

Australian VLab Centre of Excellence
**National Himawari-8
Training Campaign**

The Day Microphysics RGB product

Should you use these resources please acknowledge the Australian VLab Centre of Excellence. In addition, you need to retain acknowledgement in the PowerPoint slides of EUMETSAT, the Japan Meteorological Agency, the Bureau of Meteorology and any other sources of information.

Compiled by Bodo Zeschke, BMTC, Australian Bureau of Meteorology, using information from various sources, May 2015



Australian Government

Bureau of Meteorology

Learning Outcomes

At the end of this exercise you will:

- Have a basic knowledge how the Day Microphysics RGB product is constructed from multiple satellite channels and the physics and meteorology underpinning this.
- Have a better understanding of the advantages and the limitations of the Day Microphysics RGB product.
- Through using the EUMETSAT ePort gain a "hands on experience" in using this RGB product in combination with other observations, Derived Products and Numerical Weather Prediction (NWP) models.
- Have a better appreciation of using the Day Microphysics RGB product in monitoring, nowcasting and short term forecasting of various meteorological phenomena.
- Note – corresponding WMO-1083 Capabilities and BOM Enabling Skills are given in Appendix 1.

Contents

Introduction

- The many channels of Himawari-8
- The seven WMO endorsed RGB products

Familiarisation with the RGB product

- Colour blindness test
- How the RGB product is created (channel combination recipe, beams explained)
- Identifying features in the RGB product and relating this to the palette
- Some interesting features the RGB product can show

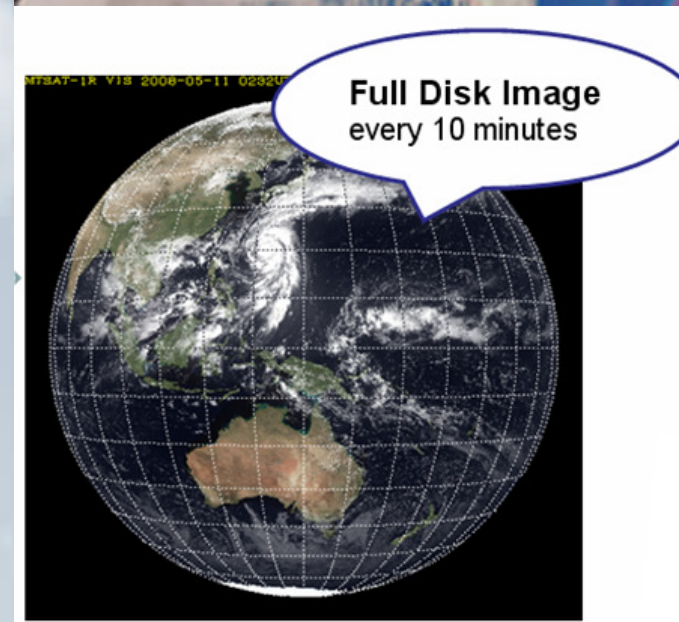
Case Study

- Displaying the data (EUMETSAT ePort)
- Comparing the RGB product with single channel data, overlaying Derived Product.
- Examining the RGB product in animation

Summary and Appendix – useful reference material

The Japanese Geostationary Satellites Himawari 8/9

Band	Central Wavelength [μm]	Spatial Resolution
1	0.43 - 0.48	1Km
2	0.50 - 0.52	1Km
3	0.63 - 0.66	0.5Km
4	0.85 - 0.87	1Km
5	1.60 - 1.62	2Km
6	2.25 - 2.27	2Km
7	3.74 - 3.96	2Km
8	6.06 - 6.43	2Km
9	6.89 - 7.01	2Km
10	7.26 - 7.43	2Km
11	8.44 - 8.76	2Km
12	9.54 - 9.72	2Km
13	10.3 - 10.6	2Km
14	11.1 - 11.3	2Km
15	12.2 - 12.5	2Km
16	13.2 - 13.4	2Km

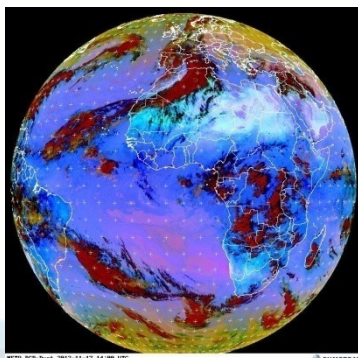


RGB products for Operational Forecasting – EumetSAT recommendation – the Day Microphysics RGB

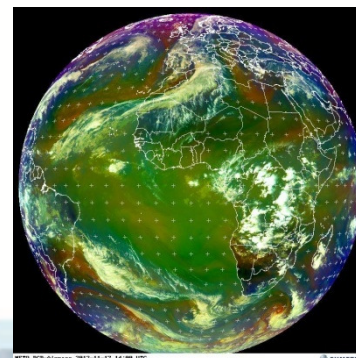


Australian Government
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Two RGB composites which complement each other



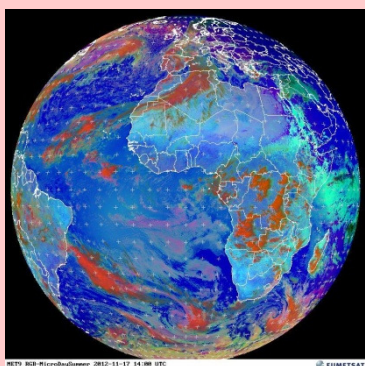
24 hour Microphysical RGB



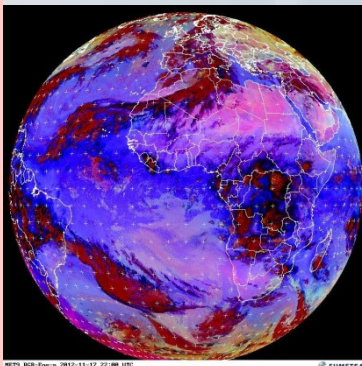
Airmass RGB

Five application specific RGBs

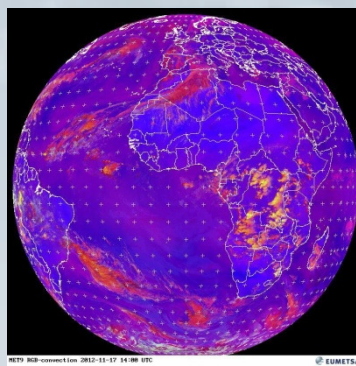
from RGB Products
Overview (RGB Tutorial)
J. Kerkmann EumetSAT



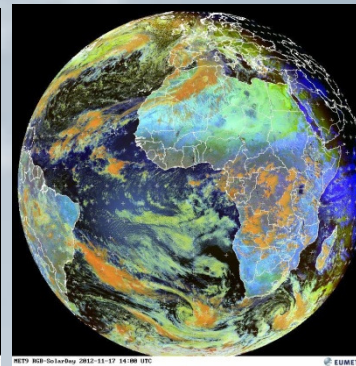
Day
Microphysical
RGB



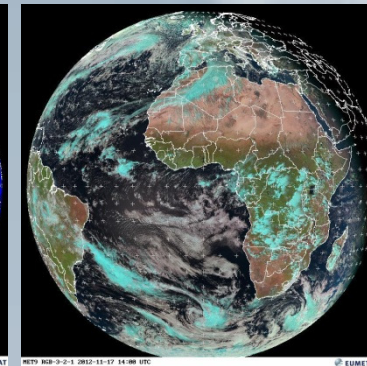
Night
Microphysical
RGB



Day
Convection
RGB



Snow / fog
RGB



Natural
Colours RGB

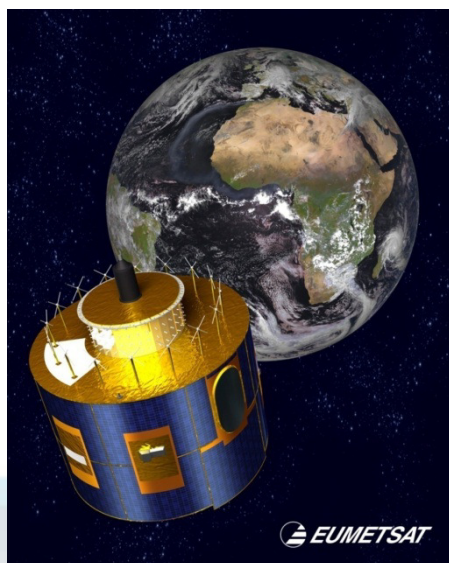
EUMETSAT strategy of using RGB products – two “24-hour products” that are used all the time and five application specific RGB products.

At World Meteorological Organisation (WMO) level: agree on a strict minimum of harmonised RGB composites. The following strategies for the application of RGB products to the forecasting routine were outlined:

Two RGB composites which complement each other are used all of the time. These are the 24 hour Microphysics RGB and the Airmass RGB.

Five application specific RGB products (Day Microphysics RGB, Night Microphysics RGB, Day Convective Storm RGB, Day Snow-Fog RGB, Natural Colours RGB) are used selectively when appropriate.

EUMETSAT processing of METEOSAT data – Day Microphysics RGB



Recommended Range and Enhancement:

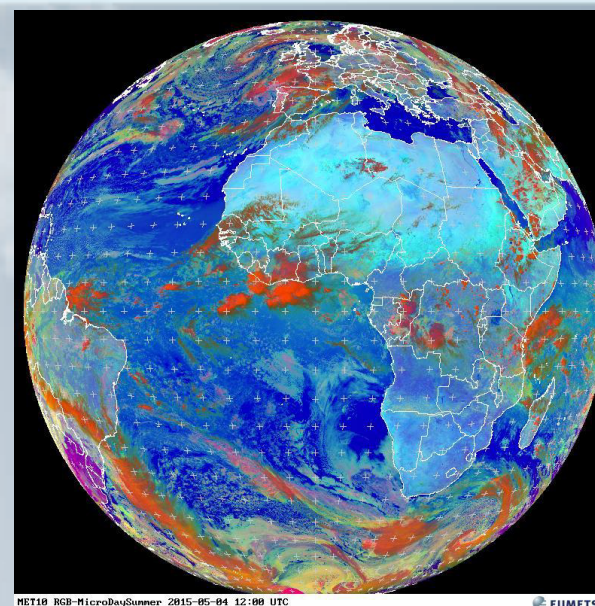
Beam	Channel	Range	Gamma
Red	02 (VIS0.8)	0 ... +100 %	1.0
Green	04r (IR3.9r)	0 ... +60 %	2.5
Blue	09 (IR10.8)	+203 ... +323 K	1.0

CHANNEL COMBINATION

Deep precipitating cloud (precip. not necessarily reaching the ground)	Deep precipitating cloud (Cb cloud with strong updrafts and severe weather) or thick, high-level lee cloudiness with small ice particles	Thin Cirrus cloud (large ice particles)	Thin Cirrus (small ice particles)
Supercooled, thick water cloud – large droplets	Supercooled, thick water cloud – small droplets	Supercooled thin water cloud with large droplets	Supercooled, thin water cloud with small droplets
Thick water cloud (warm rain cloud) - large droplets	Thick water cloud (no precipitation) – small droplets	Thin water cloud with large droplets	Thin water cloud with small droplets
Ocean	Veg. Land	Fires / Desert	Snow

COLOUR INTERPRETATION

EUMETSAT = European Organization for the Exploitation of Meteorological Satellites



EUMETSAT 0 degree RGB Composite

EUMETSAT processing of METEOSAT data – Day Microphysics RGB

The previous slide shows the channels used in the RGB product, the thresholds (range) applied to the Beams and the Gamma correction that is applied to selected Beams as per EUMETSAT recipe

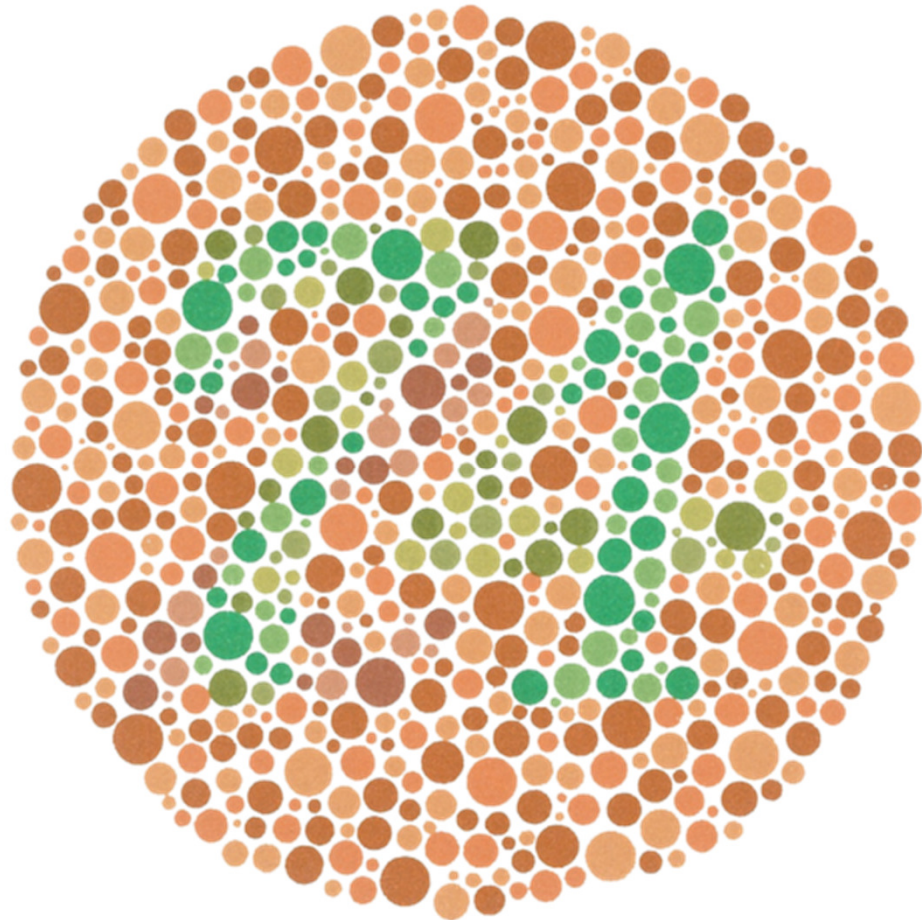
The appearance of the RGB product for the full disk earth image scanned by the Meteosat satellite is also shown. Note that this looks very different from the familiar single channel visible and infrared images. This RGB product also looks very different from the true colour earth image.

For this reason the colour palette assists in interpreting the features of interest to the Forecaster in the RGB product output.

Intermission

To take full advantage of the RGB products you should be able to see the number "74" in the pattern on the right.

