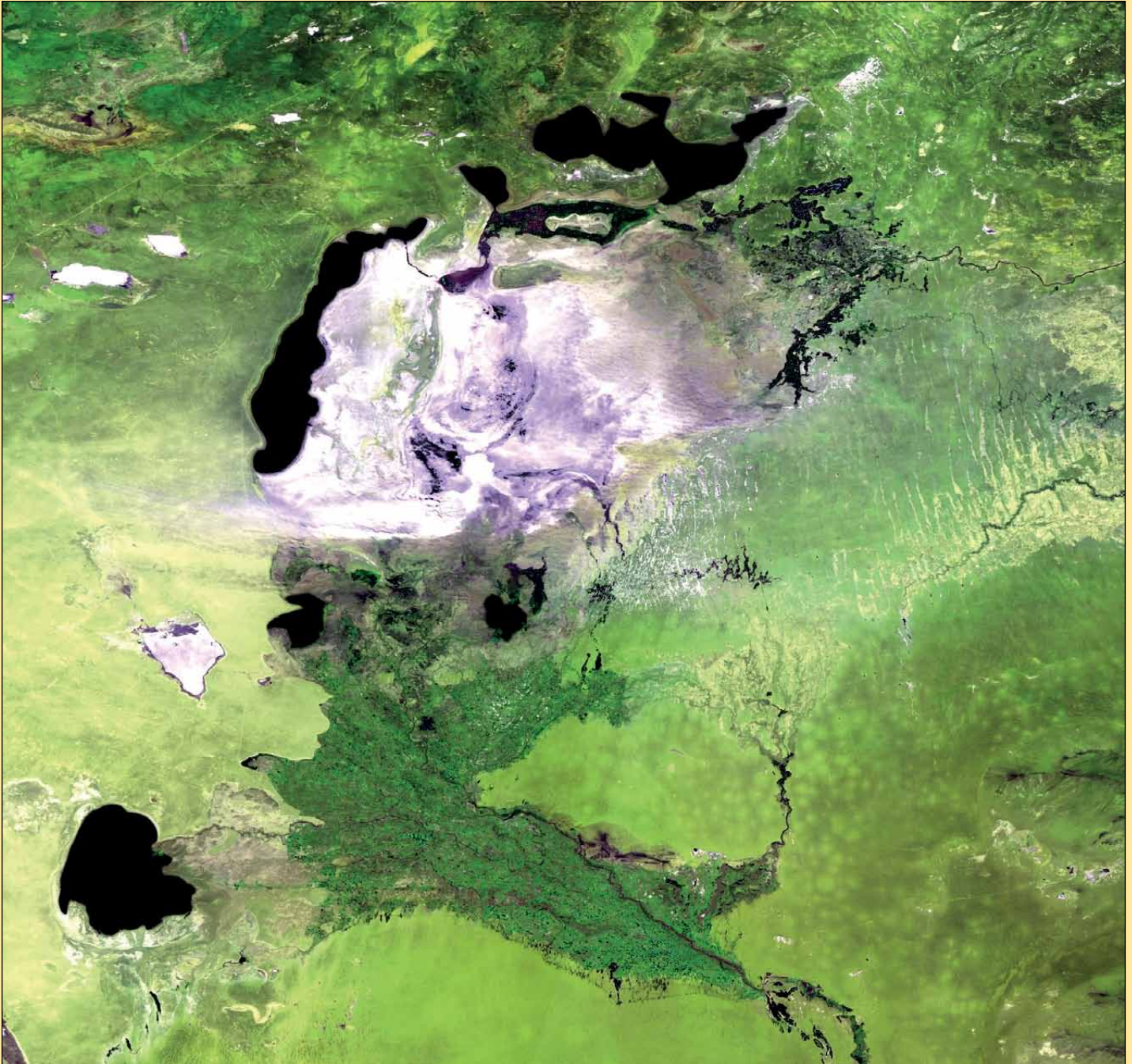
Figure 2 - The same area, imaged by *Aqua* approximately two hours later.

NASA images courtesy Jeff Schmaltz
LANC/EOSDIS MODIS Rapid Response Team at NASA GSFC

Belgium's PROBA-V Satellite

views the Aral Sea

John Tellick



The **Vegetation-1** and **Vegetation-2** instruments aboard the **SPOT 4** and **SPOT 5** satellites, which had been monitoring and mapping worldwide vegetation on a daily basis, were retired last May after almost 15 years of service. This functionality is due to be continued by ESA's **Sentinel-3** satellites but, as the first of these is not due to launch till mid 2015, this creates a major time gap in the data continuity.

As a stop-gap measure, Belgium decided to build a small satellite mission based on the successful PROBA (Project for On-Board Autonomy) expertise, using state of the art technology. The mission, launched on May 6, 2013 and called **PROBA-V** (where 'V'

stands for 'vegetation'), became officially operational on June 1, and will fulfil—even on its own—all the specifications of the vegetation user community.

This image of central Asia's receding Aral Sea was acquired by the PROBA-V minisatellite on May 13 at a resolution of 300 metres/pixel, and depicts the white salt terrain left behind by the receding southern Aral Sea (now known as the Aral Karakum Desert). The greenery to the south represents cultivated land irrigated by the Amu Darya river. The southern Aral Sea is now probably beyond saving and may dry out completely by the end of this decade.

Image: ESA/VITO

The DVB-S2 System

Alan Swards

Overview

This 'new' system, the specification for which was initiated about 20 years ago, is designed to replace the older DVB-S system which has provided the bulk of Digital TV from its start until the present time. With commendable forethought, the specification allowed for advances such as HDTV, and required significant developments in communications equipment. Most people are familiar with DVB-S2, in that it is the means by which HD TV channels are delivered to homes by *Sky* and other broadcasters; the version that *EUMETCast* are proposing to use for their new service is that same standard, but utilising some of the more powerful features such as variable coding and modulation (VCM). A new forward-looking standard has already been issued for the future, DVB-2SX, although it is noted that, at present, equipment to run such a communications channel does not exist.

