APPLICATIONS OF METEOSAT SECOND GENERATION (MSG)

RGB COMPOSITES WITH CHANNELS 01-11 AND THEIR INTERPRETATION

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Recommended Schemes for RGB Image Composites

	RGB Composite	Applications	Time
1.	RGB 10-09,09-07,09:	Dust, Clouds (thickness, phase), Contrails Fog, Ash, SO2, Low-level Humidity	Day & Night
2.	RGB 05-06,08-09,05	Severe Cyclones, Jets, PV Analysis	Day & Night
3a.	RGB 10-09,09-04,09:	Clouds, Fog, Contrails, Fires	Night
3b.	RGB 02,04r,09:	Clouds, Convection, Snow, Fog, Fires	Day
4.	RGB 05-06,04-09,03-01:	Severe Convection	Day
5.	RGB 02,03,04r:	Snow, Fog	Day
6.	RGB 03,02,01:	Vegetation, Snow, Smoke, Dust, Fog	Day

1. RGB 10-09, 09-07, 09 ("24-hour Microphysics")

R = Difference IR12.0 - IR10.8

G = Difference IR10.8 - IR8.7

B = Channel IR10.8

Applications:	Clouds, Contrails, Dust, Ash, SO2, Low-level Humidity
Area:	Full MSG Viewing Area
Time:	Day and Night
Users:	most European & African NMSs, Middle East

Physical Interpretation
(for dust/ash/water/ice clouds)

R = Difference IR12.0 - IR10.8
Optical Thickness, Tsurf-Tcloud

G = Difference IR10.8 - IR8.7
Optical Thickness, Tsurf-Tcloud, Phase

B = Channel IR10.8
Top Temperature

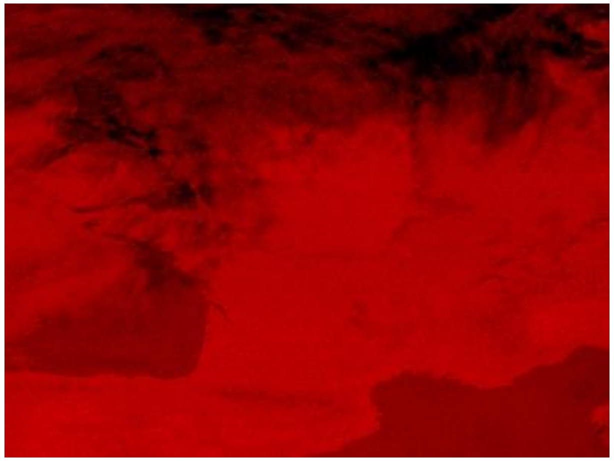
1a. RGB 10-09, 09-07, 09 ("24-hour Cloud Microphysics")

devised by: Z. Charvat, HP. Roesli, J. Kerkmann, A. Eronn

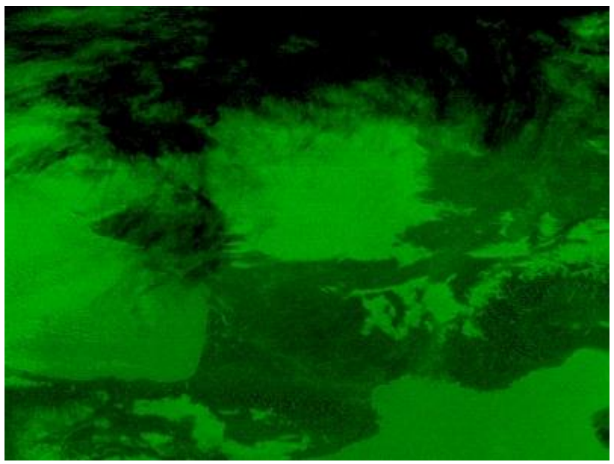
Recommended Range and Enhancement:

Beam	Channel	Range	Gamma
Red	IR12.0 - IR10.8	-4 … +2 K	1.0
Green	IR10.8 - IR8.7	0 … +6 K	1.2
Blue	IR10.8	+248 … +303 K	1.0