If you cannot see this number, please send an email to b.zeschke@bom.gov.au and I will adapt this training resource accordingly



Channel combination recipe of the Day

Microphysics RGB

(For more details see Appendix 2)

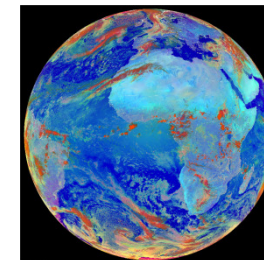
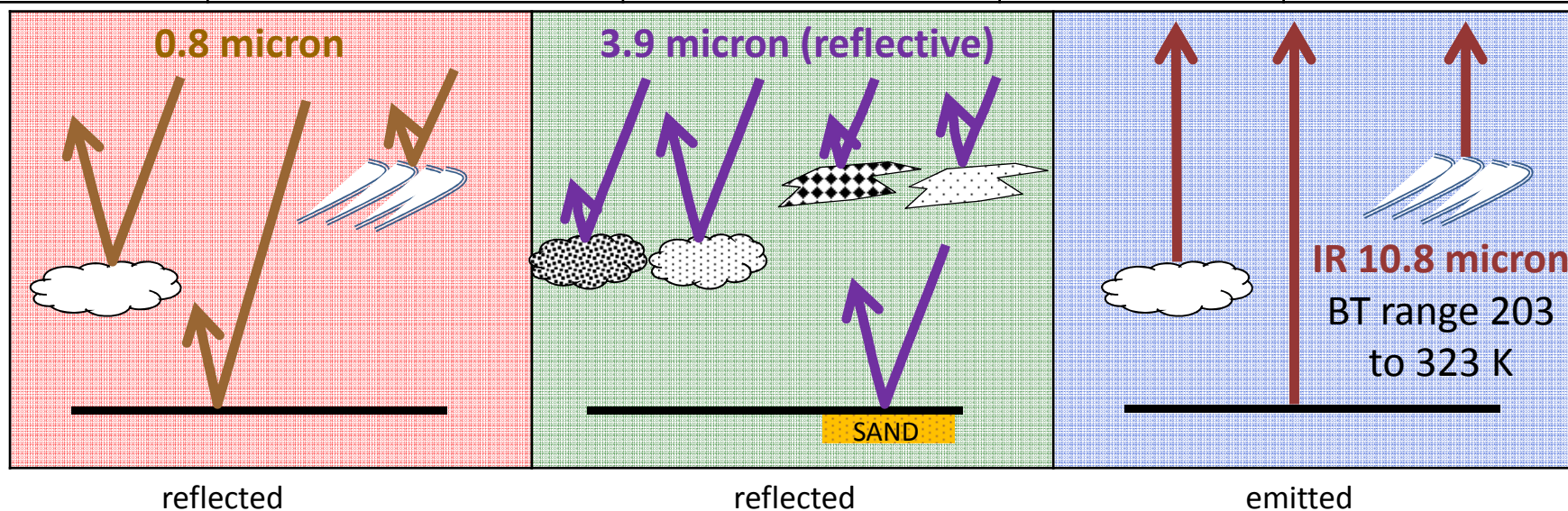


image courtesy
EUMETSAT

Recommended Range and Enhancement

Beam	Channel	Range	Gamma	Gamma 2
Red	VIS0.8	0 ... 100%	1.0	1.0
Green	NIR3.9 (r) (reflected / solar component)	0 ... 60%	2.5	1.0
Blue	IR10.8	+203 ... +323 K	1.0	1.0



Channel combination “recipes” of the Day Microphysics RGB

- **In the RED beam** - The visible reflectance at 0.8 microns approximates the cloud optical depth (thickness) and amount of cloud water and ice. Typically, water cloud is more reflective than ice cloud and thus will have a stronger red beam component. This channel also gives information about the surface of the earth. For example, vegetated land, desert and snow cover are all very reflective
- **In the GREEN beam** - the 3.9 μm shortwave infrared solar reflectance gives a qualitative measure for cloud particle size and phase. Typically smaller water droplets or small ice particles have a higher reflectivity, resulting in a stronger green beam component. A sandy earth surface also has a strong reflectance in this channel.
- **In the BLUE beam** - The 10.8 μm infrared brightness temperature is a function of surface and cloud top temperatures. The scaling for this beam results in a strong blue beam component for warm surfaces, whereas cold cloud tops will not have any contribution in this beam.

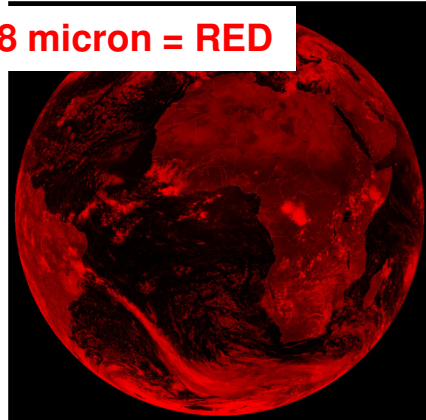
Obtaining the reflective component for the 3.9 micron channel

- For the 3.9 micron channel at daytime the outgoing radiance is due to solar reflection and thermal emission. Thus in order to determine a channel reflectance, it is necessary to subtract the thermal part from the satellite signal.
- To do this, the temperature of the observed object is needed. The usual candidate at hand is the 11 brightness temperature (e.g. VIIRS I5 or M12), since most objects behave approximately as blackbodies in this spectral interval.
- If the satellite observation is given in terms of the brightness temperature, then the corresponding spectral radiance can be derived by convolving the relative spectral response with the Planck function and dividing by the equivalent band width. This gives the spectral radiance given the brightness temperature and may be expressed in $W m^{-2} \mu m^{-1} sr^{-1}$. In order to get the total radiance over the band one has to multiply with the equivalent band width.

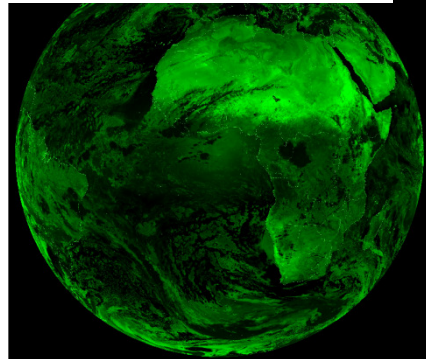
From https://pyspectral.readthedocs.org/en/latest/37_reflectance.html

The input beams that go to make up the Day Microphysics RGB.

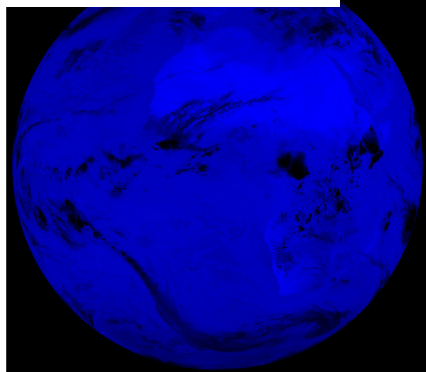
0.8 micron = RED



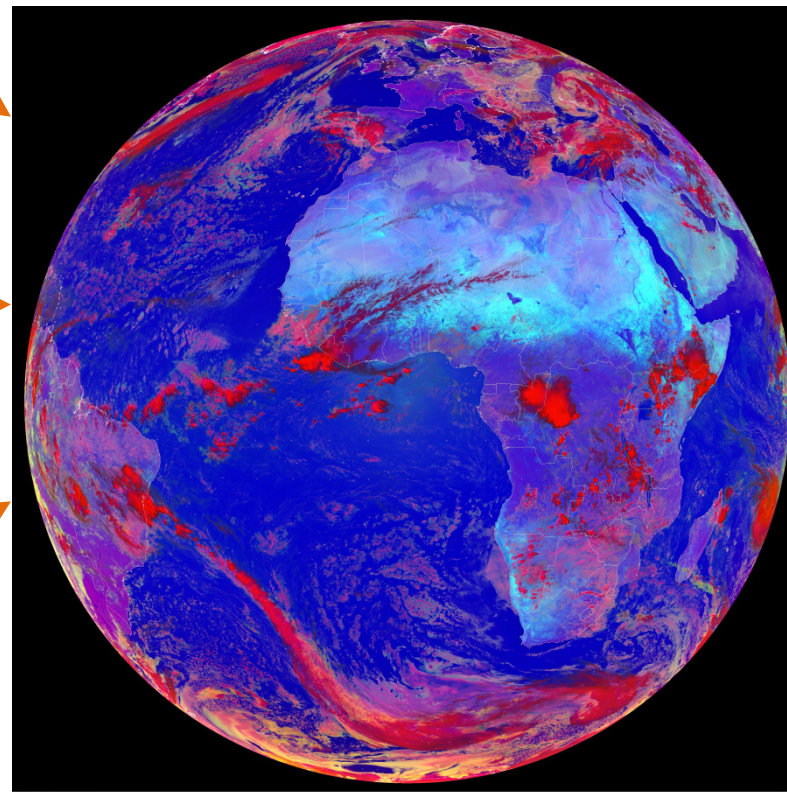
3.9 (r) micron = GREEN



10.8 micron = BLUE



Beam	Channel	Range	Gamma	Gamma 2
Red	VIS0.8	0 ... 100%	1.0	1.0
Green	NIR3.9 (r) <small>(reflected / solar component)</small>	0 ... 60%	2.5	1.0
Blue	IR10.8	+203 ... +323 K	1.0	1.0



Western Hemisphere 8 April 2015 1200 UTC

The input beams that go to make up the Day Microphysics RGB.

In the preceding slide you can familiarize yourself with the output of each of the beams for the Day Microphysics RGB product output of the Western Hemisphere 8 April 2015 1200 UTC.

In the red beam, note the strong contribution from the highly reflective cloud tops.

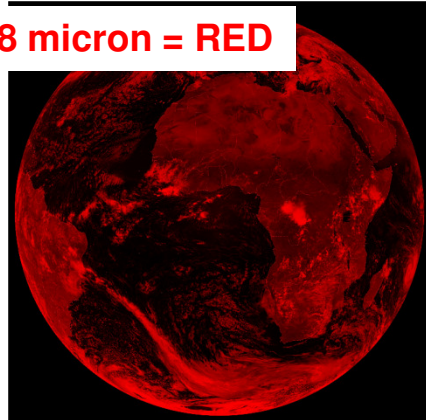
In the green beam, note the strong contribution from desert surfaces (Sahara, Kalahari deserts of Africa). Note that the storm tops over central Africa have very little contribution in this beam, indicating that the stormtops are likely to have large ice crystals.

In the Blue beam it is clear to see that all of the high cloud tops do not have any contribution.

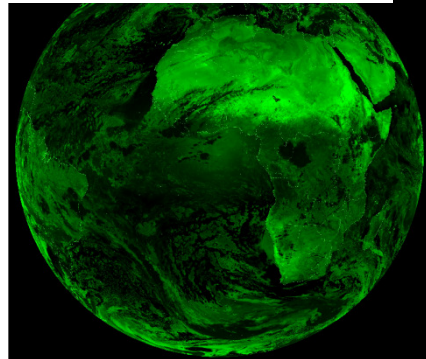
The next slide shows the effect of combining two beams.

The input beams that go to make up the Day Microphysics RGB.

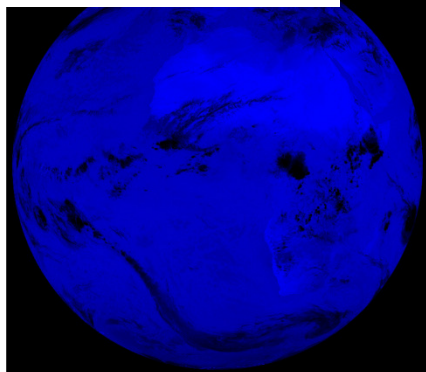
0.8 micron = RED



3.9 (r) micron = GREEN



10.8 micron = BLUE



Combining beams



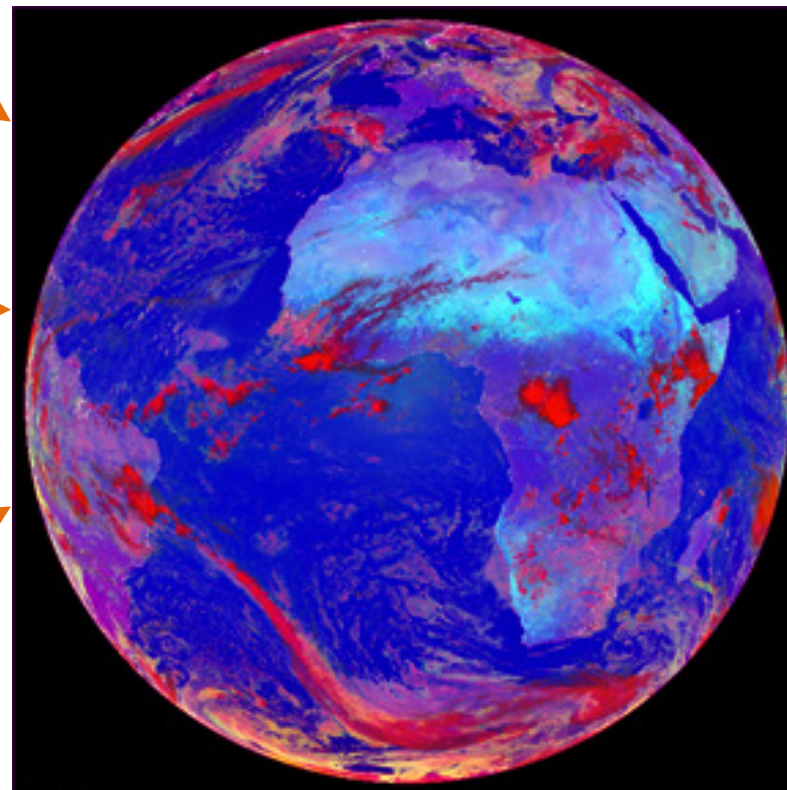
Yellow is made by mixing red and green



Magenta is made by mixing red and blue



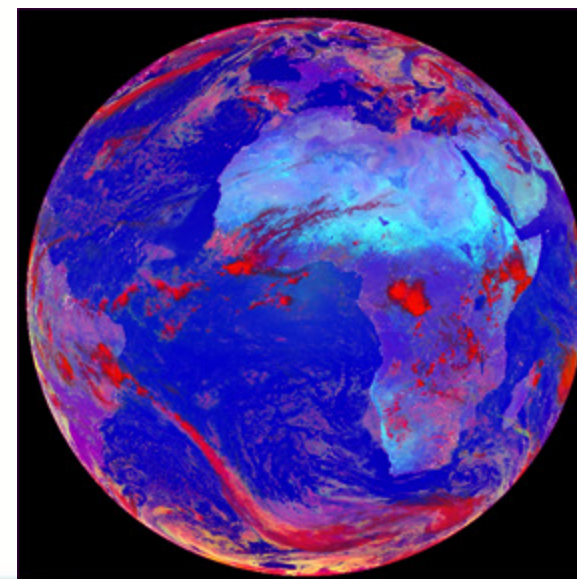
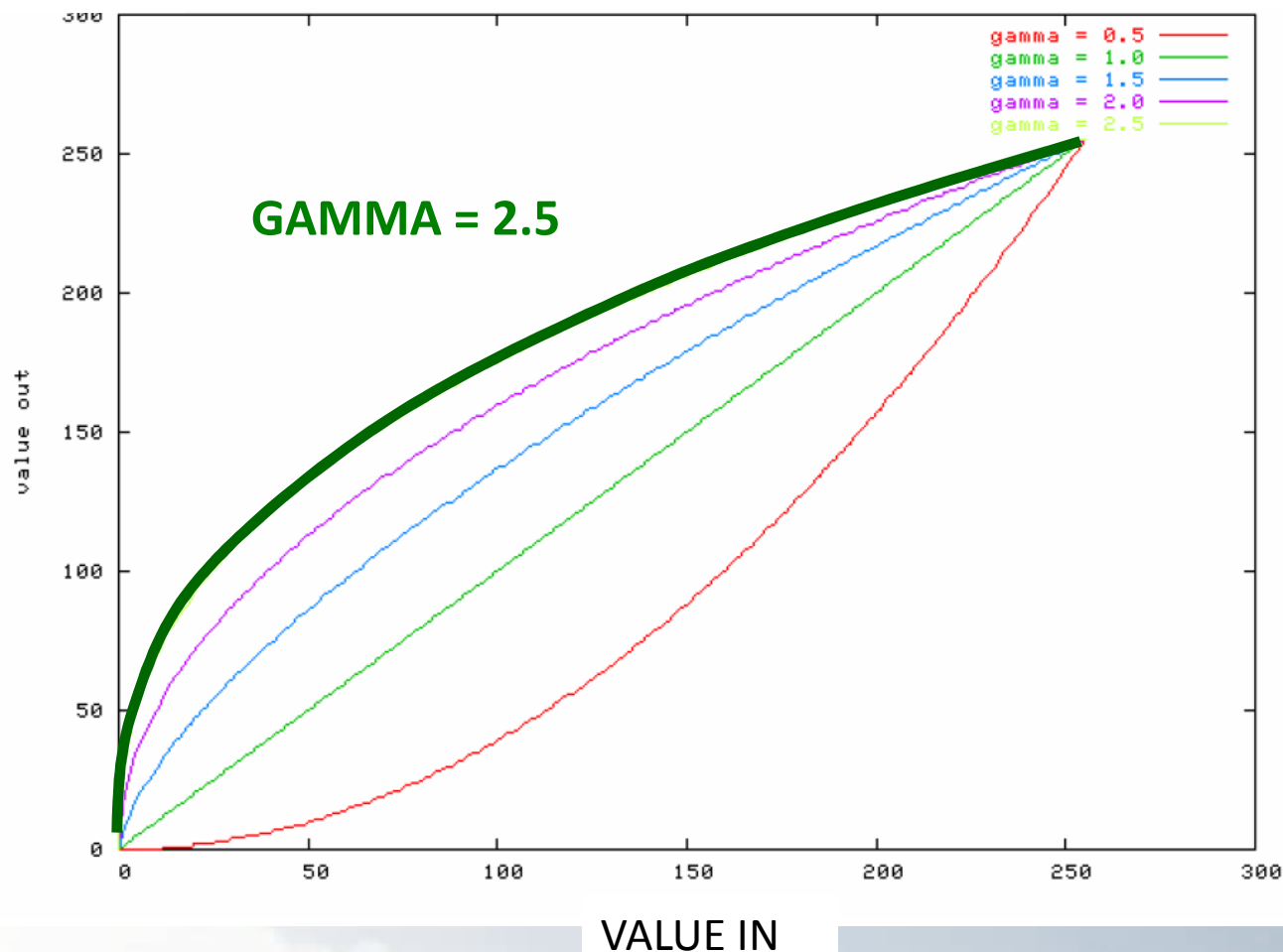
Cyan is made by mixing green and blue



