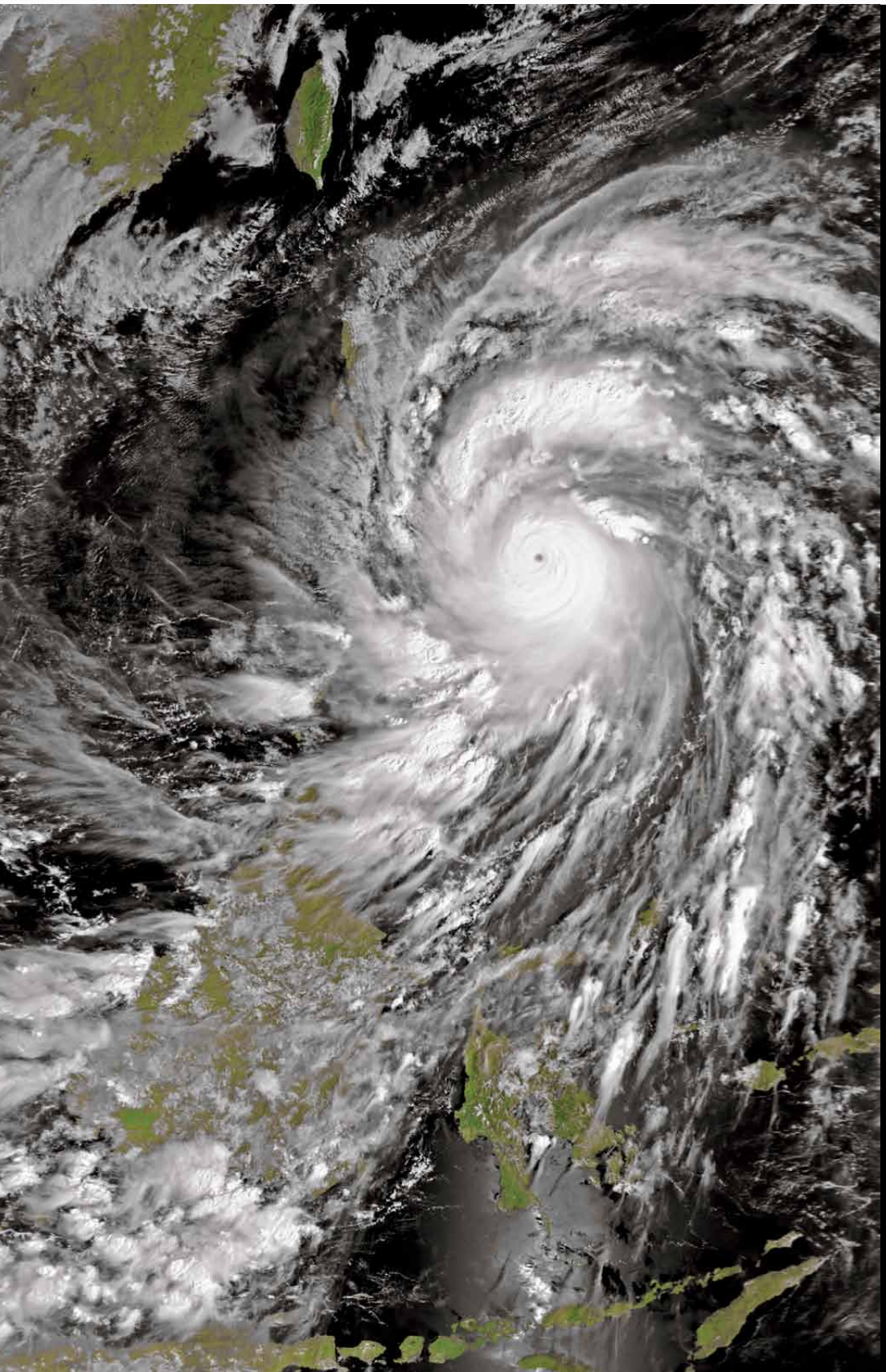
The GEO Quarterly

Group for Earth Observation

The Independent Amateur Quarterly Publication for Earth Observation and Weather Satellite Enthusiasts

41

March 2014



Inside this issue . . .

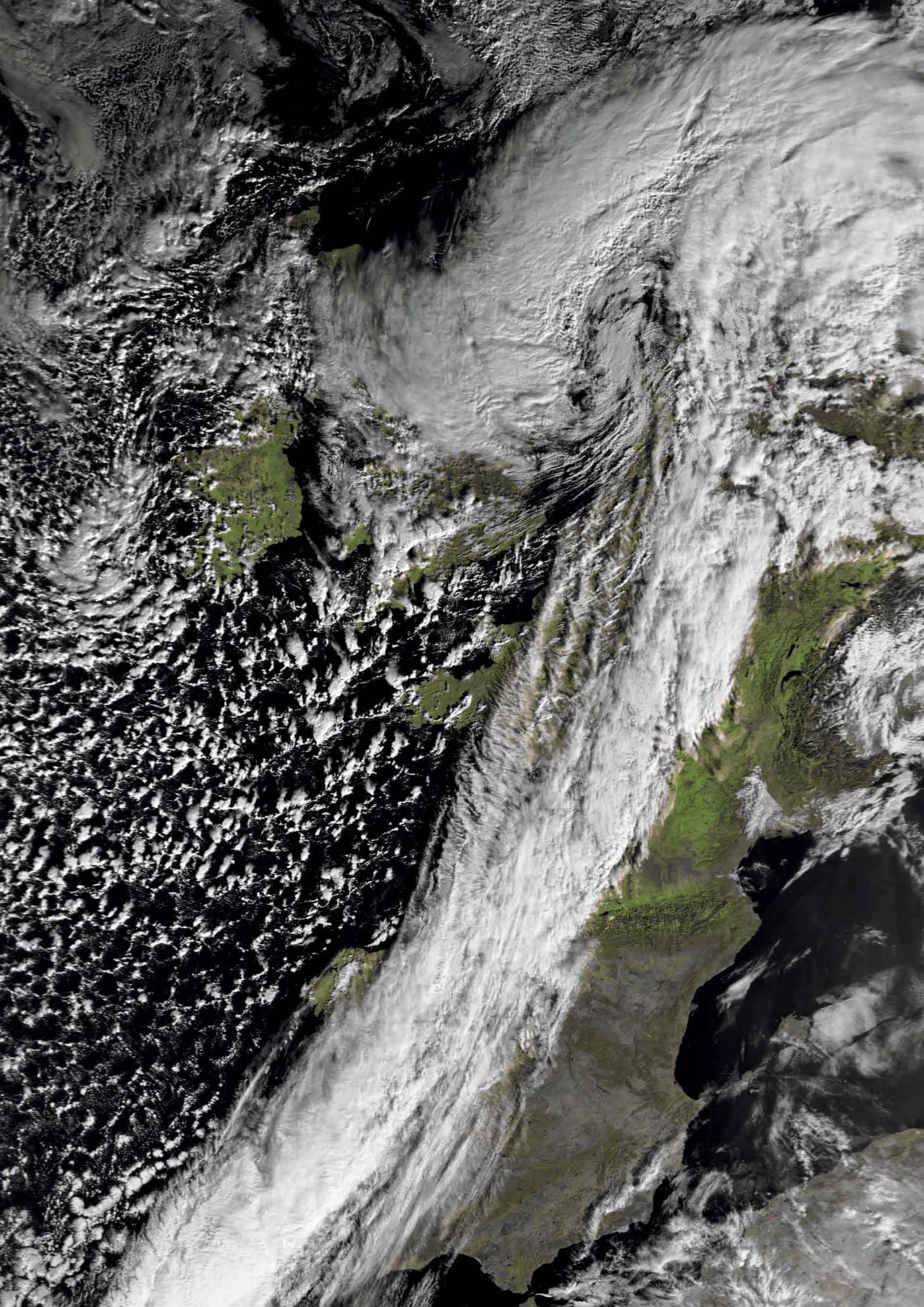
Following last issue's foray into the field of APT reception with a DVB-T dongle, courtesy Raydel Abreu Espinet, Francis Bell narrates his experiences with the same technique in an article full of explanatory screenshots of the SDR# software in action.

With reference to satellite imagery of Antarctica, along with some superb photography from the ground, Les Hamilton describes the enigmatic Antarctic Dry Valleys, where snow seldom lies.

GEO's 2014 Symposium takes place in late April, where the keynote address will be delivered by Klaus-Peter Renner from EUMETSAT. *With delivery of products switching to EUMETCast S2 VCM at the end of 2014, we hope to learn everything we can about the new system.*

The period from Christmas through to mid February 2014 has been noteworthy for the unprecedented succession of Atlantic storms that have struck the British Isles and western Europe. This issue contains numerous spectacular satellite images of these storms.

Plus, there articles on the recovering Ozone Hole, Typhoon Haiyan, the Lena Delta, Radiation Fog, and tips on selecting the optimum PC for the new EUMETCast data.



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Editorial

Les Hamilton
geoeditor@geo-web.org.uk

The cover image for this issue is a rather splendid Metop-A HRPT transmission showing Typhoon Haiyan, which caused such terrible devastation in the Philippines during early November 2013 (see page 21 for details). At its height, Haiyan produced sustained winds of 315 kph to become the fiercest tropical cyclone ever observed, based on wind speed. Haiyan was without doubt the deadliest typhoon known to have made landfall on the Philippines with over 6000 confirmed deaths by the end of the year.

I've reported in previous editorials concerning poor reader participation and the paucity of articles related to our hobby. Matters have really plumbed new depths during the past three months with only three single page notes and a number of satellite images received. Were it not for the efforts of John Tellick, Francis Bell and myself in the week prior to copy deadline (and well beyond it), you would have had almost nothing to read in this issue. At one time it looked as if this would be a 24-page issue. As the saying goes, every cloud has a silver lining, and the atrocious recent weather which kept me indoors allowed me time to research material to fill the pages. But I shouldn't have to do that!

I hope readers are aware that GEO Quarterly has no 'office staff'. There's only me to do everything except actually printing the magazine, so I need to have a steady trickle of material arriving throughout the three months preceding publication. This means that you, the readers, must start thinking about your contributions for June's *GEO Quarterly* **now**.

I urgently require articles. Here are some topic suggestions:

- Image processing and the advantageous use of colour combinations for analysis
- further hints and tips on the use of FM dongles and SDR#
- Interpretative essays on just a few of the myriad interesting images you download
- news about the sensors aboard modern and forthcoming satellites, and their purposes
- regular reports on extreme weather events around the globe

and so on ....

I have major plans in place for the future: I'm out of the country from early to mid April, and will leave for Skye just a few days after the April 27 copy deadline. The Editor's Chair will be empty for extended periods during the lead in to Quarterly 42. As I won't be available to do all the donkey work, it's up to you. If the readership is unresponsive, you may find that there is no June issue this year.

Apologies for appearing so gloomy, but the current situation, where it falls on me to create the bulk of the content (well over 50% this issue) is unsustainable and causes me great stress: I do not intend following that path again. Like all the Management Team, I am an unpaid volunteer. GEO Quarterly is created in my spare time but instead of the joy it once was, it is now a burden. If the situation does not improve **very** quickly, I will simply step aside and get my life back.

Copy Deadline for last-minute items in GEO Quarterly 42 is Sunday, April 27, but the bulk of the content material is required well before this date.

Contents

The GEO Report

Francis Bell

The coming year promises change for those of us who are engaged in direct weather satellite reception.

The *EUMETCast* service has been running in its present image dissemination format for over 10 years. Some of you will remember the power amplifier failure on *Meteosat 3* which forced a change to the *EUMETCast* service. Up until that time the same satellite was used to both collect and then disseminate images to user services. Thereafter, separate satellites have been used: the *Meteosat* satellites for imaging the Earth but a different commercial communications satellite to retransmit the data. I judge this to be a huge advantage for users such as myself because the *DVB S1* standard used for transmissions is a commercial standard; hence there is readily available, modestly priced equipment for user stations such as mine instead of those expensive dedicated receivers we all had to use in the past.

Many GEO members will be aware that the *EUMETCast* service is about to change. This is necessary because of the volume of data being transmitted and the anticipated further increases in the near future. Not only is the *EUMETCast* service sending data relating to EUMETSAT's own satellites, but it also retransmits data from other geostationary and polar orbiting satellites. I was prompted to look at my licence agreement with EUMETSAT and discovered that I am allowed to receive 39 different data sets. The reality is that I only use about ten, but that's not to say the additional services are not valued by others. To accommodate a further expansion of *EUMETCast* services, the decision was made to stop using the current *Eurobird 9* satellite to disseminate data and move to another communication satellite which, together with a change in transmission standard to *DVB S2 VCM*, will more than double the volume of data which *EUMETCast* can retransmit.

In order to be as supportive as possible to our members, GEO has been investigating the implications of the coming changes. We have been advised that the existing *DVB S1* receivers that many of our members currently use will not work with the new *DVB S2 VCM* service. GEO's management judged it essential that we should identify and test any available receivers which will cope with the new standard. Advice from EUMETSAT pointed us in the direction of two receivers which they have successfully tested, plus a third receiver which may work with appropriate software.

In order to progress testing, GEO has imported two **Ayecka SR1** receivers from Israel, a **Novra S300E** receiver from Canada plus a **TBS 5925** receiver from USA. Tests with the *Ayecka* and *Novra* receivers are going well and you can read test reports on David Taylor's website at

http://www.satsignal.eu/wxsat/dvb-s2

Thanks are due to David Taylor and David Simmons, who have been involved with testing these receivers. The *TBS 5925* receiver has yet to be tested, and perhaps we will have to await suitable drivers for this receiver box; however, I understand that there is a group in France who claim they have a *TBS 6925* receiver working! This receiver is a computer card rather that the *TBS 5925*, which is a stand-alone box: but if the card works, it is highly likely that the box will too. Only time will tell for certain. The advantage of the TBS 5925 is that it is about half the cost of the other two receivers.

Evaluating these receivers is a high priority for GEO, and any member who has experience or knowledge about potential receivers or appropriate software for the new *DVB S2 VCM* signal standard is encouraged to get in touch with any member of GEO's management team.

GEO Symposium 2014

At our symposium on April 26, 2014, developments relating to technical issues and purchasing a new *DVB S2 VCM* receiver will have a high priority. See the separate symposium notice opposite.

Sentinel -1

An exciting new chapter of Earth observation is about to begin with the anticipated launch of ESA's *Sentinel-1* satellite in March 2014. This will be the first in the family of *Copernicus* satellites, which marks a new era of operational missions rather than demonstration or research projects. The data from the *Sentinels* will be open to users worldwide and free of charge. The new satellite will be used to monitor oil spills, sea ice, land movements and mapping changes in land use. Its radar imaging will allow it to map the Earth's surface through cloud and at night.

The issue for direct users such as GEO's membership relates to how the data is to be received. In the past, some of us received images from the *Envisat* satellite via the Envi-Ham transmissions which were so similar in format to *EUMETCast* reception that the same equipment could be used for both services.

As best I know, the timescales and data format for making the *Sentinel* images freely available to users such as GEO members have not been published: perhaps decisions are still to be made. However, I am in touch with ESA-ESRIN who were previously responsible for the retransmission of the *Envisat* images. I hope to establish their policy relating to retransmission of *Sentinel* images and then the detail of how receiver communities such as GEO should register for image reception—plus of course, the receivers necessary for direct reception. I will report to GEO as soon as there is further information.

> **Note**: do not discard your established *EUMETCast* DVB S1 receivers, as perhaps, in due course, they will be able to receive *Sentinel* satellite images. Watch this space!

Pagers

If you read the article starting on page 16 of this Quarterly, you will find that I have been experimenting with SDR for APT reception. One of the variables which impressed me was the ability of the SDR signal software to eliminate interference from adjacent pagers to the desired APT signal. At my home I do experience some pager interference, but this was entirely eliminated when using a SDR system.

Readers who are plagued with pagers may wish to try SDR as a means of eliminating the local effects. For the very modest cost of a dongle, this could prove to be very worthwhile.

GEO Symposium

At the National Space Centre, Leicester

Saturday, April 26, 2014

Francis Bell

This GEO Symposium is particularly important in view of the changes to **EUMETCast transmissions** that take place at the end of this year. The key issue for this meeting is to keep members informed about these changes, and to offer demonstrations and advice regarding the upgrading of the **EUMETCast Europe Service** from DVB-S to the DVB-S2 standard.

The Saturday programme will be along the following lines

- 9.00 - 9.30 : Arrival and registration
- 9.30 - 12.30 : Presentations
- 12.30 - 2.00 : Lunch and viewing the NSC exhibition areas
- 2.00 - 4.00 : Presentations
- 4.00 - 4.30 : Afternoon break
- 4.30 - 5.00 : GEO Membership AGM

Those involved in setting up the exhibition and demonstration area for the Symposium will be able to do so on the Friday afternoon.

The exact timing of the programme may vary a little to accommodate the speakers, but we anticipate a **keynote address** from **Klaus-Peter Renner,** a senior communications engineer from EUMETSAT, who will bring us up to date with the new **EUMETCast S2 VCM** transmission service which will start this year.

Invitations have also been extended to representatives from **Space-Band Ltd. Israel**, who manufacture the **Ayecka** satellite receiver, and **Novra Technologies Inc.** from Canada who also produce an S2 VCM satellite receiver. Each company may make a presentation or demonstration relating to their receivers.

Other guests have been invited from Dundee University; Surrey Satellite Technology Ltd.; Leicester University, relating to their involvement with the GERB instrument currently gathering data on the MSG satellites; and the designer of the **AMSAT-UK FUNcube Dongle** which is now being used for APT reception by some of our members, using Software Defined Radio (SDR).

The above list of guests should be regarded as flexible because any potential guest's commitments can change, but more positively additional people may attend our meeting.

Other topics to be covered could include results from the GERB instrument being carried on the MSG satellites and the use of software defined radio (SDR) for polar orbiting satellite reception.

Any member wishing to make a contribution, be it a presentation, a suggestion for a topic to be covered or a workshop for the exhibition and demonstration area, is invited to get in touch with Francis Bell as soon as possible by emailing your intent to

francis@geo-web.org.uk

The cost for this one day symposium has been set at £20.00. Note that this charge includes entry to our symposium, plus free car parking and a free pass into the NSC Exhibition Areas: good value for money.

Pre-Registration

Pre registration for this symposium is encouraged as it makes several aspects of planning much easier. Do not send any money, but please register by sending an email to

international@geo-web.org.uk

If necessary, you may simply turn up on April 26 without the preregistration. Also, if you have friends who are not members of our Group, they will also be welcome, in the expectation that they may be sufficiently interested to join GEO one day.

Accommodation

For those staying overnight, there are many modestly priced hotels in the Leicester area, and access to the NSC is supported by public transport. Some of our members will be using

The Campanile Hotel,
St. Matthews Way,
Bedford Street,
Leicester LE1 3JE
Tel: 01162616600.

The hotel management have stated that an early booking for accommodation is likely to get the best price.

Getting to the National Space Centre

By Road

The National Space Centre is located just off the A6, two miles north of Leicester City Centre, midway between Leicester's inner and outer ring roads. **Brown road signs** with a distinctive **rocket logo** will direct you from the arterial routes around Leicester.

By Rail

East Midland Trains and C*ross Country Trains* serve Leicester Station. From here you can take a bus or a taxi to the National Space Centre. **First Bus 54** runs every 10 minutes Monday to Saturday and every 20 minutes on Sunday from Charles Street, a short walk from the station.

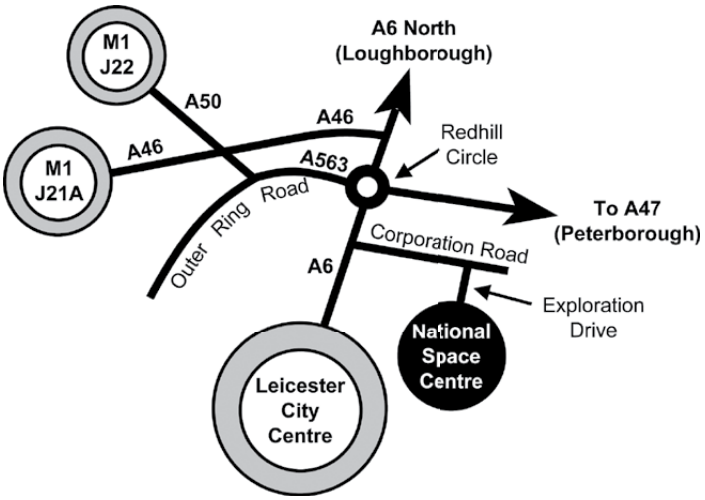
By Bus

First Bus 54 runs every 10 minutes throughout the day Monday to Saturday and every 20 minutes on Sunday running from 9.30 am.

Finally

Do keep checking the GEO website for updated details during the next few weeks, at

http://www.geo-web.org.uk/symposium.php



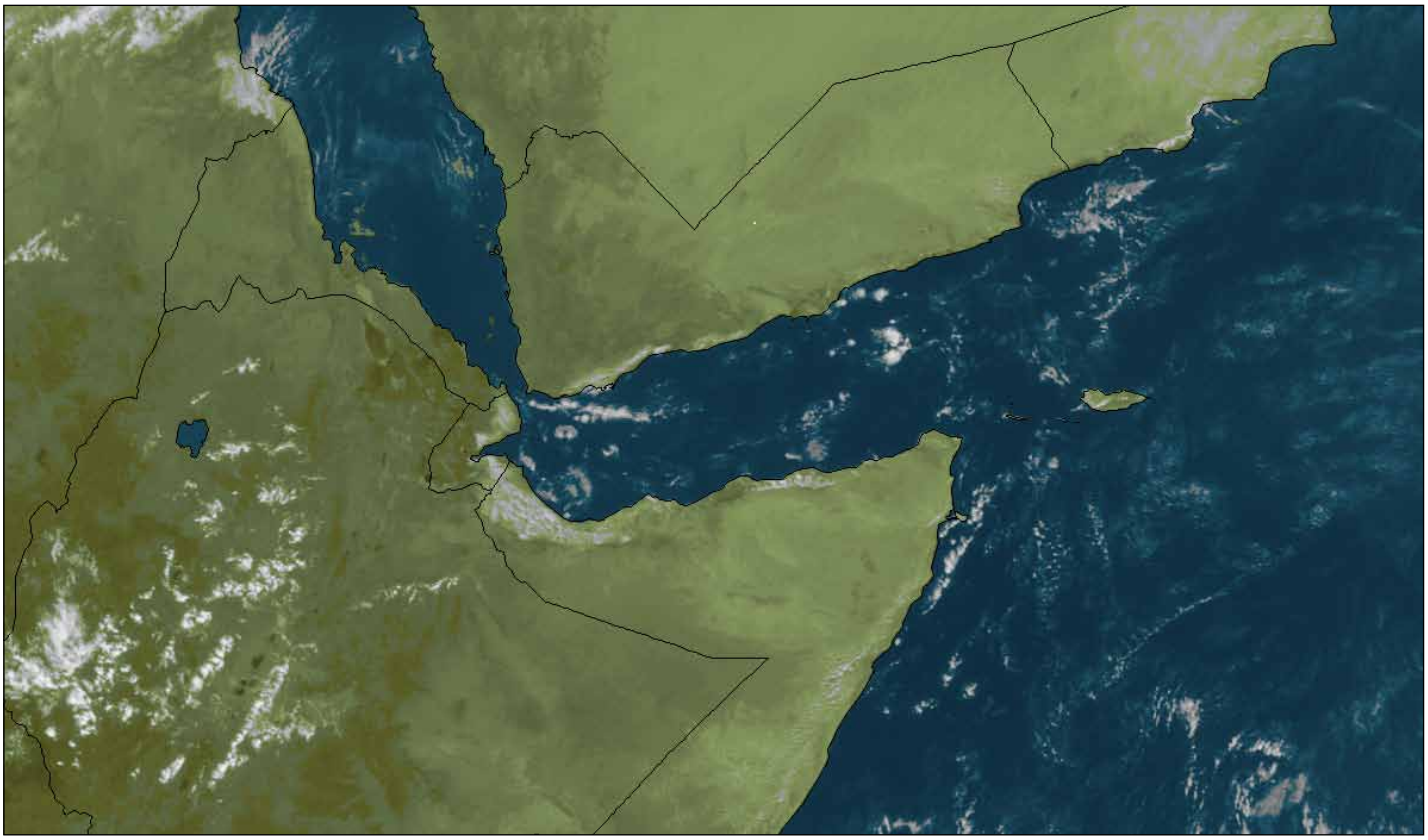


Figure 1 - This a visible wavelength Meteosat 7 image of the Red Sea and the Horn of Africa was received at 10:00 UT on January 29, 2014. The island in question is to the right of the image, to the east of Somalia.

Figure 2 - This is a January 7, 2007 *Landsat* image showing the island in the Indian Ocean which is the subject of the Quarterly Question.

QUARTERLY QUESTION

Francis Bell

GEO Quarterly 40 contained a question relating to the date when the current EUMETCast S1 service will cease. EUMETSAT have issued many notices stating that their transmission service will soon switch from S1 to the S2 VCM standard, and stating that the final date for S1 transmission will be December 31, 2014. There will be an overlap of the new and old transmissions but the definitive plan is for the old S1 service to end in December 2014 and I hope GEO readers are aware of this. Hence, the answer I was looking for was December 31, 2014. Correct answers were received from:

- John Morris (UK)
- Peter Hardy (UK)
- Frank Skillington (UK)
- Ap van Weeren (Harlingen, The Netherlands)
- Elmar Bogles (Brunssum, The Neterlands)

Quarterly Question 41

This question relates to an island in the Indian Ocean, off the Gulf of Aden, which I often see in images taken by Meteosat 7. This satellite is currently located over the Indian Ocean and provides regular images of this part of the world via retransmission by *EUMETCast*. The image shown in Figure 1 shows the Horn of Africa plus part the Indian Ocean, with the island in question well to the right of the image, in the 'jaws' of the Gulf of Aden. Figure 2 shows more detail of the island.