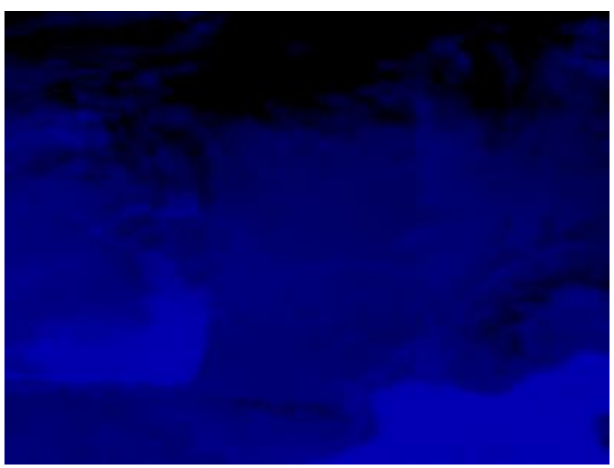
Ch.10
-Ch.09

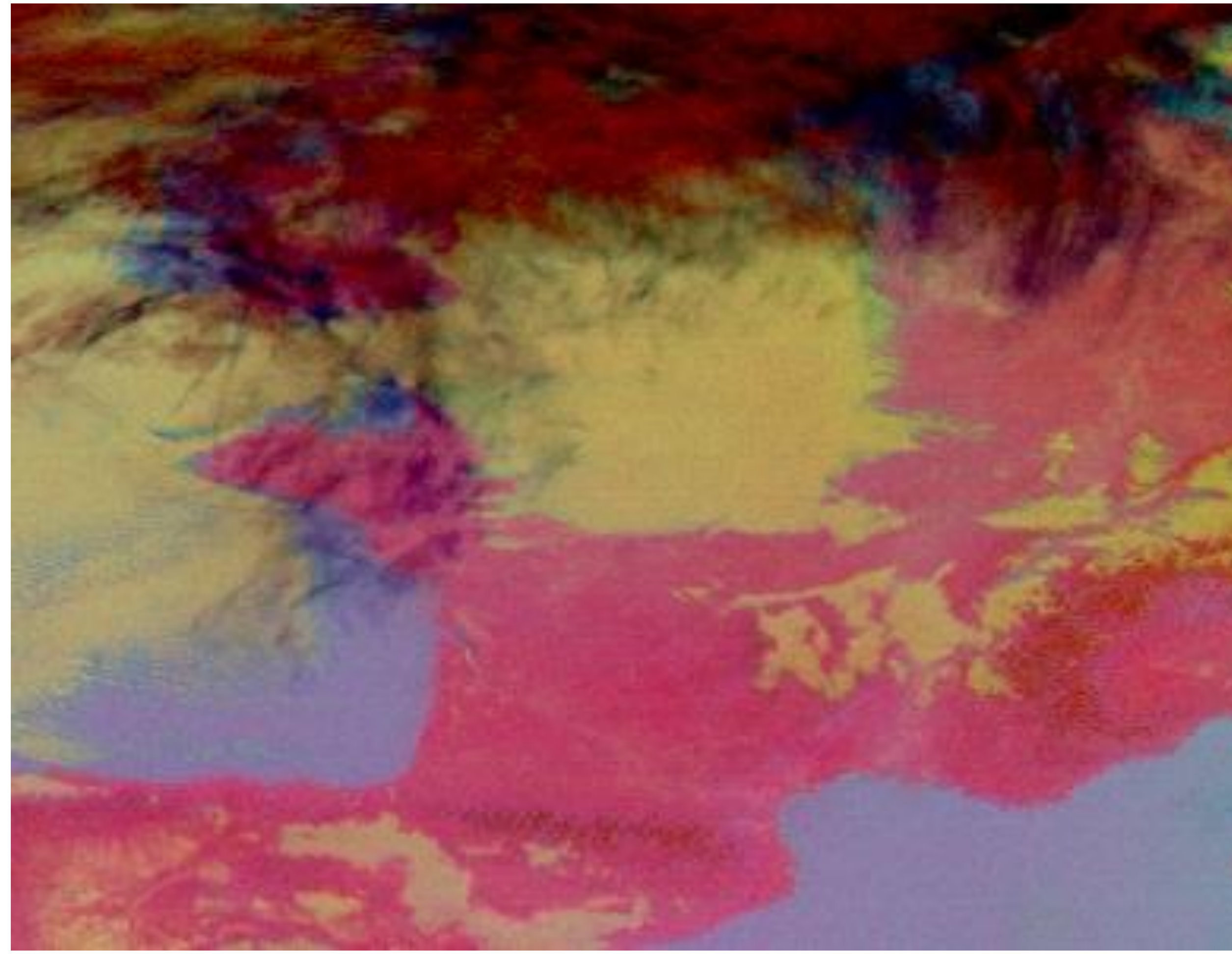


Ch.09
-Ch.07



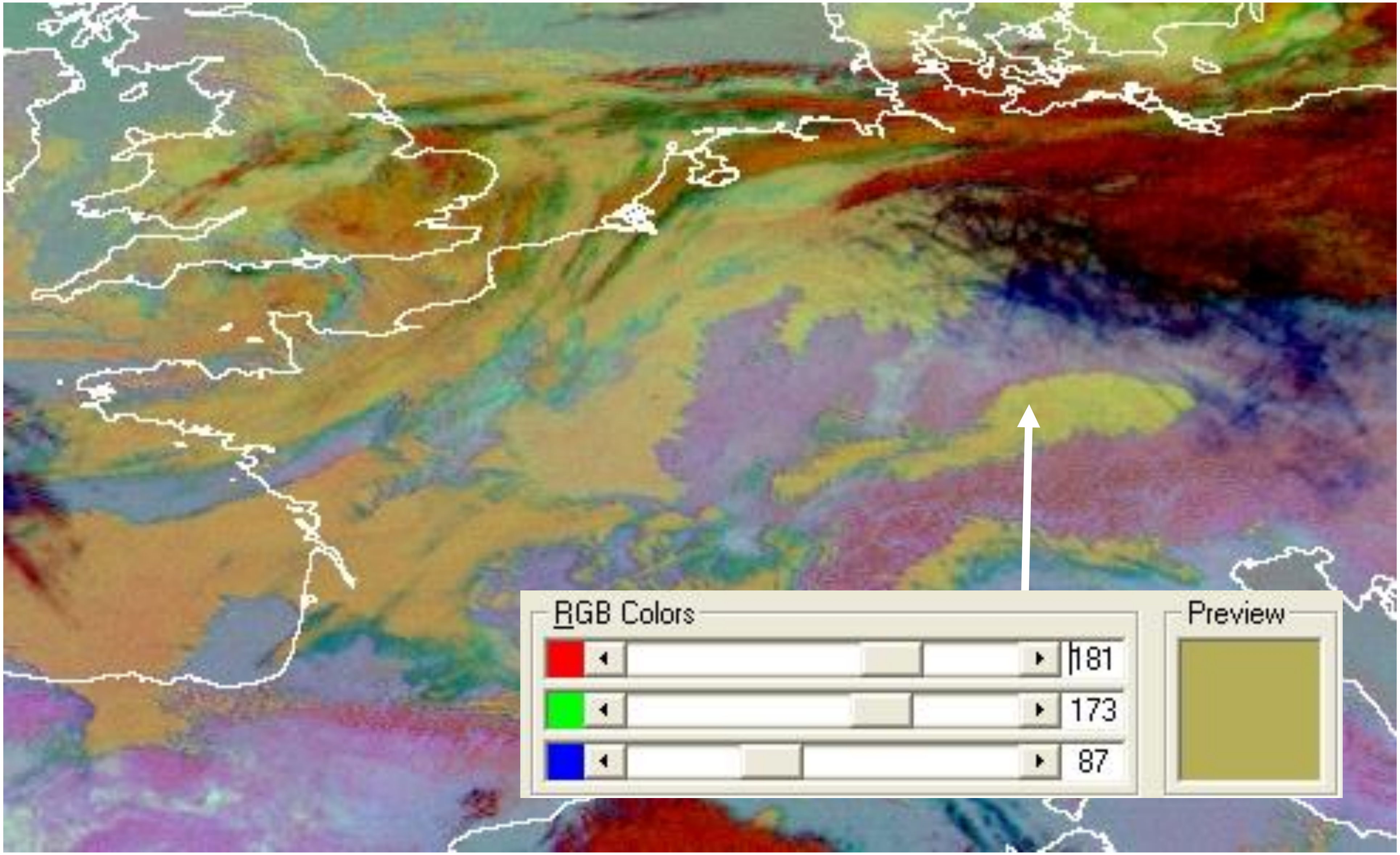