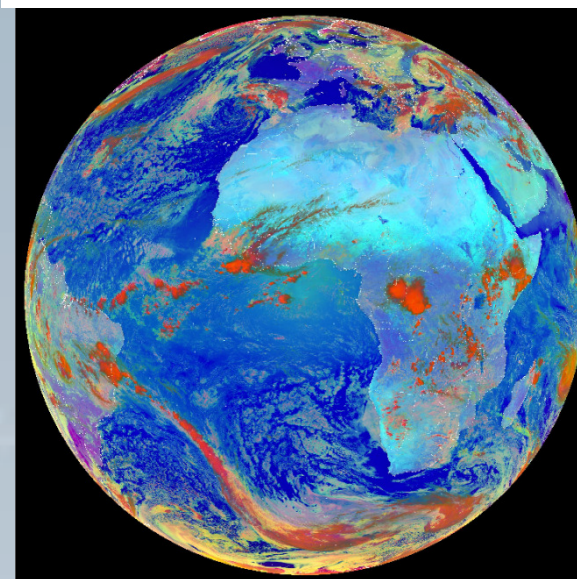
Western Hemisphere 8 April 2015 1200 UTC

GAMMA Correction applied

VALUE
OUT



Before GAMMA correction



After GAMMA correction

The GAMMA enhancement. GAMMA=2.5 applied to a Day Microphysics RGB enhancement over the Western Hemisphere. Top, without GAMMA, bottom with GAMMA = 2.5.

GAMMA Correction applied

- The Gamma correction changes the linear spreading of a selected range of pixel values over the full intensity scale to a convex ($\text{GAMMA} < 1$) or concave ($\text{GAMMA} > 1$) curve.
- The GAMMA correction enhances the contrast of the higher ($\text{GAMMA} < 1$) or lower parts ($\text{GAMMA} > 1$) of the pixel values in an image.
- Inspection of the result of applying the GAMMA correction to the green beam of the Day Microphysics RGB shows that a much more "colour balanced" image is produced. Much of the strong red colour overtones are removed.
- For more information please see http://oiswww.eumetsat.int/~idds/html/doc/best_practices.pdf

High-level / Mid-level / Low level Cloud / earth surface palette exercises.

Examine the next three slides and see if you can identify the various features in the Day Microphysics RGB product.

For reference I have also included a corresponding infrared image of each of the examples.

High-level Clouds palette – **please annotate features**



Deep precipitating cloud
(precip. not necessarily
reaching the ground)



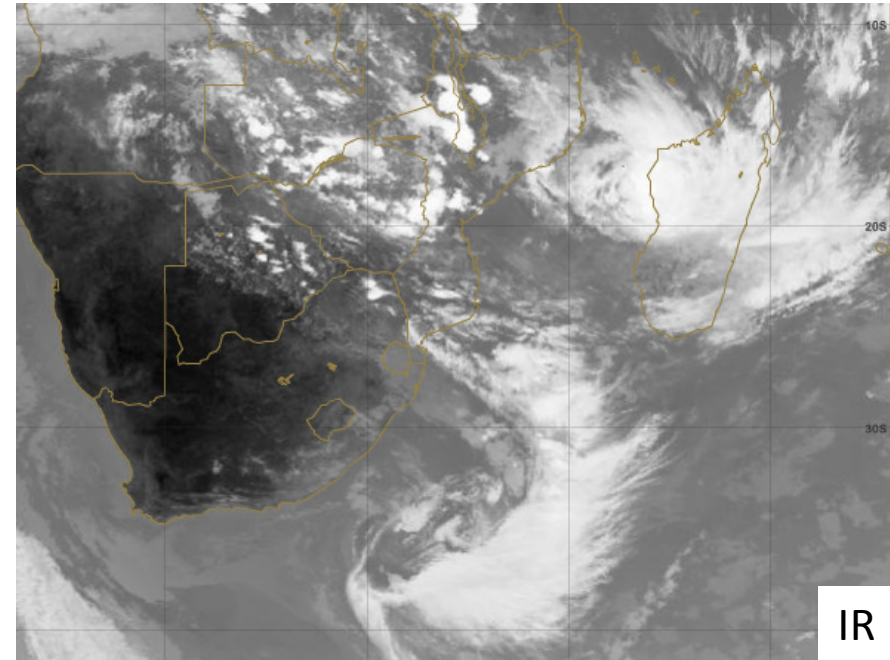
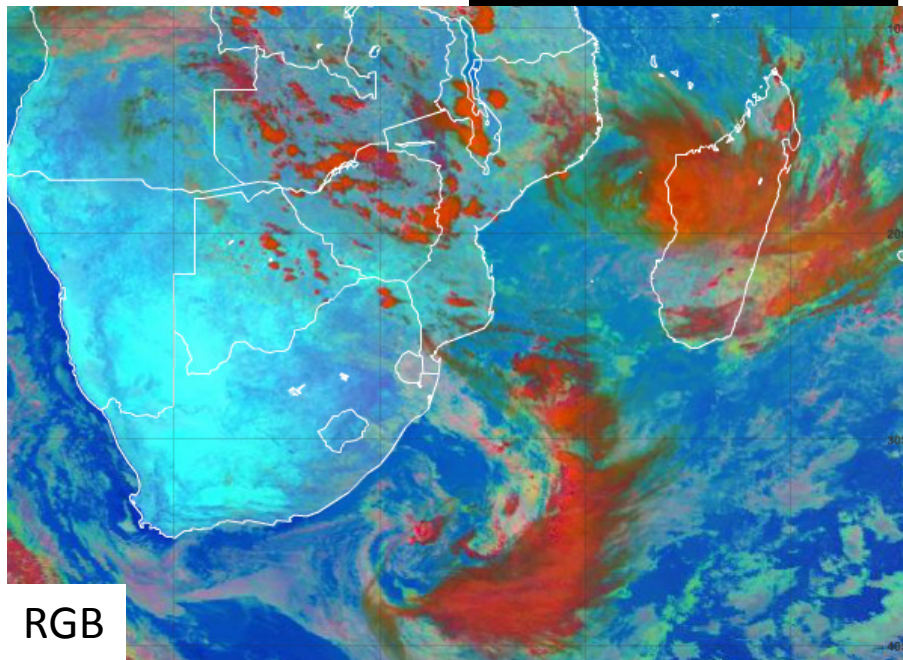
Deep precipitating cloud
(Cb cloud with strong
updrafts and severe
weather) or thick, high-
level lee cloudiness with
small ice particles



Thin Cirrus cloud
(large ice particles)



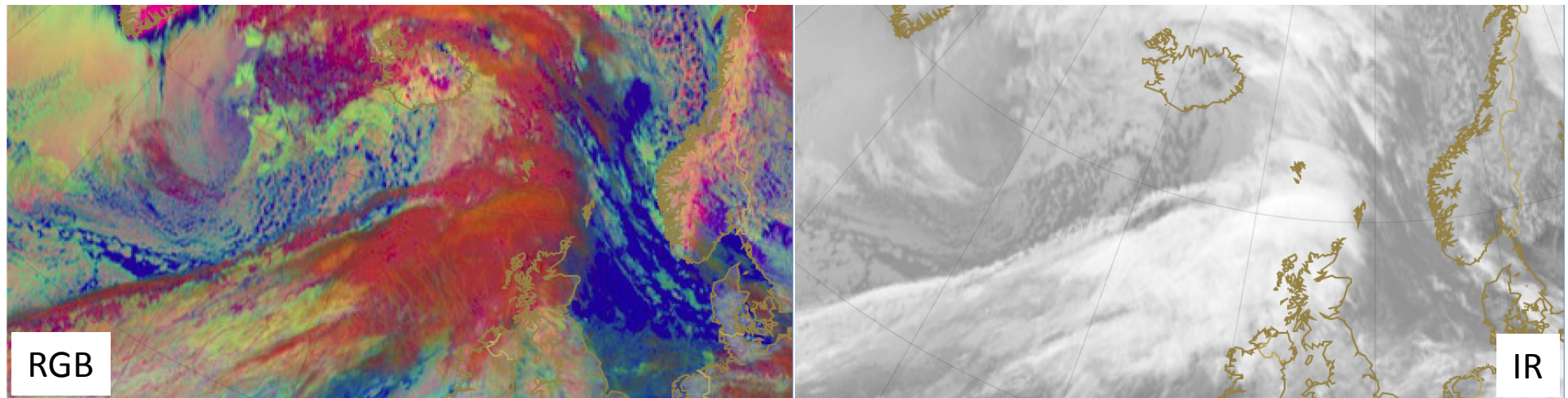
Thin Cirrus cloud
(small ice particles)



Southern Africa 5 February 2015 12UTC



Mid-level Clouds palette – **please annotate features**



North Atlantic Ocean 13 April 2015 1800UTC



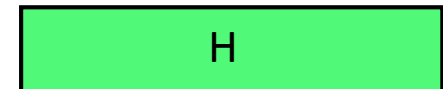
Supercooled, thick
water cloud – large
droplets



Supercooled, thick
water cloud – small
droplets



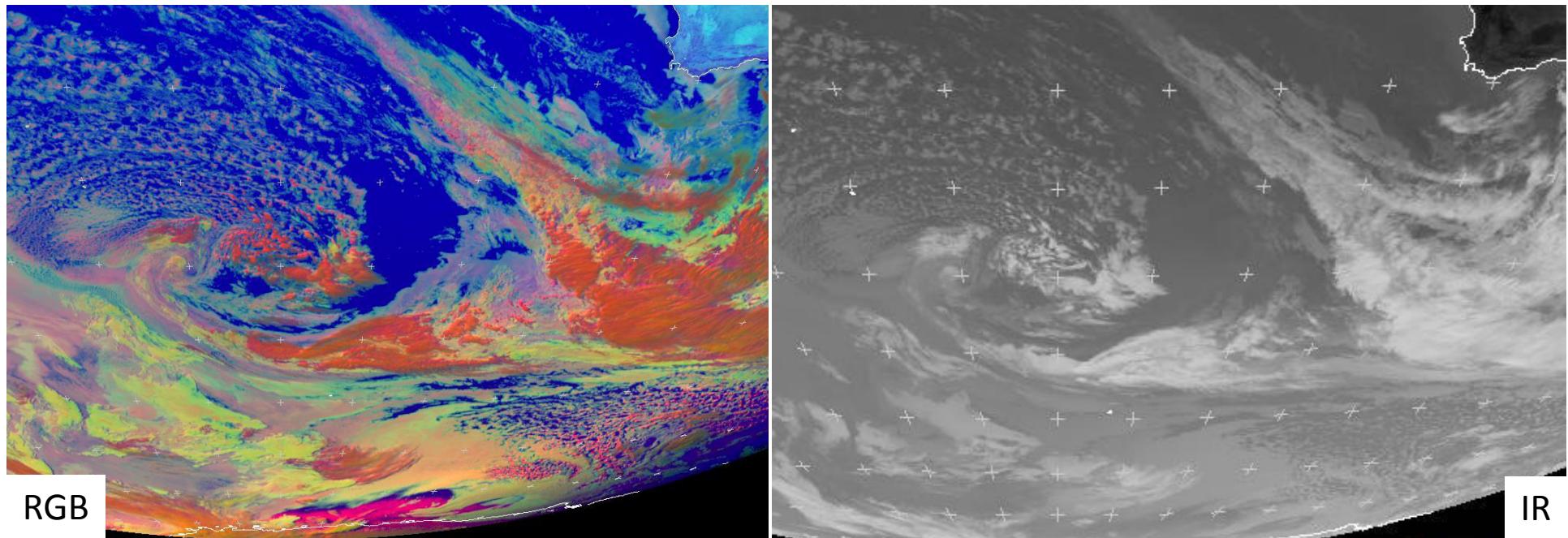
Supercooled thin water
cloud with large droplets



Supercooled, thin water
cloud with small droplets



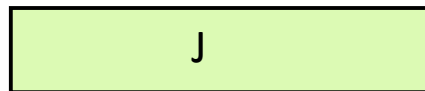
Low-level Clouds palette – **please annotate features**



South Atlantic Ocean 12 April 2015 14UTC



I



J



K



L

Thick water cloud
(warm rain cloud) - large
droplets

Thick water cloud
(no precipitation) – small
droplets

Thin water cloud with
large droplets

Thin water cloud
with small droplets

Ocean (O)


Veg. Land (V)

Fires / Desert (D)

Snow (S)

Very useful website for reference – the EUMETRAIN RGB Colour Interpretation Guide

<http://www.eumetrain.org/RGBguide/rpbs.html>

 **EUMETRAIN**
International training project sponsored by EUMETSAT
to support and increase the use of meteorological satellite data

Home | Resources | ePort | User Manual | Courses | Events | Polarstern

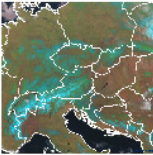
Home » Resources

RGB Colour Interpretation Guide

Satellite Instrument	RGB	Colour	Phenomena
--all--	--all--	--all--	--all--

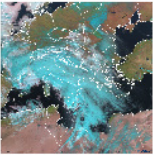
60 results found

Pages: **1** 2 3




Natural Colour RGB
Snow and ice on the ground
Description
In the Natural Colour RGB, snow and ice on the earth surface depict in cyan colour. ➔ more...

Click to enter



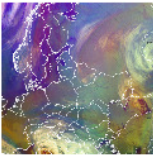
Natural Colour RGB
Ice clouds
Description
In the Natural Colour RGB, ice clouds depict in cyan colour. ➔ more...

Click to enter



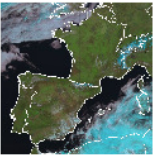
Natural Colour RGB
Oceans and lakes
Description
In the Natural Colour RGB, oceans and lakes depict in black colour ➔ more...

Click to enter



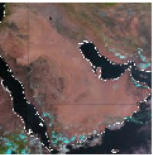
Airmass RGB
Cold cloud free land
Description
In the Airmass RGB, very cold land depicts in green colour. ➔ more...