Although, in my travels, I have managed to visit four island groups in the Indian Ocean, until recently I knew little about the island in question and I am experiencing a learning curve relating to this island, which in some ways is unique in the world. Instead of being of volcanic origin like almost every other oceanic island in the world, this island is of continental origin. It was split from mainland Africa at the time tectonic movements of the Earth's crust opened up the Red Sea and the Gulf of Aden.

The question is straightforward:

'What is the name of this island and to which country does it belong?'

I will accept variations in the spelling of the island's name, even in Arabic. So that we can all share them in your answer please include three or four lines identifying some unique character of the island: anything biological, geological, historical or political will be of interest. If there a GEO member who has been to this island please get in touch.

As an aside, I note that the island is located in an area frequented by Somali pirates, hence there will international naval activity in the seas around it aimed at protecting merchant shipping. I don't know, but perhaps the island is being used as a base for these naval ships. I had a personal experience of Somali pirates when, about two years ago, pirates approached the ship on which I was a passenger. However, defensive manoeuvres on our part, and other measures, were enough to discourage the pirates and there was a happy ending.

The GEO Report

continued from page 2

NOAA

You may have read on page 37 of the December 2013 *Quarterly* the notice that NOAA is undertaking changes in relation to its **Satellite Direct Readout** services. NOAA has been invited to our symposium of April 26 this year but they are unable to attend. As an alternative, I remain in touch with NOAA, and perhaps, at the symposium, I will be able to give a report on their behalf, relating to the future of their direct readout services.

Knowledgeable Members

I know we have many members in our group who are far more knowledgeable about technical issues and satellite reception than I am. At a time when technical changes are imminent, please keep in touch with GEO's management, because we all need to benefit from each other's knowledge and experiences: your contributions and advice will be very valuable, perhaps shortening or focusing our own testing. Any experiences with the TBS 5925 or TBS 6928 receivers would be very helpful. Also, reports relating to the use of SDR for HRPT or LRIT reception would be welcome.

Forthcoming Events

Sunday **April 13** - The West London Computer and Electronic Show. GEO will have its usual stand demonstrating direct satellite reception.

Saturday **April 26** - GEO's own symposium. Please refer to page 3.

On **March 8** and **May 10**, our Dutch friends are holding their regular one day Saturday meetings in Utrecht. For details visit their web site at

www.kunstnanen.net

Missing Quarterly?

If your copy of GEO Quarterly has failed to arrive by mail within four weeks of the advertised publication time, please contact our Membership Secretary, who can arrange for a replacement copy.

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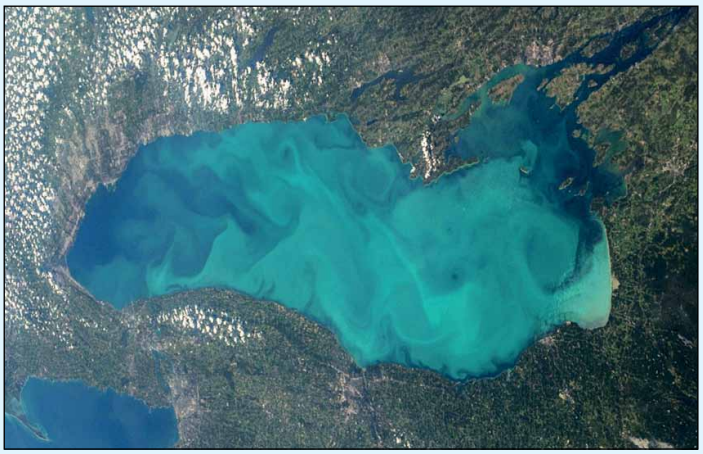
Lake Ontario 'Whiting' Event

A NASA Earth Observatory Report

These two images of Lake Ontario, both dating from August 24, 2013, highlight an unusual phenomenon. What at first glance appears from above to be a phytoplankton bloom across the lake surface is in fact a *whiting event*, a phenomenon that often occurs in late summer. Phytoplankton can of course produce stunning colour changes like this, but scientists working on the water in the area confirmed that this was instead a whiting event.

Whiting events are caused by changes in temperature, which allows fine particles of calcium carbonate to form in the water column. Increased photosynthesis by phytoplankton and other microscopic marine life can also reduce the amount of carbon dioxide in the water column, changing the acidity and allowing calcium carbonate to form. In this instance, it's these particles of calcium carbonate that are causing the characteristic 'whiting' of the water colour.

The image below was acquired by NASA's Aqua satellite, and the photograph at right taken from the International Space Station, both on August 24.



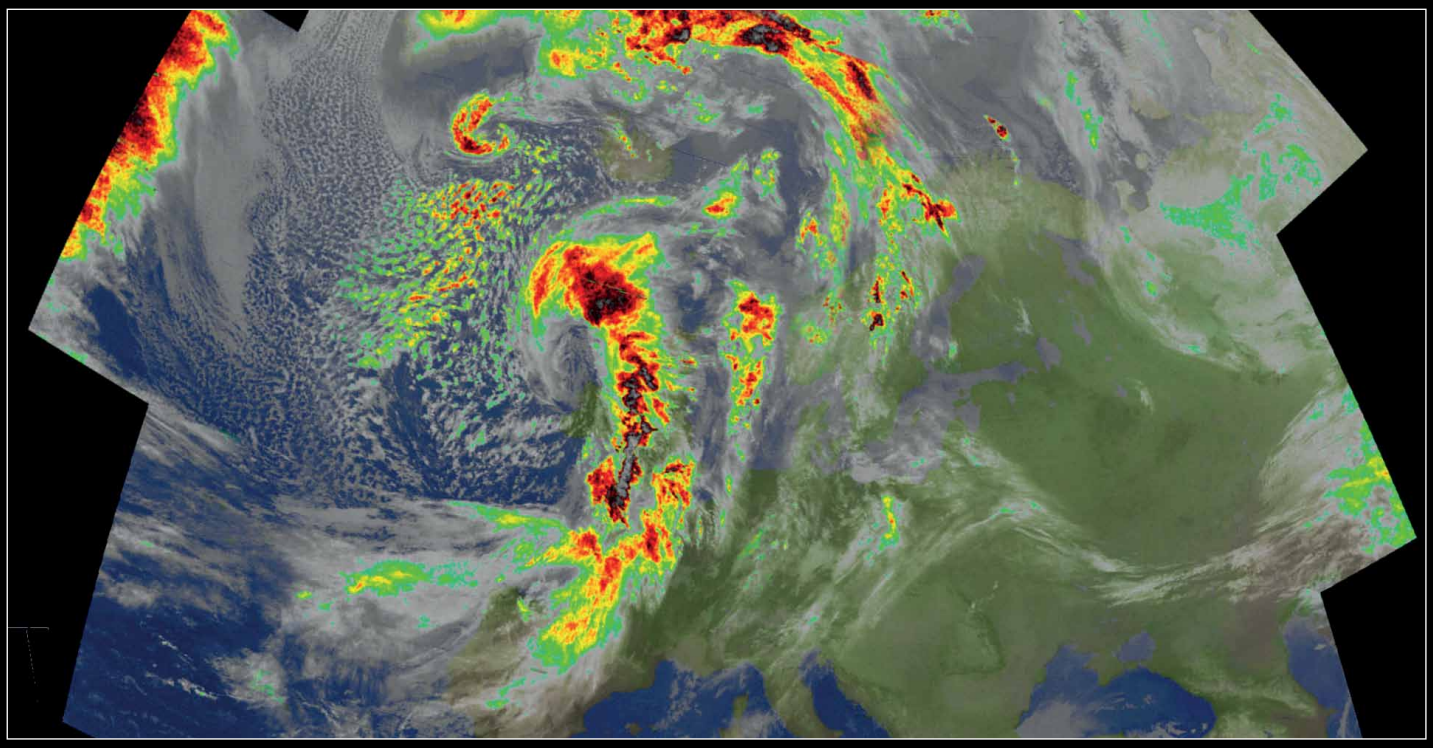
Astronaut photograph ISS036-E-35635 showing Lake Ontario
ISS Crew Earth Observations experiment and
Image Science & Analysis Laboratory, Johnson Space Center

MODIS image of the Lake Ontario 'whiting' event viewed by NASA's Aqua satellite on August 24, 2013.

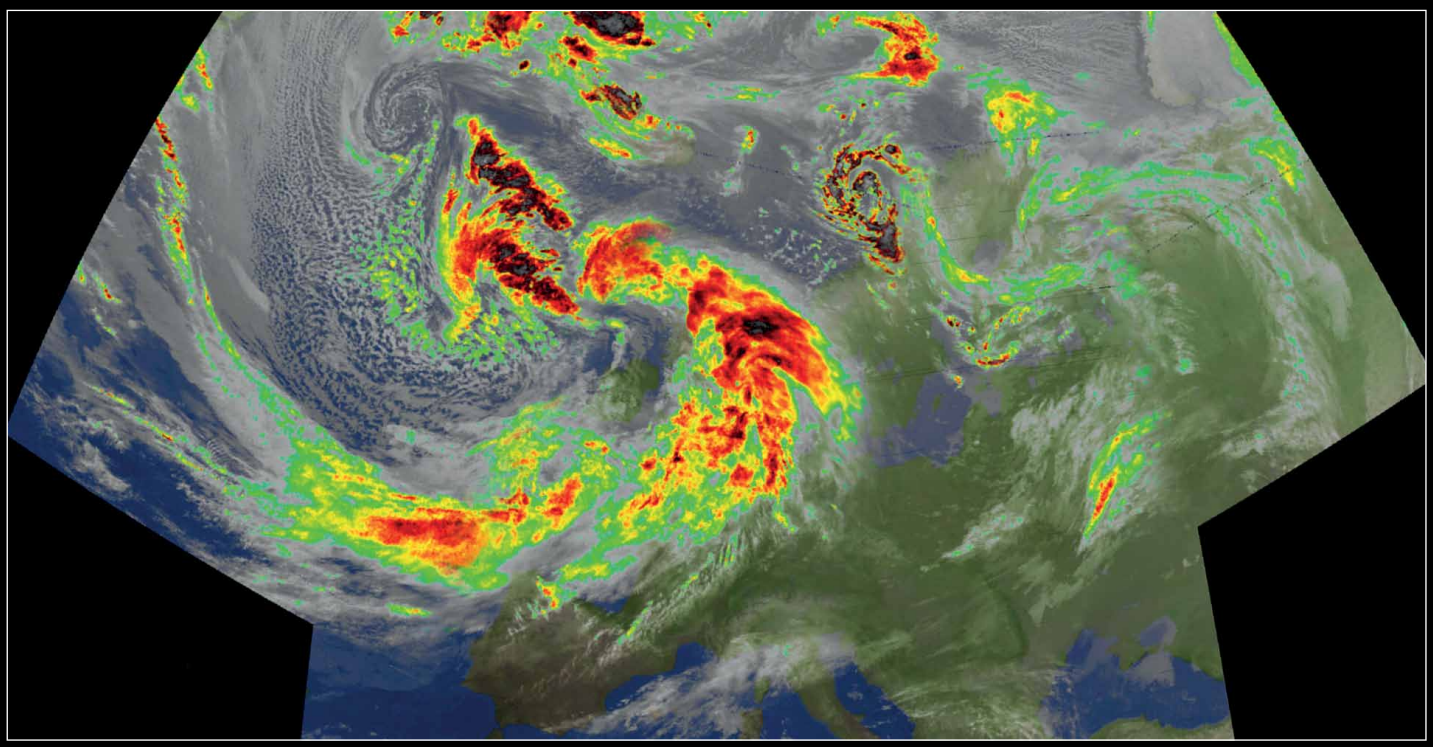
December Storms Batter Europe

Andre T'Kindt

Andre T'Kindt, a GEO reader based in Ronse (Belgium), captured multiple APT images from the NOAA satellites during last year's December storms, and compiled them into wide ranging composites. Below are two of his images, showing the amazing extent and ferocity of there Atlantic weather systems.



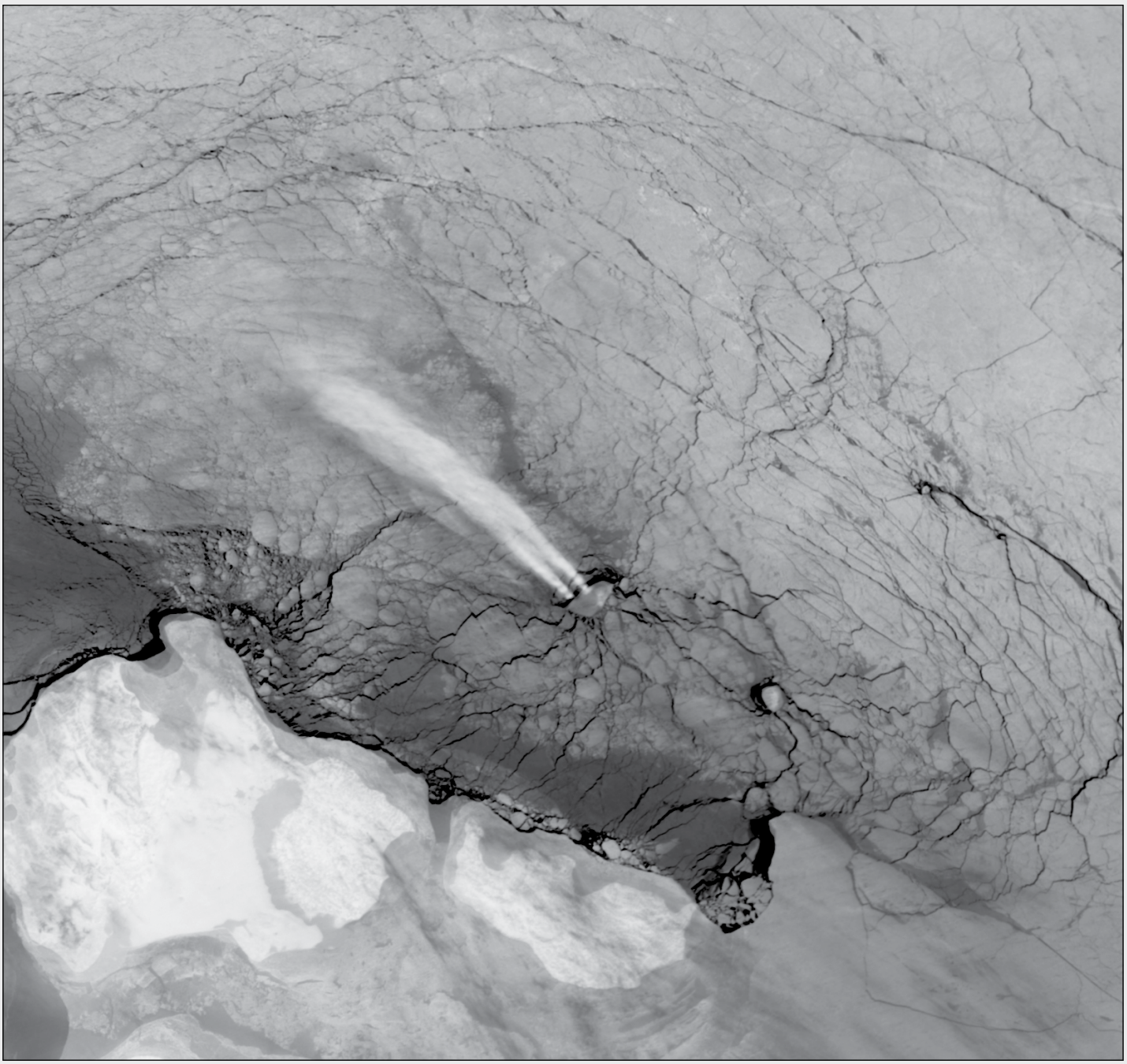
It's December 18, 2013 as yet another winter storm batters western Europe. This MCIR-precipitation composite was created from infrared images from eight different satellite passes, some from NOAA-15 and others from NOAA-18. Winds of up to 140 kph hit western parts of the UK, driving torrential rain. The darker red colours indicate where rainfall was greatest.



It's now December 23, 2013 and hurricane force winds return to the British Isles and western Europe. Thousands of people in England were forced from their homes by flooding, while in France quarter of a million homes were deprived of power in Brittany and Normandy. In the Netherlands, the Eastern Scheldt storm surge barrier was closed for the first time in six years and there was flooding in Dordrecht and Rotterdam. The winds also forced the closure of the Oeresund road-and rail bridge which links Copenhagen in Denmark with Malmo in southern Sweden.

Bennett Island

A NASA Earth Observatory Report



Since the dawn of the weather satellite era, frequent tongues of high, short-lived cloud, often stretching several hundred kilometres, have been observed streaming from tiny, 150 km^2, Bennett Island in the Russian Arctic. These clouds remained a mystery until 1992 when a joint Russian-American research team flew over the area and found they were being formed when air flow over the tiny island was being elevated to higher-than-usual altitudes.

Situated well north of the Arctic Circle (76.5°N, 149°E), Bennett Island rises to 420 metres above sea level, sufficiently high to disturb air flow in the area. When winds blow from the southeast, moist air near the surface is ramped up into the atmosphere, creating waves which propagate upwards. When this rising, moist air reaches cold, dry upper layers of the atmosphere, it condenses into cloud-forming ice crystals at an altitude of about three kilometres.

The Visible Infrared Imaging Radiometer Suite (VIIRS) on the **Suomi NPP** satellite captured this image of the Bennett Island cloud plume on February 14, 2013. This long wave (thermal) infrared image highlights the relative temperatures of the water, ice, and rising air. Cool areas such as the sea ice appear gray-white, warmer areas (open water) are dark. Brightest white of all is the cloud plume, as the moist, rising air is cooled far below the near-zero temperatures of the ice and open water.

NASA Earth Observatory NPP image by Jesse Allen

Cover and Full Page Image Details

Front Cover

The power of *Typhoon Haiyan* is evident in this **Metop A** pass acquired on November 8 last year. The image was shows Haiyan at its strongest as it tore across the Philippines, causing almost incalculable damage and taking thousands of lives. You can read a short report on this event on page 21.

Image: NOAA CLASS Archive
Processing: HRPT Reader (Vegetation tab) / Photoshop

Inside Front Cover

This image was taken in the aftermath of the *Great Storm* that swept across southern England, The Netherlands and parts of France overnight on November 27/28, 2013. This scene comes from the 10:12 UT pass from **Metop A**, and shows the departing storm making its way towards Scandinavia.

Image: NOAA CLASS Archive
Processing: HRPT Reader

Inside Back Cover

This **Metop B** image dating from November 12 was sent in by Mike Stevens, who was impressed by the view of New Zealand, surrounded by a variety of attractive cloud systems.

Image © EUMETSAT 2013

Back Cover

The first snows of winter arrived in Scotland in the early hours of November 19, but the skies rapidly cleared during the morning. This MODIS image from NASA's **Terra** satellite captured the moment, with the northwest highlands festooned in new snow.

Image: LANCE-MODIS/NASA/GSFC
Processing: SmoothMODIS / Photoshop

Because of the shortage of textual material in this issue, we have maintained the usual page count by displaying more full page images than normal. Some come from readers, for which we are most grateful: many more have been downloaded from NOAA and NASA image archives.

Page 11

David Taylor spotted this attractive image from NOAA 19 on January 11 this year, showing an almost cloud-free British Isles prior to the onslaught of the next winter storm. This is the *vegetation* interpretation created using *HRPT Reader* software.

Image © EUMETSAT 2014

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This is a NOAA 19 APT image sent ion by Andre T'Kindt from Ronse in Belgium, acquired from the 13:28 pass on February 7. Following weeks on end of gales, rain and high seas, a ridge of high pressure provided a day of sunshine and welcome relief from the ongoing saga of misery and despair. But it was short lived: the next depression looms ominously over the Atlantic Ocean.

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This **NOAA 19** image was acquired from Havana, Cuba by Raydel Abreu Espinet at 19:13 UT on January 6, 2014. He used a homebrew QFH with preamp, an RTL-SDR dongle, SDR# with Orbitron DDE support for doppler (wide-FM 40 kHz), and recorded the audio directly with *WXtoImg*. The final image was created by decoding the WAV file with *SatSignal*.

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Japan's **MTSAT2** captured this fine image of Australia at 03:32 UT on January 8, 2014.

Image: FengYun Satellite Data Center
(http://satellite.cma.gov.cn/)

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Anthony Lowe created this remarkable image of the January 26 storm that lashed the British Isles, by combining **NOAA 19** channel-2 APT images from three passes of the satellite, using the *WXtoImg* software package.

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In winter's embrace, frozen Newfoundland shows well in this **Terra** MODIS channel-1 image acquired on January 6, 2014. Channel-1 shows up snow and ice particularly well, and highlights swirls of sea ice north of Newfoundland.

Image: NASA/GSFC/LAADS Web

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This **Terra** MODIS image dating from February 3, 2014 is interesting on a number of counts. Prominent in centre stage is the Black Sea, with an unusual diagonal streamer of cloud pointing almost directly towards the *Olympic Winter Games* city of Sochi on its northeastern coast, where it nestles below the foothills of the Caucusus mountains. To the north, the Sea of Azov, tucked behind the Crimean peninsula, can be seen totally icebound. The inset annotated image pinpoints the locations of Sochi Olympic Park and the Skiing venues.

Image: LANCE-MODIS/NASA/GSFC

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This **Terra** MODIS channel-2 visible light image captured Russia's far eastern Kamchatka peninsula almost totally cloud free at 00:55 UT on December 11 last year. The low elevation of the sun illuminates the eastern slopes of the snow-covered mountain ranges, displaying the volcanic landscape in stark relief.

Image: NASA/GSFC/LAADS Web

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Taken from the same **Terra** pass as the previous image, this 250 m/pixel segment highlights several of the great Kamchatka volcanos: Shiveluch in the north, the Klyucheveskaya complex at centre (venting a thin stream of steam eastwards) , and Tobalchik to the south.

Image: NASA/GSFC/LAADS Web

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China's **Feng Yun 2F** geostationary satellite acquired this high-resolution (1 km/pixel) image of *Typhoon Haiyan* at 05:30 UT on November 8, the day it made landfall over the Philippines, with tragic result.

Image: FengYun Satellite Data Center
(http://satellite.cma.gov.cn/)

Page 43

This **Envisat** image of the southern White Nile as it courses through the Sudan dates back to June 26, 2011, and has been kindly provided by Francis Breame. The confluence city of Khartoum, where the Blue Nile joins the river following its journey through Ethiopia, lies just south of the point where the river veers to the right at the start of a wide anti-clockwise loop.