Ch.09





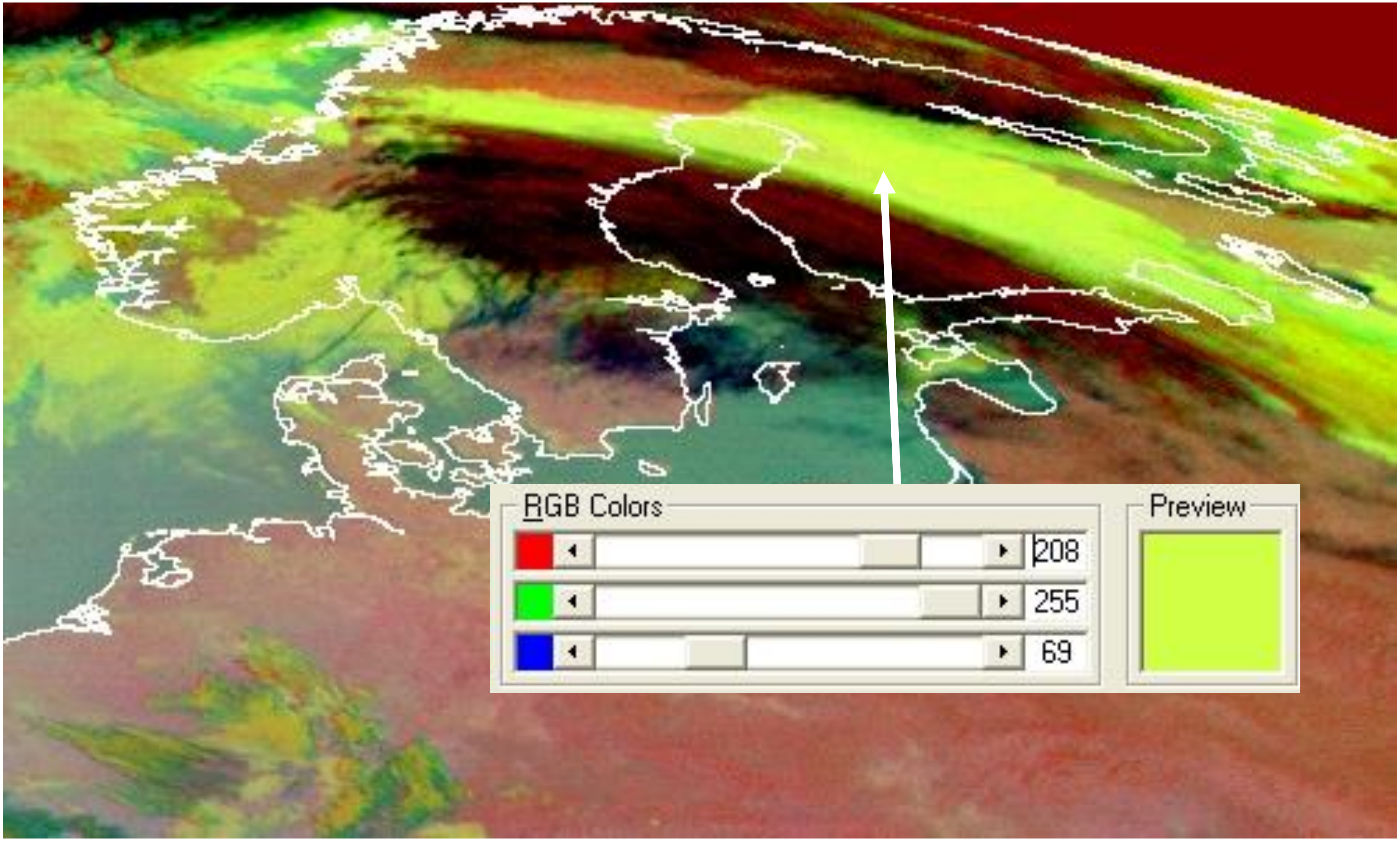
MSG-1, 23 January 2006, 03:00 UTC
RGB Composite 10-09, 09-07, 09