Click to enter



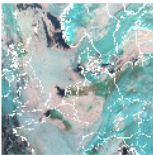
Natural Colour RGB
Vegetation
Description
In the Natural Colour RGB, the green colour over land depicts vegetation cover. ➔ more...

Click to enter



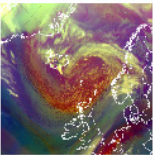
Natural Colour RGB
Sand and bare soil
Description
In the Natural Colour RGB, the red colour over land depicts bare soil or sand. ➔ more...

Click to enter




Natural Colour RGB
Water clouds
Description
In the Natural Colour RGB, water clouds are depicted in white. Very low water clouds turn into red and when ice appears on the top of the clouds colour turns into cyan. ➔ more...

Click to enter



Airmass RGB
Dry airmass
Description
In the Airmass RGB, red zones delimit dry air masses ➔ more...

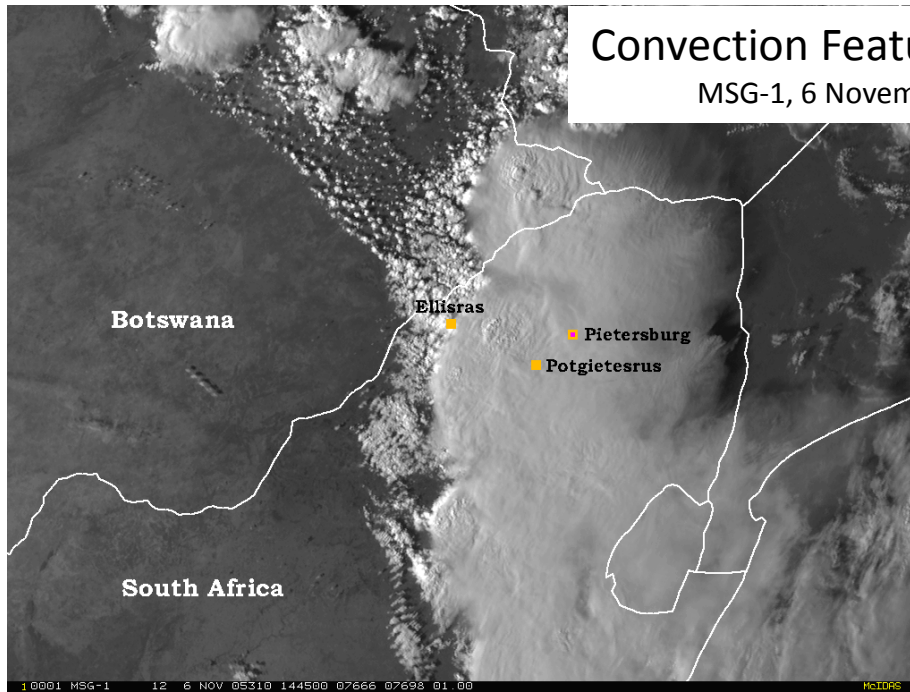
Click to enter



Natural Colour RGB
Salt lakes
Description
In the Natural Colour RGB, dried-up salt lakes depict in cyan colour. ➔ more...

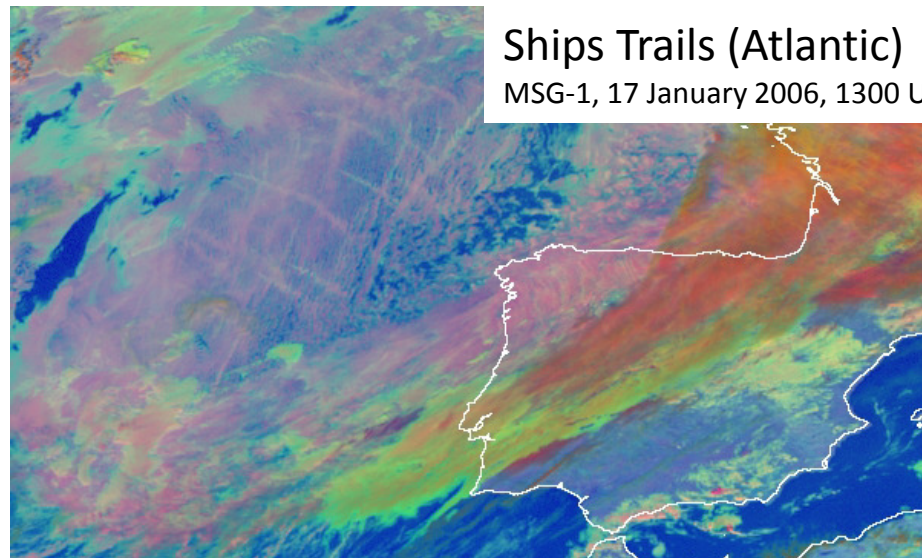
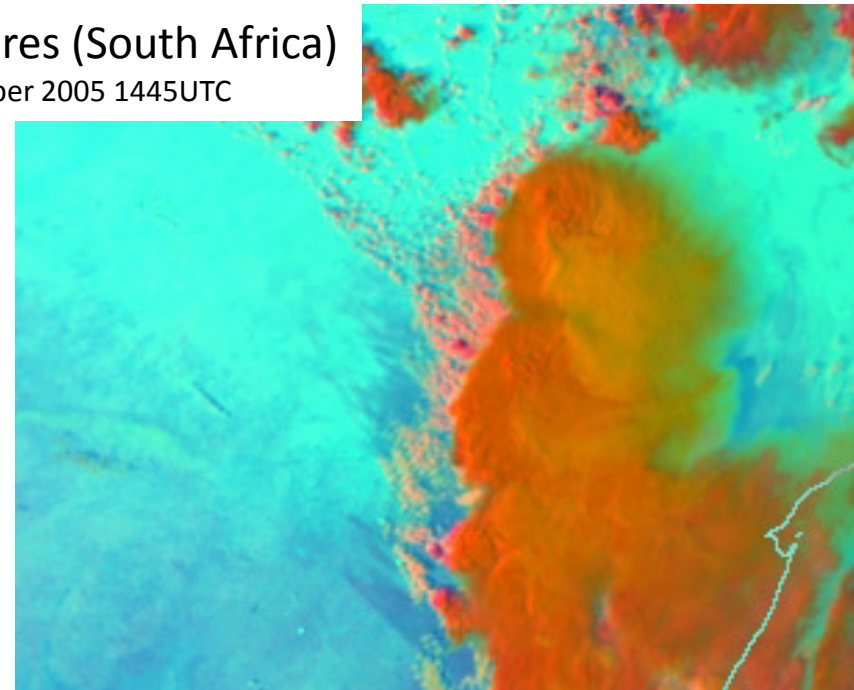
Click to enter

Some interesting features this RGB product can show



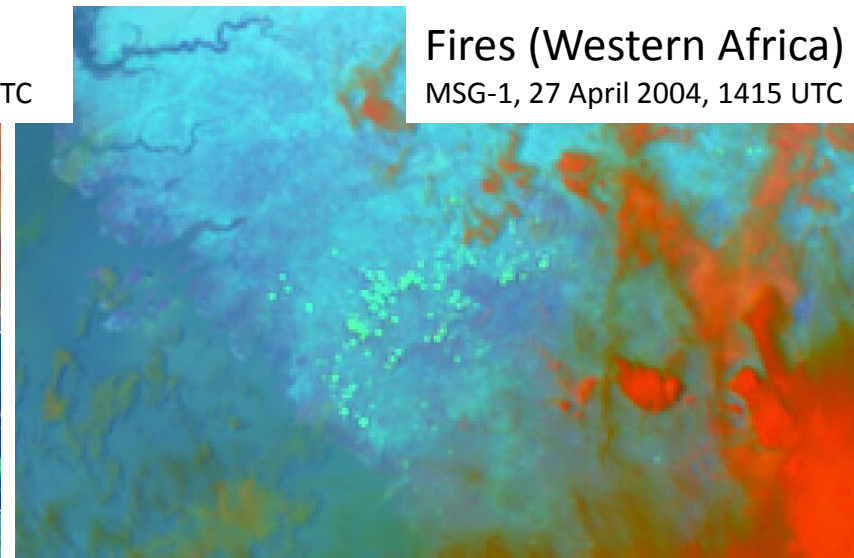
Convection Features (South Africa)

MSG-1, 6 November 2005 1445UTC



Ships Trails (Atlantic)

MSG-1, 17 January 2006, 1300 UTC



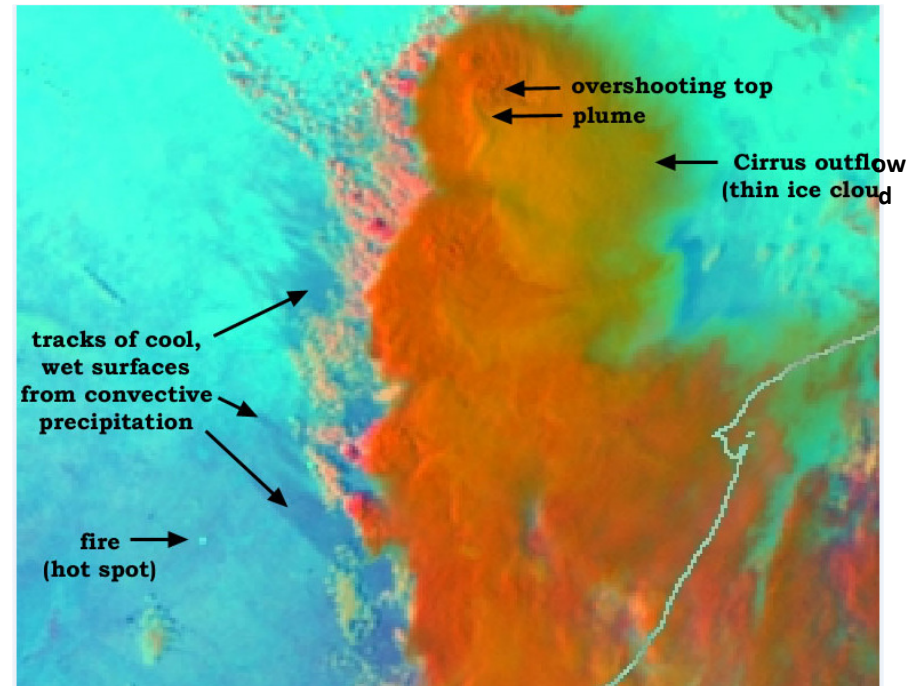
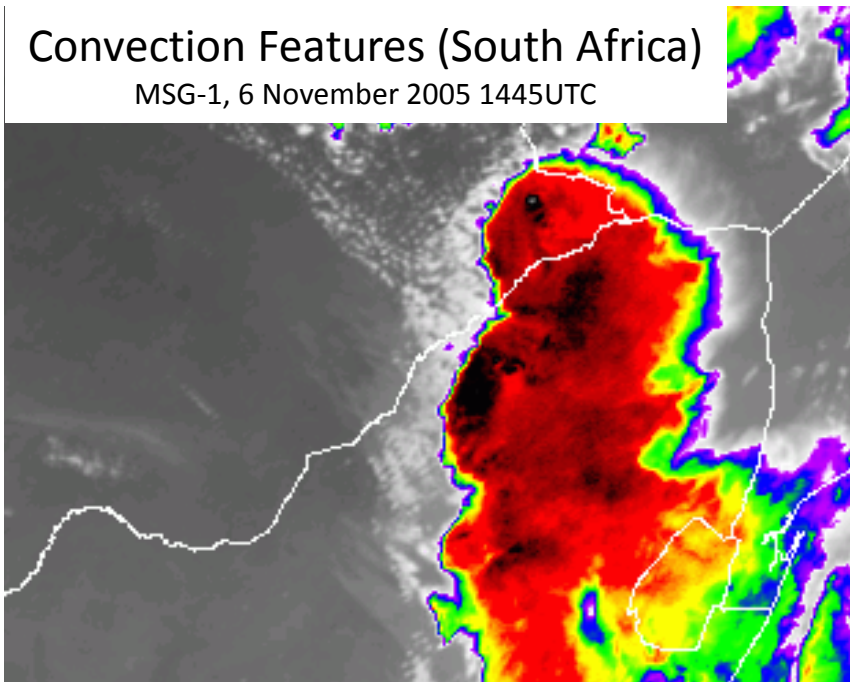
Fires (Western Africa)

MSG-1, 27 April 2004, 1415 UTC

Some interesting features this RGB product can show

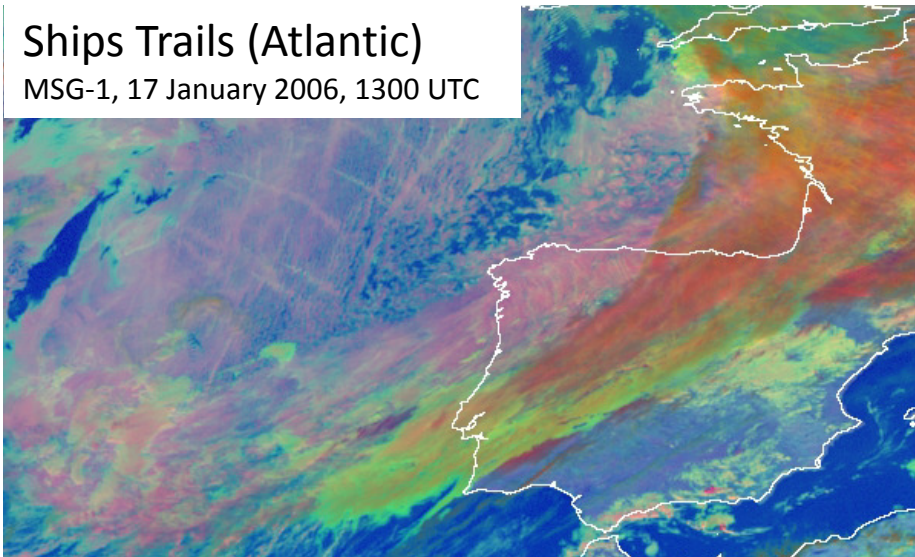
Convection Features (South Africa)

MSG-1, 6 November 2005 1445UTC



Ships Trails (Atlantic)

MSG-1, 17 January 2006, 1300 UTC



Ships trails and Fires (Africa)

MSG-1, 7 September 2003 1145UTC

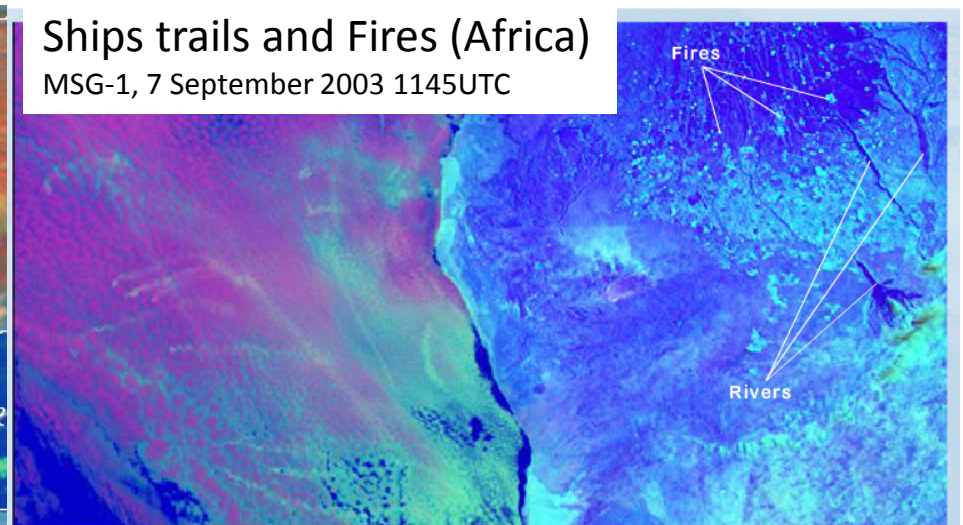


Fig 4.5 - Meteosat 8 Day Microphysics RGB - 7 September 2003 1145UTC

Some interesting features this RGB product can show

- The Day Microphysics RGB product can distinguish between storm tops with different populations of ice particles. Large ice particle cloudtops will typically show up as reddish-orange in the RGB products, whereas small ice particle cloudtops will show up as orange-yellow. Stormtops with small ice crystals may indicate strong updrafts and storm severity.
- Note that after the passage of the storms new moisture streaks left by the heavy convection are visible in the infrared images, but even more clearly in the Day Microphysics RGB product as dark blue land features on the western flank of the storm complex.
- Ship tracks can be detected because the exhaust from the funnel of the ship will result in small droplet clouds. These are quite different from the typically large droplet marine clouds.
- Fires have a very strong signal in the 3.9 micron channel and thus show up well in this RGB product.