Image © EUMETSAT 2011

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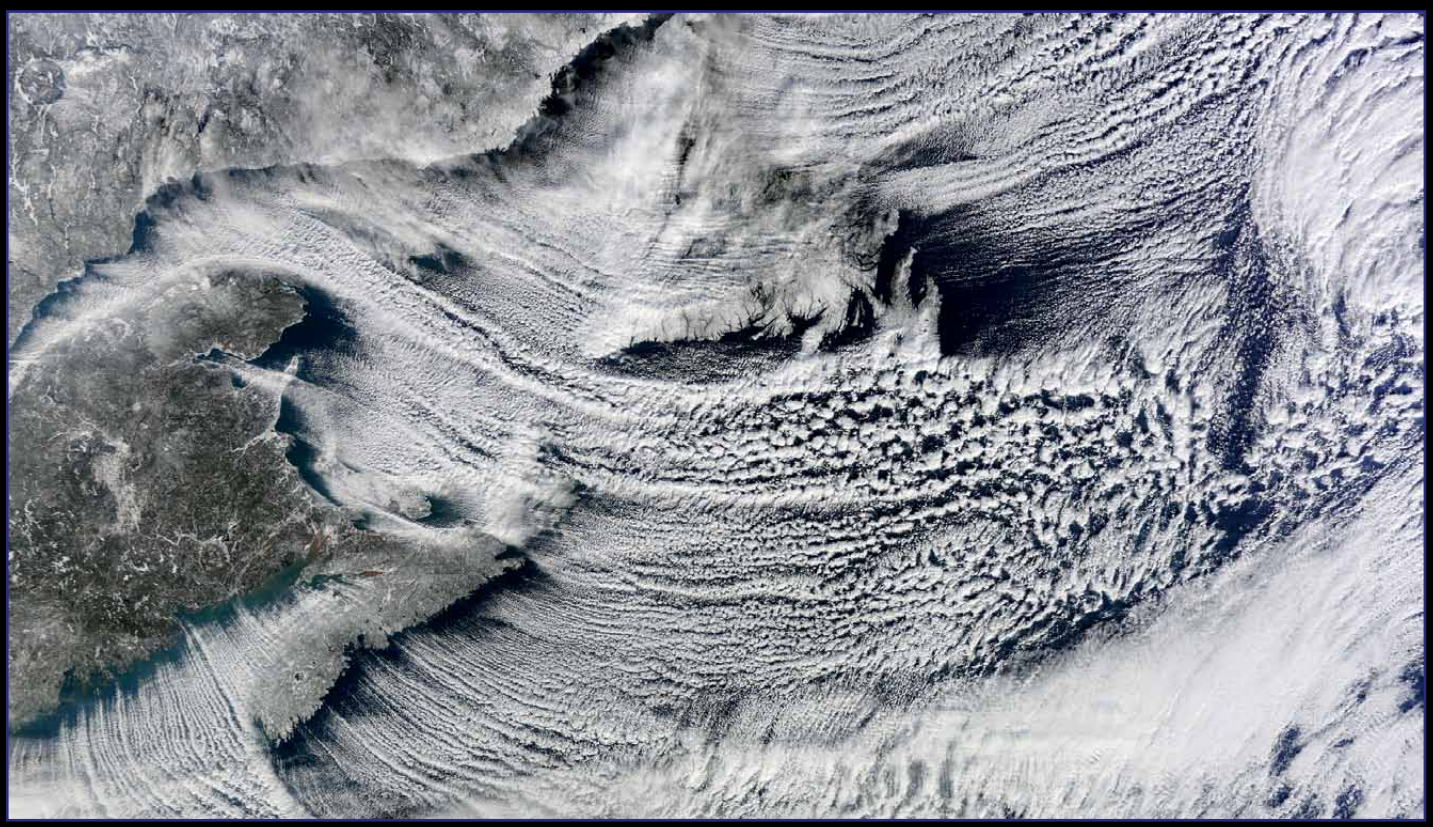
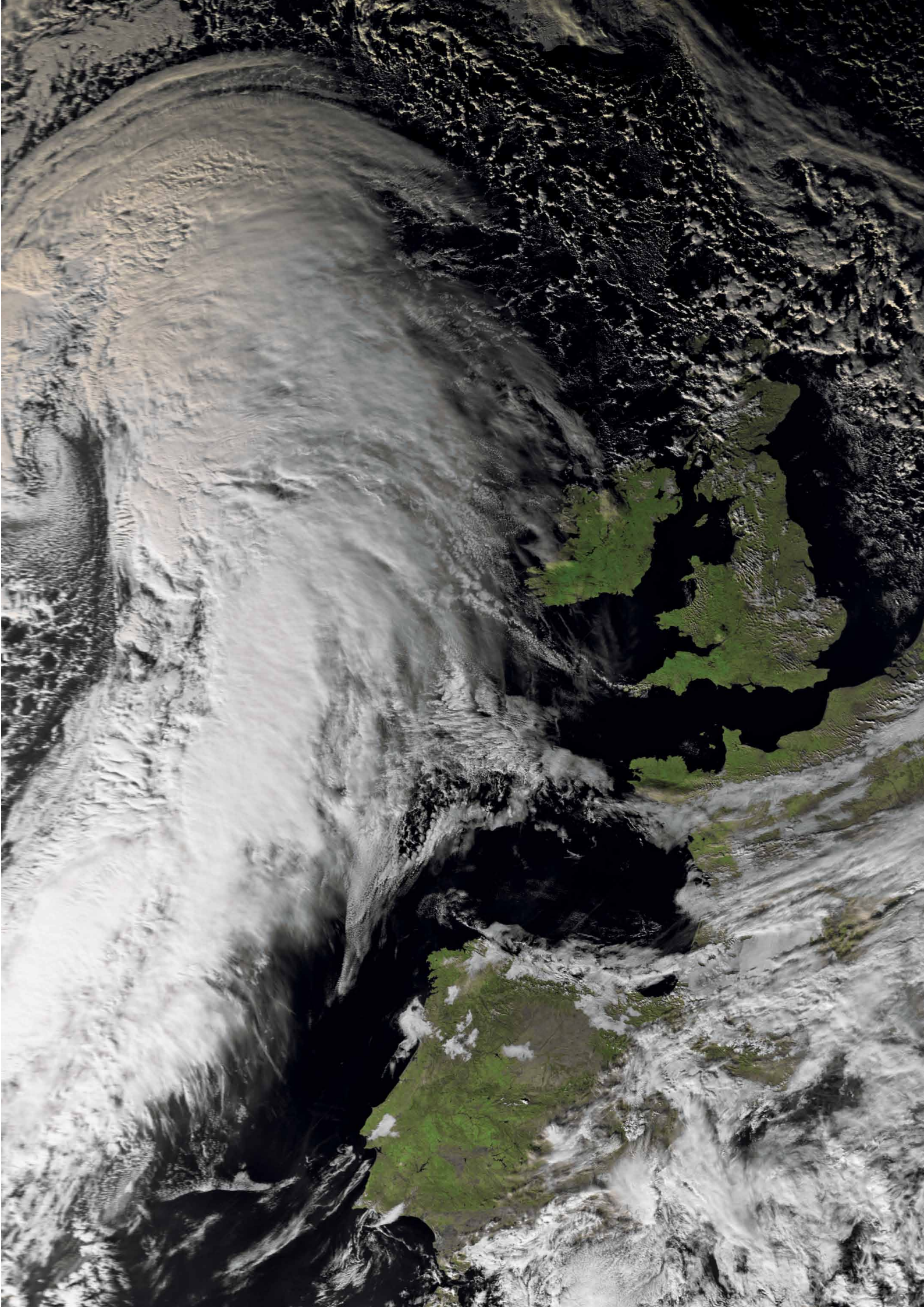
John Tellick acquired this superb **Metop-A** image via *EUMETCast* on February 6 this year, showing yet another intense storm drenching England. The situation, with rain falling on already flooded terrain in Somerset, had by now become so serious that inhabitants in three villages had been advised to evacuate their properties.

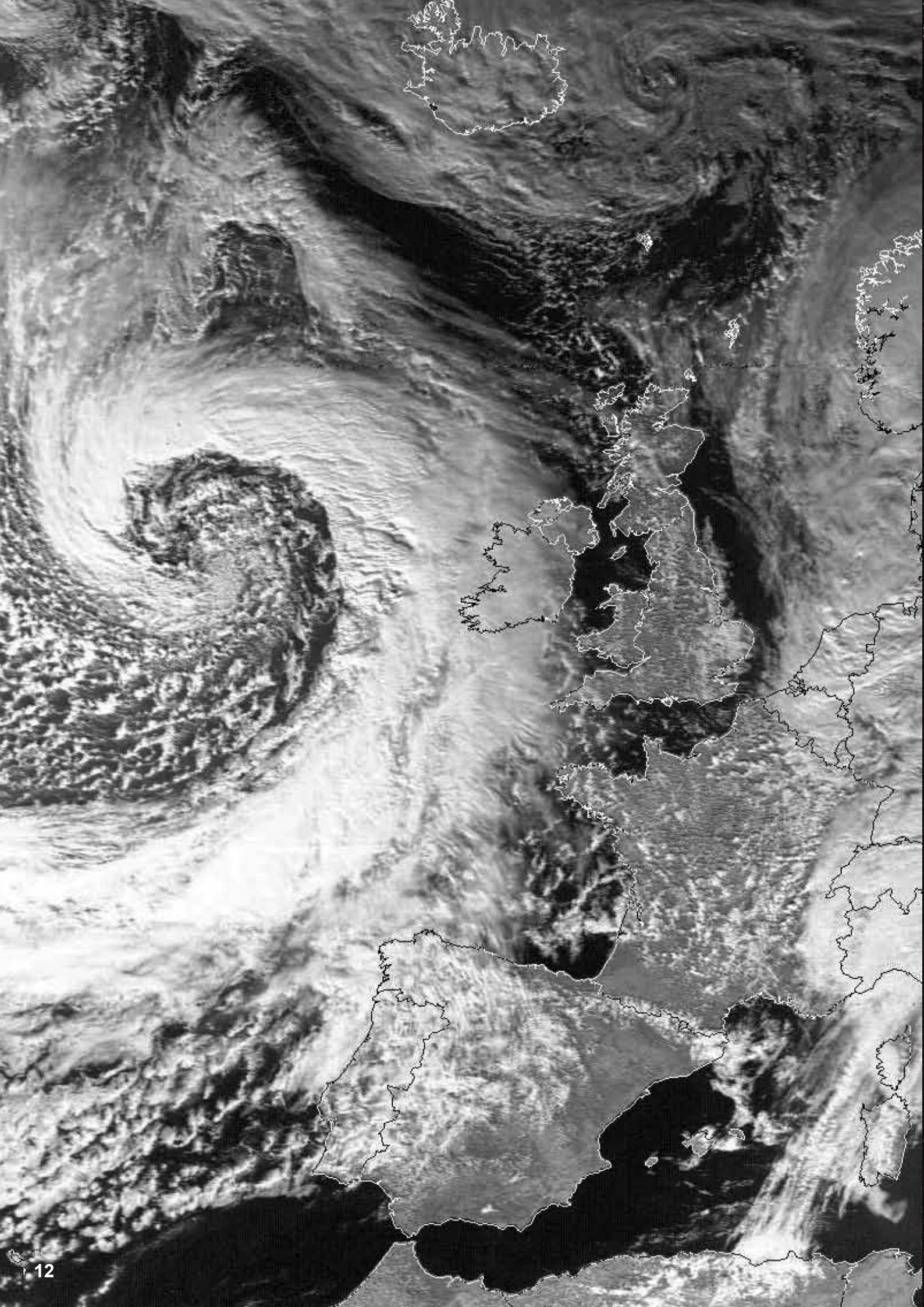
Image © EUMETSAT 2014

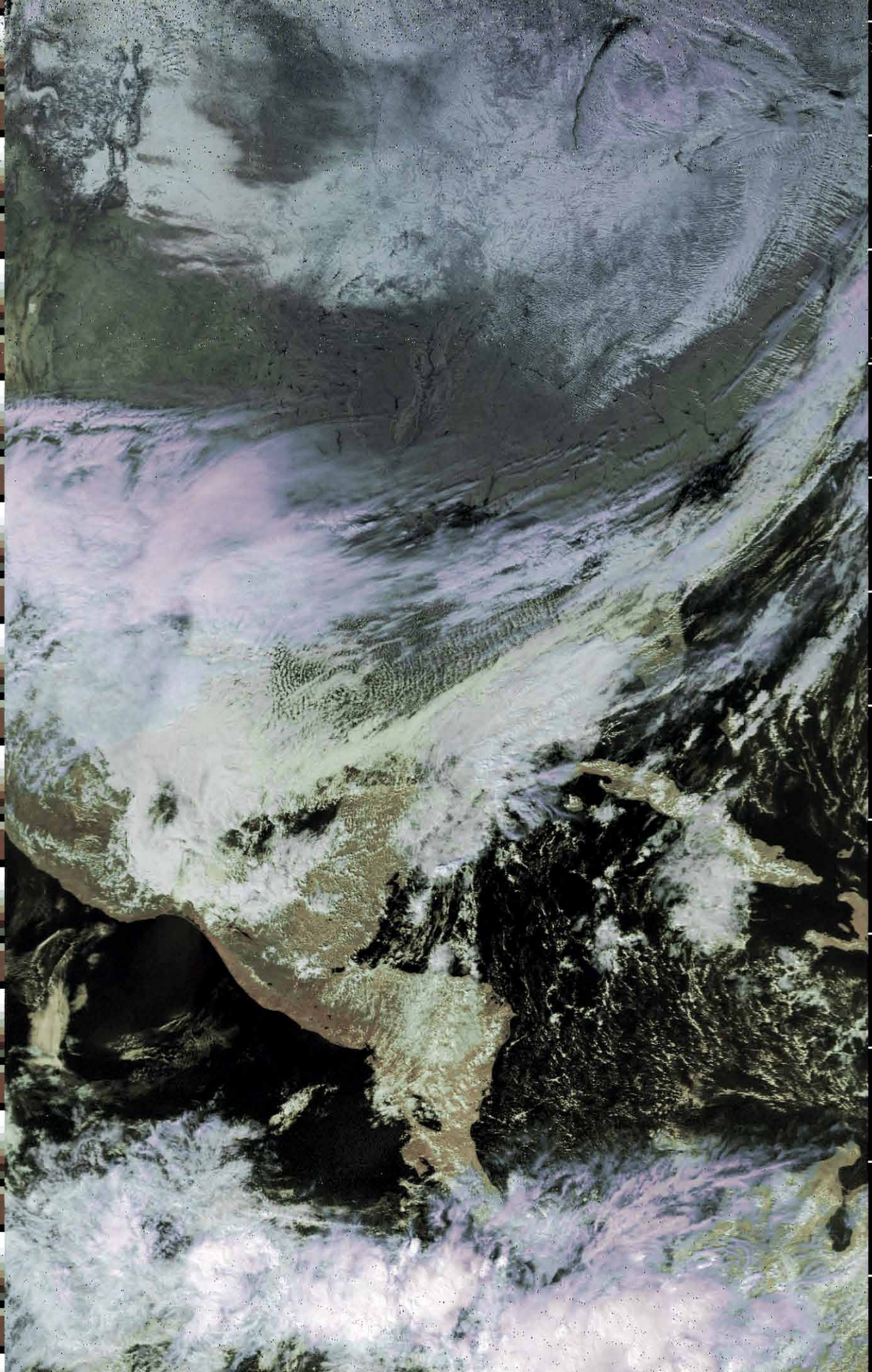
This Terra MODIS image acquired on February 3, 2014 shows the Aral Basin firmly in the grip of winter. The two great rivers bounding Kazakhstan's Kyzyl Kum desert, the Amu Darya and Syr Darya, show clearly against their snow-covered backdrop. The Syr Darya is the river that replenishes the North Aral Sea.
Image: LANCE-MODIS/NASA/GSFC

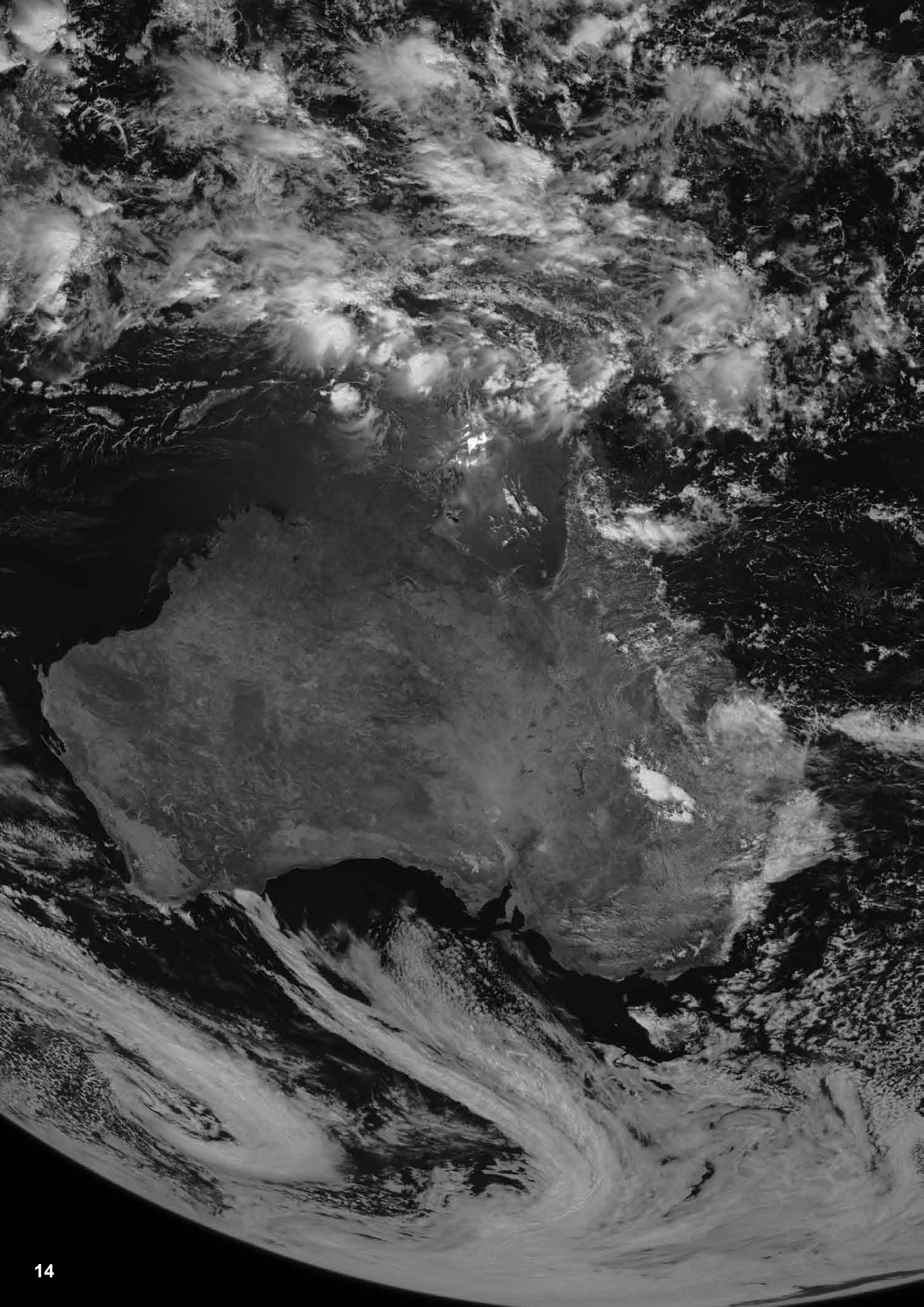


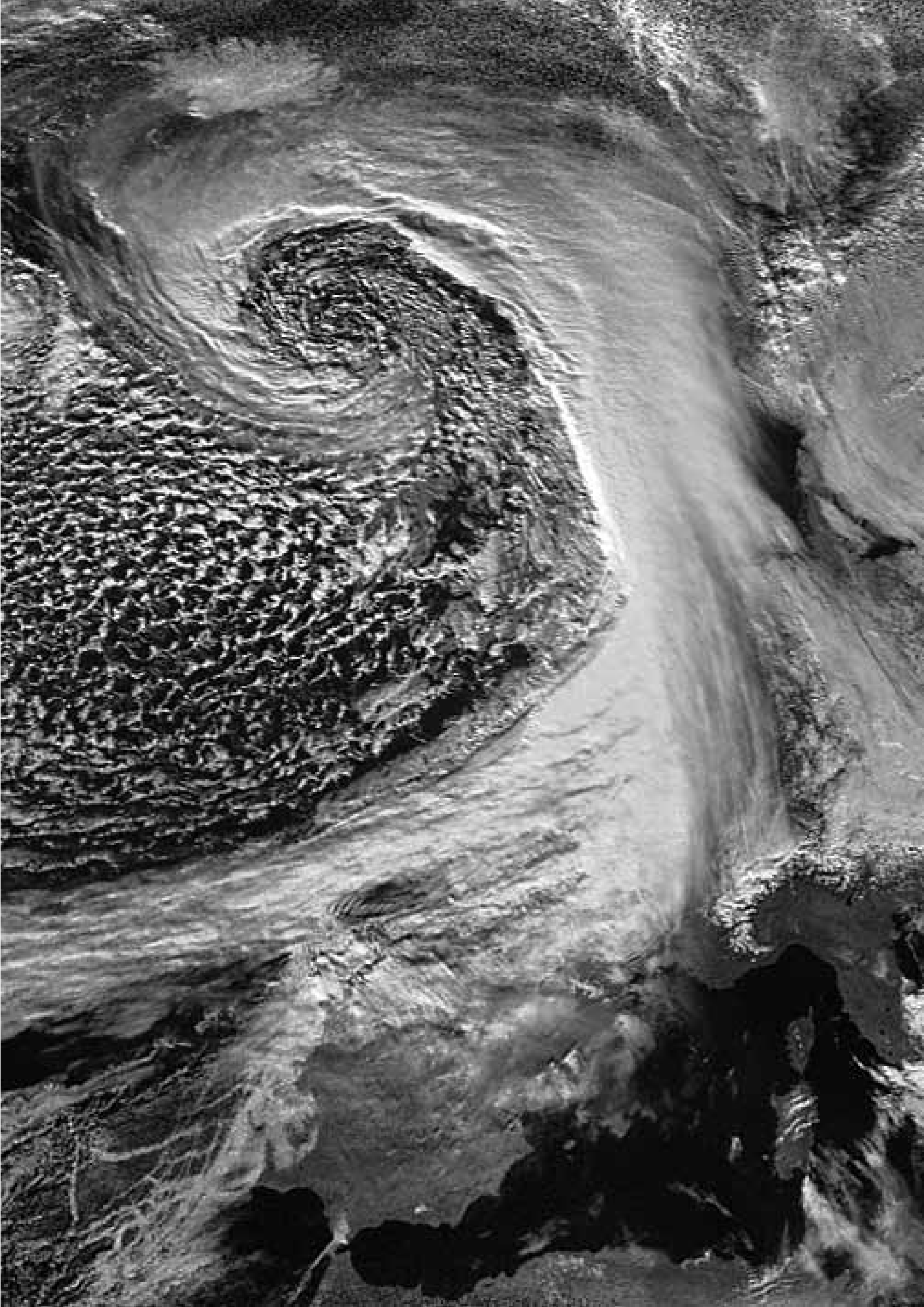
This Terra MODIS image acquired on December 14, 2013 shows a mass of cloud streets debouching from the Gulf of St Lawrence, into the Atlantic Ocean
Image: LANCE-MODIS/NASA/GSFC











Software Defined Radio and APT Reception

Francis Bell

This article is more a diary relating to my experiences with SDR than a technical report. Nevertheless, I hope it will encourage others who may be contemplating SDR reception for the first time to pursue this exciting new dimension of radio reception.

Over the past year or so I have been reading reports about SDR in *GEO Quarterly*, as well as in such publications as *RadCom* and *Wireless World*. I am also a member of AMSAT-UK, and try to keep up-to-date with their activities via their quarterly publication, *Oscar News*, which has recently been informing its membership about an SDR dongle specifically designed for the reception of radio amateur satellites using the 2-metre and 70-centimetre bands for their communications. Additionally amateur contact with the ISS also uses 2-m and 70-cm.

I certainly admit to being something of a 'Luddite' when regarding small changes in any technical system. My mental attitude tends to tell me: 'If this works satisfactorily at the moment, why bother with something totally new?' However, sometimes a quantum leap is necessary and the advertised technical advances of SDR motivated me to try it for myself.

The Dongles

Because of my long association with AMSAT-UK, I was aware of the *FUNcube* SDR dongle which had been designed by Howard Long, one of their members. Howard also organised the production and sales of the *FUNcube* both in the UK and worldwide. *Oscar News* often carries advertisements by Martin Lynch and Sons [1] for this product, which is called the **FUNcube Dongle Pro+**. The rationale behind the *FUNcube* part of the name relates to its originally intended use for radio reception from the small, 30 cm cube, amateur radio satellites (*CubeSats*) which transmit on the 2 m and 70 cm amateur radio frequencies.

Figure 1 - The two dongles for APT/SDR tested by the author

The frequency coverage of the **FUNcube Dongle Pro+** stretches from 150 kHz to 1.9 GHz, with one small gap from 240 MHz to 420 MHz. This means that it is capable of covering all the frequencies I am interested in for the reception of:

- APT
- Amateur satellites and the ISS on 2 m and 70 cm
- The potential for weather satellite HRPT close to 1.9 GHz.

Realising this, I just had to buy one of these dongles and try it for myself.

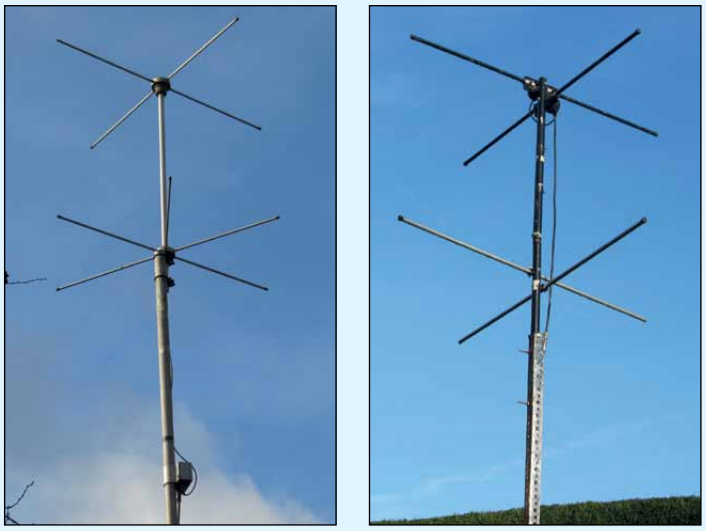


Figure 2 - The two antennas used by the author, with preamp (left) for the FUNCube Pro+ and without a preamp for the DVB-T+DAB+FM Dongle.

Having purchased my first specialist dongle, I was anxious to try one of the many more commercial dongles which I was told are widely available. I think these commercial dongles are mass-produced for the reception of television, but they also cover a wide radio spectrum, much broader than just a few selected domestic TV channels. I had heard that these dongles can be purchased from electrical shops or even supermarkets but I could not find one available locally. A friend directed to me to the website of a dealer in Guernsey, and I used this to order a **DVB-T+DAB+FM** dongle which duly arrived just two days later. Further details about sourcing this dongle appear in Note 2 at the end of this article.

Figure 1 illustrates the two dongles which were used during my introduction to SDR. Individually they easily fit into a single USB socket but, because of their body thickness, they may restrict the use of adjacent USB sockets. The *FUNcube Pro+* comes with an SMA socket while the *DVB-T+DAB* model has a short lead terminating in a standard 75 ohm TV socket. It may be noted that other dongles currently on sale in the UK come with a variety of short cables and connectors.

Antennas used with the SDR Dongles

I noticed that the software for the **FUNcube Dongle Pro+** has a facility for powering an antenna preamp, which was perfect for my established antenna with preamp, purchased about 20 years ago from *Dartcom*. This is my regular APT antenna, and although quite close to the house, it has a good view of the sky and can receive APT signals from Cairo to Newfoundland (although not in the same satellite pass). However, without powering the preamp, the signal from this antenna is almost zero (the coax lead was about 12 m long). This antenna was used for testing both SDR dongles and received worthwhile images a little closer to the horizon than a second antenna located in my lawn.

The **DVB-T+DAB+FM** dongle does not have the facility to power a preamp, so to test it I erected a second antenna in a temporary location, at head height, on my front lawn during SDR testing. This antenna is similar in design and performance to the one currently being sold by the *GEO Shop*. There was no preamp associated with this antenna as it was

intended to represent a typical crossed dipole system but without being in a perfect position. The coax lead was about 10 m long. This antenna was also used to test both SDR dongles.

This gave me four configurations: using the antenna with no preamp for each dongle, and also using the established antenna connected to its preamp with each dongle. When using the *DVB-T+DAB+FM* dongle with the antenna with preamp, I used a Bias-Tee unit to power the preamp, and this worked perfectly well [3].

Software

Neither of the two dongles came with its own software, which therefore had to be downloaded from the Internet. In the case of the **FUNcube Dongle Pro+,** I was given assistance in selecting the correct software during the AMSAT-UK meeting in Guidford, by Carlos Eavis, who downloaded it by following the link to *'FUNcube'* on their website at

http://amsat-uk.org

I was specifically recommended to use the program **SDRsharp** (SDR#), which was duly loaded from

http://sdrsharp.com/

and used during all my *FUNcube dongle Pro+* testing, although I did notice a few weeks later that this dongle also works with other software.