Example: Low Clouds (mid latitude)



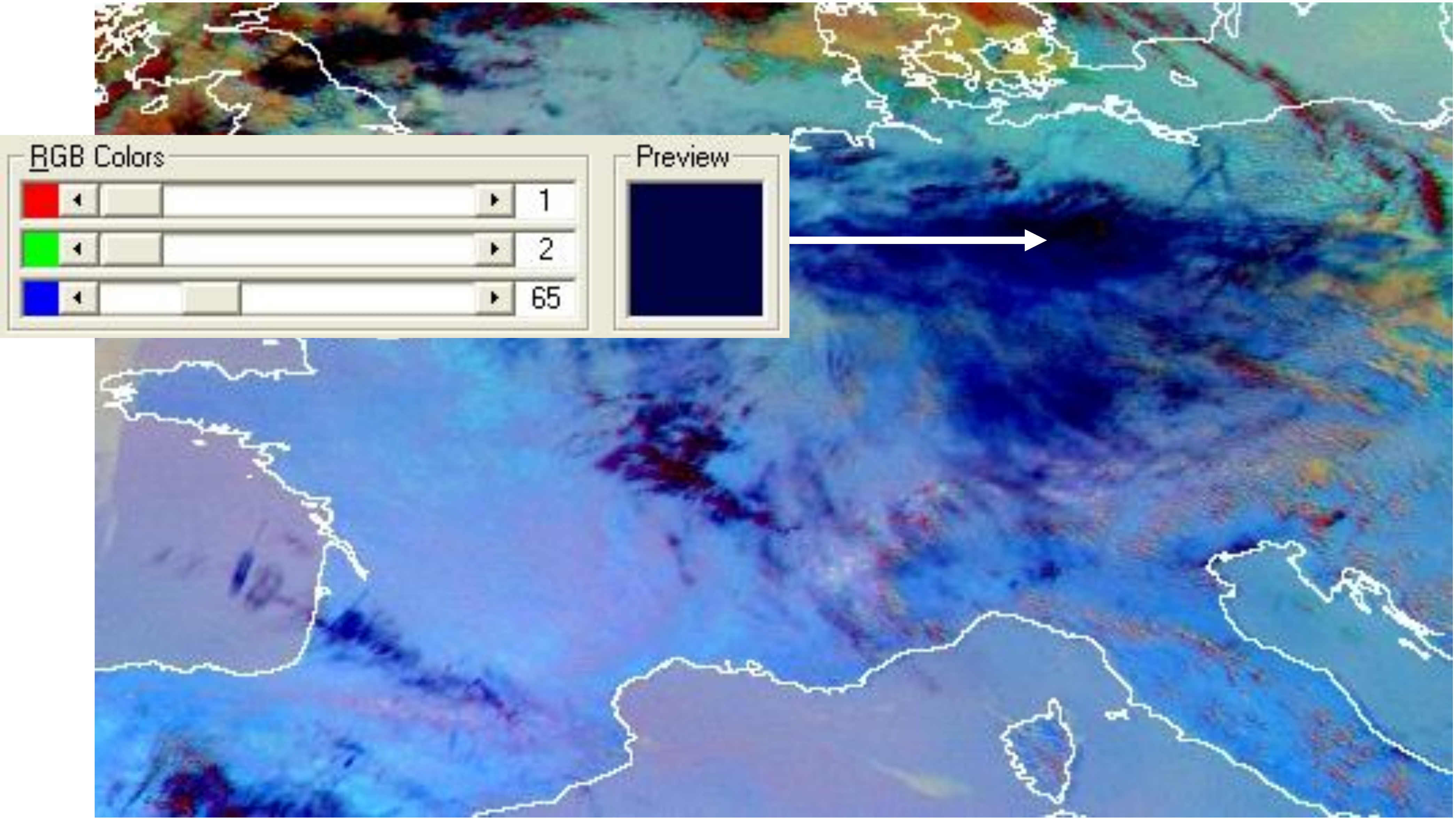
MSG-1, 17 February 2004, 12:00 UTC

Example: Low Clouds (high latitude)