Activity: Exploring EUMETRAIN ePort

- To gain "hands on experience" in using this RGB product in combination with other observations, Derived Products and NWP, please take some time to work through the following ePort activities.
- EUMETRAIN ePort helps to integrate the RGB products with single channel satellite data.
- It helps to integrate RGB products with Derived Products.
- You can explore the RGB products by overlaying model parameters to get a better feel for the products.
- The ePort can give a "flavour" of what we might expect with the display of Himawari-8 data, although the way this data will be displayed in Visual Weather, SatAID and on the web may be different from the ePort.

image courtesy EUMETSAT

Activity: Exploring EUMETRAIN ePort – may work best in **Firefox** <http://eumetrain.org/eport.html>

The screenshot displays the EUMETRAIN ePort website. The header features the EUMETRAIN logo and navigation links: Home, Resources, ePort, User Manual, Events, and Polarstern. A dropdown menu is open under the 'ePort' link, listing regions: Europe, South-Africa, Middle-East, Polar, Atlantic, Archive: Europe, Archive: South-Africa, Archive: Middle-East, Archive: Polar, and Archive: Atlantic. The 'Archive: Atlantic' option is highlighted with a red rectangle. Below the menu, the 'Concept of ePort' section explains that ePort is a product that allows users to compare satellite images with numerical model fields. It also mentions that the current version provides a view from the Southern hemisphere and that satellite images serve as a reference in which the current state is discussed. A large satellite image of the Earth is visible on the right side of the page, with a timestamp 'RGB Fri 20-03-2015 09:15' and an 'INFO' button at the bottom.

About us | Contact us

EUMETRAIN
International
to support a

Home Resources ePort User Manual Events Polarstern

Home » ePort

ePort

Concept of ePort

ePort is a product that allows you to compare satellite images with numerical model fields.

At the moment ePort provides a view from the Southern hemisphere. Satellite images also serve as a reference in which the current state is discussed.

All images generated by the archive which make qualitative research!

Europe
South-Africa
Middle-East
Polar
Atlantic
Archive: Europe
Archive: South-Africa
Archive: Middle-East
Archive: Polar
Archive: Atlantic

RGB Fri 20-03-2015 09:15

INFO

image courtesy EUMETSAT

Activity: Exploring EUMETRAIN ePort – choosing Archive: Atlantic (Northern and Southern Hemisphere)

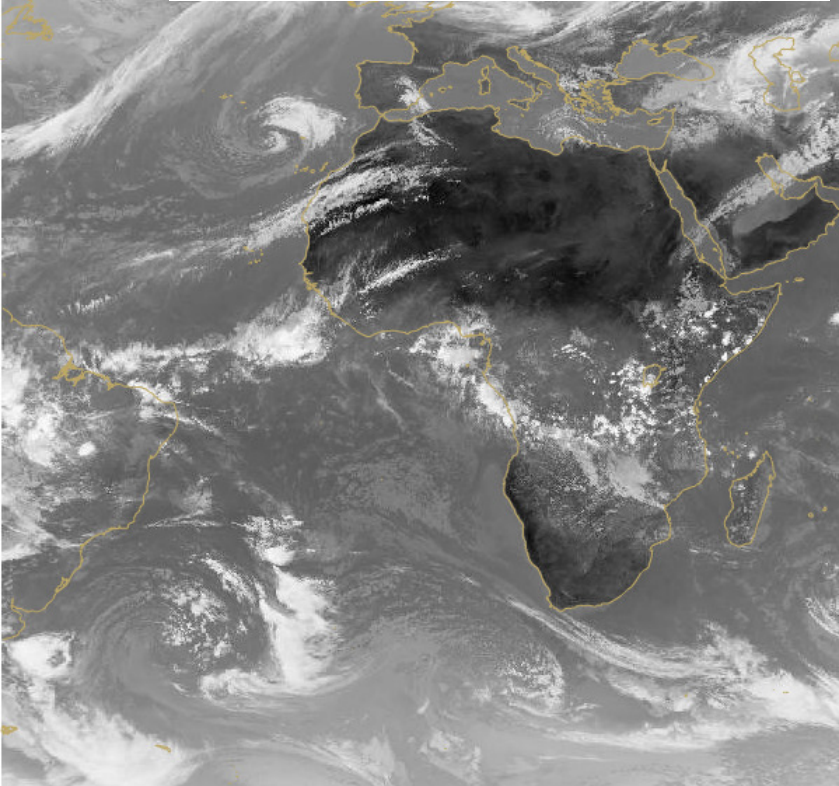
[Home](#) | [Resources](#) | [ePort](#) | [User Manual](#) | [Courses](#) | [Events](#) | [Polarstern](#)

[Home](#) » [ePort](#) » Archive: Atlantic

Archive: Atlantic

Meteosat 9 IR10.8 - 11

Choose 13 April 2015 1200UTC



... Select a date

13 April 2015: 1200UTC

13 April 2015: 0600UTC

13 April 2015: 0000UTC

12 April 2015: 1800UTC

12 April 2015: 1200UTC

12 April 2015: 0600UTC

12 April 2015: 0000UTC

11 April 2015: 1800UTC

11 April 2015: 1200UTC

11 April 2015: 0000UTC

10 April 2015: 1800UTC

10 April 2015: 1200UTC

10 April 2015: 0600UTC

10 April 2015: 0000UTC

09 April 2015: 1800UTC

09 April 2015: 1200UTC

09 April 2015: 0600UTC

09 April 2015: 0000UTC

08 April 2015: 1800UTC

08 April 2015: 1200UTC

08 April 2015: 0600UTC

08 April 2015: 0000UTC

07 April 2015: 1800UTC

07 April 2015: 1200UTC

07 April 2015: 0600UTC

07 April 2015: 0000UTC

06 April 2015: 1800UTC

06 April 2015: 1200UTC

06 April 2015: 0600UTC

06 April 2015: 0000UTC

05 April 2015: 1800UTC

05 April 2015: 1200UTC

05 April 2015: 0600UTC

05 April 2015: 0000UTC

04 April 2015: 1800UTC

↑ ↓

GO!

Then "GO"

image courtesy EUMETSAT

Activity: Exploring EUMETRAIN ePort

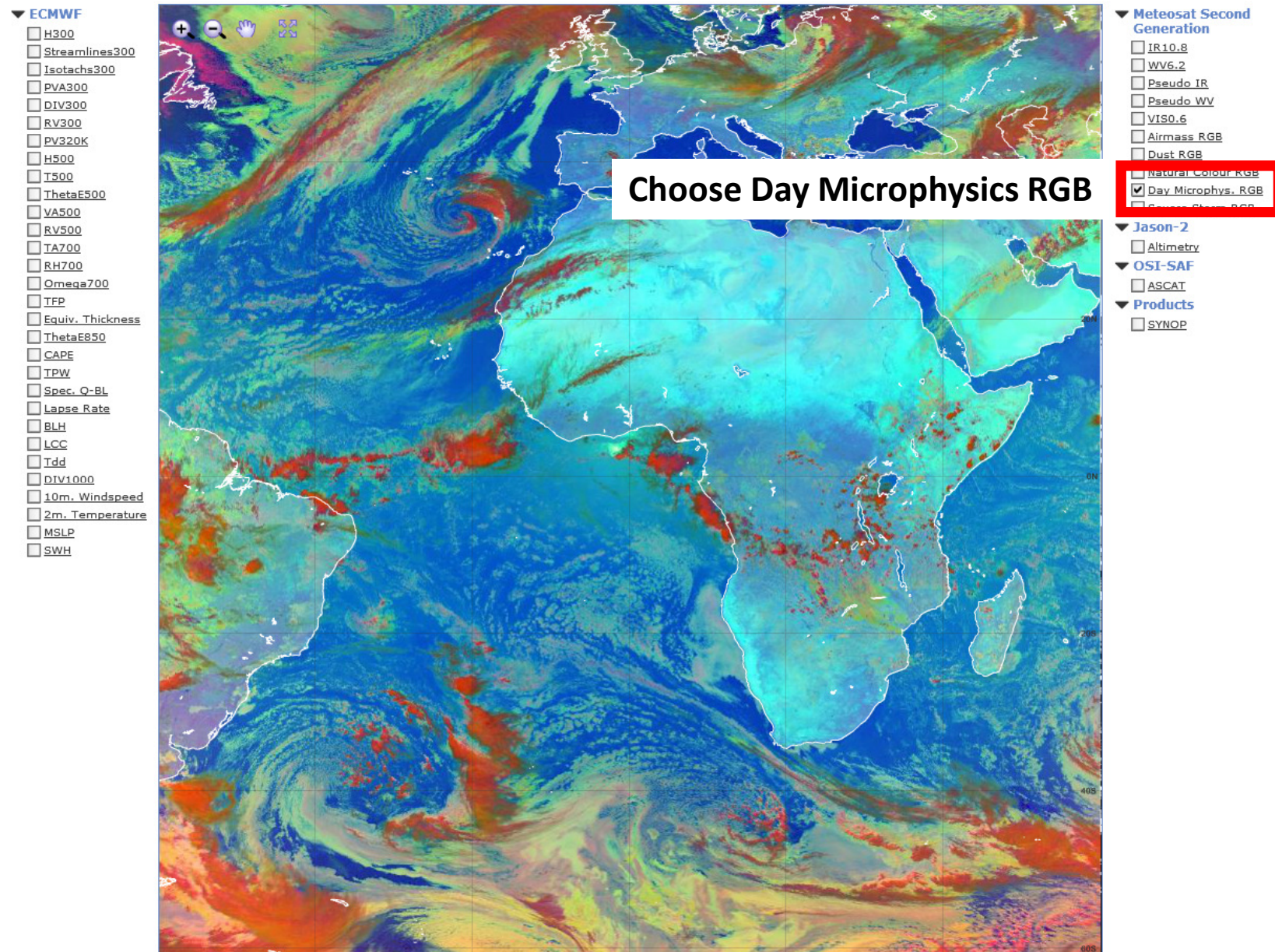


image courtesy EUMETSAT

Activity: Exploring EUMETRAIN ePort

ePort - Tooltip - Mozilla Firefox
www.eumetrain.org/eport/tooltip/euro/day_microphysics.html

Day Microphysics RGB

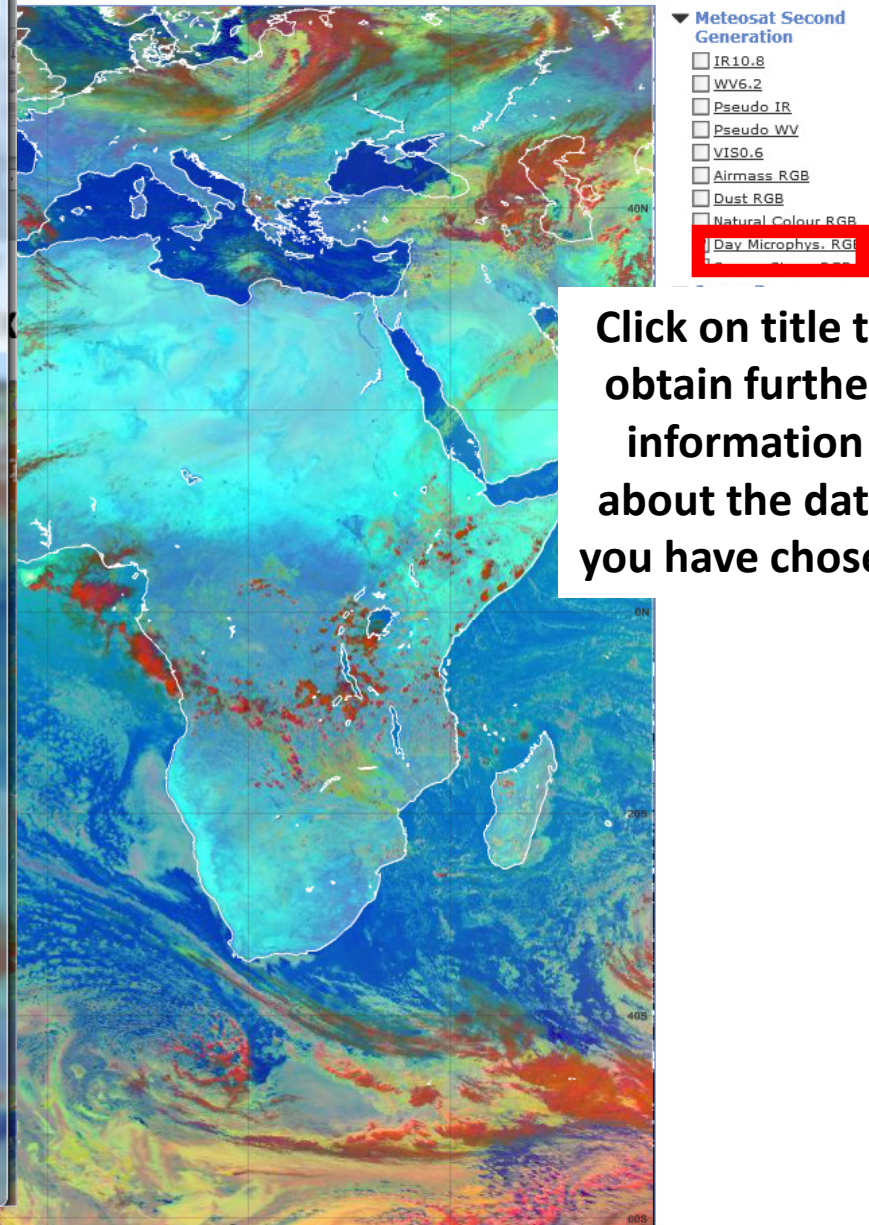
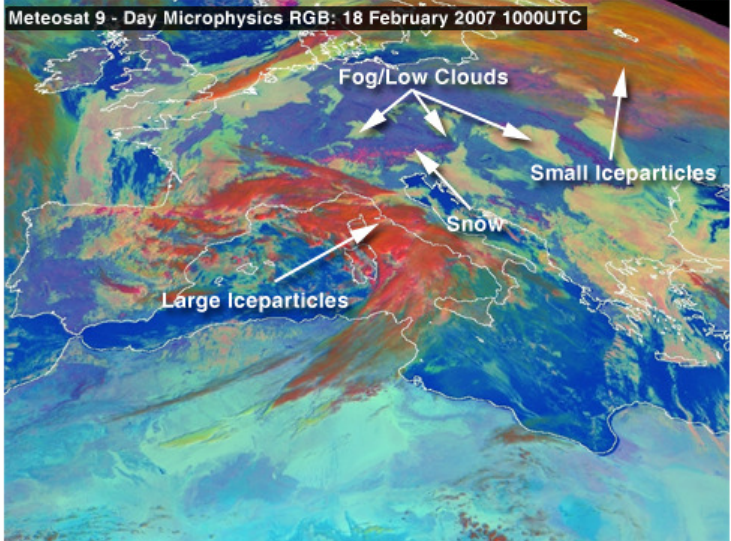
The Night Microphysics product is an RGB composite based upon the IR3.9 and the window channels of Meteosat Second Generation satellite.