For the **DVB-T+DAB+FM** dongle, the appropriate software was downloaded from the *RTL-SDR Community* website. My understanding for this downloading process was that the site reads the chipset in the dongle and then downloads the correct software. Whatever the exact sequence, the system downloaded the correct software which worked first time. For the protocols of downloading this software see Note 4.

Running the Software

Using either dongle, running the programs was an instant delight. Instead of a conventional radio receiver where preset frequencies are selected one at a time, or using a tuning knob to select a single frequency, with the SDR radio a broad range of radio spectrum activity was revealed in real time either side of the selected frequency. The various screen shots will give some idea of the dynamics of running these SDR programs (figures 4 - 7). There is a graphical, oscilloscope-type display of the incoming signal and a waterfall pattern lasting a few seconds generated by all activity on the selected band. Together, these constitute a beautiful audio-visual picture of the selected band.

Setting the Parameters

The software for SDR allows the setting of many parameters and even now I have not explored all of these. But the following must be set to allow signal reception. It's worth noting that some of the parameters can be changed while the program is running but others require the program to be stopped while adjustments are made, and then restarted

Frequency

The set frequencies for me that were in the 137 MHz range for APT or 88 MHz to 108 MHz for tests using public broadcasting signals. Frequency adjustments are easily made by over typing the displayed numerical frequency shown either at side of, or above, the main screen displayed. Alternatively, using the mouse, the whole of the frequency grid can be moved sideways, thus adjusting the frequency range being displayed on the screen while running the program.

Sound Cards

The dongle's sound card must be compatible with the selected software. For the *FUNcube Dongle Pro+* it was the *FUNcube Pro+* sound card and for the DVB-T+DAB+FM dongle it was *RTL-SDR/USB* sound card.

The correct audio output sound card must also be selected, this can either be used to listen to the audio or to use it as signal source for image display using another computer: alternatively direct the audio to an internal sound card perhaps in another computer for image display.

Figure 3 - The SDR Sharp input panel

Text continues on page 20

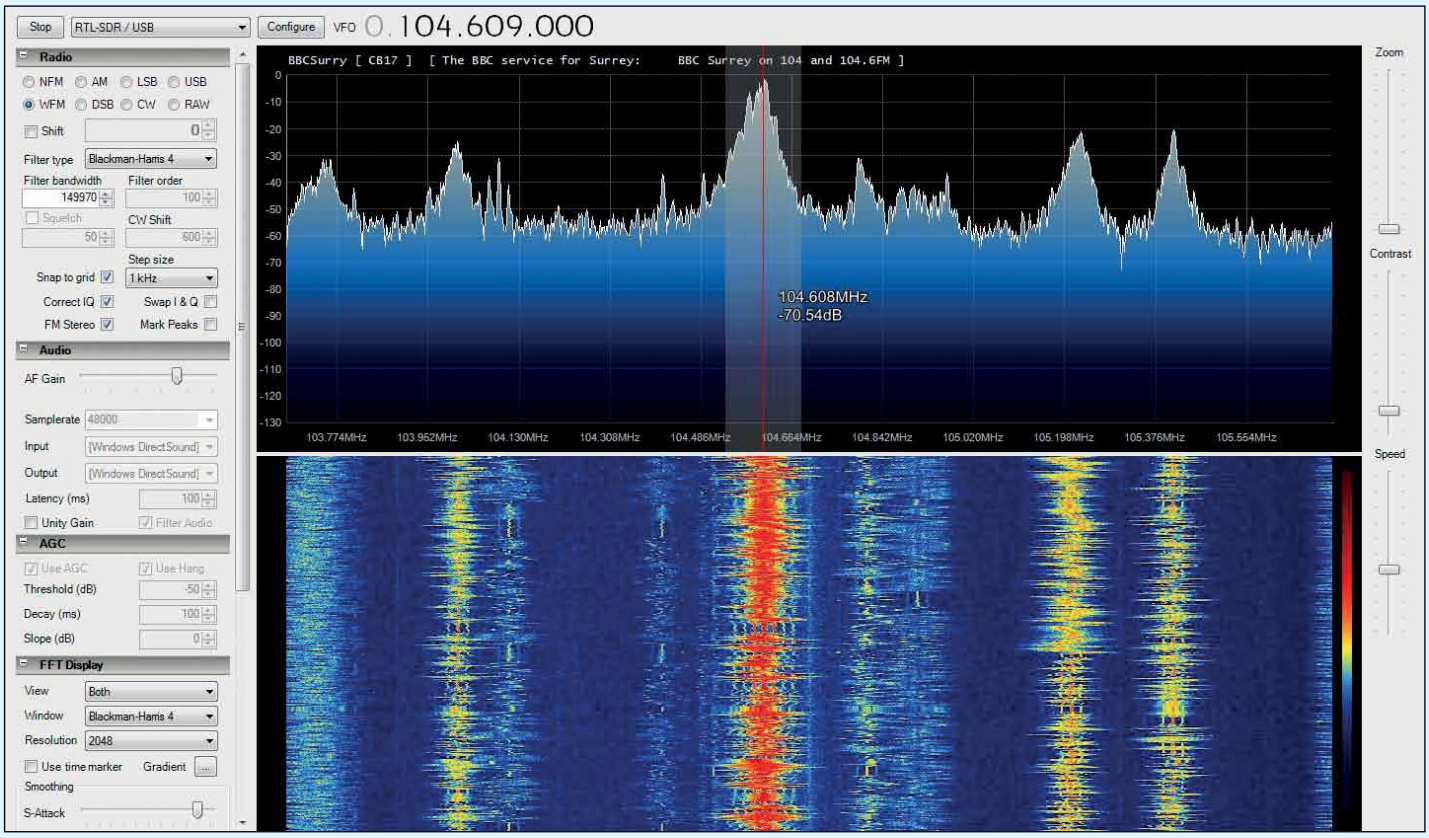


Figure 4

This is a screen shot showing VHF FM public broadcasting using the **DVB –T+DAB+FM dongle**. At my location in SW Surrey I found this very useful for setting up and testing both dongles, as these signals (between 88 and 108 MHz) are available 24 hours a day. Using these signals was much more convenient that having to wait for an APT pass and then quickly trying to set up all the necessary parameters for the dongle's hardware and software. I suspect that similar signals are available in many parts of the world. The frequency of these public broadcasting signals is close enough to the antenna's design frequency of 137 MHz to provide a strong signal into the dongles.

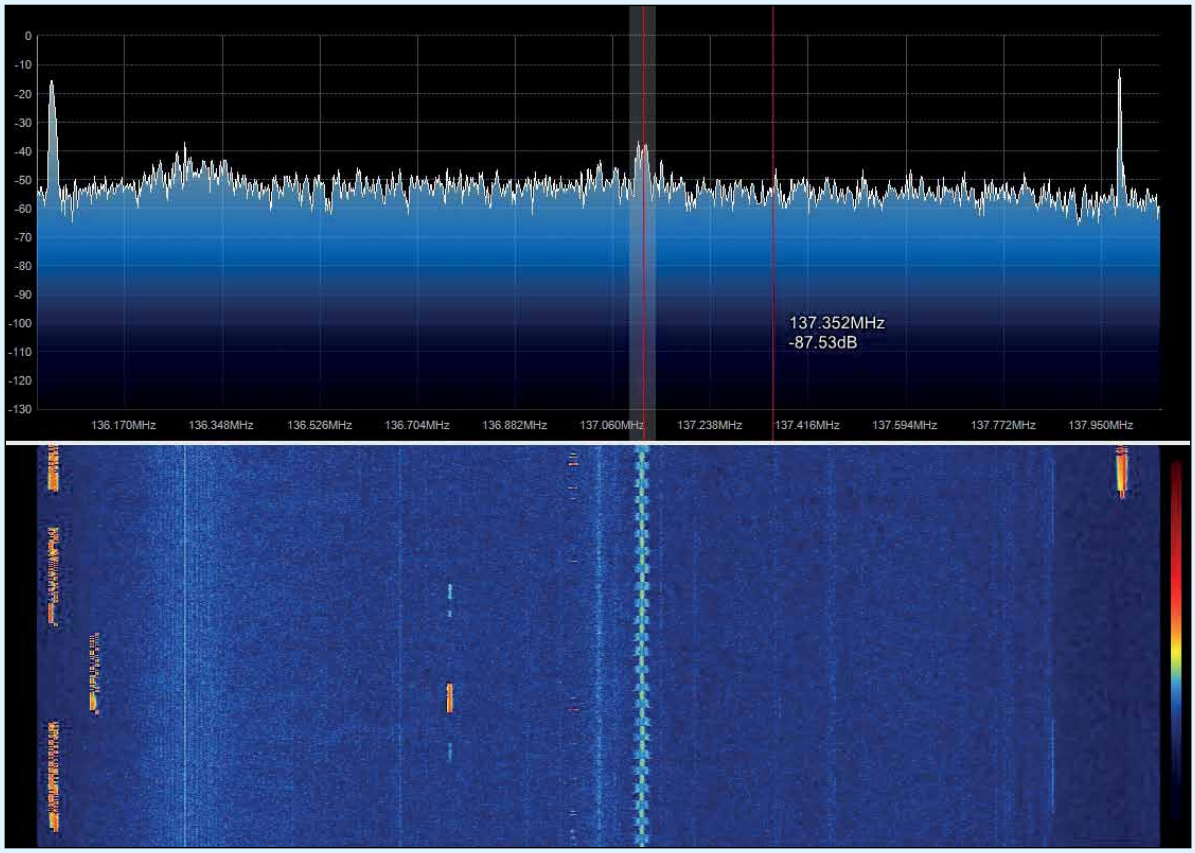


Figure 5

This screen shot was taken during live reception of a NOAA 19 signal using the *DVB-T+DAB+FM* dongle and lawn-located, low level antenna. With the receive frequency set at 137.116 MHz, the display shows the incoming signal while the waterfall identifies other nearby signals detected during the previous 12 seconds, and the intermittent activity of pagers towards 137.9 MHz (close to the NOAA 18 frequency) and also near 137.1 MHz (the down link frequency for NOAA 19).

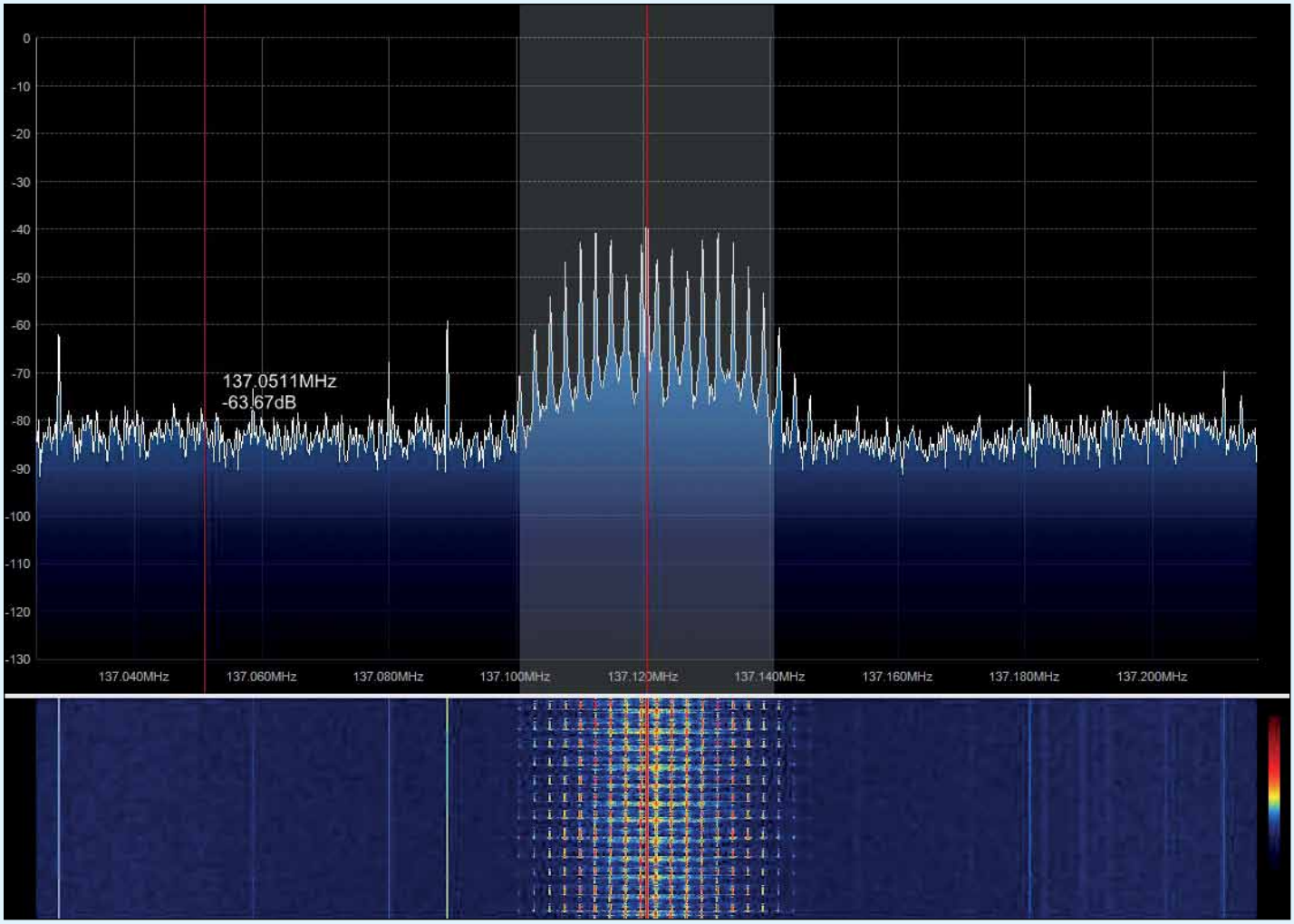


Figure 6

This screen shot was taken while using the *FunCube Pro+* dongle set for an incoming frequency of 137.12 MHz with the filter bandwidth at 40,000 kHz. This time the antenna was the well positioned Dartcom one, fitted with a preamp. APT signals don't come much better than this. Notice that some structure can be seen within the APT signal and that on this occasion there are no pager intrusions.

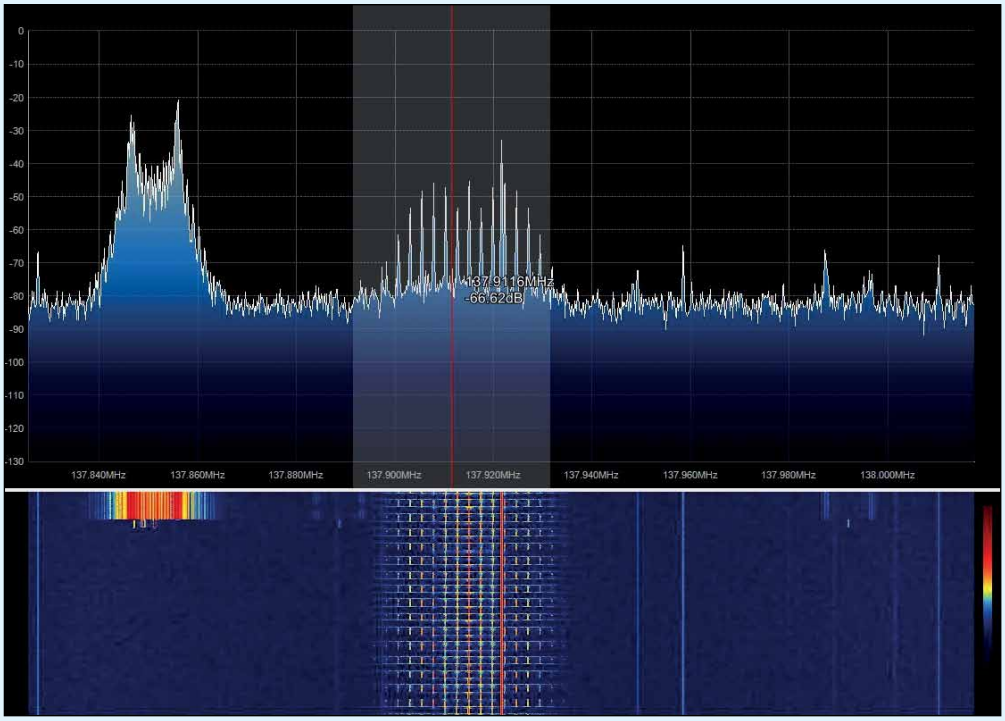


Figure 7

This screen shot shows a NOAA 18 APT signal centred at 137.91 MHz, recorded using the *FunCube Pro+* dongle with the *Dartcom* antenna. However, notice the sudden appearance of a strong pager signal at 137.85 MHz which began about three seconds before this screen was recorded. Yet filtering by the dongle was tight enough so that the pager did not interfere with the APT signal. Other APT receivers with less precise filtering may well suffer interference from such pagers.

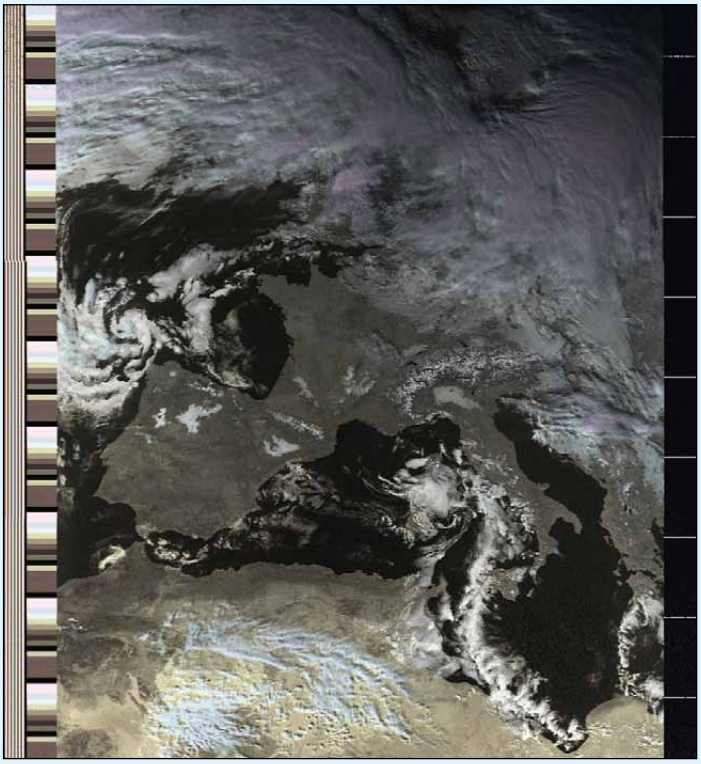


Figure 8

This image is a channel 2+4 colour composite created in *WXtoImg* from a NOAA 19 pass received at 12.48 UT on December 8, 2013. Because of the lack of illumination, detail towards the north of the UK becomes rather dark, so the recording was stopped before the loss of signal. The receiver used was the **FunCub Pro+** dongle with the *Dartcom* antenna. It is interesting to record the snow covered Alps and Pyrenees, and if you can spot it, some snow on the Atlas mountains is just identifiable at the bottom left of the image.

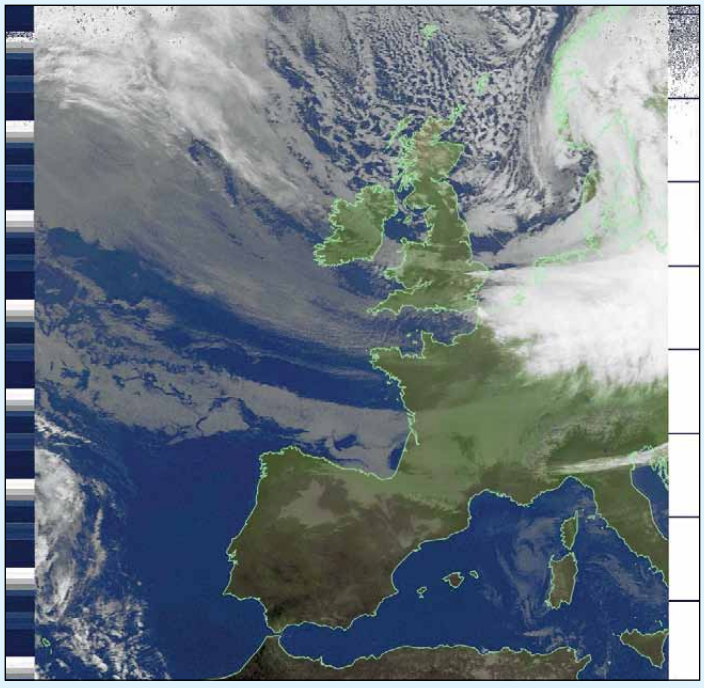


Figure 9

This NOAA 19 infrared image was decoded in *WXtoImg* from a WAV file recorded from the 13.21 UT pass on December 5, 2013 using the **DVB-T+DAB+FM** dongle and the antenna positioned on my lawn (with no preamp). Interestingly, this image records cold weather and a water surge sweeping down the North Sea, which resulted in flooding along the east coast of England. The somewhat restricted south to north coverage in this image is a function of the antenna position, and not the actual performance of the dongle.

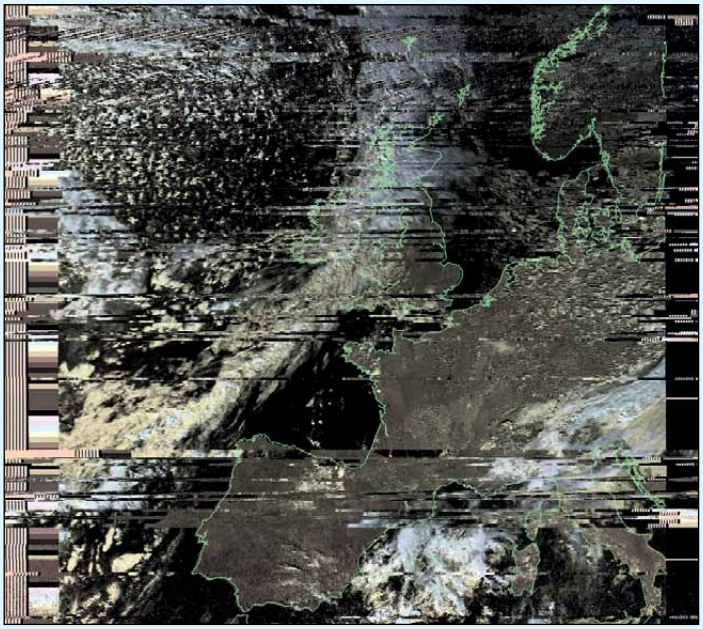


Figure 10

This image illustrates how synchronisation can be lost if the receiving system becomes overloaded when maintaining the screen display at the same time as recording the incoming image data. Hence the recommendation to minimise the display during the recording process.

For the record, this image comes from the 13:21 UT NOAA 19 pass from October 30, 2013, and was downloaded using the **DVB-T+DAB+FM dongle** with the lawn based antenna (no preamp).

Preamp

The control panel within the *FUNcube Pro+* program has a facility to power an antenna preamp which I activated when using their dongle; this is not available with the *SDRSharp* software used with the DVB-T+DAB+FM dongle.

Modulation.

The APT signal is frequency modulated hence from the menu frame I selected FM also setting the signal bandwidth at 40,000 Hz. Note public broadcast is wide-band FM.

Running

Running the programs for either dongle was an absolute delight with the impressive display of activity covering the selected part of the RF spectrum. In real time using the mouse it is possible to scroll across the frequencies both listening to a particular station and watching adjacent activity. I suggest anyone trying this for the first time practises using the 88-108 MHz FM band before moving to 137 MHz NBFM where repeaters can often be seen and heard. When you have done this you should be ready for an APT signal from the NOAA satellites. Of course to make life easy for APT reception satellite passes must be predicted and these are available from many sources: I use the 'Heavens-Above' web site.

The host computer.

I do not know the minimum computer requirement to run these programs but I strongly suspect only a relative new computer will prove suitable, certainly a fast processor is required. I used two computers during testing one was my Acer X1430 running *Windows 7 Home Premium 64 bit* with an AMD E-300 duel core processor; the other computer was 7 year old Dell computer running *Windows Vista* with an *Intel Pentium* duel core processor. Both worked well but I think were close to their limits when running the software's display screen

The processor speed is critical when running these programs. I noticed when I was running the programs with their screen displays the processor was running at about 92% of capacity. Well I guess that's okay most of the time but I also noticed when recording APT images there was a regular loss of signal synchronisation which was clearly visible in the display image See Fig ? I judged this loss of synchronisation was due to an overloaded processor. On one occasion quite by chance I recorded an image but with the dongle display screen minimised, that is, the program was still running but there was no display. The resulting image was now perfect and on double checking I found the processor capacity was down to about 50% capacity. The advice here is clear; if you are recording an APT image first watch the dongle display screen to establish the best possible signal, then minimise the screen but continue to route the audio signal to the program recording or displaying the image. I used the *WXtoImg* software for recording and displaying the APT image either by using the computer's own internal sound card or sending the audio signal to a standby rather old laptop but again running *WXtoImg*. The advice here seems clear cut if you want to record an APT image minimise the dongle screen display: unless you have a faster computer that the ones I used.

Just a note about pager interference. If you a troubled with interference from local pager transmission it may well be worth experimenting with a SDR dongle for your APT reception because the software filtering and bandwidth are so tight that it should be possible to exclude any local pager interference. This may be a godsend to some members troubled by pagers.

My thanks go to David Simmons G1MAL who has helped me on several occasions with the dongle testing, particularly the downloading of the correct software and then demonstrating its use. Without David's help I would have life would have been more difficult.

Notes

1 The FUNcube dongle Pro+ may be purchased from Martin Lynch and Sons Ltd., Outline House, 73 Guildford Street, Chertsey Surrey KT16 9AS Their web site is www.hamradio.co.uk or email sales@hamradio.co.uk Telephone 03452300599. Expect the price for a single unit to be about £150. For a full specification visit their website. As best I know there is no other point of sale for this FUNcube dongle Pro+.