This brief paper aims to provide a simple description of the way the DVB-S2 system operates, and its main features, so that readers will have some idea of how their equipment works and why certain things have happened. I will try and avoid getting into too much technical detail but, as the system is pretty technical to start with, that may not be possible all the time.

Scope

The DVB-S2 specification covers the equipment that lies between an input from a digital movie (eg MPEG) or other digital streams or packets, and the output which goes to the uplink transmitter of the satellite. In specifying the signal which results, it also covers the receiving chain required to receive and demodulate the signal.

Mode Adapter

The first element in the chain, the Mode Adapter, defines how the input signals are processed and turned into blocks of data bits. These can be of two sizes, around 40,000 bits or 15,000 bits, and the output of this element is data, blocks consisting of a header (BB Header) and a data field. The header identifies the type of data (packets or stream) and contains housekeeping information, including the ISI (Input Stream Identifier). This is followed by a Stream Adapter, which modifies the data, padding it if necessary, then scrambling it for randomisation to make a fixed length block called the BB Frame. The size of this frame is determined by the selected FEC rate.

Forward Error Correction (FEC)

The BB frames then go to the Forward Error Correction (FEC) element which adds error correction bits to the data to meet the specified rate. This is done in two stages: an 'inner' coding and an 'outer' coding, both of which result in extra parity bits being appended to the BB Frame to produce an FEC Frame. These frames come in two sizes, 64,800 bits for a 'NormalFECframe' and 16,200 bits for a 'ShortFECframe'. The inner code is produced by an LDPC (Low-Density Parity-Check) encoder while the outer code uses a BCH encoder. For certain modulations (which include 8PSK and 16APSK) the output of the LDPC encoder is bit interleaved. The object of the FEC coding is to produce an output which is 'Quasi Error Free', equivalent to a bit error rate (BER) of 10^{-7} at the rated signal to noise ratio.

Modulation

The output of the FEC element is a block called an FECFrame with sizes noted above, which is then bit-mapped

into constellations according to the requirements of the modulation chosen—such as QPSK, 8PSK and 16APSK, some with prespecified optional code rates.

The input sequence is a FECFRAME, the output sequence a XFECFRAME (complex FECFRAME), composed of $64 \cdot 800 / \eta \text{MOD}$ (normal XFECFRAME) or $16 \cdot 200 / \eta \text{MOD}$ (short XFECFRAME) modulation symbols. Each modulation symbol is a complex vector in the format (I,Q) (I being the in-phase component and Q the quadrature component) or in the equivalent format $\rho \exp(j\varphi)$ (ρ being the modulus of the vector and φ being its phase). ηMOD is the number of bits per symbol of the selected modulation.

Physical Layer

The data XFECFRAMEs are then sent as input to a Physical Layer Framing element. This element performs a number of functions as follows:

- generating a dummy PLFRAME when there is no XFECframe waiting for transmission,
- slicing the XFECFRAME into a specified number of slots of 90 symbols each,
- generation and insertion before the XFECFRAME of a header (PLHEADER) of one SLOT of 90 symbols length for receiver configuration,
- Pilot Block insertion (for modes requiring pilots) every 16 SLOTS, to help receiver synchronization. The Pilot Block is composed of $P = 36$ pilot symbols,
- Randomisation of the (I, Q) modulated symbols by means of a physical layer scrambler.

A dummy PLFRAME consists of a PLHEADER and 36 SLOTS of unmodulated carriers.

The output of this element is a PLFRAME, which is then subjected to square root raised cosine filtering, before passing to the quadrature modulator. The PLHEADER provides receiver synchronization and physical layer signalling.