Red	=	VIS0.8	0 to 100%
Green	=	IR3.9r	0 to 60%
Blue	=	IR10.8	+203 to +323K

The use of the reflective component of the IR3.9 channel makes this RGB very powerful. Due to difference in particle sizes, water clouds (Fog/Stratus), Cirrus and convective cells can easily be recognised. Especially for convective clouds the cells with severe updrafts are characterised by smaller iceparticles. They thus appear orange in the RGB. Cirrus clouds have low reflectivity for the VIS0.8 and appear greenish.

You can read more about this Day Microphysics RGB in chapter 4 of the [RGB CAL](#).

Meteosat 9 - Day Microphysics RGB: 18 February 2007 1000UTC



Click on title to
obtain further
information
about the data
you have chosen

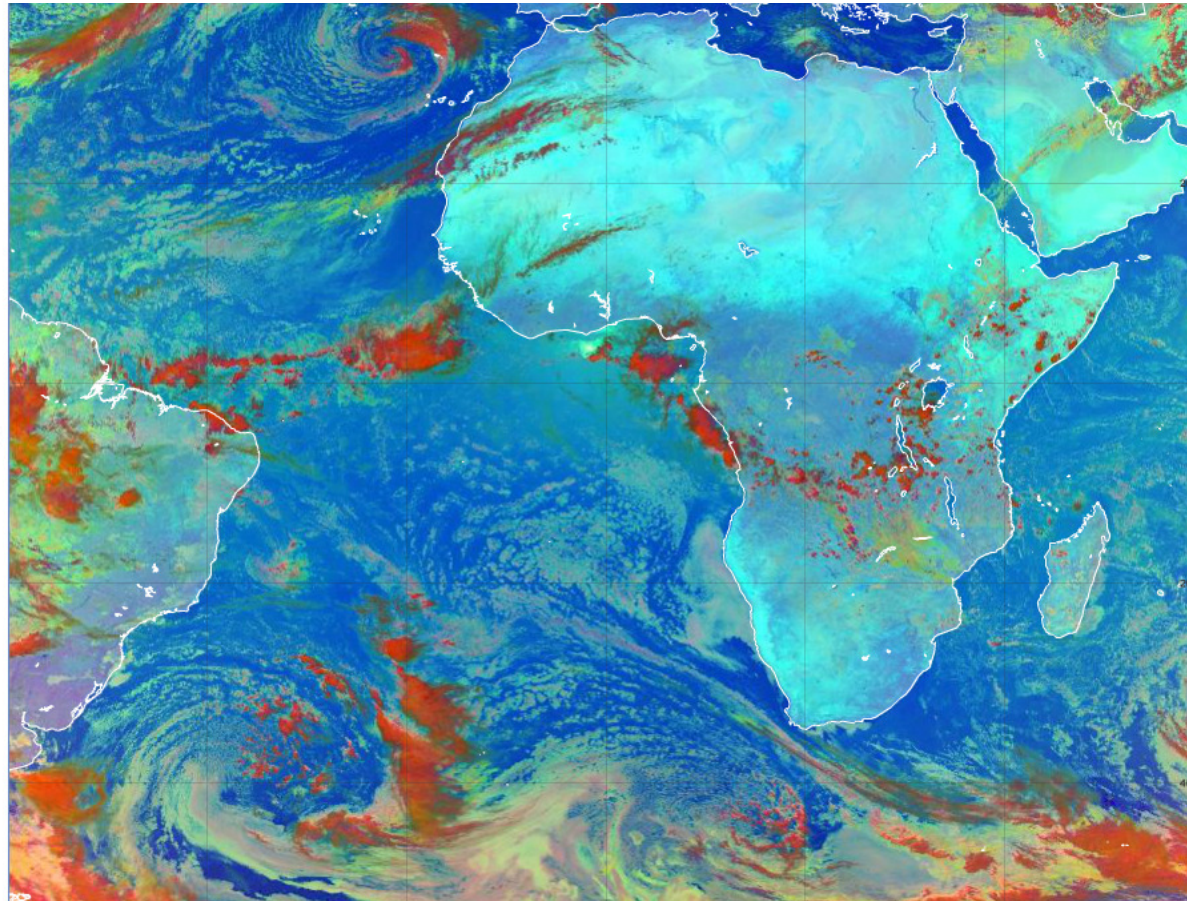
Activity: Comparing single channel image with RGB product

Question: annotate the areas where the RGB product is giving more information

- ▼ ECMWF
- ☐ H300
 - ☐ Streamlines300
 - ☐ Isotachs300
 - ☐ PVA300
 - ☐ DIV300
 - ☐ RV300
 - ☐ PV320K
 - ☐ H500
 - ☐ T500
 - ☐ ThetaE500
 - ☐ VA500
 - ☐ RV500
 - ☐ TA700
 - ☐ RH700
 - ☐ Omega700
 - ☐ TFP
 - ☐ Equiv. Thickness
 - ☐ ThetaE850
 - ☐ CAPE
 - ☐ TPW
 - ☐ Spec. Q-BL
 - ☐ Lapse Rate
 - ☐ BLH
 - ☐ LCC
 - ☐ Tdd
 - ☐ DIV1000
 - ☐ 10m. Windspeed
 - ☐ 2m. Temperature
 - ☐ MSLP
 - ☐ SWH

Compare the RGB product with single channel **IR** and **VIS**

- First make all of the highlighted options active
- Then turn the Day Microphys. RGB option on and off



- ▼ Meteosat Second
- ☒ IR10.8
 - ☐ Pseudo IR
 - ☐ VIS0.6
 - ☐ Day Microphys. RGB
- ▼ Jason-2
- ☐ Altimetry
- ▼ OST-SAF
- ☐ ASCAT
- ▼ Products
- ☐ SYNOP

Activity: Exploring EUMETRAN ePort

The screenshot displays the EUMETRAN ePort website interface. At the top, there is a navigation bar with links for 'Home', 'Events', and 'Polarstern'. Below this, a secondary navigation bar contains 'Home', 'ePort', and 'User Manual'. A dropdown menu is open under the 'ePort' link, showing a list of regions: 'Europe', 'South-Africa', 'Middle-East', 'Polar', and 'Atlantic'. Below these, there is a section for 'Archive' with options: 'Archive: Europe', 'Archive: South-Africa', 'Archive: Middle-East', 'Archive: Polar', and 'Archive: Atlantic'. The 'Archive: Europe' option is highlighted with a red border. The main content area features a large satellite image of Europe and surrounding regions, overlaid with a color-coded meteorological data map. To the right of the map, there is a sidebar with a list of data products and their corresponding checkboxes. The products are grouped under three categories: 'Meteosat Second Generation', 'Jason-2', and 'OSI-SAF'. The 'Meteosat Second Generation' category includes 'IR10.8', 'WV6.2', 'Pseudo IR', 'Pseudo WV', 'VIS0.6', 'Airmass RGB', 'Dust RGB', 'Natural Colour RGB', 'Day Microphys. RGB' (checked), and 'Severe Storm RGB'. The 'Jason-2' category includes 'Altimetry'. The 'OSI-SAF' category includes 'ASCAT'. The 'Products' category includes 'SYNOP'.

Home Events Polarstern

Home ePort User Manual

Europe
South-Africa
Middle-East
Polar
Atlantic
Archive: Europe
Archive: South-Africa
Archive: Middle-East
Archive: Polar
Archive: Atlantic

EUMETRAN provides five panels allowing

Meteosat Second Generation
☐ IR10.8
☐ WV6.2
☐ Pseudo IR
☐ Pseudo WV
☐ VIS0.6
☐ Airmass RGB
☐ Dust RGB
☐ Natural Colour RGB
☒ Day Microphys. RGB
☐ Severe Storm RGB

Jason-2
☐ Altimetry

OSI-SAF
☐ ASCAT

Products
☐ SYNOP

image courtesy EUMETSAT

Activity: Exploring EUMETRAIN ePort – choosing Archive: Europe

Home Resources ePort User Manual Courses Events Polarstern

Home » ePort » Archive: Europe

Archive: Europe

Meteosat 10 Airmass RGB - 13 April 2015: 1800UTC

Choose 13 April 2015 1200UTC

... Select a date

- 13 April 2015: 1800UTC
- 13 April 2015: 1200UTC**
- 13 April 2015: 0600UTC
- 13 April 2015: 0000UTC
- 12 April 2015: 1800UTC
- 12 April 2015: 1200UTC
- 12 April 2015: 0600UTC
- 12 April 2015: 0000UTC
- 11 April 2015: 1800UTC
- 11 April 2015: 1200UTC
- 11 April 2015: 0600UTC
- 11 April 2015: 0000UTC
- 10 April 2015: 1800UTC
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- 09 April 2015: 0000UTC
- 08 April 2015: 1800UTC
- 08 April 2015: 1200UTC
- 08 April 2015: 0600UTC
- 08 April 2015: 0000UTC
- 07 April 2015: 1800UTC
- 07 April 2015: 1200UTC
- 07 April 2015: 0600UTC
- 07 April 2015: 0000UTC

↑ ↓

GO!

Then "GO"

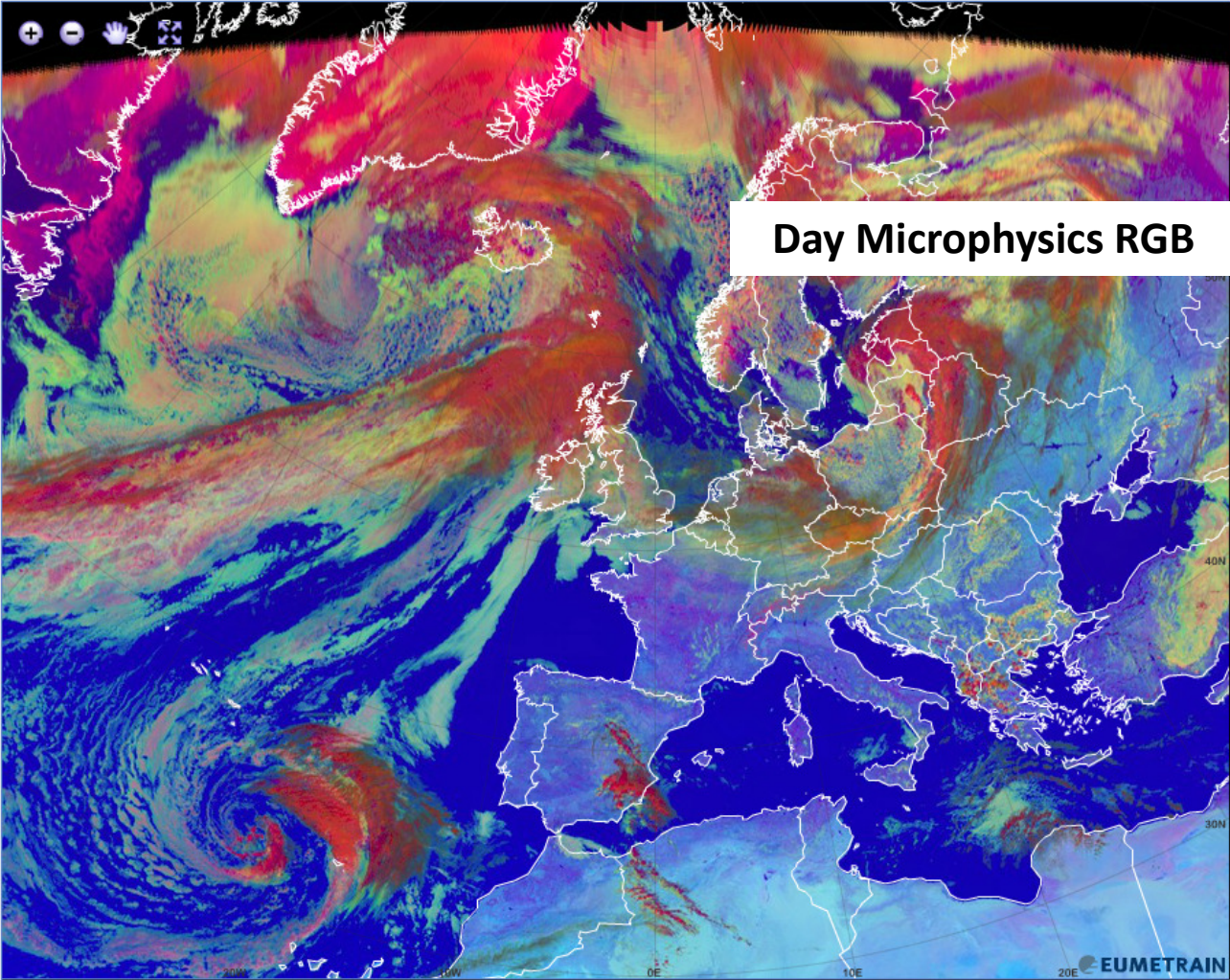
Activity: Exploring EUMETRIN ePort

[Home](#) | [Resources](#) | [ePort](#) | [User Manual](#) | [Courses](#) | [Events](#) | [Polarstern](#)

[Home](#) » [ePort](#) » [Archive: Europe](#) » 13 April 2015 1200UTC

▼ **ECMWF NWP**

- ☐ H300
- ☐ Streamlines300
- ☐ Isotachs300
- ☐ CVA300
- ☐ DIV300
- ☐ RV300
- ☐ Height PV=1.5
- ☐ H500
- ☐ T500
- ☐ ThetaE500
- ☐ CVA500
- ☐ RV500
- ☐ H700
- ☐ TA700
- ☐ RH700
- ☐ Omega700
- ☐ ITP
- ☐ Equiv. Thickness
- ☐ ThetaE850
- ☐ Wind850
- ☐ CAPE
- ☐ Showalter Index
- ☐ TPW
- ☐ Spec. Q-BL
- ☐ Lapse Rate
- ☐ BLH
- ☐ LCC
- ☐ Tdd
- ☐ DIV1000
- ☐ 10m. Windspeed
- ☐ 2m. Temperature
- ☐ MSLP



Day Microphysics RGB

▼ **Meteosat Second Generation**

- ☐ IR10.8
- ☐ WV6.2
- ☐ VIS0.6
- ☐ Enhanced IR10.8
- ☐ Pseudo IR
- ☐ Pseudo WV
- ☐ Airmass RGB
- ☐ Dust RGB
- ☒ Day Microphys. RGB
- ☐ HRVIS RGB
- ☐ Severe Storm RGB

▼ **NWCSAF**

- ☐ CT
- ☐ CTHH
- ☐ CRR
- ☐ PC
- ☐ SPhR LPW BL
- ☐ SPhR LPW ML
- ☐ SPhR LPW HL
- ☐ SPhR LI

▼ **MPEF**

- ☐ GII
- ☐ TPW
- ☐ DIV
- ☐ MPE

▼ **Products**

- ☐ SYNOP
- ☐ Opera RADAR
- ☐ ASCAT
- ☐ JASON
- ☐ ESTOFEX
- ☐ VCS
- ☐ Vertical Profile

EUMETRIN

Activity: Exploring EUMETRAN ePort

[Home](#) | [Resources](#) | [ePort](#) | [User Manual](#) | [Courses](#) | [Events](#) | [Polarstern](#)

Home » ePort » Archive: Europe » 13 April 2015 1200UTC

▼ ECMWF NWP

- ☐ H300
- ☐ Streamlines300
- ☐ Isotachs300
- ☐ CVA300
- ☐ DIV300
- ☐ RV300
- ☐ Height PV=1.5
- ☐ H500
- ☐ T500
- ☐ ThetaE500
- ☐ CVA500
- ☐ RV500
- ☐ H700
- ☐ TA700
- ☐ RH700
- ☐ Omega700
- ☐ TFP
- ☐ Equiv. Thickness
- ☐ ThetaE850
- ☐ Wind850
- ☐ CAPE
- ☐ Showalter Index
- ☐ TPW
- ☐ Spec. Q-BL
- ☐ Lapse Rate
- ☐ BLH
- ☐ LCC
- ☐ Tdd
- ☐ DIV1000
- ☐ 10m. Windspeed
- ☐ 2m. Temperature
- ☐ MSLP