2 The website ***www.cosycave.co.uk*** offers a number of SDR dongles. The one I tested was the DVB-T+DAB+FM with a USB-2 plug. According to exactly which unit you buy, the cost will be in the range £10 to £15.

3 A Bias-Tee unit for powering an antenna pre amp is available from the GEO shop price £25.

4 To download the software to run the DVB-T+DAB+FM dongle go the web site RTL-SDR Community Web Site.

For a different program for the same dongle go to

www.hdsdr.de

SUPER TYPHOON HAIYAN

Pummels The Philippines

Les Hamilton

Super Typhoon Haiyan, pictured on our front cover and again on page 37, was an exceptionally powerful typhoon that devastated the Philippines on November 8, 2013. It proved to be the deadliest typhoon ever recorded to make landfall in the Philippines, causing close on 8000 fatalities at the time of writing, and severely damaging the homes of more than four million people.

Already classified as a super typhoon by November 6—equivalent to a Category-5 hurricane on the *Saffir-Simpson* scale—*Haiyan* continued to intensify until, in mid evening, the *Joint Typhoon Warning Center* based at Pearl Harbour was estimating the system's one-minute sustained windspeed as 315 kph. On finally achieving landfall at Guiuan in the Philippines, this intensity was undiminished, making *Haiyan* the strongest tropical cyclone ever known to make landfall anywhere, surpassing the 305 kph of *Hurricane Camille* over the Mississippi delta in August 1969.

Typhoon Haiyan caused catastrophic damage throughout much of Leyte and Samar islands, where cities and towns were largely destroyed. In Surigao City, 282 mm of rain fell, most of it during a period of just 12 hours. Storm surges were recorded in many locations, some as high as 15 metres. The surges on the islands of Leyte and Samar only reached between five and six metres, but it was these that proved the most damaging.

Tacloban

Although wind speeds were extreme, the major cause of damage and loss of life appears to have been the storm surges. The major focus of devastation was on the east coast of Samar and Leyte, in particular in the city of Tacloban. The terminal building of Tacloban airport was destroyed by a 5.2 metre storm surge which engulfed everything up to the second storey. So powerful was the storm that large ships were washed ashore at Tacloban. In many ways, the scene resembled the aftermath of a tsunami.

Tacloban city suffered widespread and near total devastation from the surge: many homes, shops and schools were completely destroyed, trees were knocked over or broken and cars and vans were piled up. The low-lying areas on the eastern side of Tacloban were hardest hit, with some areas completely washed away as flooding extended a full kilometre inland on the east coast of the province. In all, roughly 90% of Tacloban was totally destroyed. Widespread power interruptions, landslides and flash floods were also reported. Major roads were blocked by trees and became impassable, and more than 450 domestic and international airline flights were cancelled. In addition, there were severe shortages of both clean water and food as officials and rescue workers struggled to distribute aid. Looting was widespread.

In the aftermath of Haiyan's passage, matters were greatly compromised by extensive pillaging that took place in the two weeks following the storm. Over a thousand convicts escaped from three prisons and joined residents in ransacking large areas. A particularly lucrative target was Tacloban's electricity transformers, which were torn apart and their copper cores sold for scrap on the black market. Sections of fallen power lines were also stolen for their copper. As a result, most of the city remains without electricity, and is plunged into darkness overnight.

Another effect of Haiyan is that much of the population has moved elsewhere in the Philippines. More than a third of the 1,370 students at the University of the Philippines campus in Tacloban have transferred to other campuses, and many more have dropped out because they can no longer afford to attend. The migration of the most able to find opportunities elsewhere is leaving behind a city populated by the poor and destitute.

But some aspects of life in the city have improved, and relief food and drinking water are now generally available. But the continued lack of power makes life difficult for businesses and there are as yet few signs of economic recovery.

Vietnam

On leaving the Philippines, *Haiyan* bore down on Vietnam, where more than 600,000 people were evacuated in northern provinces. Rainfall totals in excess of 450 mm and wind gusts touching 150 kph were recorded. Ten people were killed during preparations for *Haiyan's* landfall but, thanks to adequate warnings, there were no fatalities after the typhoon landfall.

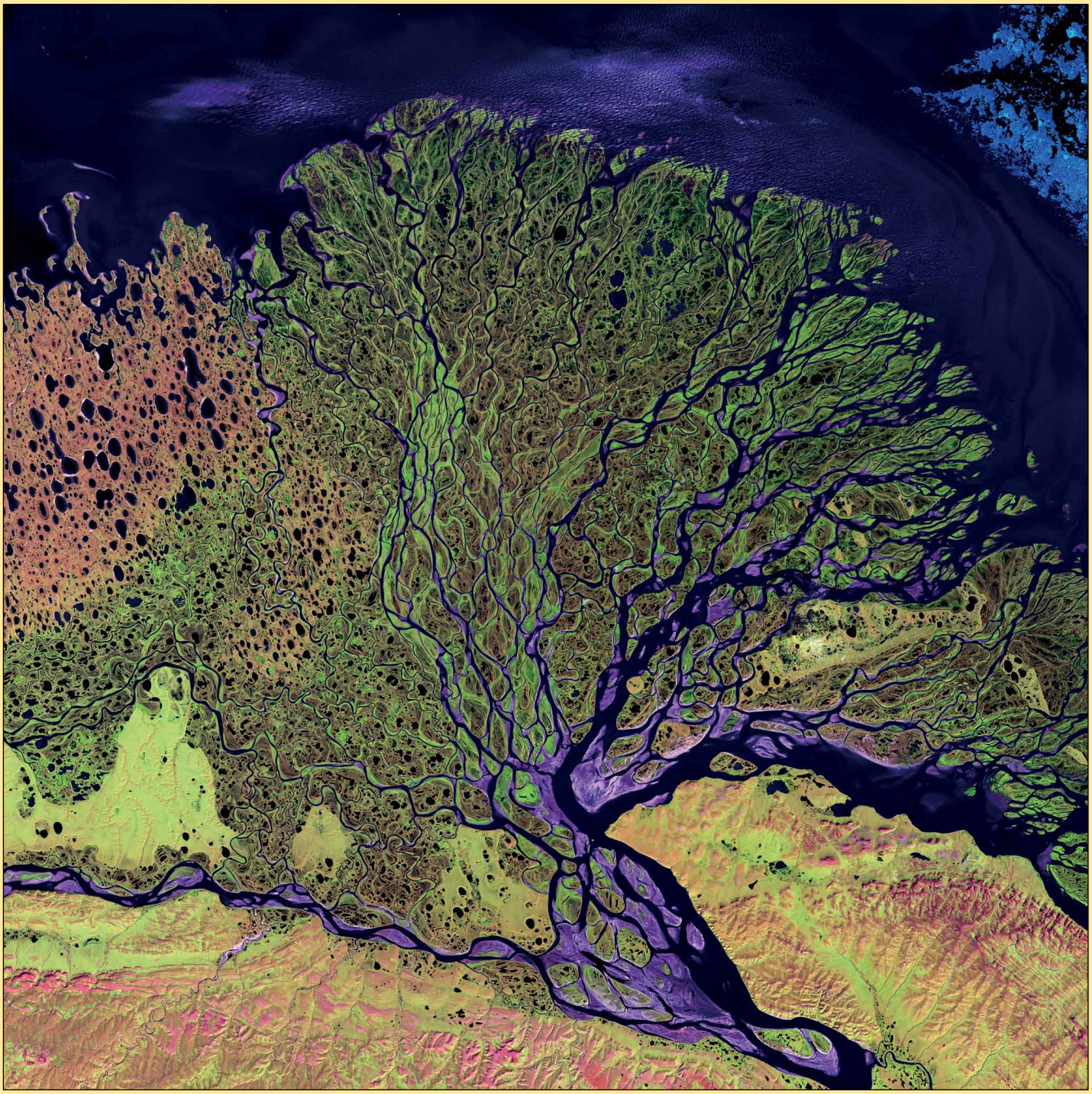
Siberia's Lena Delta

John Tellick

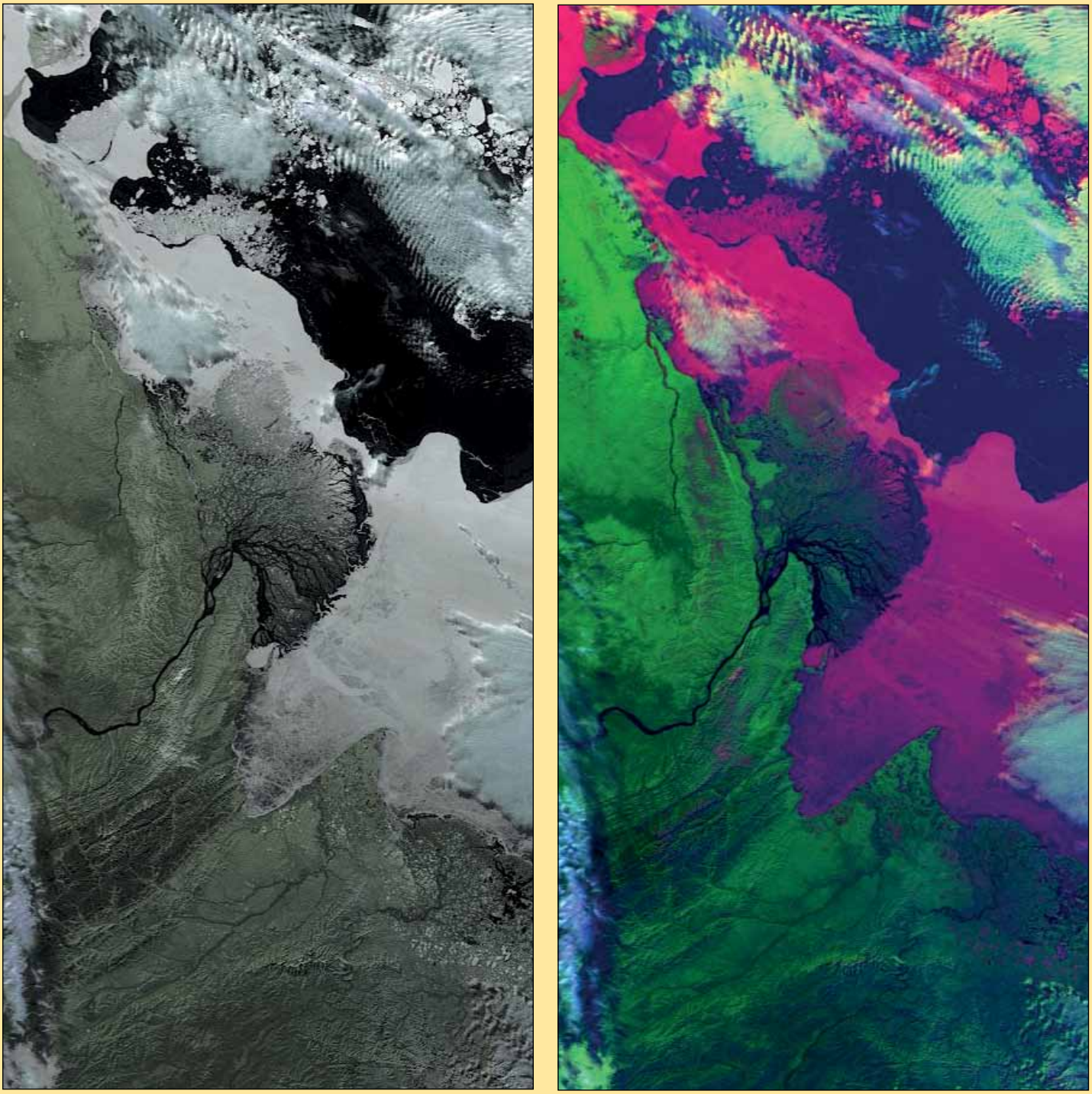
The advent of Metop-A and -B worldwide AVHRR dissemination via EUMETCast has allowed us to view every part of the world in high resolution—clouds permitting. By using the RGB options on David Taylor's AVHRR Reader, various features can be highlighted and/or enhanced. The trouble is that you can't sit by the computer all day on the off-chance of seeing something interesting nor spend hours reviewing the day's imaging. So I guess we miss a lot?

However, I did happen to be by the computer when a 'quick look' image of northern Russia and the Arctic Ocean was being received. The area in question, which often seems cloudy, was on this day fairly clear, and showing an interesting feature—which I learned later to be the Lena River Delta.

The Lena River is one of the three great Siberian rivers that flow into the Arctic Ocean. It is the world's 11th longest river



The Lena Delta, imaged by the Enhanced Thematic Mapper plus (ETM+) sensor aboard NASA's Landsat 7 satellite on February 27, 2000.
Image provided by the USGS EROS Data Center Satellite Systems Branch



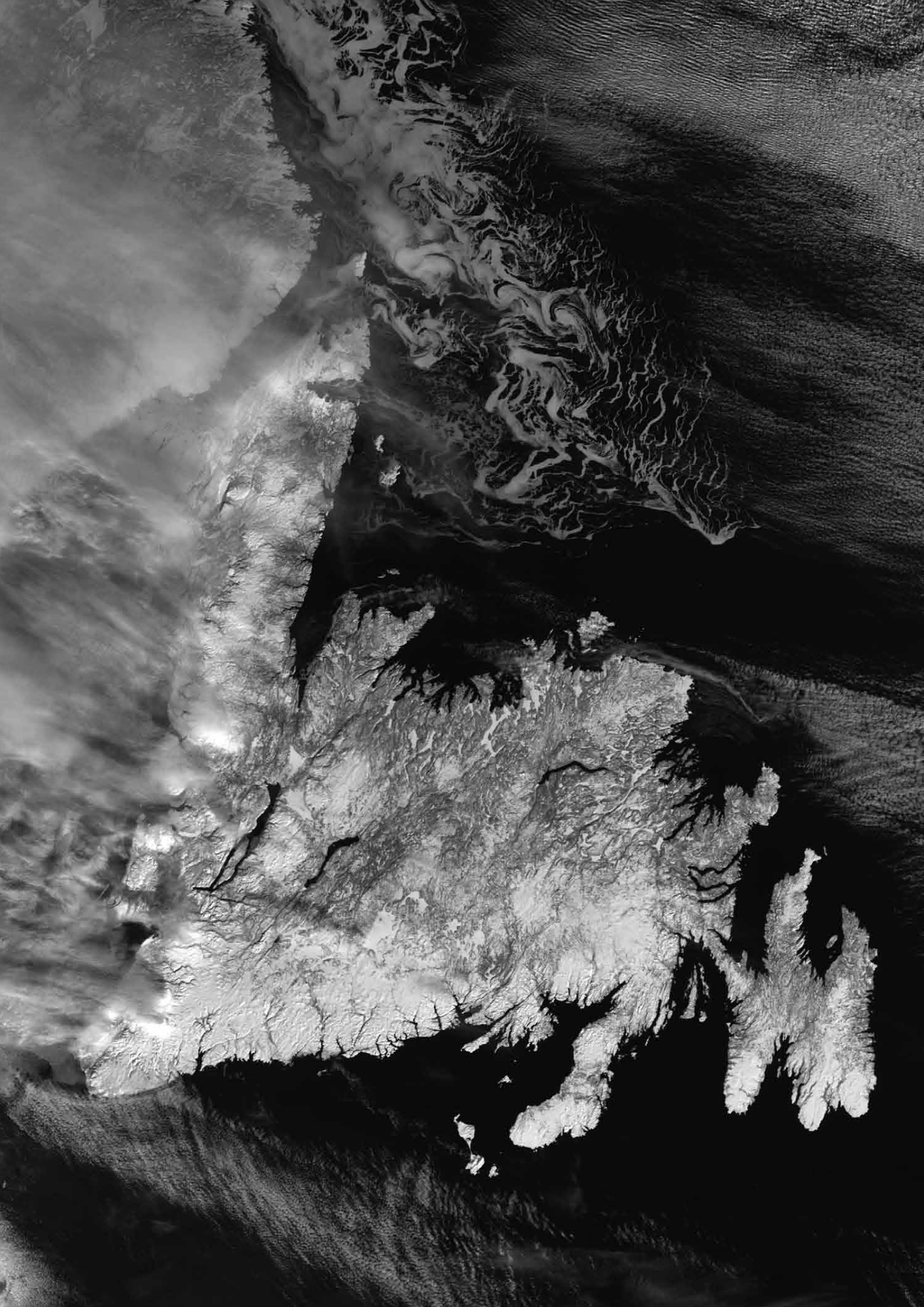
The Lena Delta and Leptev Sea as imaged by Metop-B on June 11, 2013. The left-hand image is the standard false-colour rendition produced with David Taylor's *HRPT Reader* software. while that on the right has been processed with an RGB palette which enhances the contrast between frozen terrain (green) and sea ice (magenta).
Image © EUMETSAT 2013

and has the world's 9th largest watershed area. Its source is in the Baikal Mountains, just west of Lake Baikal, and it's joined by several other rivers as it flows to the Arctic Ocean.

The total length of the river is around 4350 kilometres and it is 'the only big river in the world flowing on the permafrost area. Its hydrology is unique and characterised by its immense spring floods.'

The River Lena enters the Leptev Sea, part of the Arctic Ocean, through a vast delta, which shows up well in these Metop-B image from June 11, 2013. As you can see, much of the Leptev Sea remains covered in sea ice, even at this time of the year. The Lena Delta extending into the Leptev Sea is around 400 kilometres across and formed into many flat islands. This terrain is frozen tundra for seven months of the year, but from around May becomes a lush wetland wildlife area.

The Lena is one of the cleanest rivers in the world. It still flows along its original course, uninterrupted by man-made intrusions such as hydro-power stations, dams, and industrial developments which would affect the river's environment. The Lena River represents a natural source of fresh water, a commodity which, every year, becomes less and less available all over the planet. Still one of the pristine areas of our planet, one wonders how much longer the Lena can remain this way.



Britain's Wild, Wet and Windy Winter

John Tellick

Here in the British Isles, the winter of 2013/14 is turning out to be a record breaker, it seems, characterised by an endless succession of depressions sweeping in from the Atlantic. Ever since last December, and continuing as I compose this note in early February, these storms have been crossing the country. Today, yet another deep depression is battering southwest England and Wales; even here in London, strong winds are whistling around my house and the Met. Office has issued a warning of yet more gales and rain in two days time as another depression lies waiting in the wings.

Several of these storms have caused considerable damage, either from gales, rain or tidal surges: in some cases all three simultaneously. Parts of Somerset have been flooded since Christmas and there has been widespread flooding elsewhere in southern England. In fact, January 2014 turned out to be the wettest January recorded in the south of England for at least 100 years: probably the wettest ever.

It's been quite a change for me, living in SW London, from the last three winters, when it was often cold with accompanying snow and frost. This winter has been mild so far and quite sunny at times, with hardly any frost. In the garden, my fuchsias are still in full flower along with geraniums. Last week I spotted a butterfly in the garden and had a large bumble bee buzzing around indoors.

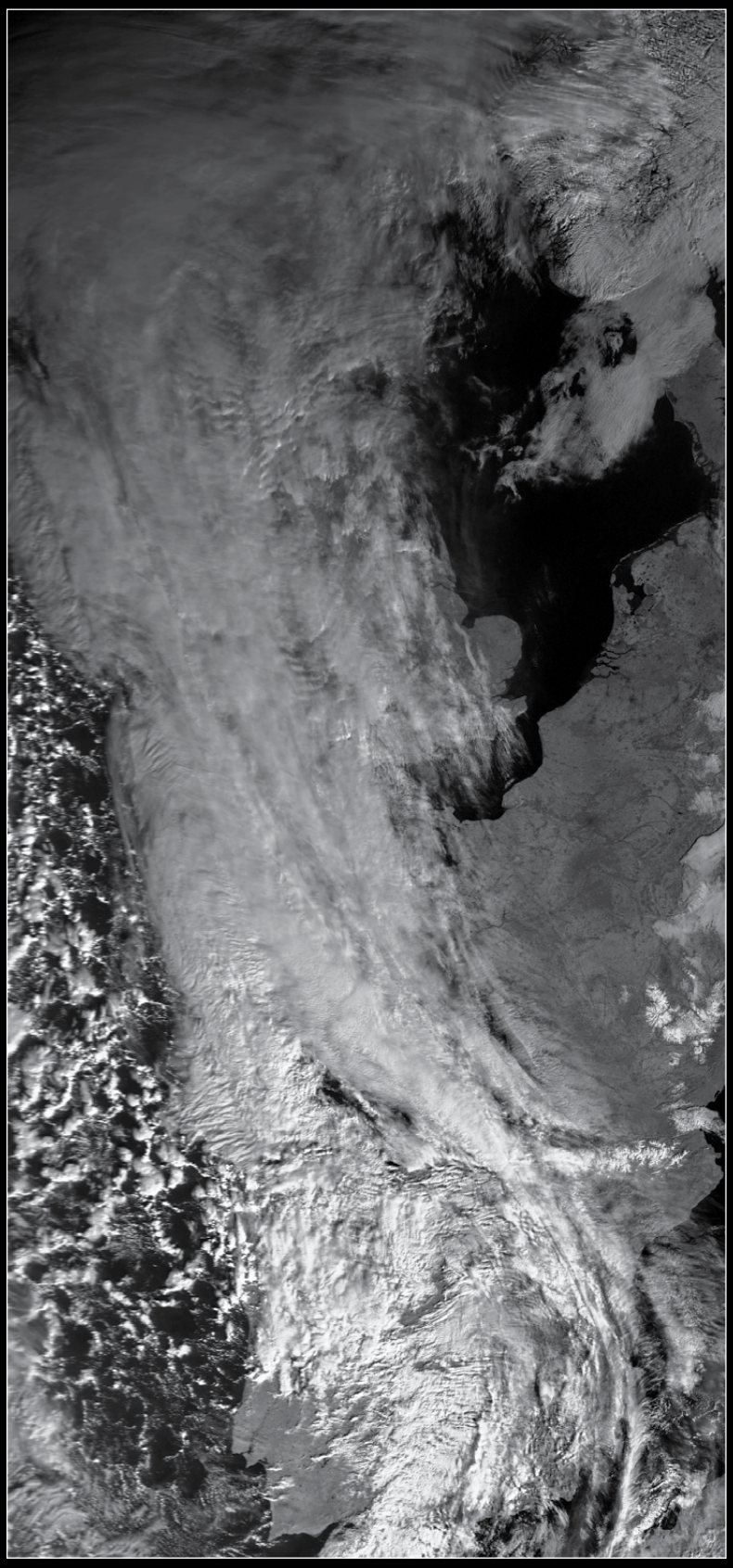
When the wind drops, and with temperatures quite often around 10° to 12°C, it can be very pleasant— for a while. But strong winds and rain are the norm at the moment.

France too has had problems, with wind damage and flooding along the Atlantic and Channel coasts, in the wake of these massive depressions. I started archiving satellite images during December after a particularly deep depression coincided with high spring tides, and caused tidal surges in the North Sea and along the coasts of parts on Britain, with a view to producing an article. But, with as many as three depressions crossing the UK most weeks, one could fill a whole issue of the *GEO Quarterly* with them. Nevertheless, many of the images are particularly spectacular, and a few appear here and on page 26.

Spring tides.

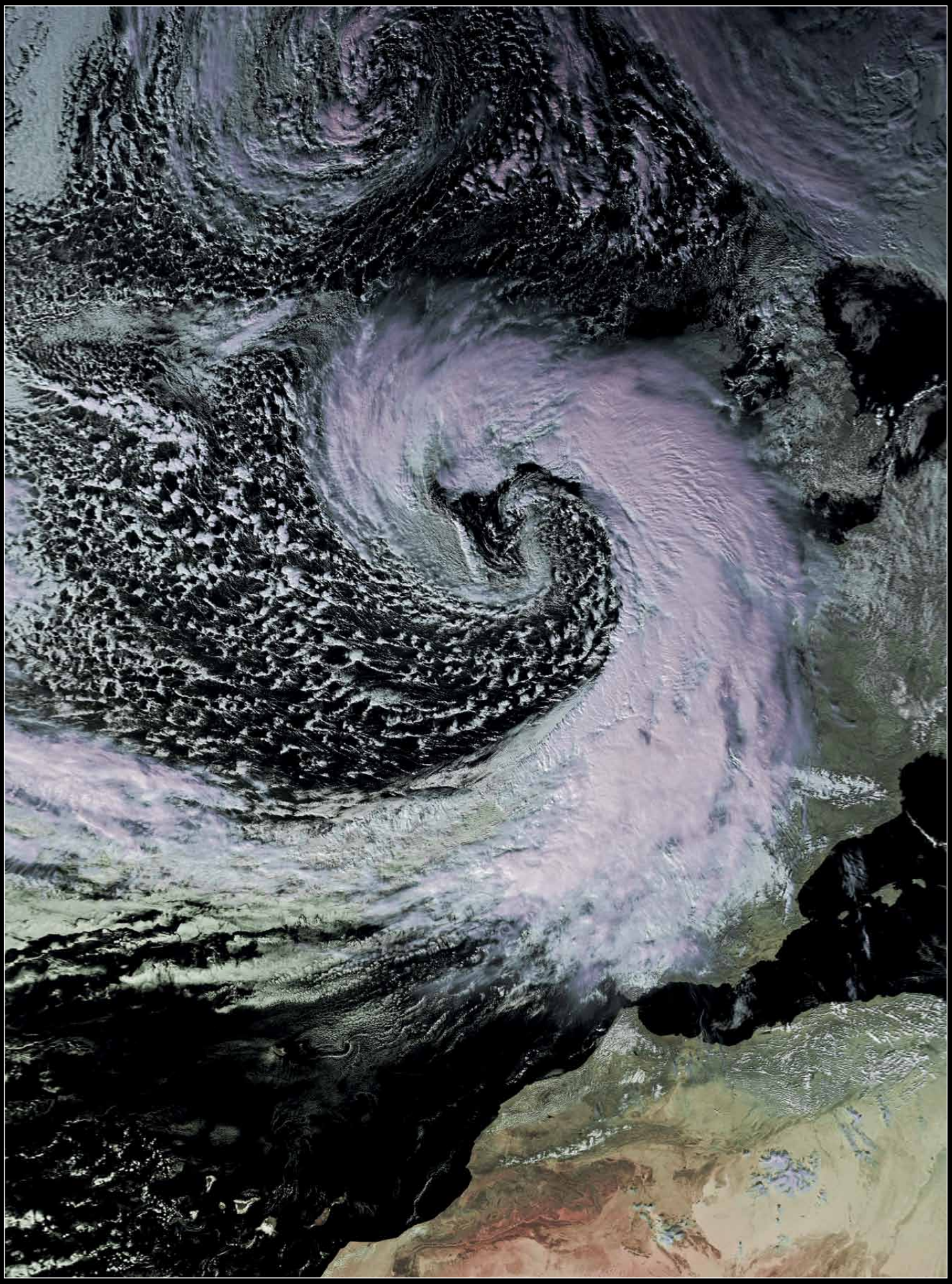
It's worth a few words on the effects of spring tides on this weather scenario. Tides are, of course, the rise and fall of sea levels caused by the combined gravitational forces exerted by the Moon and the Sun, and the rotation of the Earth. While tides are usually the largest source of short-term sea-level fluctuations, sea levels are also subject to forces such as wind and barometric pressure changes, which can result in what are termed storm surges. This is especially true in shallow seas and near coasts.