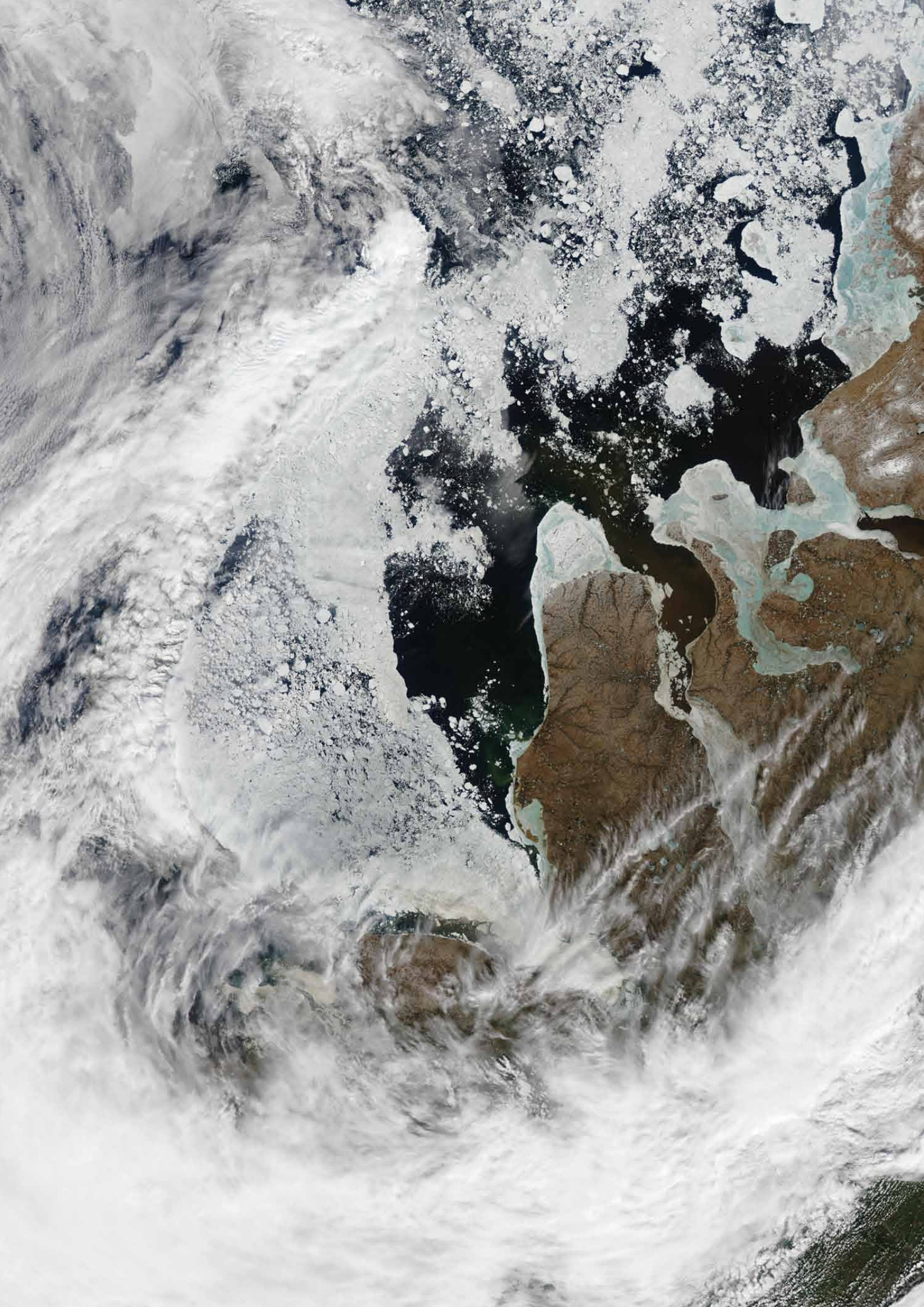
Note

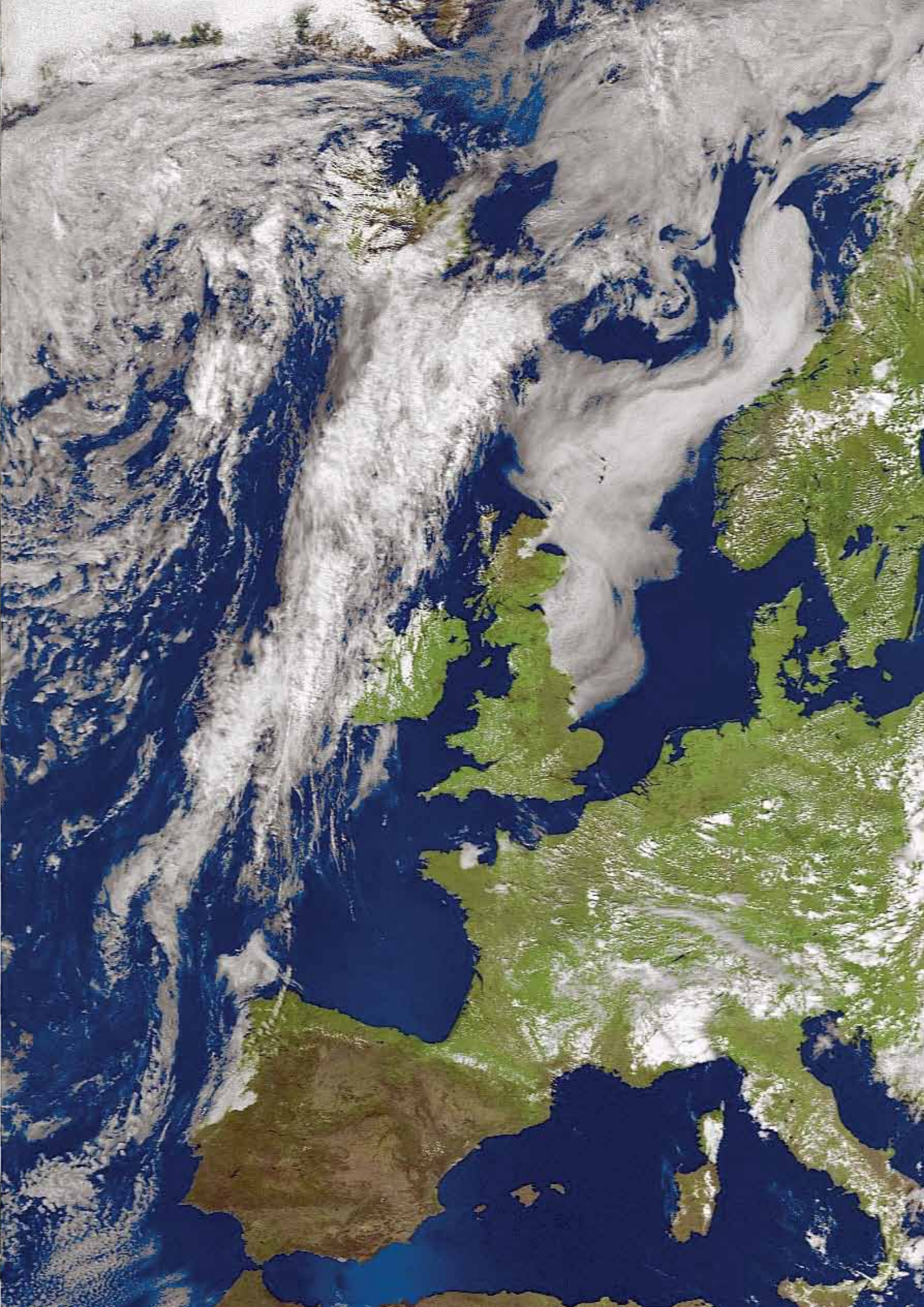
After decoding the PLHEADER, the receiver knows the PLFRAME duration and structure, the modulation and coding scheme of the XFECFRAME, and the presence or absence of pilot symbols.

Operation of the System

It will be evident from the preceding description that the frame that goes to the transmitter (and appears in the receiver) has a header which informs the receiver of the modulation type and coding which has been used together with other information needed by the receiver to decode the frame.