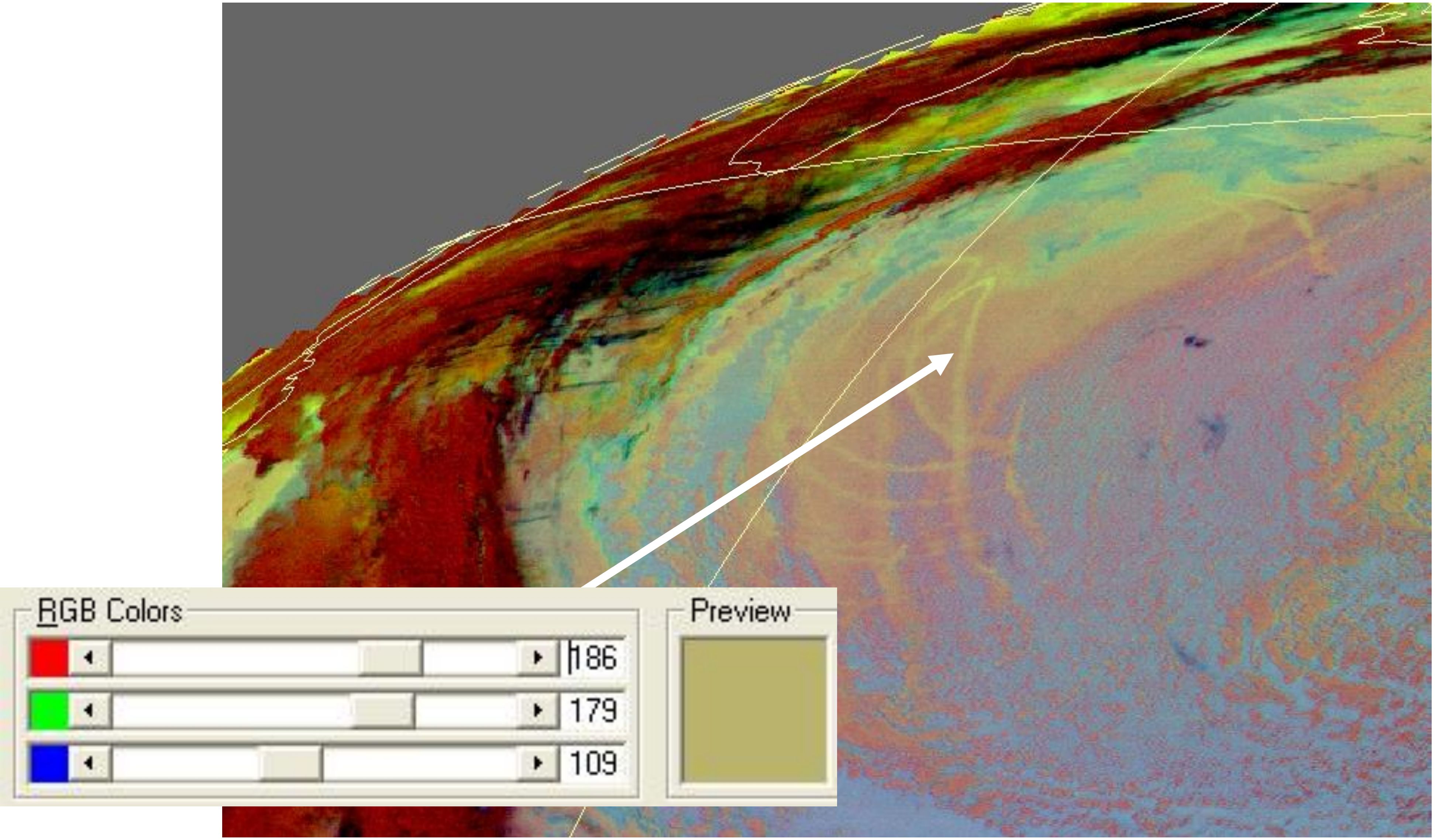
MSG-1, 7 February 2005, 10:00 UTC

Example: Thin Cirrus