Spring tides are those very high and low tides that occur at the times of New Moon or Full Moon, when the Sun and Moon are in approximate alignment with the Earth so that their gravitational pulls reinforce each other. When these tides coincide with a deep depression (low pressure) and its associated strong winds, storm surges occur, as happened during the night of December 5/6 2013, causing problems across much of the North Sea coastline. The same storm's wind and rain also caused considerable damage across inland northern Europe and the UK.

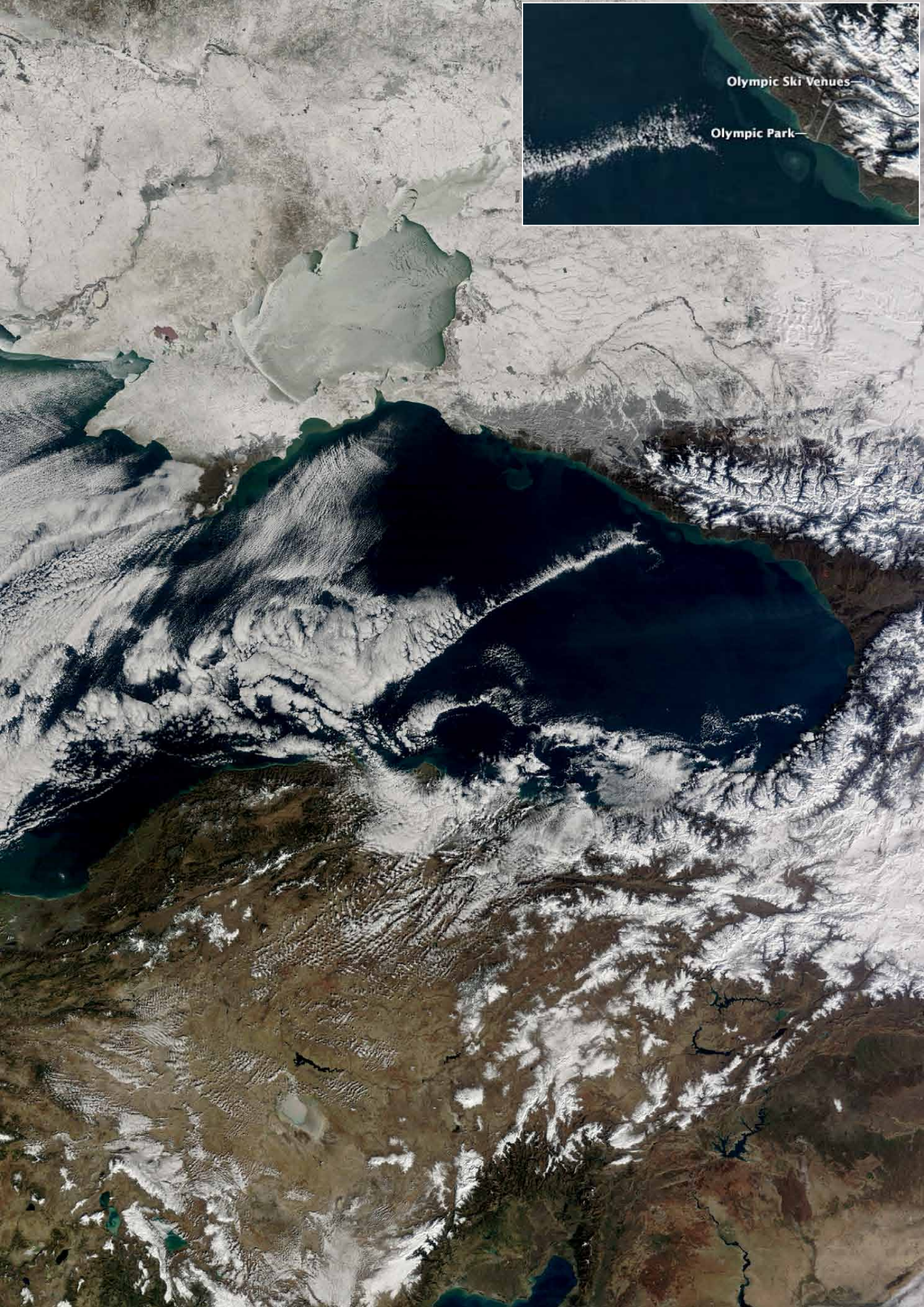


Much of Spain and the British Isles are lost beneath cloud in this Metop-A image acquired at 09.45 UT on February 3, 2014. East Anglia, The Netherlands and part of Denmark are enjoying a brief period of respite.

Image: NOAA CLASS Library



This NOAA 19 image, acquired by John Tellick at 13:54 UT on February 4, 2014, shows yet another massive Atlantic depression bearing down on the sodden British Isles


Olympic Ski Venues
Olympic Park

Relentless Warming Continues

Earth's Long-Term Climate Warming Trend Sunstained in 2013

A NASA Earth Observatory Report

Scientists at NASA's Goddard Institute for Space Studies (GISS) [1] have reported that 2013 continued the long-term trend of increasing mean air temperatures over Earth's land and sea surfaces. Their analysis of global temperatures has shown that 2013 tied with 2006 and 2009 as the seventh warmest year since 1880. Indeed, the list of hottest years on record is already hugely dominated by the years of the 21st century: and each of the 12 years starting with 2001 features as one of the 14 warmest on record. Global temperatures are affected by the El Niño-Southern Oscillation, with its extremes of *El Niño* and *La Niña* leading respectively to unusually warm and cool years. With *El Niño* holding sway in 2010, that year topped the previous record set in the *El Niño* year of 1998. Conversely, 2012—a *La Niña* year—was cooler than 2010, yet still ranked as the tenth warmest year since records began in 1880. The GISS report illustrates how Earth continues to experience temperatures warmer than those measured several decades ago.

The upper map on the opposite page depicts global temperature anomalies for 2013. It does not show absolute temperatures, but instead shows how much warmer or cooler various parts of the Earth were compared with an averaged base period from 1951 to 1980. The GISS team assembled its analysis using publicly available data from roughly 6,300 meteorological stations around the world, as well as ship-based and satellite observations of sea surface temperature, and Antarctic research station measurements. Then software is used to calculate the difference between surface temperature in a given month and the average temperature for the same place from 1951 to 1980. This three-decade period functions as a baseline for the analysis. For more explanation of how the analysis works, read *World of Change: Global Temperatures* [2].

The global average temperature for 2013 was 14.6° Celsius, which is 0.6°C warmer than the mid 20th century baseline. The average global temperature has risen about 0.8°C since 1880. Exact rankings for individual years are sensitive to data inputs and analysis methods.

> "Long-term trends in surface temperatures are unusual, and 2013 adds to the evidence for ongoing climate change," according to GISS climatologist Gavin Schmidt. "While one year, or one season, can be affected by random weather events, this analysis shows the necessity for continued, long-term monitoring."

Weather patterns and other natural cycles cause fluctuations in average temperatures from year to year. This is especially the case at regional and local levels. For instance, while the globe experienced notably warm temperatures in 2013, the continental United States experienced a fairly average year (ranked only 42nd among its warmest) while it was the hottest year ever in Australia's recorded history.

Regardless of the regional differences in any year, continued increases in greenhouse gas levels in Earth's atmosphere are driving a long-term rise in global temperatures. Each calendar year will not necessarily be warmer than the one before but, with the current level of greenhouse gas emissions, scientists do expect each decade to be warmer than the previous one. The decade-by-decade temperature trend is depicted in the second map opposite.

It has been 38 years now since of a year with cooler than average temperatures has been recorded. The graph at the foot of the following page shows how the long-term temperature trend has continued to rise, even when the effect of an *El Niño* or *La Niña* event skews temperatures to be warmer or cooler in a particular year. Orange bars represent global temperature anomalies in *El Niño* years, with the red line showing the longer trend (the classification of years comes from the NOAA Oceanic Niño Index). Blue bars depict *La Niña* years, with a blue line showing the trend. Neutral years, where neither *El Niño* nor *La Niña* is active, are shown in gray, the black line showing the overall temperature trend since 1950. Note that even the *La Niña* years are warmer than they used to be.

Scientific evidence states that the level of carbon dioxide in Earth's atmosphere is presently higher than at any time in the past 800,000 years. In 1880, the first year included in the GISS analysis, the global carbon dioxide level was about 285 parts per million; by 2013, it had peaked to more than 400 parts per million. Carbon dioxide is a greenhouse gas that traps heat and plays a major role in controlling changes to Earth's climate. It occurs naturally, and is also emitted by the burning of fossil fuels.

Related Reading

1 NASA Goddard Institute for Space Studies GISS Surface Temperature Analysis (GISTEMP)
http://data.giss.nasa.gov/gistemp/

2 NASA Earth Observatory (2012) World of Change: Global Temperatures.
http://earthobservatory.nasa.gov/Features/WorldOfChange/decadaltemp.php

3 NASA Earth Observatory (2011, January 14) Different Records, Same Warming Trend
http://earthobservatory.nasa.gov/IOTD/view.php?id=48574

4 NASA Earth Observatory (2007, November 5) Earth's Temperature Tracker
http://earthobservatory.nasa.gov/Features/GISSTemperature/

5 NASA Earth Observatory (2010, June 3) Global Warming
http://earthobservatory.nasa.gov/Features/GlobalWarming/page1.php

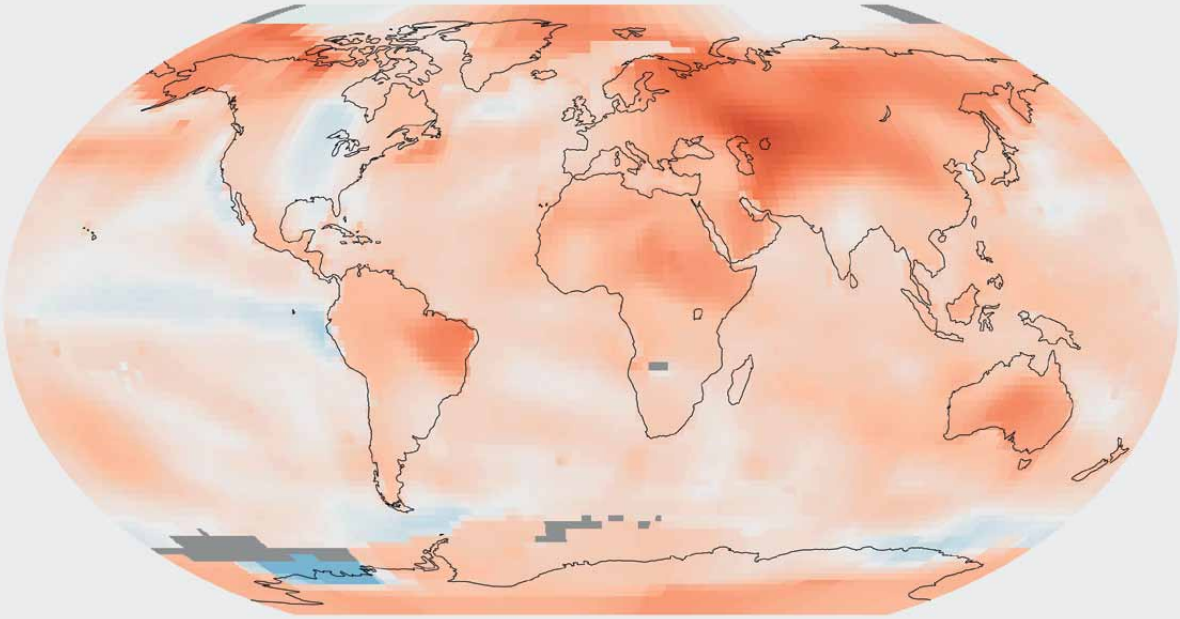
6 NASA Earth Observatory (2013, March 26) Arctic Amplification
http://earthobservatory.nasa.gov/IOTD/view.php?id=81214

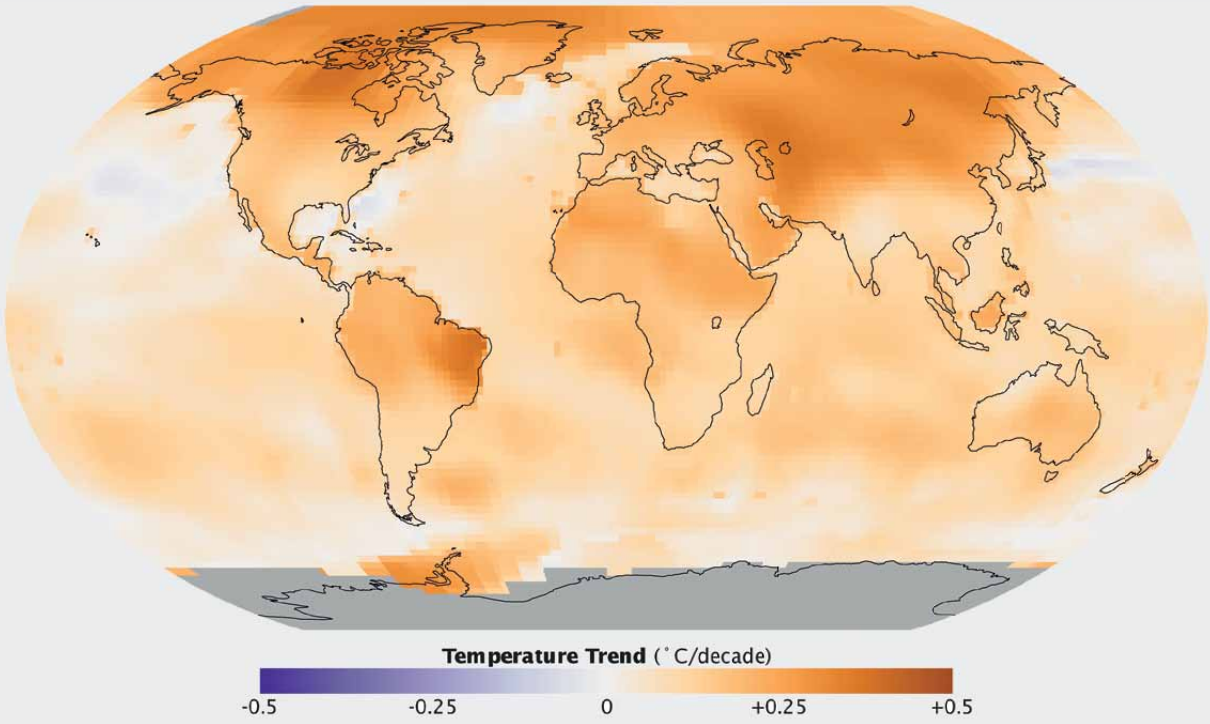
7 NASA Earth Observatory (2013, September 27) Global Patterns of Carbon Dioxide
http://earthobservatory.nasa.gov/IOTD/view.php?id=82142

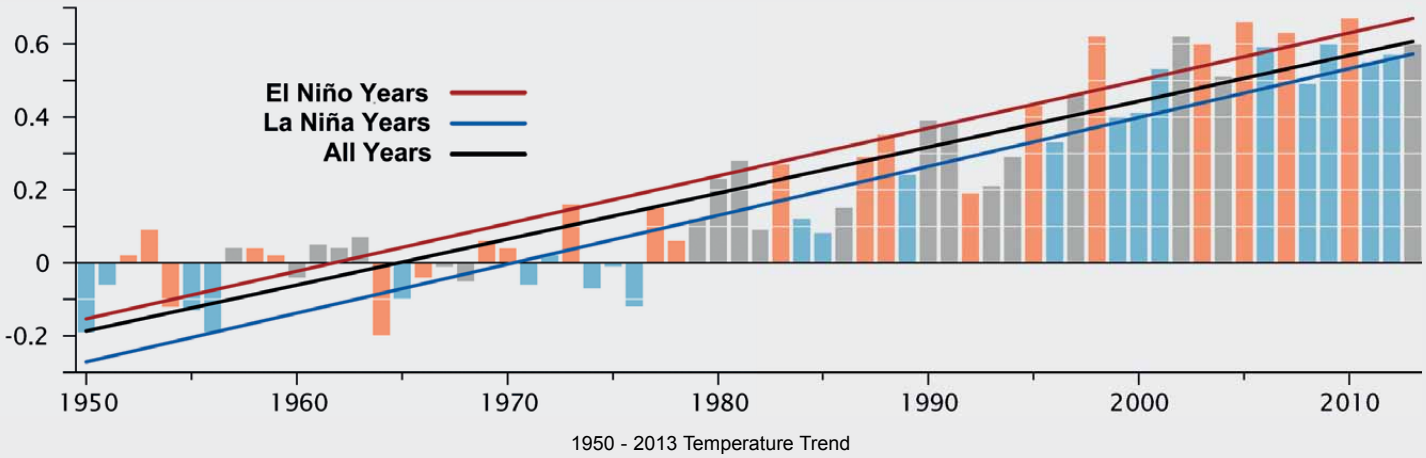
8 NASA Earth Observatory (2011, June 16) The Carbon Cycle
http://earthobservatory.nasa.gov/Features/CarbonCycle/page1.php

Note

Many of the above URLs are Case Sensitive. Do take care when keying them in.







1950 - 2013 Temperature Trend

NASA images by Gavin Schmidt and Robert Simmon, based on data from the NASA Goddard Institute for Space Studies

The Dry Valleys of Antarctica

Les Hamilton

Renowned as a land of snow and ice, almost the entire continent of Antarctica lies beneath a 14 million square kilometre ice cap with an average depth of some 1500 metres (and a maximum of 4776 metres at the South Pole). Most of this ice is permanent, less than 2% of it melting seasonally during the austral summer. Such melting that does take place occurs predominantly along the west coast of the Antarctic peninsula and its attendant islands, which enjoy a so-called *maritime Antarctic climate.* Here, average temperatures can remain just a few degrees above freezing for between three and four months at a stretch, exposing the rocky shorelines that provide such excellent habitats for several species of penguin.

But inland from the coast, Antarctica is both frigid and arid, receiving so little precipitation—annual mean 166 mm—that it is technically a desert. Yet, despite the intense cold, there exists a group of almost snow-free valleys centred on 77.5°S, 163°E in Victoria Land, only 130 kilometres as the crow flies from the famed Scott Base across McMurdo Sound (figure 1).

Figure 1 - Location map for the Dry Valleys

These **McMurdo Dry Valleys** [1,2] are to be found in a cluster, west of McMurdo Sound, and are so named because of their extremely low humidity and lack of snow and ice cover. The *Landsat-7* satellite image (figure 2) and detailed USGS map of the region (figure 3) both clearly show the three principal *Dry Valleys*: Victoria Valley, Wright Valley and Taylor Valley. One of the few areas of Antarctica not covered by thousands of meters of ice, the *McMurdo Dry Valleys* stand out starkly in the satellite image. For a few weeks each summer, temperatures can become warm enough to melt glacial ice and create streams that feed freshwater lakes lying on the valley floors. Though permanently capped by a thick layer of ice, these lakes remains unfrozen throughout the year, and support colonies of bacteria and phytoplankton.

Figure 2 - The Dry Valleys as imaged by NASA's Landsat-7 on December 18, 1999.
Landsat 7's Enhanced Thematic Mapper plus (ETM+) Image by Robert Simmon, based on data provided by the NASA GSFC Oceans and Ice Branch and the Landsat 7 Science Team

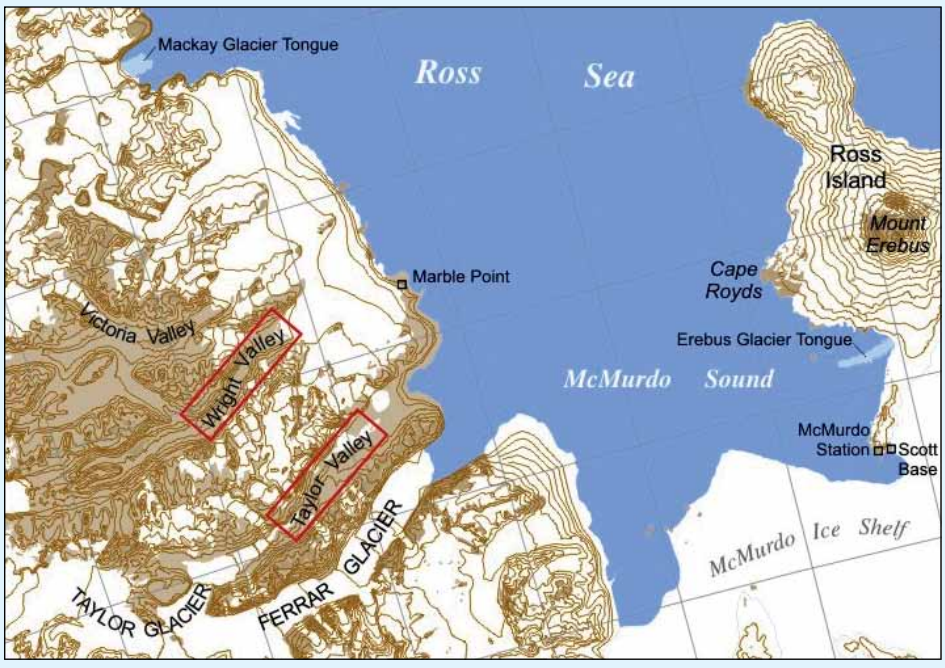


Figure 3 - Map showing the McMurdo Dry Valleys
Source: USGS

Additionally, photosynthetic bacteria have been found living in the relatively moist interiors of surrounding rocks.

Scientists consider the *Dry Valleys* to be the closest of any terrestrial environment to Mars. Over the past 14 years, however, summers here have been colder than usual, and the lakes are becoming more and more frozen. If the trend continues, it is possible that the biological communities the lakes harbour could go into hibernation.

Taylor Valley

While flying over Antarctica aboard a P-3 aircraft in November 2013, *Operation*

Figure 4 - Taylor Valley and the Taylor Glacier, photographed in November 2013
Photo: NASA/ Michael Studinger

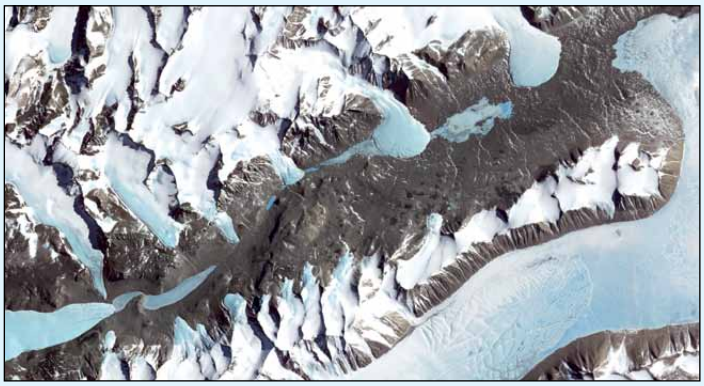


Figure 5 - Taylor Valley slants from lower left to upper right in this image
Image: NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team.

Figure 6 - A Terra ASTER image showing Lake Bonney
Image: NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team.

IceBridge [3] project scientist Michael Studinger photographed the southernmost of the main *Dry Valleys*, Taylor Valley (figures 4, 5), which extends some 30 kilometres from Taylor Glacier in the west to McMurdo Sound. One of the most remote and geologically exotic places on the planet, Taylor Valley is surrounded by some spectacular mountain scenery, and contains its eponymous glacier with its spectacular *Blood Falls*.

The reason Taylor Valley and its neighbours are so conspicuously bare is due to the presence of the Transantarctic Mountains to their south: these force moisture from the air as it passes over them, leaving the valleys in a precipitation shadow that creates one of the driest places on Earth. Any snow that falls on the valleys is swept away by the relentless cold, dry katabatic winds that frequently surge downhill from the ice cap toward the sea at over 300 kph. The mean annual temperature here is around -20°C, and the annual precipitation averages around 100 mm water equivalent. The lack of precipitation has helped to preserve the dramatic sequences of exposed rock shown in the photograph above.

Figure 7 - Blood Falls
Photograph: Mike Martoccia/Wikimedia

The light brown bands are layers of sandstone which were formed on the bed of a shallow sea between 250 million and 400 million years ago, during an era when Earth's southern continents were locked into the *Gondwana* supercontinent. The dark horizontal band of rock that divides the sandstone is a dolerite sill, intruded during a later volcanic interlude about 180 million years ago, possibly one of the events that tore *Gondwana* apart.