Successive frames may or may not be dummy frames and the modulation and coding specified for successive frames may be different. As the signal at this point in the receiver is noisy (probably with a bit error rate of about 1 in 100 or 1 in 1000), the initial decoding of the frame header has to be successfully done in the presence of this noise. It is only when the FEC decoder has operated on the data contained in the frame that the data emerges with the very low bit-error-rate specified for the data. So the PL header data, comprising the MODCOD and type of frame is protected by a separate 64 symbol PLS (Physical Layer Signalling) code which is a non-systematic binary code of length 64 and dimension 7 with minimum distance $d_{\min} = 32$. It is equivalent to the first order Reed-





Installing the TBS6925 Tuner Card

Continued from page 24

will help you get your new systems up and running. I had very interesting days working with *TBS Support* in trying out new experimental software, some of which worked and some which didn't. But at the end, those guys in Singapore, along with *Crazycat Software*, have given us a good system to work with, and I thank them for their efforts.

There is of course one other option if you don't want to go into your PC, and that is the *TBS5925 USB Box*, which is connected into a USB 2.0 socket. Set-up is similar to that for the PCIe Card, using the same driver and configuration—and giving identical results.

You can also use the TBS Set-up from the download centre for the TBS6925 card, called 'How to lock Eumetsat VCM signal with TBS-IP Tool'. Either way will give the same results. It's entirely your choice.

Glossary of Terms

- SNR - Signal to Noise Ratio-db
- BER - Bit Error Rate-bps
- VCM - Variable Code Modulation

Happy weather watch from Portland. My thanks to Jean-Pierre for all his help and assistance, to Ernst for his patience in explaining the system, and finally to *TBS Support*, without whose help and assistance none of this would have happened.

Reference

- 1 Envisat DDS with Windows XP - GEOQ 30, page 43.

ESA's Rosetta Spacecraft makes successful rendezvous with comet



ESA's *Rosetta* probe, launched in 2004, became the first spacecraft ever to rendezvous with a comet when it finally caught up with **Comet 67P/Churyumov-Gerasimenko** on August 6, 2014 after a ten year journey that required two Earth fly-by assists. This image, taken by its OSIRIS narrow-angle camera on August 3 from a distance of 285 km shows the comet's cratered surface at a resolution of 5.3 metres/pixel. The comet is currently 405 million kilometres from Earth, but rushing sunwards at over 50 000 kph. Currently in a 100 km orbit, *Rosetta* will be lowered into a final orbit just 30 km above the comet's surface.

Image: ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA

The DVB-S2 System

Continued from page 21

Muller under permutation. It transmits 7 bits for physical layer signalling purposes, the MODCOD (modulation and coding) (5 bits) and TYPE (frame size -large or small) (2 bits).

Estimate of Frame and Data Rates

I will now try and estimate the frame rate that might occur with the parameters adopted for the *EUMETCast* system. To simplify the calculation, I will neglect the times taken up for the PLHEADER and the pilot symbols, but I estimate that this will only result in an error of a few percent. I further assume that all data is sent with normal FEC frames (64800 bits). I also assume 8PSK 3/5 modulation and coding for the Basic Service (BS), and 16APSK 2/3 for the High Volume Service (HVS).

Because of the added parity bits resulting from the *Forward Error Correction* element, only about 38688 bits of the frame are data for the BS frames and 43040 bits for the HVS frames. The 8PSK signal allows 3 bits to be modulated on to one symbol, while the more efficient 16APSK signal allows 4 bits per symbol. The time to transmit one BS frame works out at 655 microseconds (μ s), [64800 bits at 3 bits per symbol, of which 38688 bits are data], and for one HVS frame, 491 μ s [64800 bits at 4 bits per symbol, of which 43040 bits are data], assuming a 33 megasample/sec symbol rate. Thus one frame of BS data containing 38688 data bits is sent in 655 μ s, and one frame of HVS data containing 43040 bits is sent in 491 μ s. From these figures, it can be calculated that sending a sequence of only BS frames will result in a data rate of 59 Mbits/s, while sending a sequence of only HVS frames will result in a data rate of 87.6 Mbits/s.

Let us consider a sequence of sending a single BS frame followed by 2 HVS frames. This takes 1637 μ s, i.e. 611 of the triple frames per second. Overall data rates work out at 23.6 Mbit/s for BS, and 52.6 Mbit/s for the HVS. Similarly, sending repeated sequences of one BS frame followed by 3 HVS frames will result in an average BS data rate of 18 Mbit/s and an HVS data rate of 60 Mbit/s. Adjusting the ratio of BS/HVS frames allows a range of desired data rates to be obtained.

Note that the actual rates achieved in practice will be somewhat lower than those quoted above, as I have not taken account of various (relatively small) additional requirements for housekeeping data that are included in the frames. Nevertheless, these figures seem to be similar to those published for estimated EUMETCast data rates for the new system.

email: alan@asewards.net

web site: <http://asewards.free.fr>

NOAA 16 Decommissioned

Following more than thirteen years in operation, yet another of the NOAA satellites, NOAA-16, was decommissioned on June 9, 2014. The satellite suddenly stopped sending data to Earth early on June 6, and efforts to rectify the situation were unsuccessful. The APT service from NOAA-16, which had a planned operational lifetime of between three and five years, suffered a failure just seven weeks following launch in September 2000, but continued to provide HRPT imagery until last June. NOAA-16 was in fact replaced as the primary satellite in 2005, but remained active as a back-up.