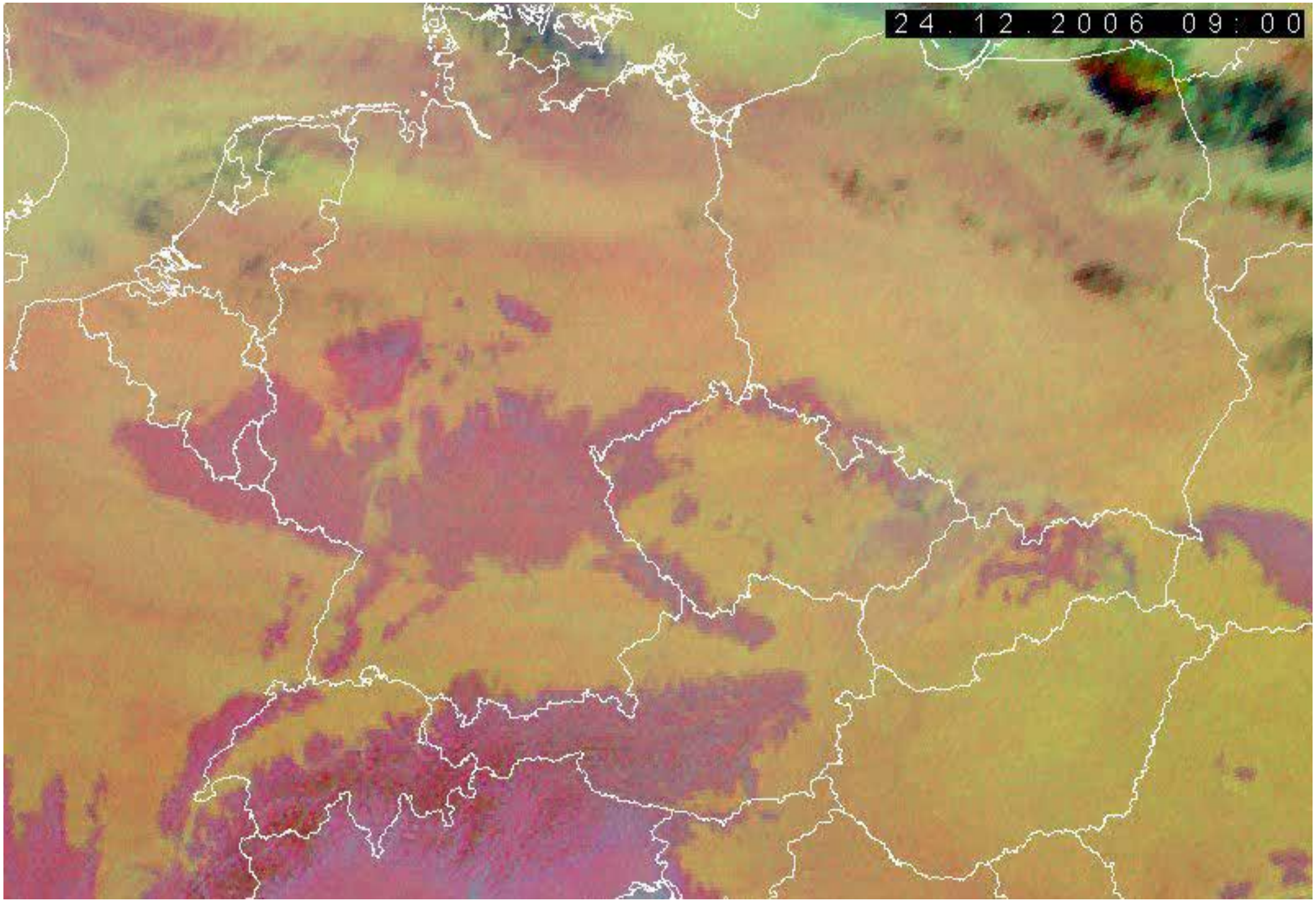
MSG-1, 20 September 2006, 12:00 UTC

Example: Ship Trails



MSG-1, 25 January 2007, 04:00 UTC