The photograph is dominated by Taylor Glacier, noteworthy because (like all glaciers in the *Dry Valleys*) it is cold-based. This means that its base is frozen to the ground below. The majority of Earth's glaciers are wet-based: pressure underneath the glacier melts the ice to produce a lubricating film of water which allows the entire mass of the glacier to scrape downhill over its bedrock, picking up piles of debris which are later deposited as substantial moraines. Cold-based glaciers on the other hand, are found where temperatures are so low that their basal ice cannot melt and remains firmly welded to the bedrock: only the upper portion of such a glaciers moves, slowly creeping forwards under its own weight. Cold-based glaciers are largely non-erosive: they pick up minimal debris along their margins and create only rudimentary moraines. From above the difference between the two is very clear: instead of exhibiting the typical highly ridged and crevassed surface of an alpine glacier, the surface of a cold-based glacier is comparatively flat and smooth.

Blood Falls

Just visible as a small, dark smudge on the snout of the glacier at lower right in figure 4 are *Blood Falls*. Here, intermittent trickles of iron-rich hypersaline water from a sub-glacial reservoir seep out from a fissure in the glacier's 30 metre leading edge and stain the ice red. This gives the appearance of a blood-red waterfall cascading down the glacier into Lake Bonney (figures 7-11). The phenomenon has been known since its discovery in 1911 by Australian geologist Griffith Taylor, who gave his name to the surrounding valley. Originally the red colour was thought to be caused by red algae, but is now known to be the work of a population of chemosynthetic bacteria similar to those found near hydrothermal vents near mid-ocean ridges.

It is postulated that, some five million years ago, what is now Taylor Valley used to be a fjord-like inlet of the sea which, as the climate cooled and the sea retreated, became isolated as an inland saltwater lake. As Taylor Glacier advanced, it buried the lake under some 400 metres of ice, totally isolating its saline waters for the best part of two million years. The increasingly frigid temperatures resulted in water at the surface of this sub-glacial lake to start freezing, causing salts to precipitate out and concentrate in the solution below. It is believed that iron entered the lake as a result of the scraping motion of the early Taylor Glacier against its bedrock. Today, the trapped solution is so salty—around three times as saline as the world's oceans—that it never freezes.

The sub-glacial lake has also trapped more than a dozen species of extremophile bacteria, which have been able to survive in its dark, oxygen-free waters on energy gained by metabolising sulphur and iron compounds. The water in the lake is not itself red: the red colour only develops when iron compounds produced by the bacteria are oxidised (basically to rust particles) when the liquid emerges from the glacier.

Many astrobiologists think that Jupiter's moon Europa, possesses a liquid ocean beneath its icy crust. Should life exist on Europa, it may well be as forms of extremophile bacteria.

References

1 McMurdo Dry Valleys
http://en.wikipedia.org/wiki/McMurdo_Dry_Valleys
2 McMurdo Dry Valleys
http://www.mcmurdodryvalleys.aq/
3 Operation IceBridge - GEOQ 39, page 51

Figure 8 - Blood Falls spills from Taylor Glacier into Lake Bonney
Photo: Mike Martoccia

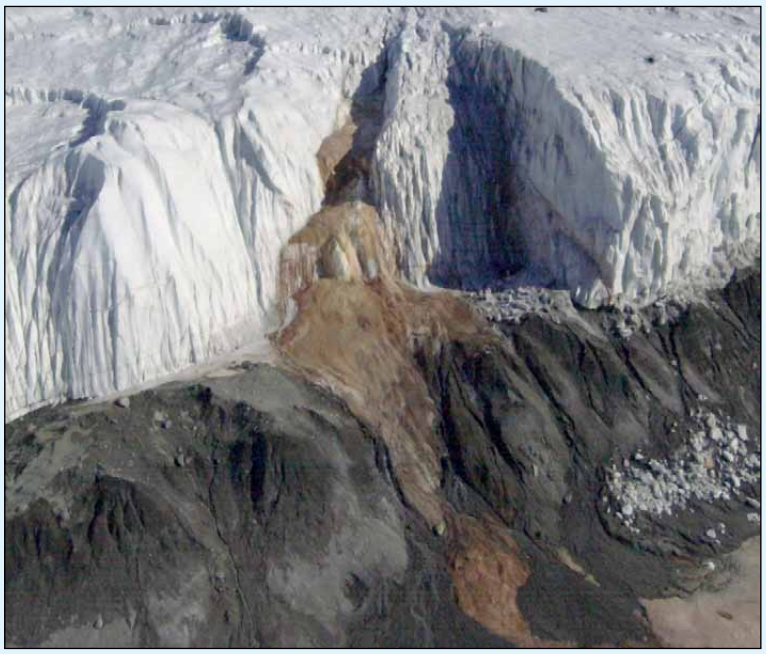
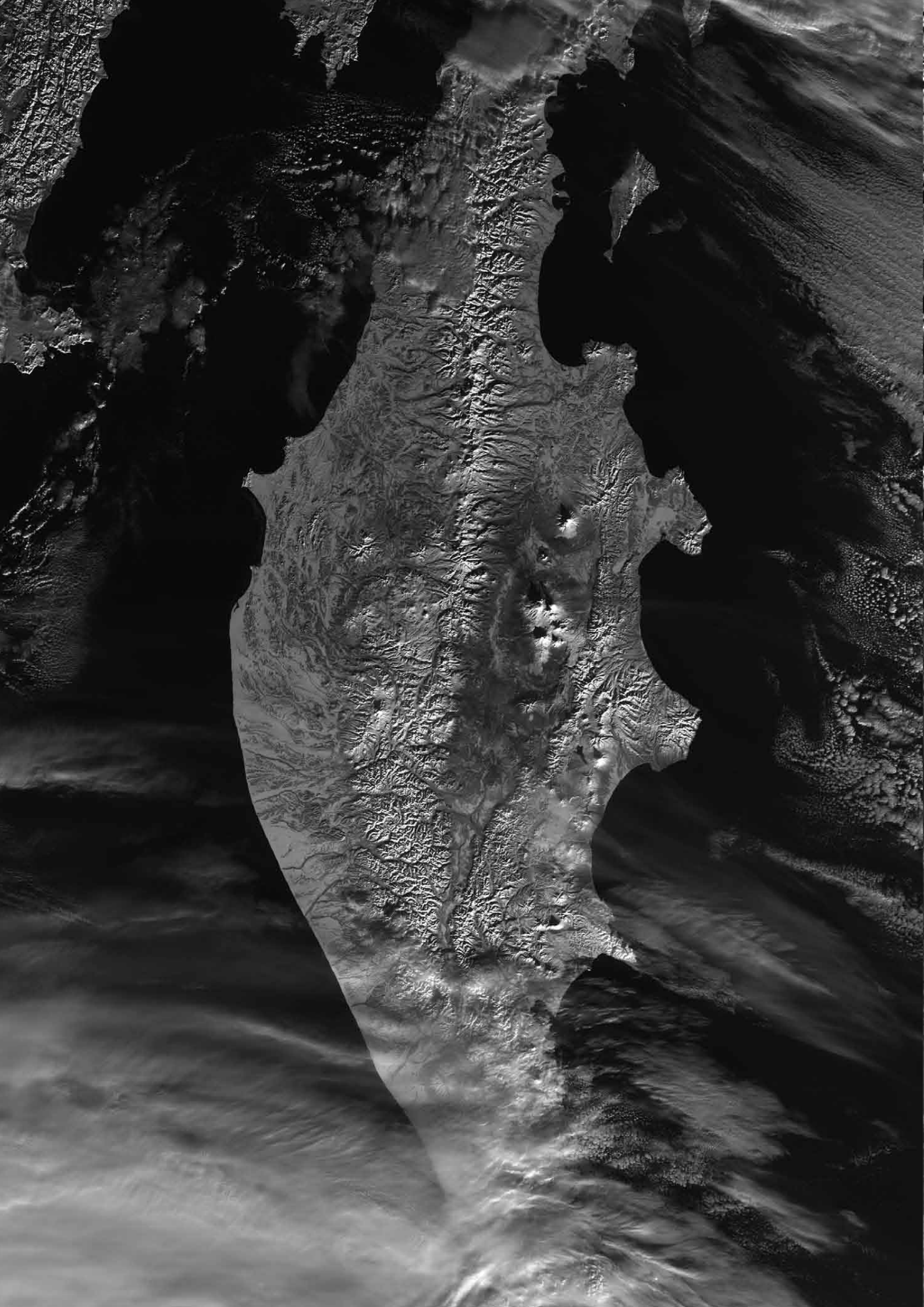


Figure 9 - A close-up of Blood Falls spilling from a fissure in Taylor Glacier
Photo: Kristan Hutchison, National Science Foundation.

Figure 10 - A scientific campsite near Blood Falls
Photo: Mike Martoccia

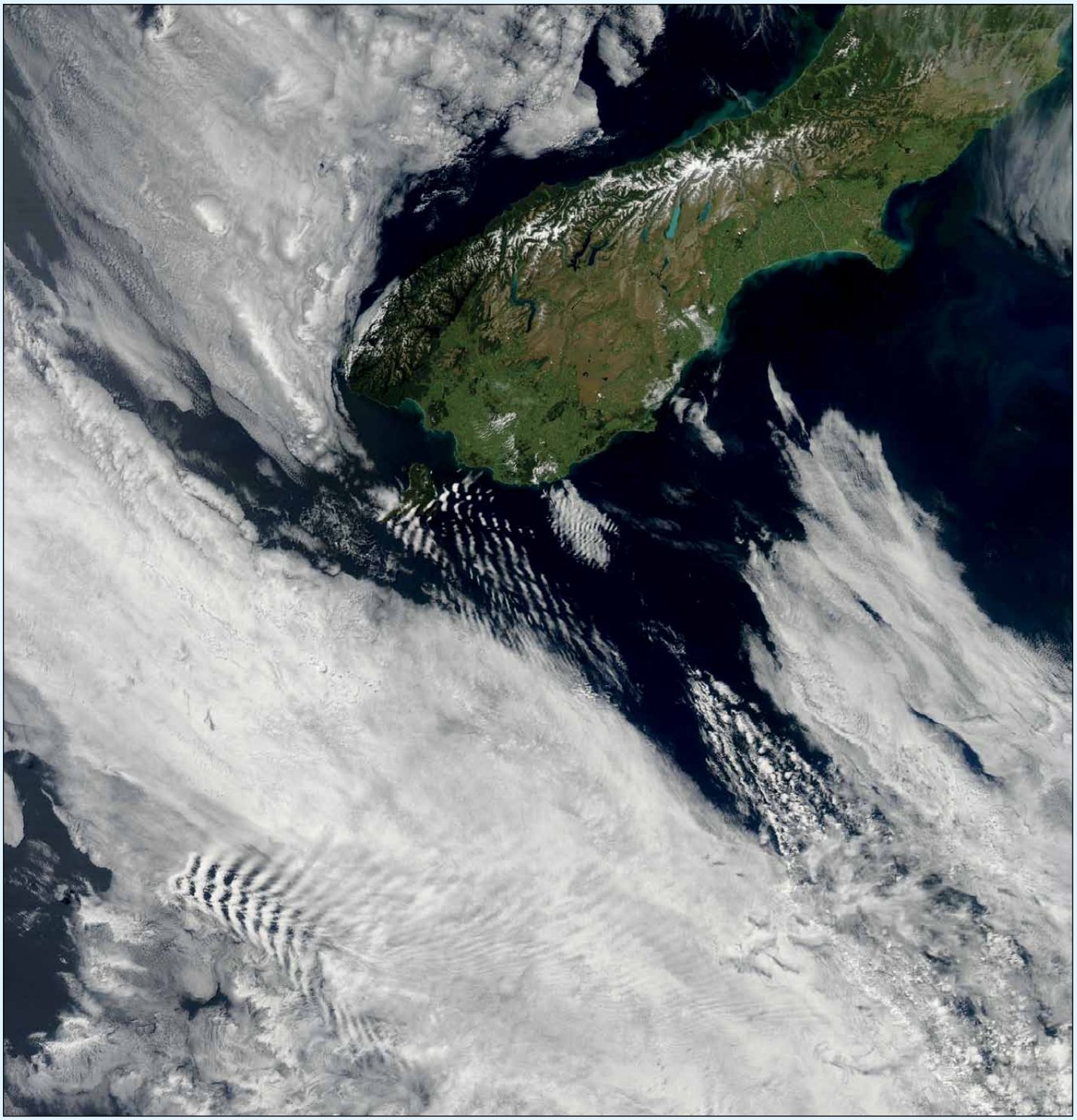
Figure 11 - Blood Falls spills from Taylor Glacier into Lake Bonney
Photo: Kristan Hutchison, National Science Foundation.

Figure 12 - The Commonwealth Glacier in Taylor Valley.
Mount Erebus can be seen on the horizon.
Photo: Kelly Speelman, National Science Foundation.



Auckland Island

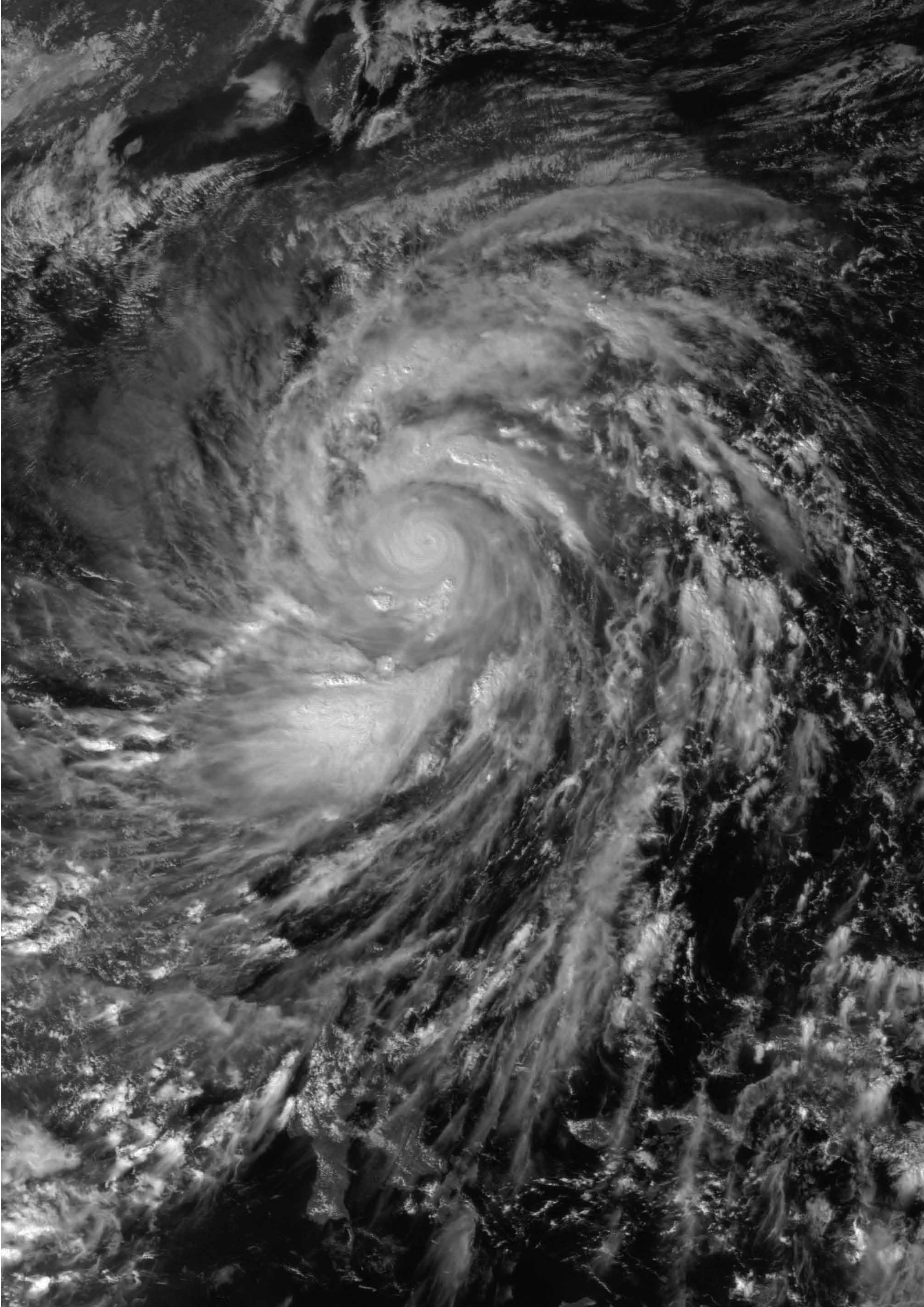
Les Hamilton



This **Terra** MODIS image, which was acquired on December 3 last year, intrigued me when I spotted a set of prominent lee wave clouds over the Pacific Ocean, to the southwest of New Zealand (lower left of image). This came as something of a surprise as I was unaware of any land there that might give rise to such a phenomenon: so I did a little research and discovered that, in this remote area of the ocean, lies a small archipelago, the *New Zealand Auckland Islands*: Auckland Island itself, Adams Island, Enderby Island, Disappointment Island, Ewing Island, Rose Island, Dundas Island and Green Island. These islands, which have a combined area of just 625 km^2, lie just over 450 kilometres from the southern coast of New Zealand at approximately 50°S, 166°E.

Auckland island, by far the largest member of the group, accounts for 510 km^2 of the total area and, like the remainder of the islands, has no permanent population. It is notable for its steep cliffs and rugged terrain, its four mountains rising to over 600 metres clearly being the cause of the prominent wave cloud in the image.

Image: LANCE-MODIS/NASA/GSFC



Antarctic Ozone Levels show signs of Gradual Recovery

Les Hamilton

GEO has reported on **Antarctic Atmospheric Ozone Depletion** several times during the past decade [1,2]. The phenomenon, popularly dubbed the **Ozone Hole**, relates to the annual reduction in stratospheric ozone concentrations above the Earth's polar regions, more especially over Antarctica, during late spring. Stratospheric ozone acts as a natural sunscreen, absorbing harmful ultraviolet (UV) radiation emitted by the sun, thereby making life on our planet possible. UV radiation damages DNA in plants and animals, causes sunburn and eye damage, and can lead to skin cancer. It is not overstating the case to say that, without ozone in our planet's atmosphere, life on Earth (as we know it) would be impossible.

During the early 1980s, a combination of ground-based, balloon and satellite measurements revealed for the first time that ozone concentrations over the Antarctic were falling dramatically each spring before recovering with the onset of each austral summer. This was a trend that accelerated year on year until 1994, then held relatively constant until 2006, the year when the *Ozone Hole* attained its greatest ever recorded geographical extent of 29.9 million square kilometres. Previous to 1979, ozone concentrations lower than 220 DU over Antarctica had never been observed, but from 1980 this became the norm as levels dropped rapidly, dipping below 100 DU for the first time in 1994 when the deepest ozone hole ever (73 DU) was recorded on September 30 that year.

NASA's Ozone Hole Watch website at

http://ozonewatch.gsfc.nasa.gov/meteorology/annual_data.html

tabulates a wealth of information about the *Ozone Hole* for every year since 1979 (1995 excepted). This includes:

- mean area for the season September 7 - October 13
- mean depth for the season September 21 - October 16
- single-day maximum area, and
- single-day minimum depth.

The ozone hole is a seasonal phenomenon that starts building up with the reappearance of the sun following the long period of winter darkness. Circumpolar winds trap cold air above the continent during the Antarctic spring, and sunlight catalyses reactions involving chlorine compounds which deplete ozone in the stratosphere. This process reaches its peak between late September and early October, after which conditions ease. Generally, by early December, the seasonal Ozone Hole has closed again.

Notably, the season when the *Ozone Hole* attains its maximum spread does not coincide exactly with the occurrence of maximum ozone depletion. Figure 2 plots the mean minimum recorded

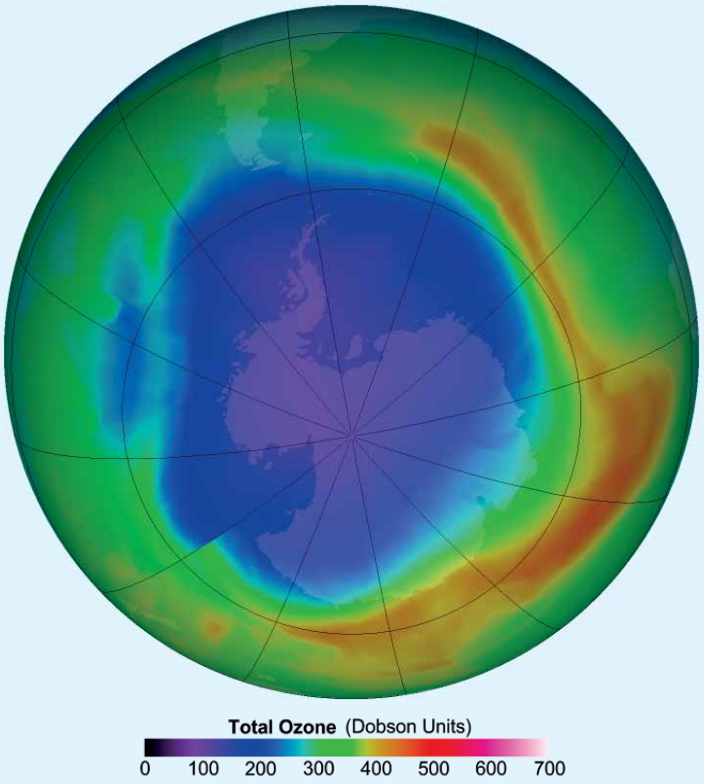


Figure 1
The year's deepest, single-day *Ozone Hole* over the Antartctic was recorded on September 29, 2013, when the concentration fell to 116 DU. The mean value throughout the 'Minimum Period' (Sept 21 - Oct 16) was 132.5 DU.

atmospheric *concentrations* of ozone in the stratosphere during the September 21 - October 16 window while figure 3 does likewise for the mean maximum geographical *areas* of the Ozone Hole between September 7 - October 13 (all data courtesy *NASA Ozone Hole Watch*).

It is clear that the area and depth of the ozone hole have generally stabilised since 1994, although annual fluctuations remain because ozone levels are also affected by more mundane processes such as yearly variations in stratospheric temperature and circulation: colder conditions in particular favour enhanced ozone depletion, creating a wider Ozone Hole with a lower ozone concentration at its centre. Figure 4 opposite shows a selection of Ozone Hole maps showing both the extent and depth of the Ozone Hole for selected

... continued on page 40

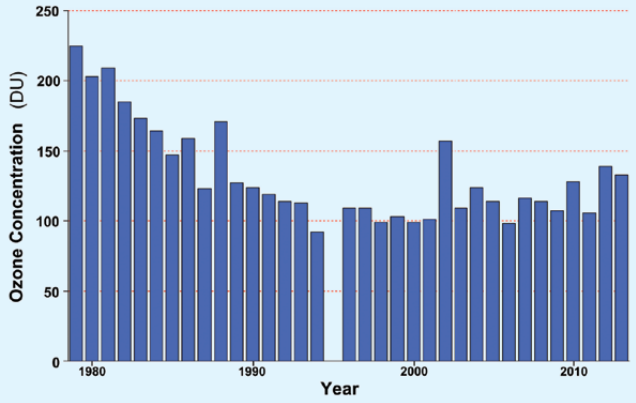


Figure 2 - Annual minimum ozone levels (Dobson Units)

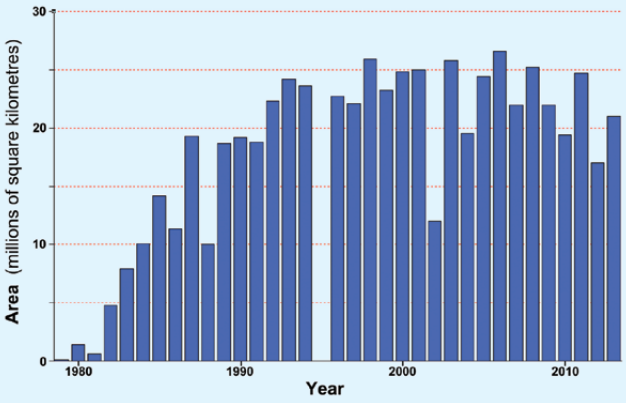


Figure 3 - Area covered by the ozone hole by year ($km^2 \times 10^6$)

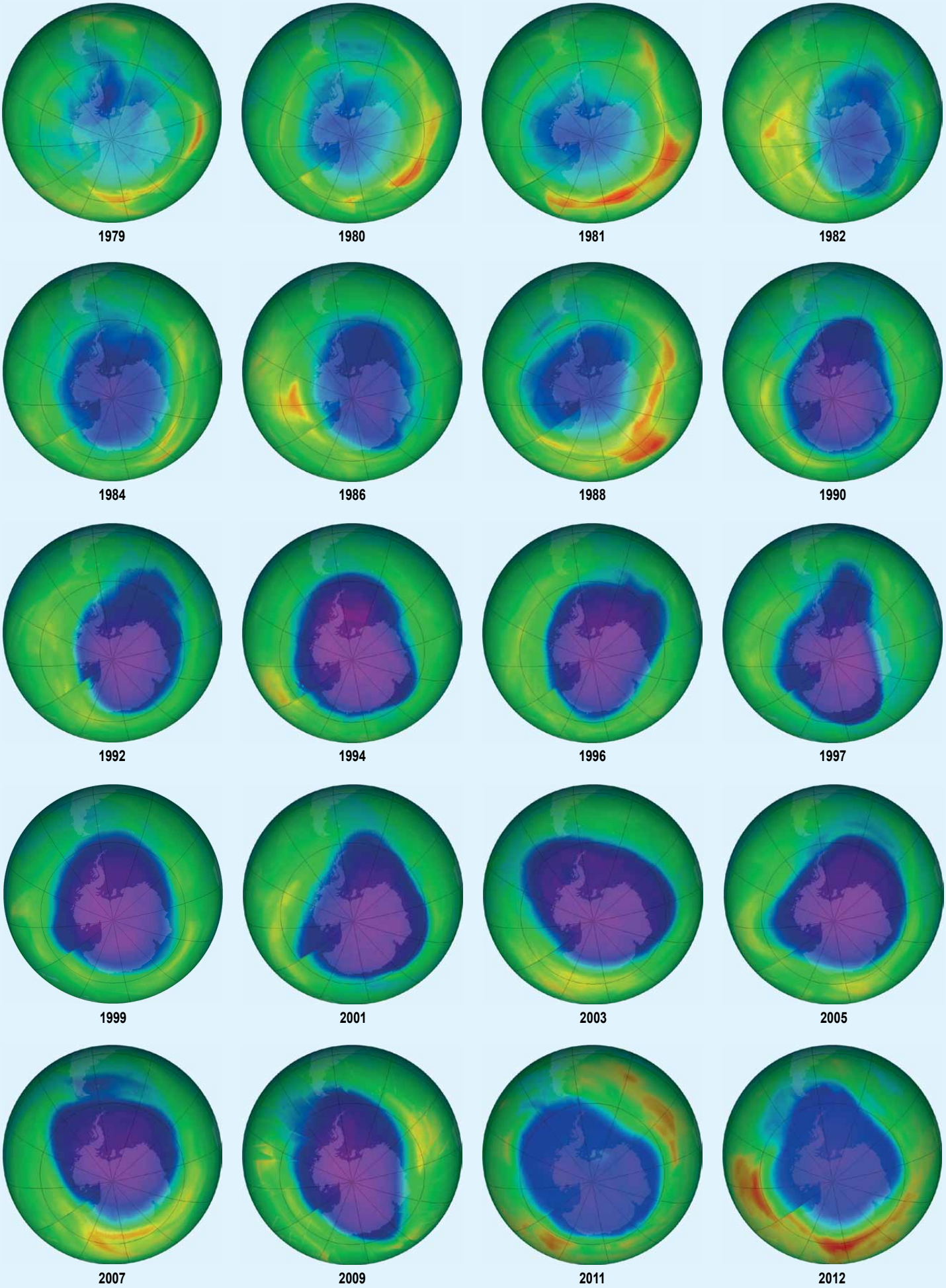


Figure 4
Maps plotting changes in the mean annual extent and depth of the Ozone Hole between 1979 and the present day.

years between 1979 and 2012. The outer edge of the Ozone Hole lies at the boundary between the cyan and dark blue regions; the areas of highest ozone depletion over the south pole region are rendered in shades of magenta. Variations in the apparent shape of the Ozone Hole from year to year have no significance. The Ozone Hole is dynamic, and stratospheric circulation slowly shifts its contours, even over the course of a single day. Figure 1 (above) shows the Ozone Hole at the time of its maximum extent this year, achieved on September 29. Note the marked reduction in purple colouring around the South Pole in the most recent maps.