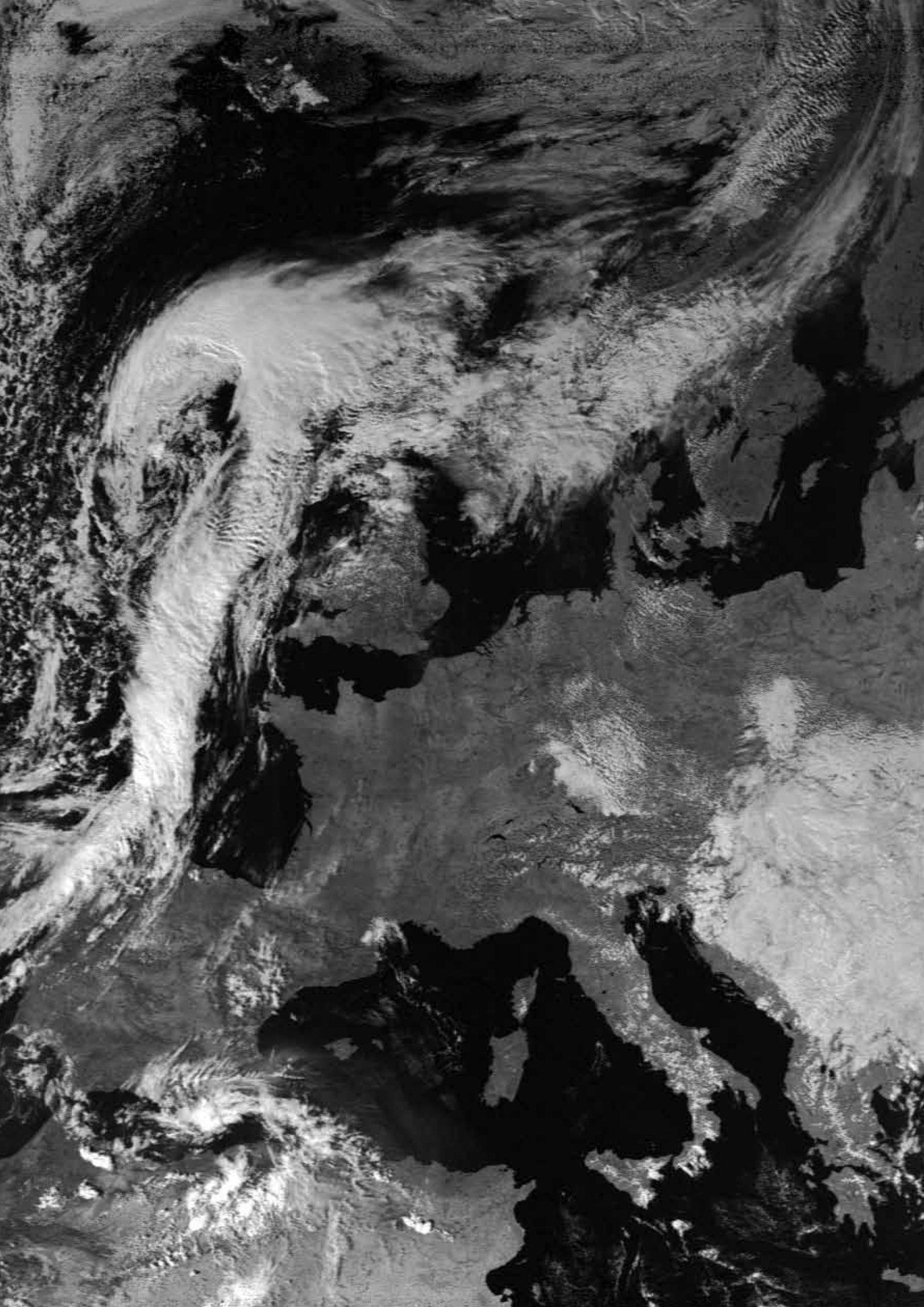
A channel-2 APT image acquired just two days following the launch of NOAA-16 is reproduced on page 26.



ESA astronaut Alexander Gerst is sharing his incredible views from 400 kilometres above on the International Space Station. This photograph shows Super Typhoon Neoguri as it approached Japan. At its height, Neoguri produced wind speeds of 240 kph, and its eye in the centre of the typhoon was 65 kilometres wide. Thousands of people in Okinawa, Japan, and elsewhere were evacuated.



Reader Marc Peigneux sent in this unusual cloud image which he photographed while travelling through the Touraine district of France. The cloud looks rather like the mushroom cloud associated with a nuclear explosion, and indeed it does have a nuclear origin. It was produced during a strong anticyclone, on a particularly calm, wind-free day, by the condensing water vapour cloud emitted by the nuclear power station at Chinon, in the West of Touraine.



Currently Active Satellites and Frequencies

Polar APT Satellites			
Satellite	Frequency	Status	Image Quality
NOAA 15	137.6200 MHz	On	Good
NOAA 18	137.9125 MHz	On	Good
NOAA 19	137.1000 MHz	On	Good / [1]
Meteor M N1	137.1000 MHz	Sporadic	[1]

Polar HRPT/AHRPT Satellites				
Satellite	Frequency	Mode	Format	Image Quality
NOAA 15	1702.5 MHz	Omni	HRPT	Weak
NOAA 18	1707.0 MHz	RHCP	HRPT	Good
NOAA 19	1698.0 MHz	RHCP	HRPT	Good
Feng Yun 1D	1700.4 MHz	RHCP	CHRPT	None: Device failure
Feng Yun 3A	1704.5 MHz	---	AHRPT	[2]
Feng Yun 3B	1704.5 MHz	---	AHRPT	[2]
Feng Yun 3C	1704.5 MHz	---	AHRPT	[2]
Metop A	1701.3 MHz	RHCP	AHRPT	Good
Metop B	1701.3 MHz	RHCP	AHRPT	Good
Meteor M N1	1700.0 MHz	---	AHRPT	[2]