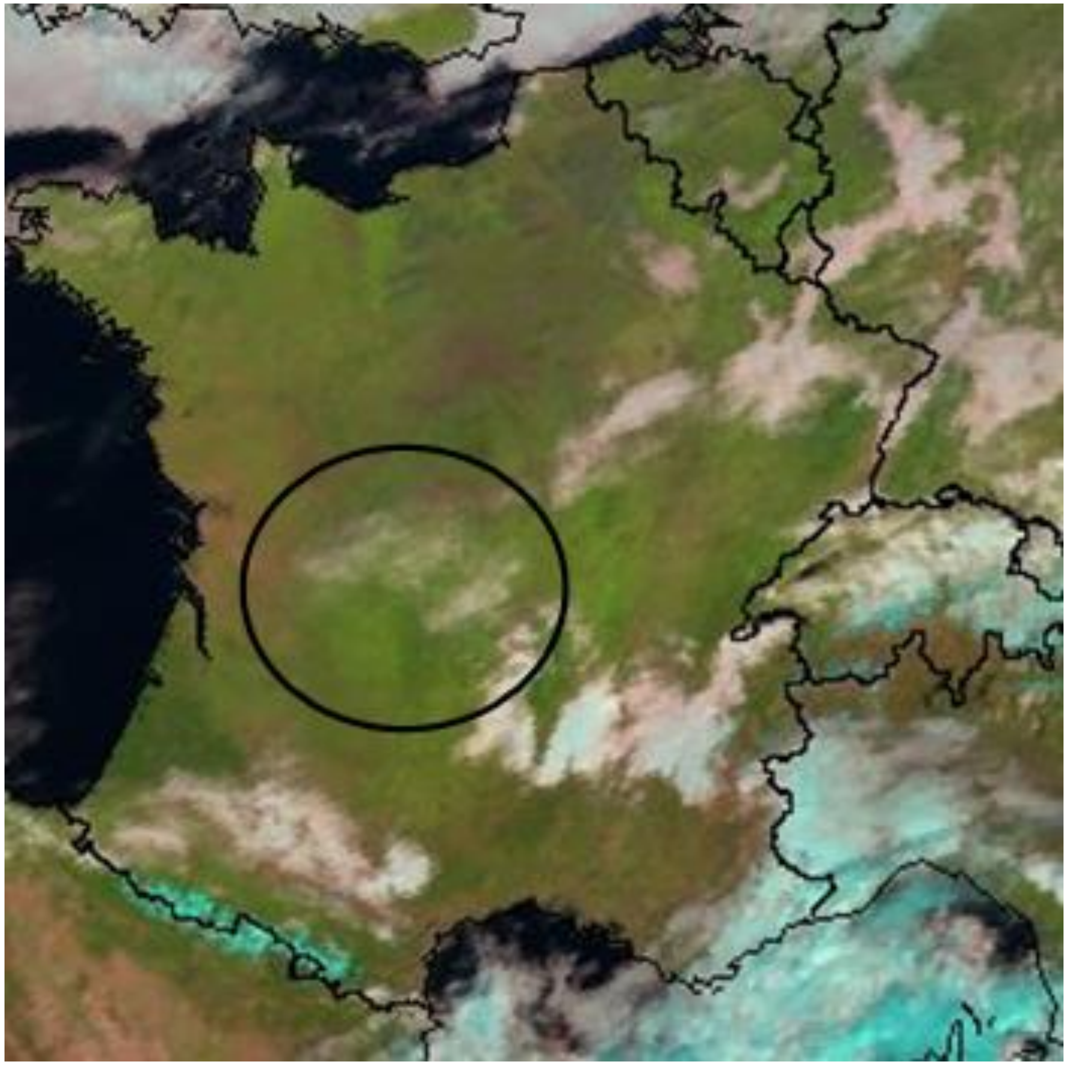
Example: Power Station Plumes



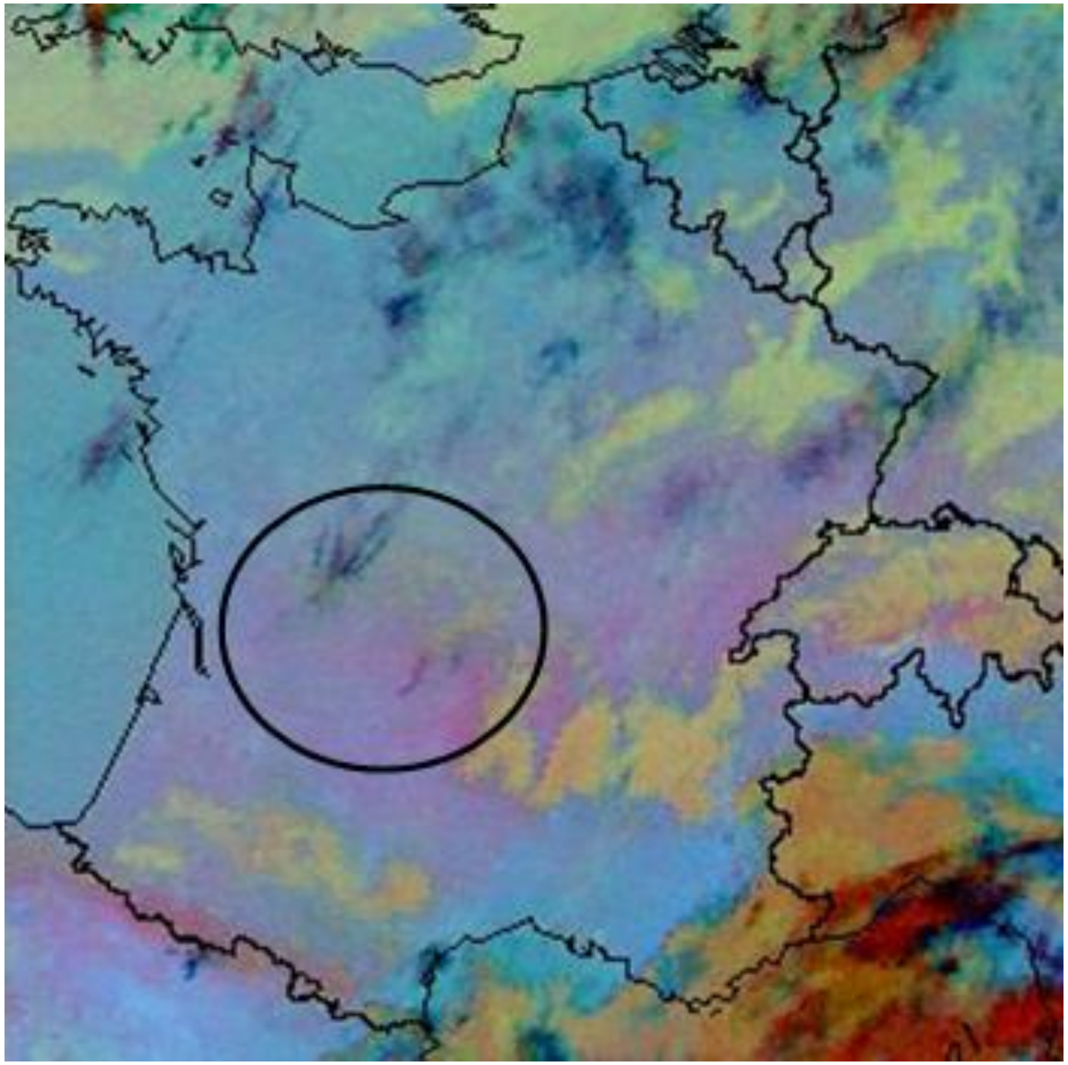