The Antarctic Ozone Hole Images

The images of the *Ozone Hole* in figures 1 and 4 were created from measurements made by NASA's Total Ozone Mapping Spectrometer (TOMS) instruments, which flew aboard a variety of satellites (Nimbus 7, Meteor 3-05, ADEOS and Earth Probe) between 1979–2003, and by the Royal Netherlands Meteorological Institute (KNMI) Ozone Monitoring Instrument (OMI), which has been operating from NASA's Aura satellite since 2004. The dark blue and purple areas indicate the position and extent of the *Ozone Hole*.

The 2012 Antarctic Ozone Hole

The average area covered by the Antarctic Ozone Hole during 2012, at 17.8 million km^2, was the second smallest on record since 1988. This is an area roughly equivalent to that of the USA, Canada and Mexico combined. The fact that it has taken over two decades for ozone levels to fall back to pre-1990 levels relates to the long lifetimes of ozone-depleting substances released into the atmosphere prior to implementation of the Montreal Protocol.

Additionally, the minimum mean concentration of ozone in the atmosphere above Antarctica in 2012, 139.1 DU, was the second highest recorded since 1988: only the anomalous 157.4 DU spike of 2002 was higher. And at the South Pole itself, ground-based observations by NOAA recorded a minimum level of 136 DU. Outwith the 'Ozone Hole Season', total ozone levels over the Antarctic are typically in the range 240-500 DU.

The 2013 Antarctic Ozone Hole

The average area of the Ozone Hole this year showed an increase to 21.0 million km^2, but was still significantly below the average since the mid 1990s of 22.5 million km^2.

Conclusion

Since 2006, as the effects of the 1987 **Montreal Protocol** [2] banning the release of ozone-destroying chemicals into the atmosphere has started to take effect, the ozone hole is stabilising. Indeed, the trend suggests that ozone levels are at last slowly starting to decrease again.

Levels of chlorine in the atmosphere are falling [5] as a result of the treaty, but as yet not sufficiently to have a major shrinking effect on the ozone hole. Currently, it is the annual variations in temperature, and the winds which transport ozone from the tropics to polar regions, which largely determine the size of the ozone hole. Such natural events were largely responsible for the disparity between the large ozone hole of 2006 and the much smaller one in 2012. And variations like this are expected to continue for several decades yet. Only when chlorine levels fall below those prevalent in the 1990s—probably some time between 2015 and 2030—will major reductions in the ozone hole become apparent, hopefully leading to a full recovery by about 2070.

References

1 The Expanding Ozone Hole - GEOQ 13, page 4 (2007)
2 Montreal Protocol and the Ozone Hole - GEOQ 36, page 18 (2012)
3 NASA Ozone Hole Watch
http://ozonewatch.gsfc.nasa.gov/
4 Antarctic Ozone Hole: 1979 to 2008
http://earthobservatory.nasa.gov/IOTD/view.php?id=38835
5 NASA Reveals New Results from inside the Ozone Hole
http://www.nasa.gov/content/goddard/new-results-from-inside-the-ozone-hole/

FROM IMAGE TO INSIGHT

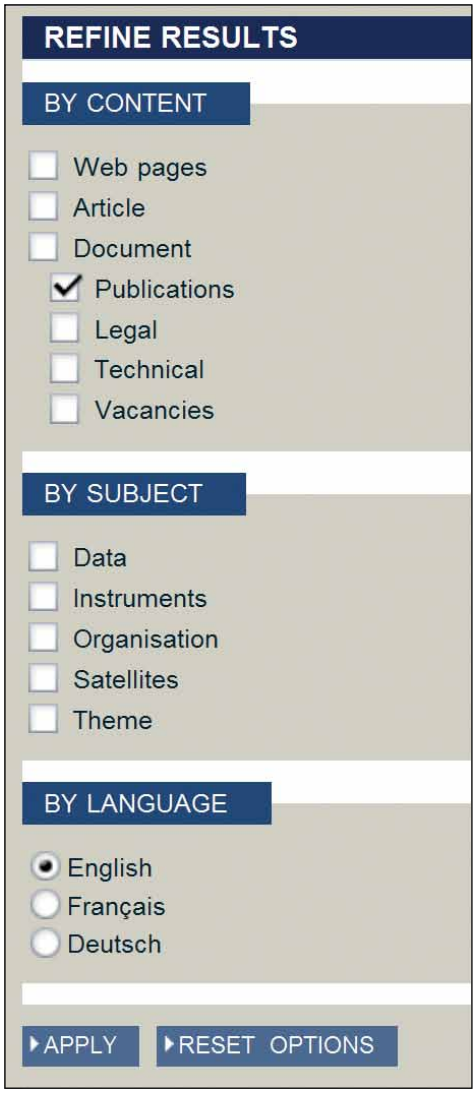
More and more specialist publications are eschewing the printed medium these days and moving totally over to electronic distribution. One of the latest 'casualties' of this trend has been EUMETSAT's popular *Image* newsletter. The following announcement appeared in *Image No 38*, published in July 2013:

> **IMAGE goes online**
>
> This is the final print edition of *IMAGE*, whose contents will have a new home on our website. In addition to future editions of IMAGE, there will be a PDF archive of past editions dating back to May 2000 on the website.
>
> ***http://www.eumetsat.int/website/home/InSight/***

This website is called *INSIGHT*. To search for past editions of *Image* newsletter, use the **search** panel at on the top right hand corner of the web page and type in 'IMAGE newsletter'. This opens the a search filter panel illustrated below.

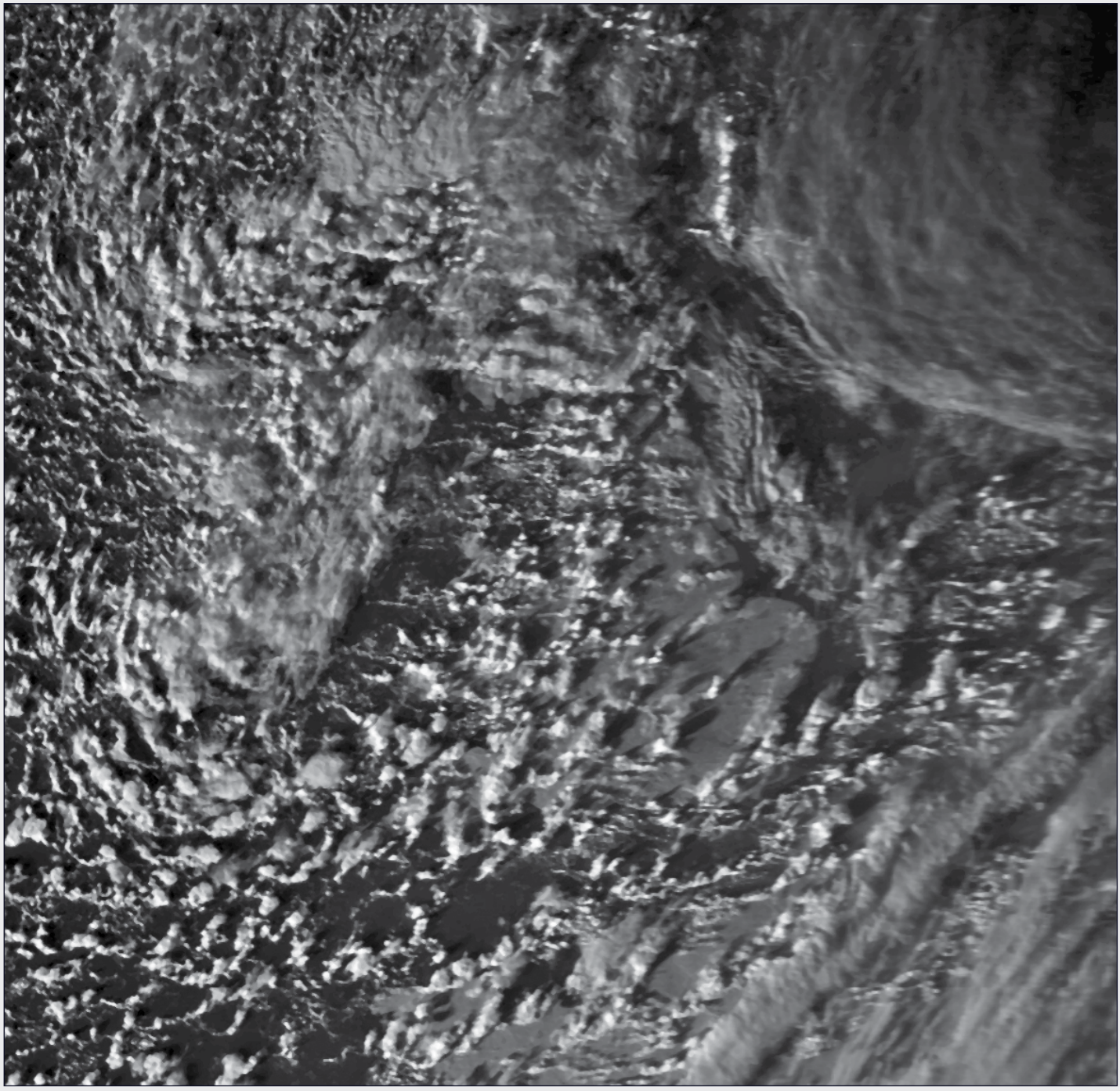
Tick **Document** and then **Publications**, whilst un-checking all the remaining ticked options.

Finally, clock the **Apply** button at the foot of the panel and you will be provided with a list of links to past Image newsletters. For reasons not understood, all issues do not seem to be available, but the entire website is so comprehensive that you might be better served searching for a specific topic (rather than newsletter). If that topic has been covered in an Image newsletter, a link will be provided.



Long Shadows

Robert Moore



On October 28, 2013, showery weather was moving in towards the UK from the Atlantic. In the afternoon, when the sun was low in the west, NOAA 18 made a pass over the UK.

Patches of what look like quite vigorous convection were to be seen casting long shadows, notably across the English midlands and East Anglia, the most conspicuous shadow across east Anglia being about 80 kilometres in length.

Are the tall columns of cloud a natural meteorological phenomenon or are they created by rising columns of warm air from power stations or industrial plant?

What is perhaps especially interesting about this image is that it does indeed show the clouds to be in vertical columns, something that would not have been at all obvious without the oblique sunlight.

Radiation Fog in Sweden

Anders Höök

In the last issue of GEO Quarterly (GEO Q40), there was a very beautiful image of Scandinavia with the rivers in the middle and northern parts of Sweden especially prominent. David Taylor, who wrote about the image, challenged the Swedish readers to confirm his hypothesis that it might be fog or mist that was making the rivers so prominent (figure 1).

As I am one of them (I live in Vallentuna, Sweden), I felt it was appropriate to try to check: so I made a phone call to the Swedish Meteorological and Hydrological Institute (SMHI). I happened to come in contact with meteorologist Sverker Hellström. He told me that on this very occasion (Sunday, August 25, 2013), the phenomenon had also been noticed by SMHI, and had been discussed in a blog written by meteorologist Mattias Lindh. The information below comes from his blog, which also showed a satellite image (figure 2), however not so beautiful as the one in GEO Q40. I also include a photograph from the blog showing a view from ground level (figure 3).

A major area of high pressure had been dominating the weather over Sweden for some time before August 25. At the end of the summer this results in nice daytime temperatures and relatively cold nights. Such prevailing high pressure and absence of wind gives high heat radiation during the nights. This results in veils of mist over meadows and in depressions, what we in Sweden call '*the dancing fairies*'.

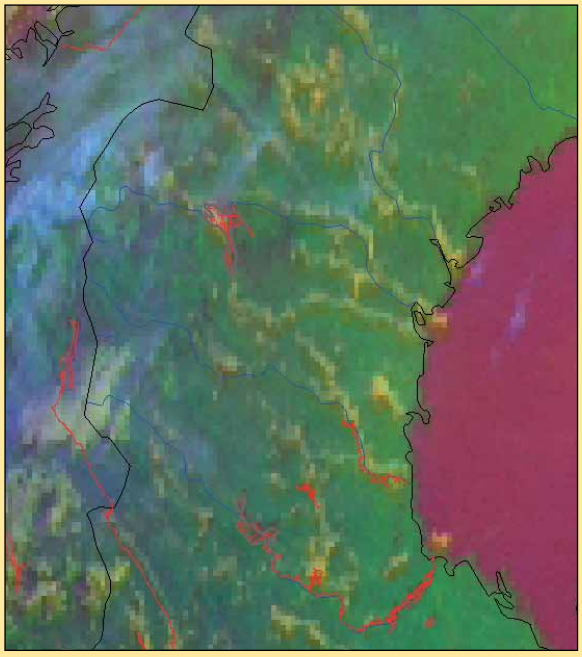


Figure 2 - A satellite image showing in the valleys and adjacent to rivers in southern Norrland at 7 am on Sunday, August 25, 2013.
Image courtesy SMHI/ Mattias Lindh

So, radiation mist is common during late summer and autumn. The ground loses heat due to long wavelength heat radiation, becomes cool, and water vapour can condense from the air.

Radiation mist had occurred in many places during the days around August 25. During these cold and calm nights the cold air descends into depressions and valleys, where the mist accumulates. This most probably explains why the rivers in the image are so prominent. But one can also note in the same image that, in the more southern parts of the country, other places than rivers are misty. These, I believe, are low-lying parts of the land.

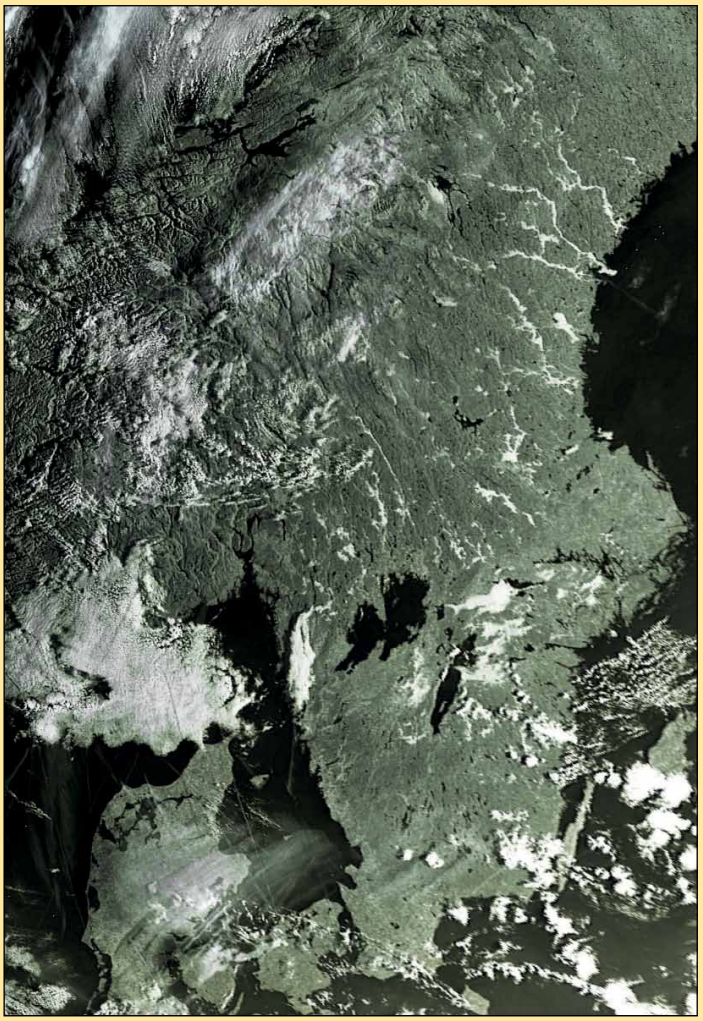
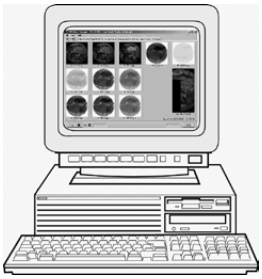


Figure 1 - Radiation Fog in Swedish River Valleys
NOAA 15 image courtesy the University of Berne/David Taylor

Figure 3 - A chilly morning with radiation mist over low lying terrain

You can access Mattias Lindh's blog at
http://www.smhi.se/Bloggar/2.1701/2013/08/27/alvar-och-alvor/

Some thoughts on future EUMETCast Computers



David Taylor

I know that there is still a corps of GEO Members who are using *Windows XP* as the operating system of choice for their *EUMETCast* receiving stations. It is probably common knowledge these days that Microsoft have been planning to end support for *Windows XP* for some time, and the deadline on which they intend to stop supplying security updates is imminent: April 8, 2014.

It therefore makes sense now, provided your PC is capable, to move to a more recent operating system such as *Windows-7* or *Windows-8*, both of which handle the *EUMETCast* software and satellite programs just as before. If your PC is rather long in the tooth, consider buying a new one with quad-core processor, 8 GB of memory, and equipped with *Windows 8.1*.

A quad-core computer with 8 GB memory should be a good starter. It's not essential to go for an SSD system disk for the type of use we tend to make—and most definitely keep that massive data flow away from any SSD, as these have a limited re-write life span. You can purchase a 2 TB or 3 TB hard disk quite cheaply these days. Perhaps the minimum system to aim for is one with a 500 GB system disk and a 2 TB data disk; and make sure there's room to fit a second network card (the motherboard will most likely already have an Ethernet port built-in), and get speakers if you don't already have them.

You can read what Microsoft have to say on the topic at

http://www.microsoft.com/en-gb/windows/enterprise/endofsupport.aspx

Why is Microsoft ending support for XP and Office 2003?

In 2002, Microsoft introduced its *Support Lifecycle* policy based on customer feedback, to offer more transparency and predictability of support for Microsoft products. As per this policy, Microsoft *Business and Developer* products, including *Windows* and *Office*, receive a minimum of 10 years of support (5 years Mainstream Support and 5 years Extended Support), at the supported service pack level.

Thus, *Windows XP SP3* and *Office 2003* will come out of support on April 8, 2014. If your organisation has not started the migration to a modern desktop, you are late. Based on historical customer deployment data, the average enterprise deployment can take 18 to 32 months from business case through full deployment. To ensure you remain on supported versions of *Windows* and *Office*, you should begin your planning and application testing immediately to ensure you deploy before support ceases.

What does end of support mean to customers?

It means you should take action. After April 8, 2014, there will be no new security updates, non-security hotfixes, free or paid assisted support options or online technical content updates. Running *Windows XP SP3* and *Office 2003* in your environment after their end of support date may expose your company to potential risks, such as:

- Security & Compliance Risks: Unsupported and unpatched environments are vulnerable to security risks. This may result in an officially recognized control failure by an internal or external audit body, leading to suspension of certifications, and/or public notification of the organizations inability to maintain its systems and customer information.
- Lack of Independent Software Vendor (ISV) & Hardware Manufacturers support: A recent industry report from Gartner Research suggests "many independent software vendors (ISVs) are unlikely to support new versions of applications on Windows XP in 2011; in 2012, it will become common." And it may stifle access to hardware innovation: Gartner Research further notes that in 2012, most PC hardware manufacturers will stop supporting Windows XP on the majority of their new PC models.

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

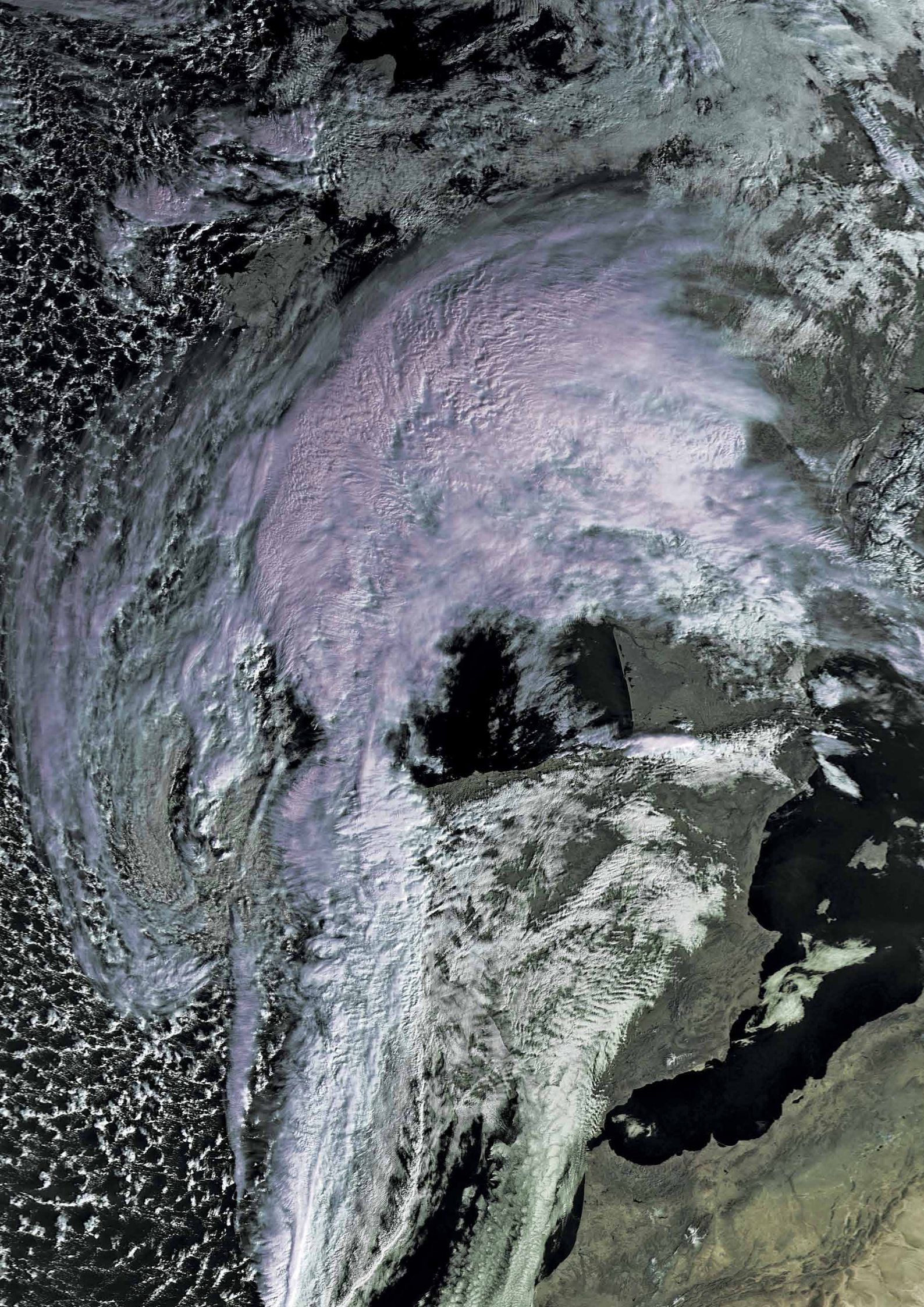
Satellite	Frequency	Mode	Format	Image Quality
NOAA 15	1702.5 MHz	Omni	HRPT	Weak
NOAA 16	1698.0 MHz	RHCP	HRPT	Good
NOAA 18	1707.0 MHz	RHCP	HRPT	Good
NOAA 19	1698.0 MHz	RHCP	HRPT	Good
Feng Yun 1D	1700.4 MHz	RHCP	CHRPT	None: Device failure
Feng Yun 3A	1704.5 MHz	---	AHRPT	[2]
Feng Yun 3B	1704.5 MHz	---	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



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@btopenworld.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 42 is Sunday, April 27, 2014

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 *YouSendIt*

www.yousendit.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.

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

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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

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

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

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	---
GEO Quarterly Back Issues (subject to availability)	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

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

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

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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.

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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 frequencies required for NOAAs 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