Geostationary Satellites				
Satellite	Transmission Mode(s)		Position	Status
Meteosat 7	HRIT 1691 MHz / WEFAX 1691 MHz		57.5°E	On
Meteosat 8	HRIT (digital)	---	3.5°E	On [3]
Meteosat 9	HRIT (digital)	LRIT (digital)	9.5°E	On [4]
Meteosat 10	HRIT (digital)	LRIT (digital)	0°W	On
GOES-12	GVAR 1685.7 MHz	---	60°W	On
GOES-13 (E)	GVAR 1685.7 MHz	LRIT 1691.0 MHz	75°W	On [5]
GOES-14	---	---	105°W	Standby
GOES-15 (W)	GVAR 1685.7 MHz	LRIT 1691.0 MHz	135°W	On [5]
MTSAT-1R	HRIT 1687.1 MHz	LRIT 1691.0 MHz	140°E	Standby
MTSAT-2	HRIT 1687.1 MHz	LRIT 1691.0 MHz	145°E	On
Feng Yun 2D	SVISSR	LRIT	86.5°E	On
Feng Yun 2E	SVISSR	LRIT	104.0°E	On
Feng Yun 2F	SVISSR	LRIT	112.0°E	On

Notes

- 1 LRPT Signals have been reported from Meteor M N1 but are sporadic with periods off. This satellite's carrier frequency can cause interference to NOAA 19 when the two footprints overlap.
- 2 These satellites employ a non-standard AHRPT format and cannot be received with conventional receiving equipment.
- 3 Meteosat operational backup satellite
- 4 Meteosat Rapid Scanning Service (RSS)
- 5 GOES 13 and GOES 15 also transmit EMWIN on 1692.70 MHz

Amazing Double Oxbow Feature

in Canyonlands National Park

A NASA Earth Observatory Report



Meanders and oxbows are usually associated with gently flowing rivers passing over soft soil on broad floodplains, much like today's Lower Mississippi. But as this image, captured by the Operational Land Imager (OLI) aboard the *Landsat 8* satellite shows, the Colorado River boasts some dramatic, serpentine meanders in addition to its renowned canyons.

This double oxbow, called the *Loop*, is located in Canyonlands National Park, about eight kilometres upstream from the confluence of the Green and Colorado Rivers. Known as an '*entrenched meander*' by geologists, the Loop's canyon walls are about 150 metres high, about the equivalent of a 50 storey building. The lower canyon walls are part of the *Hermosa Formation*, a group of sedimentary rock layers that formed about 300 million years ago.

At the narrowest point, just 150 metres of rock separate the channels of the *East Loop*; the slightly wider neck of the *West Loop* measures about 520 metres. As the Colorado River continues to erode the canyon wall, it will eventually punch through and create a new channel, leaving an oxbow lake.

Geologists have been intrigued as to how the entrenched meanders of the Colorado River formed ever John Wesley Powell and his team of explorers passed through the Canyonlands region in 1869. Were the meanders established by ancestral rivers that flowed on softer sediments long before tectonic forces uplifted the

Colorado Plateau? Or was it something about the intrinsic rock of the Colorado Plateau that determined the shape and distribution of oxbows and meanders?

Geologists consider that both these ideas are relevant, and in a recent study published in the *Bulletin of the Geological Society of America* ^[1], Deborah Harden, an emeritus professor of geology at San Jose State University, concluded that meanders like the Loop got their shape at least partly because of ancestral rivers. After considering factors such as the steepness of the river bed, the resistance of canyon walls to erosion and the structure of bedrock near meanders, she found that areas that were relatively flat before the uplift had the most meanders then—and still do today.

But she also found that the composition of the rock has some effect on the river's bends as well. Broader meanders, for instance, are more common in areas with erodible rock, while cutoffs are concentrated in areas with transitions from harder to softer rock layers.

Reference

- 1 Harden, D. (1990) Controlling factors in the distribution and development of incised meanders in the central Colorado Plateau, *The Geological Society of America Bulletin*, 100 (2), 233-242.

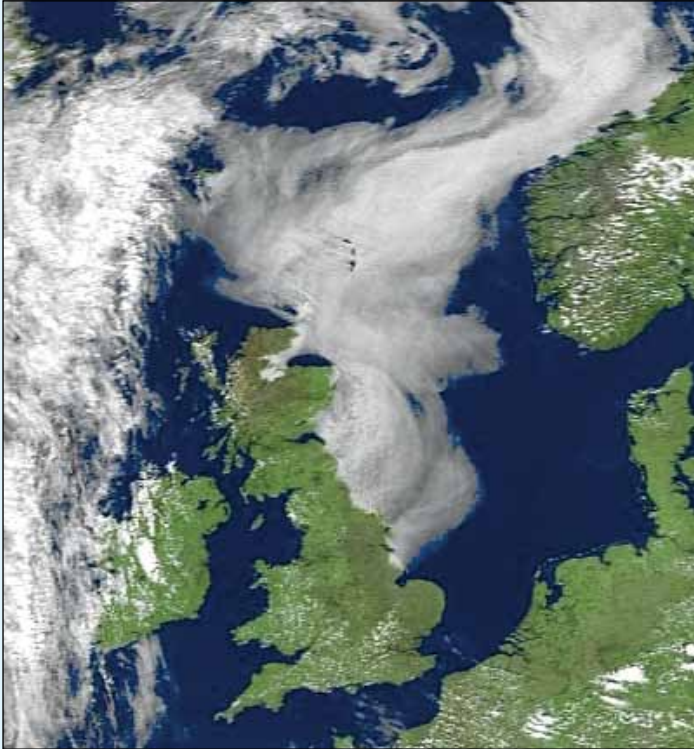
Credit: NASA Earth Observatory images by Jesse Allen and Robert Simmon, using Landsat data from the U.S. Geological Survey. Caption by Adam Voiland.