Legend:

- Undefined
- Fractional
- Semitransp. above
- Semitransp. thick
- Semi. meanly thick
- Semitransp. thin
- Very high opaque
- High Opaque
- Medium
- Low
- Very low
- Sea; Ice
- Land; Snow
- Sea; Cloud Free
- Land; Cloud Free
- Non-processed

Check with "Cloud Type"

▼ Meteosat Second Generation

- ☐ IR10.8
- ☐ WV6.2
- ☐ VIS0.6
- ☐ Enhanced IR10.8
- ☐ Pseudo IR
- ☐ Pseudo WV
- ☐ Airmass RGB
- ☐ Dust RGB
- ☒ Day Microphys. RGB
- ☐ Natural Colour RGB
- ☐ HRVIS RGB
- ☐ Severe Storm RGB

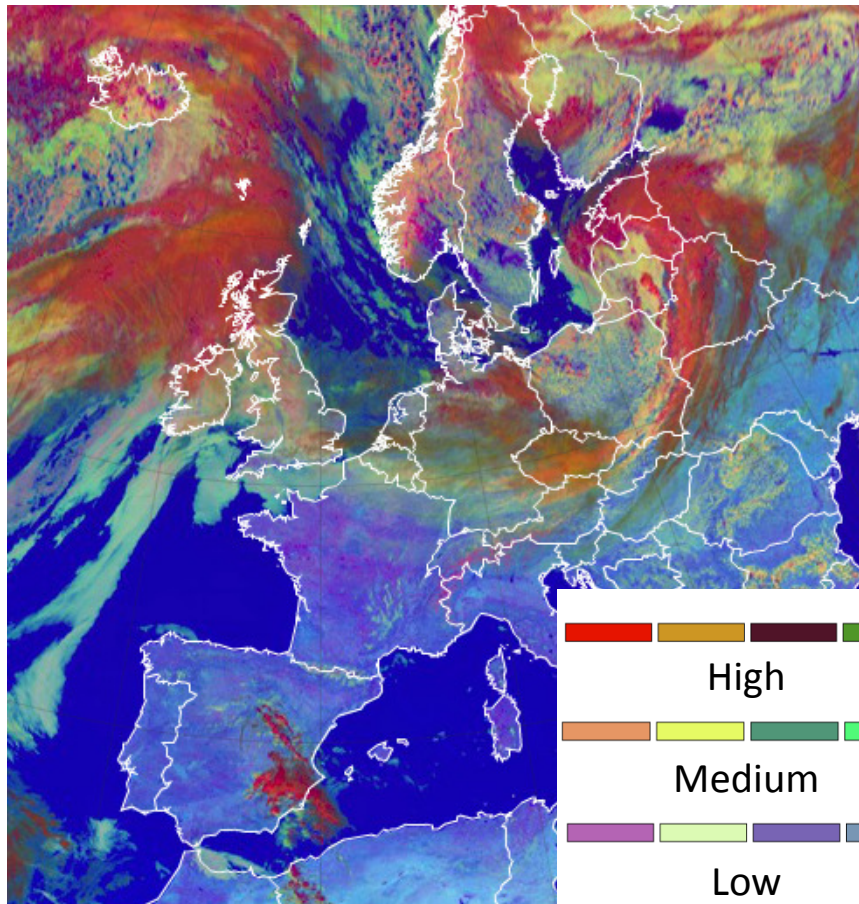
▼ MPEF

- ☐ GII
- ☐ TPW
- ☐ DIV
- ☐ MPE

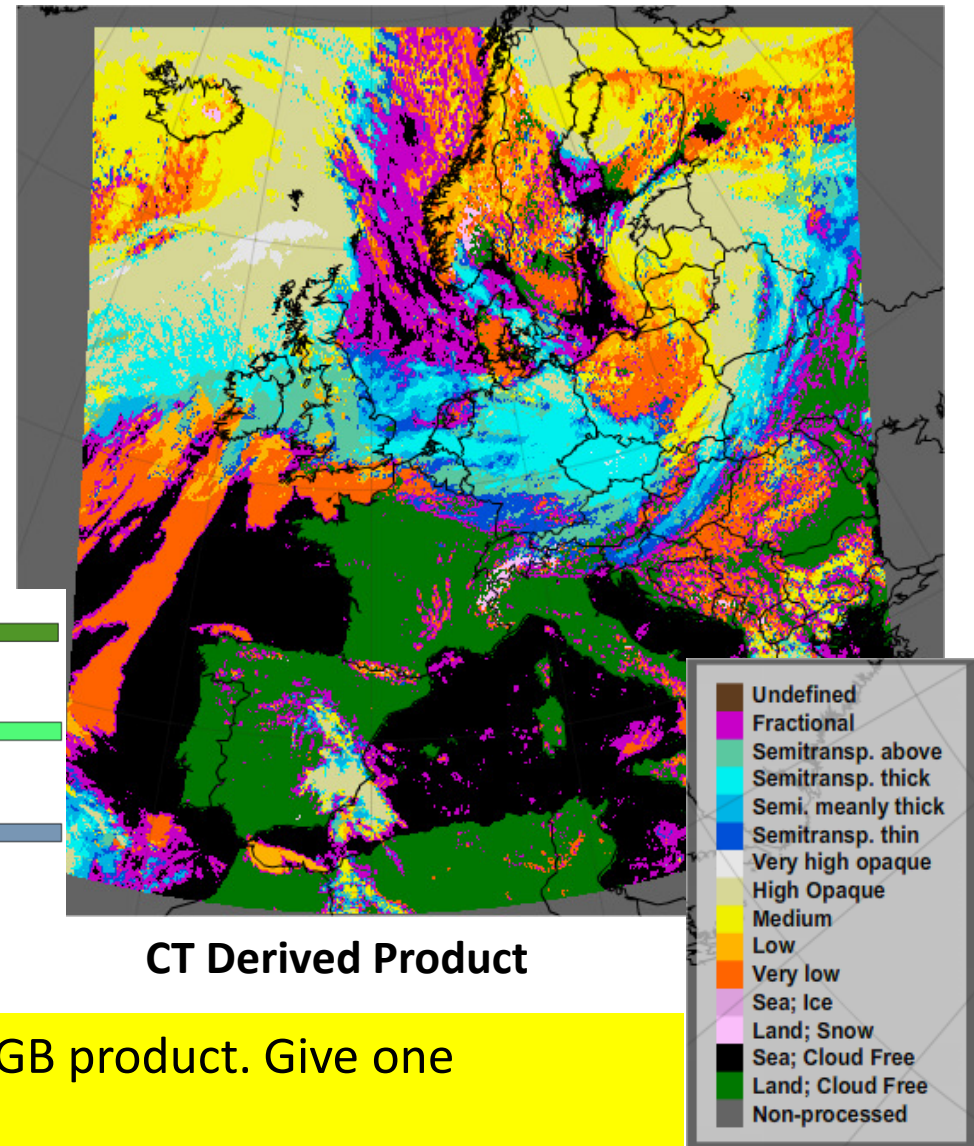
▼ Products

- ☐ SYNOP
- ☐ Opera RADAR
- ☐ ASCAT
- ☐ JASON
- ☐ ESTOFEX
- ☐ VCS
- ☐ Vertical Profile

Activity: Comparing the RGB with the Derived product



Day Microphysics RGB product



CT Derived Product

Question: Give one advantage of the RGB product. Give one advantage of the Derived Product.

Cloud Type (CT) Derived Product algorithm summary description (1)

(from <http://www.nwcsaf.org/HD/MainNS.jsp>)

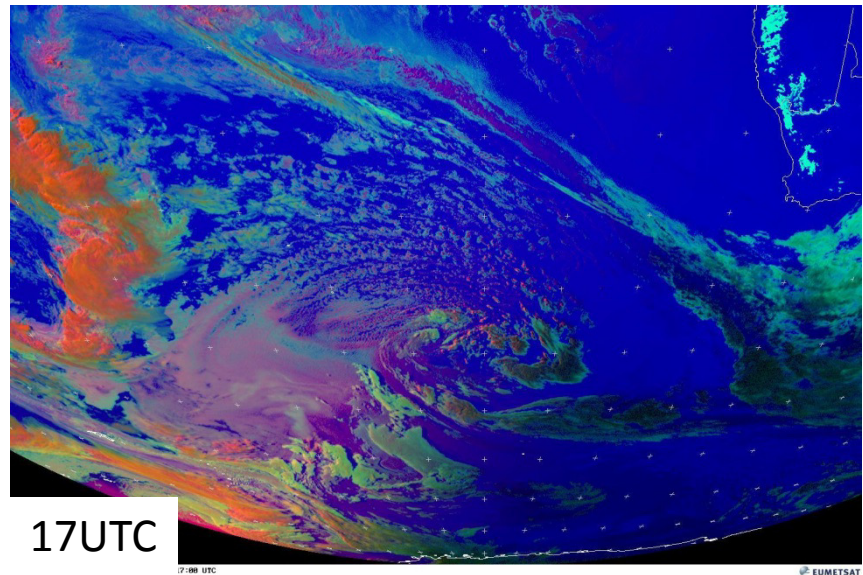
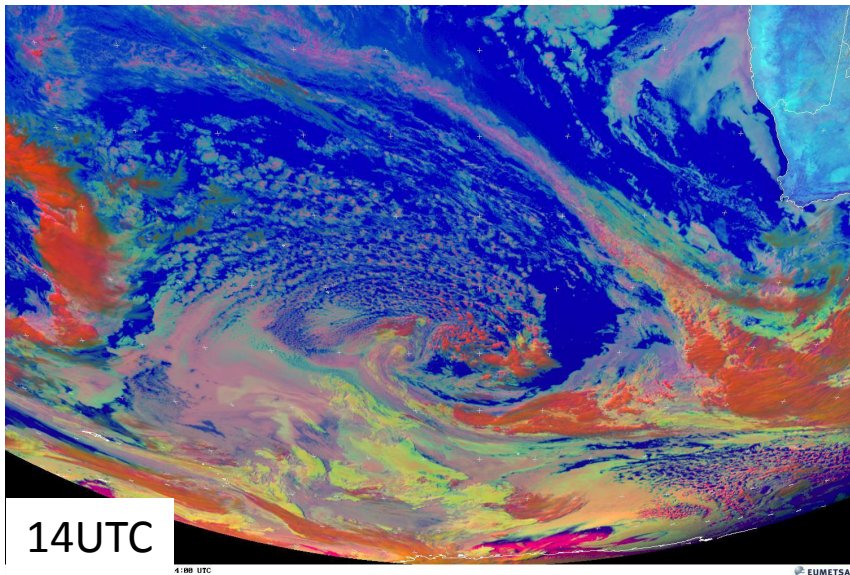
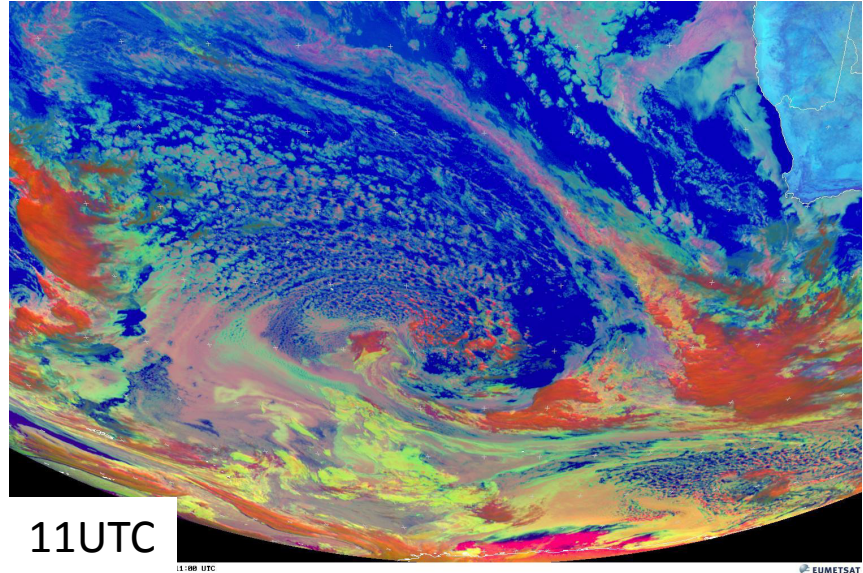
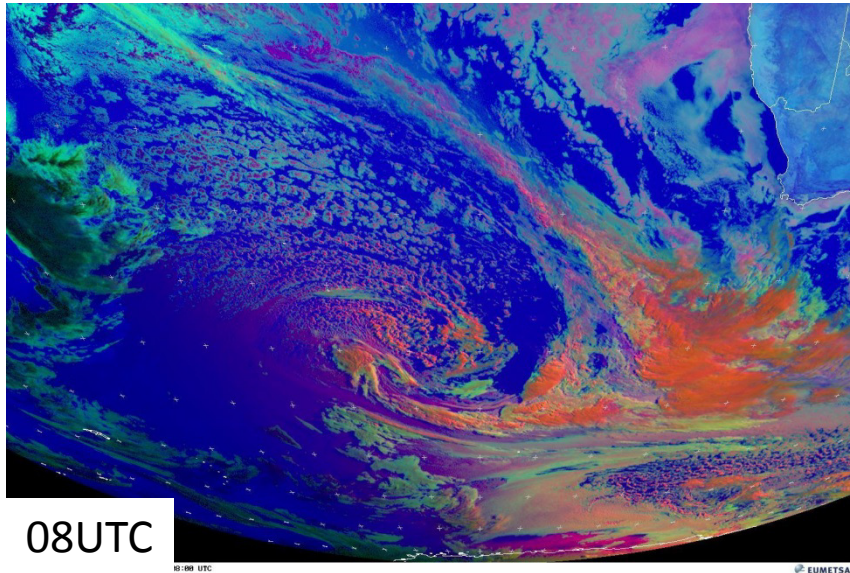
- The CT algorithm is a threshold algorithm applied at the pixel scale, based on the use of CMA and spectral & textural features computed from the multispectral satellite images and compared with a set of thresholds.
- The set of thresholds to be applied depends mainly on the illumination conditions, whereas the values of the thresholds themselves may depend on the illumination, the viewing geometry, the geographical location and NWP data describing the water vapour content and a coarse vertical structure of the atmosphere.
- The CT classification algorithm is based on the following approach:
- Main cloud types are separable within two sets: the fractional and high semitransparent clouds, from the low/medium/high clouds. These two systems are distinguished using spectral features : $T_{10.8\mu m}-T_{12.0\mu m}$, $T_{3.9\mu m}-T_{10.8\mu m}$ (in night-time conditions only), $R_{0.6\mu m}$ (in day-time conditions only), and textural features (variance $T_{10.8\mu m}$ coupled to variance $R_{0.6\mu m}$ in daytime conditions) .

Cloud Type (CT) Derived Product algorithm summary description (2)

(from <http://www.nwcsaf.org/HD/MainNS.jsp>)

- Within the first set, the fractional and high semitransparent are separated mainly using their T8.7 μ m-T10.8 μ m brightness temperature differences, but also their R0.6 μ m visible reflectance (in daytime conditions only).
- The remaining categories are distinguished through the comparison of their T10.8 μ m to NWP forecast temperatures at several pressure levels. T7.3 μ m and T8.7 μ m are also used to refine the separation between low and medium clouds, especially useful in case of low level thermal inversion.
- No separation between cumuliform and stratiform clouds is performed in the current version of CT.
- A separate processing is applied to compute a cloud phase flag, based on the use of CT cloud type, T8.7 μ m, T10.8 μ m (all illumination), R0.6 μ m and R1.6 μ m (at daytime only).