Images of North Sea Haar

July 23, 2014

On July 23 this year, large stretches of Britain's eastern coastline were beset by huge swathes of haar. While much of the country sweltered in Mediterranean temperatures, the coasts remained obdurately cool and sunless for much

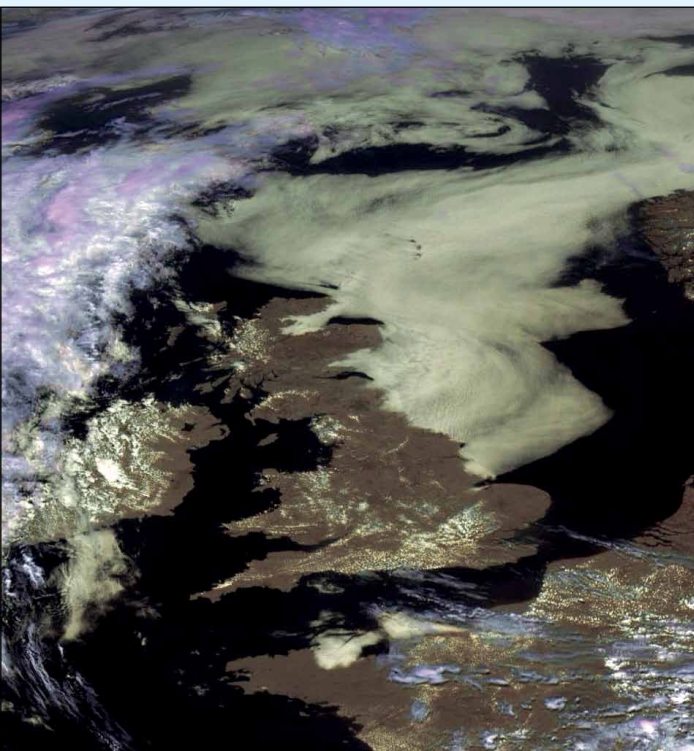
of the day. Three readers submitted satellite images of the situation, where a huge region of haar stretched across much of the North Sea. Below are their submissions, along with the MODIS image from NASA's *Aqua* satellite, for comparison.



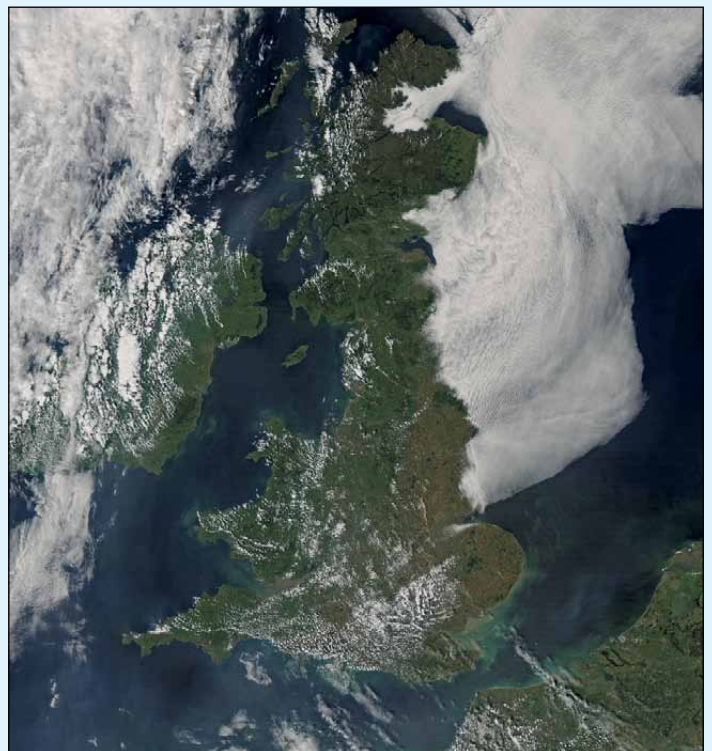
Anthony Lowe captured this NOAA 19 APT image showing the haar from the 13:18 UT pass on July 23, 2014.



Andre T'Kindt captured this NOAA 15 APT image showing the haar from the 15:46 UT pass on July 23, 2014.



Mike Stevens the 12:30 image from Meteosat 10 on July 23, decoding the new DVB-S2 data stream with a TBS 6925 Digital Satellite TV Tuner Card.
Image © EUMETSAT 2014



This is a section from the 12:25 UT MODIS image from NASA's *Aqua* satellite on July 23, 2014.
Image: LANCE-MODIS/NASA/GSFC

EUMETCast On-Line Registration Guide

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

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

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

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

GEO Helplines

Douglas Deans

Dunblane, Perthshire, SCOTLAND.

All aspects of weather satellites from APT, HRPT to Meteosat-9 DVB/EUMETCast systems.

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

John Tellick

Surbiton, Surrey, ENGLAND.

Meteosat-9 advice: registering for the various MSG services, hardware and software installation and troubleshooting. John will also field general queries about any aspect of receiving weather satellite transmissions.

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

Geoff Morris GW3ATZ

Shotton, Flintshire, NE WALES.

Geoff has lots of experience with aerial, coax,connectors, mounting hardware etc. and has also done a lot of work with the orbiting satellites. Geoff has been a EUMETCast Meteosat-9 user for some time and is familiar with David Taylor's MSG software. He should be able to share his experiences with newcomers to this branch of the hobby.

- Tel: (01244) 818252
- e-mail: gw3atz@btoopenworld.com

Mike Stevens

Portland, Dorset, England.

Assistance with reception of EUMETCast to include Metop-A and Metop-B; also MSG Data reception and set-up within the PC, and assistance with dish alignment and set-up.

- email: mikeg4cfz@gmail.com

Guy Martin G8NFU

Biggin Hill NW Kent, ENGLAND

Guy is prepared to advise anyone who wishing to receive **MSG/Metop** using Windows 2000 or XP. Can also help with networking and ADSL router setup.

- gmartin@electroweb.co.uk

Hector Cintron

San Juan, Puerto Rico, USA

Hector is prepared to field enquiries on HRPT, APT, EMWIN and NOAAPORT

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

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

Weather Satellite Reports

If there is a single Internet Forum that is relevant to all weather satellite enthusiasts, it must surely be Douglas Deans' *Weather Satellite reports*.

Here you will find every conceivable type of information about weather satellites, whether polar or geostationary, APT, HRPT, LRIT or whatever.

Absolutely everything is covered, and the information is updated every week. Special additional bulletins may be issued if an important change takes place mid week.