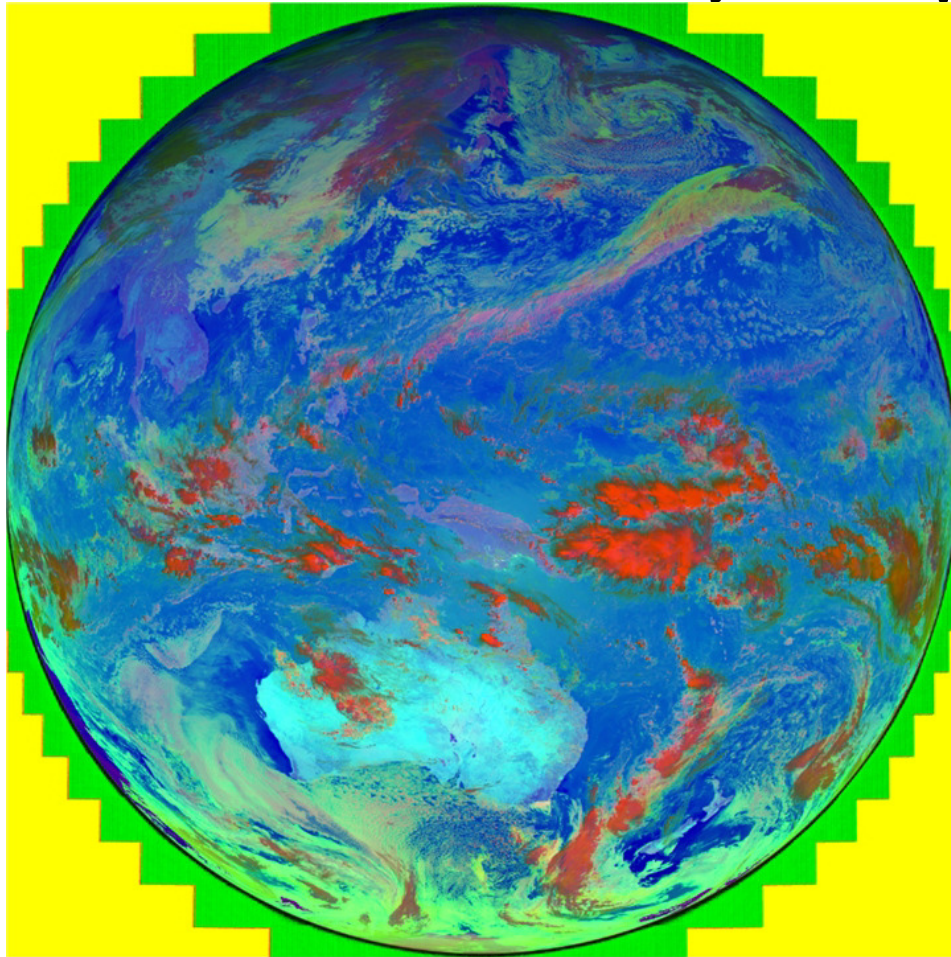
Summary of Day Microphysics RGB animation – , South Atlantic Ocean, Meteosat-10, 12 April 2015 08-17UTC



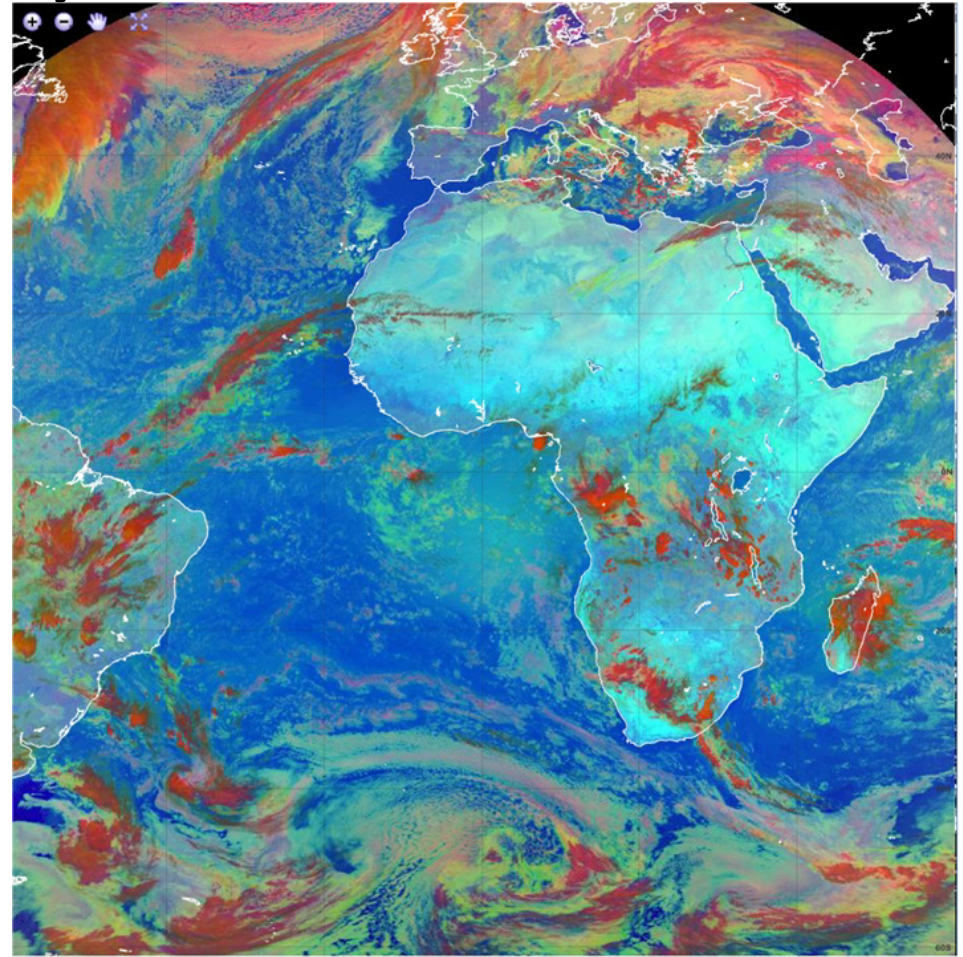
... and now, Himawari-8 compared to Meteosat-10

image courtesy JMA and Chris Down (BOM) **Day Microphysics RGB**

image courtesy EUMETSAT



Himawari-8 25 January 2015, 0230UTC



Meteosat-10 25 January 2015 1200UTC

Question: Please highlight any differences that you note between the two images

Day Microphysics RGB product – Summary (1)

from https://www.meted.ucar.edu/satmet/multispectral_topics/rgb/print.htm

This RGB is useful for cloud analysis (for example cloud identification, type, and phase), monitoring convection, fog, and fires.

- The visible reflectance in red approximates the cloud optical depth and amount of cloud water and ice
- The 3.9 μm shortwave infrared solar reflectance in green gives a qualitative measure for cloud particle size and phase
- The 10.8 μm infrared brightness temperature produces blue shading as a function of surface and cloud top temperatures (the warmer the surface, the greater the blue contribution); therefore warmer land and ocean surfaces appear in shades of blue whereas colder cloud tops have less blue input and appear more orange and red

Day Microphysics RGB product – Summary (2)

from https://www.meted.ucar.edu/satmet/multispectral_topics/rgb/print.htm

Advantages:

- Can clearly distinguish between ice phase clouds at high elevations and water phase clouds at lower elevations, providing a pseudo three-dimensional view of the atmosphere
- Can identify subtle microphysical variations within clouds that are not apparent on other images or RGBs
- Helps discriminate between precipitating and non-precipitating water clouds
- Can help identify severe convective clouds with strong updrafts
- Can give information about the land surface

Limitations:

- The RGB is complicated in terms of the number and variety of colors and requires expertise to interpret it but it is a very powerful product
- Only available during daytime

Appendix 1: Underpinning WMO-1083 and Enabling Skills

WMO 1083 2.3.3.4 – **Interpreting satellite imagery: Interpret satellite images, including use of common wavelengths (infrared, visible, water vapour and near infrared) and enhancements and animated imagery, to identify cloud types and patterns, synoptic and mesoscale systems, and special features (fog, sand, volcanic ash, dust, fires, etc.);**

WMO 1083 2.3.3.3 - Extreme weather: **Describe the weather, with emphasis on any extreme or hazardous conditions that might be associated with convective and mesoscale phenomena,** and the likely impact of such conditions;

Enabling Skills Document Element 2, Performance Component 2 - **Identify cumulonimbus clouds, their intensity** and stage of development.

Enabling Skills Document Element 2, Performance Component 7 - **Discriminate between clouds with small or large cloud particles**

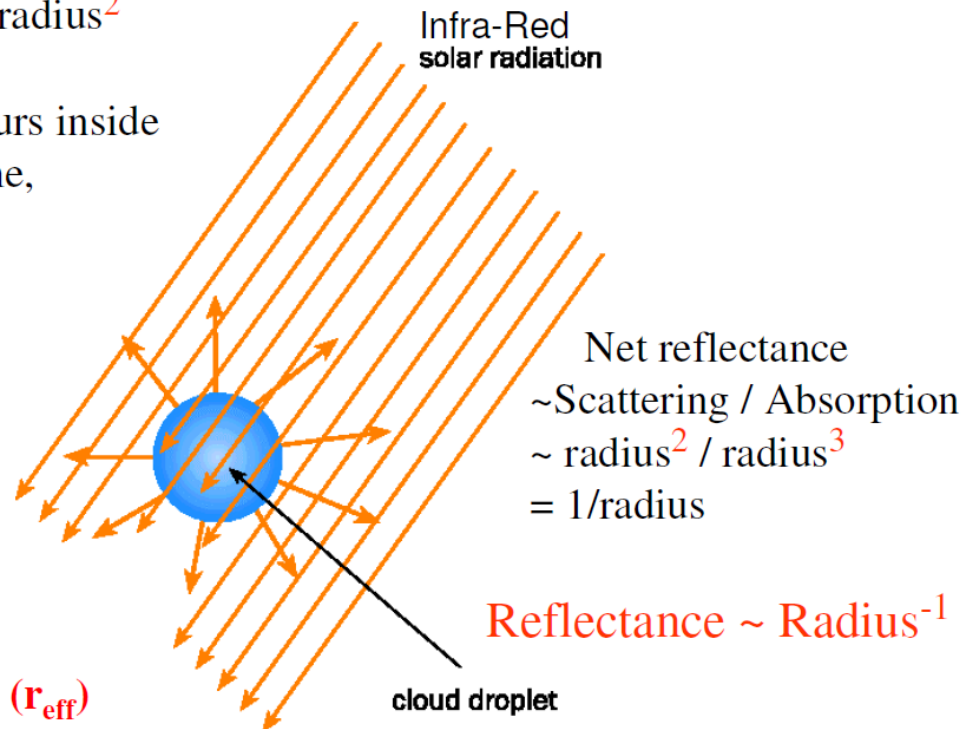
Enabling Skills Document Element 4, Skills, **Performance component pertaining to "Fires and Smoke"**

Appendix 2: Explaining the channel combination recipe in more detail – the Red, Green and Blue beams

from <http://eumetrain.org/data/2/208/208.pdf>

Scattering occurs on the drop surface, $\sim \text{radius}^2$

Absorption occurs inside
The drop volume,
 $\sim \text{radius}^3$



Definition of
Effective Radius (r_{eff})
of cloud droplets:

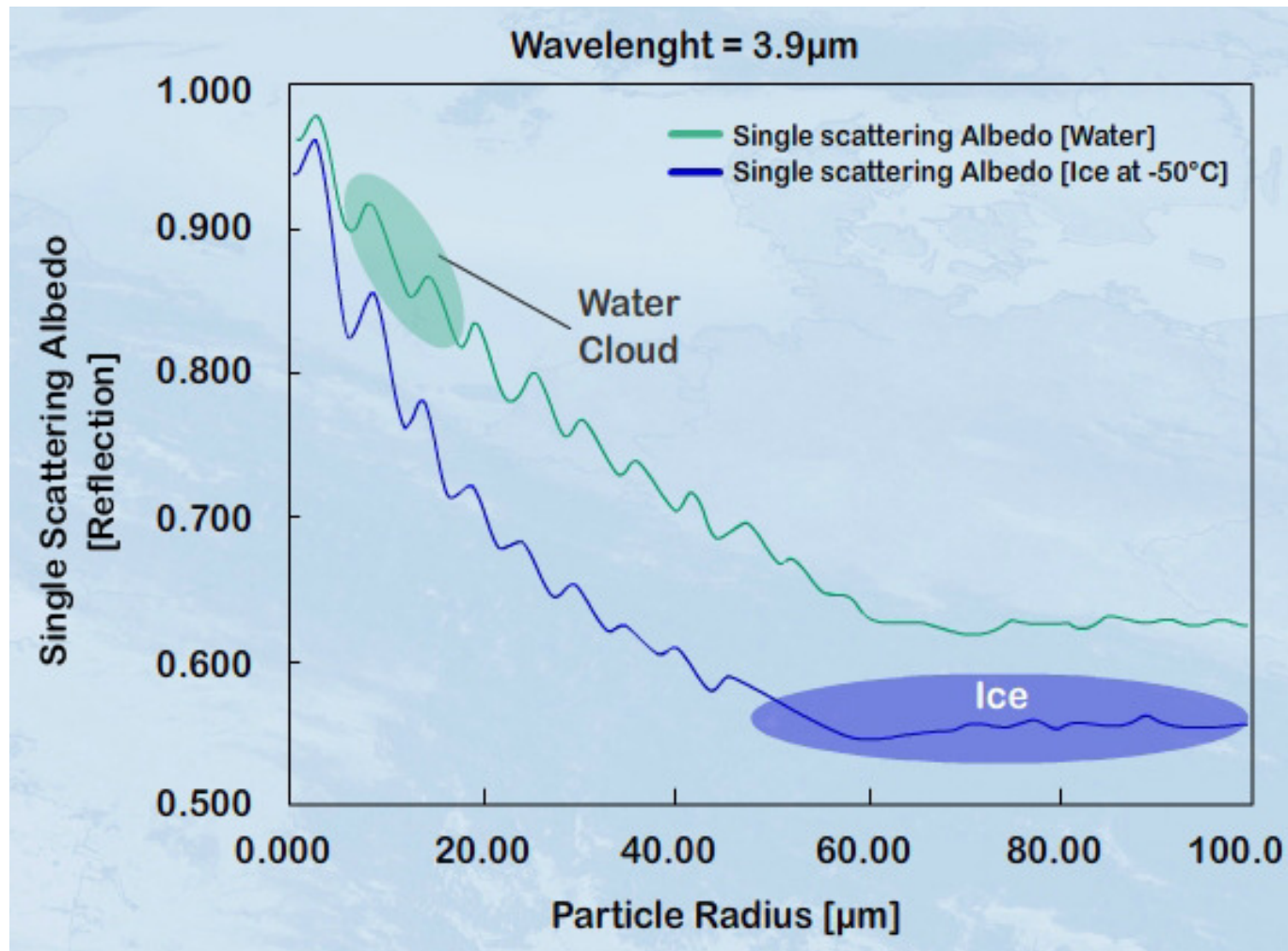
Sum of volumes / sum of surface areas
of the droplets in the measured cloud volume

For the visible
channel used in
the Red beam,
reflectance \sim
radius of the cloud
droplet⁻¹

Therefore, small
droplets are more
reflective.

Appendix 2 - Explaining the channel combination recipe in more detail – the **Green** beam

(from http://www.eumetrain.org/data/3/34/rgbcal_ch4.swf)



For the 3.9 micron channel used in the Green beam, the scattering is more pronounced for water cloud, compared to ice crystals. That is because water droplets are typically smaller in size. However, small ice crystals would also have a higher scattering albedo.