You can read the bulletins from this URL

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

or, even better, elect to have the reports sent to you by email every Monday.

Internet Discussion Groups

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

APT Decoder

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

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

GEO-Subscribers

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

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

Satsignal

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

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

MSG-1

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

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

Copy Deadline for GEO Quarterly No 44 is Sunday, October 26.

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

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

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

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

Images and Diagrams

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

Gridding, Overlays and Captions

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

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

Submission of Copy

Materials for publication should be sent to the editor,

Les Hamilton
8 Deeside Place
Aberdeen AB15 7PW
Scotland

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

geoeditor@geo-web.org.uk

Particularly large attachments (8 MB and above) can be transmitted via *Hightail*

<https://www.hightail.com/>

And finally . . .

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

Group for Earth Observation

Membership Application Form



Current Annual Subscription Rates (4 issues)

- Tick United Kingdom ... £25 Europe ... £35 Rest of World ... £40
 a
 box Electronic Membership (downloadable PDF Quarterly) ... £15

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

- **PayPal** - Visit the GEO Shop website at <http://www.geo-web.org.uk/shop.html> and add your subscription to your basket
- UK residents may pay by means of a **personal cheque** or **Postal Order** made payable to 'Group for Earth Observation'
- Payment by **direct bank transfer** can be arranged. Please email francis@geo-web.org.uk for BIC and IBAN details.

Name (please PRINT clearly)

Email Address (please print **very** clearly)

Address

Declaration

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

Town/City

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

Postcode/ZIP

Callsign

Country

Signature

Telephone Number

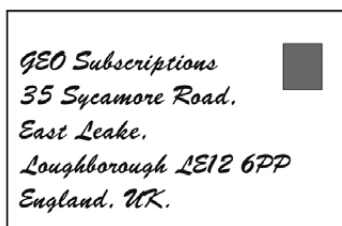
FAX

Date

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

Please send your completed form to:

David Anderson (GEO subs),
 35 Sycamore Road,
 East Leake
 Loughborough LE12 6PP, UK



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R2FU Weather Satellite Receiver for NOAA APT



This state-of-the-art, USB powered APT receiver for the NOAA satellites is also controlled via a USB port, so no longer requires a serial interface like its predecessors. It also features hardened filtering to overcome UK pagers.

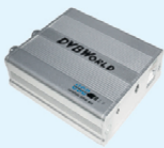
UK members price - £210.60
UK non-members price - £230.60

Current Price List

	Members' Prices			Prices for non-Members		
	UK	EU	RoW	UK	EU	RoW
R2FU APT Receiver	210.60	216.00	224.00	230.60	236.00	244.00
BNC Lead (0.25 metre)	5.50	6.25	6.75	7.50	8.25	8.75
UK Power Supply Unit (12 volt)	10.50	-----	-----	13.00	-----	-----
Sandpiper Turnstile Antenna	65.00	-----	-----	77.50	-----	-----
Dartcom High Quality QFH antenna	280.00	360.00	-----	300.00	380.00	-----
Bias Tee	25.00	25.50	26.00	29.00	29.50	30.00
GEO-PIC 1.0	7.00	7.80	8.40	7.00	7.80	8.40
Martelec MSR40 EPROM	10.00	10.75	11.25	10.00	10.75	11.25
DVB-S2 USB Receiver (DVBW 2102)	60.00	65.00	-----	70.00	75.00	-----
DVB-S2 USB-S Receiver (DVBW 2104)	75.00	80.00	-----	85.00	90.00	-----
Telestar 80 cm dish with LNB	72.00	-----	-----	79.00	-----	-----
Telestar Ku band universal LNB	13.70	15.20	-----	20.20	21.70	-----
Technisat Satfinder Alignment Meter	26.50	29.50	-----	29.50	32.50	-----
Bias Tee	3.80	4.60	5.60	n/a	n/a	n/a
GEO Quarterly (PDF on CD) 2004-2013 (Annual compilations - state year)	8.00	8.80	9.30	n/a	n/a	n/a
GEO Membership (4 magazines p.a.)	25.00	35.00	40.00	25.00	35.00	40.00

All prices are in £ sterling and include postage and packaging

DVBW DVB-S USB2102 Receiver



This DVBWorld DVB-S USB-2 receiver is recommended for trouble-free EUMETCast reception. It is supplied with a GEO set-up CD containing software and instructions.

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

DVBW DVB-S2 USB2104 Receiver



This DVBWorld DVB-S2 USB-2 receiver is also available for those who wish to receive FTA satellite HDTV on their computer (but not recommended for EUMETCast reception).

UK members price - £75.00
UK non-members price - £85.00

Sandpiper Turnstile Antenna



This high-quality turnstile antenna has been specially manufactured for GEO, for use in APT reception from the NOAA polar orbiting weather satellites.

UK members price - £65.00
UK non-members price - £77.50

Telestar 80 cm dish and Universal 0.2 dB LNB (or equivalent)



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

UK members price - £72.00
UK non-members price - £79.00

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 by email to

tech@geo-web.org.uk

or made through the GEO Website at

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

Goods are normally shipped within 28 days, subject to availability.



Not yet 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: but non-members cannot benefit from the discounted members prices.

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

Subscription Rates (12 months, 4 issues, including P&P) for GEO Quarterly are

£25 (UK)
£35 (EU)
£40 (rest of world)

GEO Quarterly - Back Issues (Only available to GEO Members)



Paper copies of back issues of GEO Quarterly may be available, but it is advisable to check before ordering.

UK members price - £3.80

Annual compilations of GEO Quarterly back issues in PDF format are available on CD. Be sure to state the year of each annual compilation that you wish to order.

UK members price - £8.00

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 - £26.50
UK non-member's price - £29.50

GEO PIC 1.0 for the RX2



Programmed with the new channel 18/19 frequencies required for NOAA's 18/19.

UK members price - £7.00
UK non-members price - £7.50

GEO Bias Tee



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 - £25.00
UK non-members price - £29.00