MSG-1, 24-25 December 2006

CLICK HERE

Example: Dissolving Low Clouds



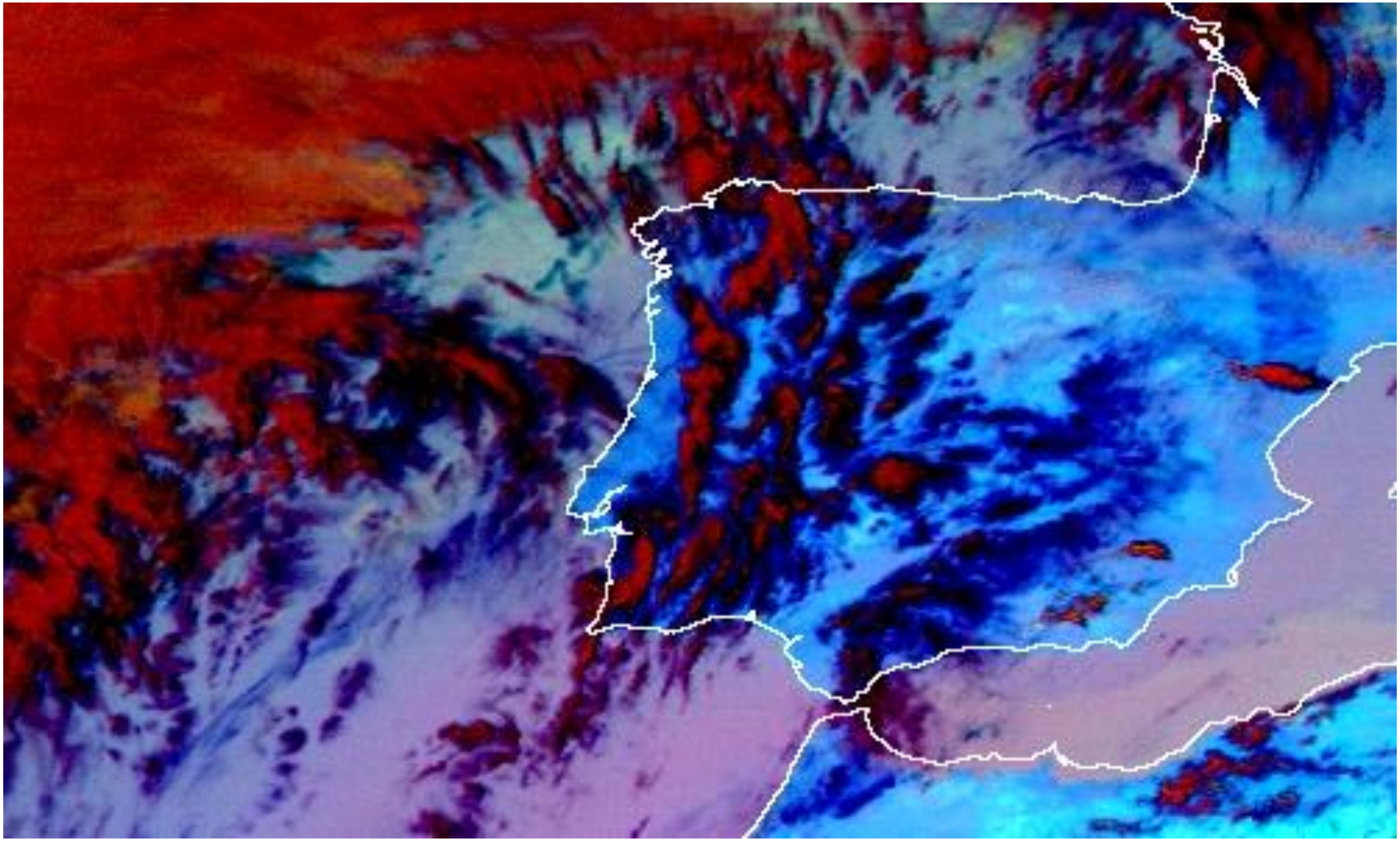
Natural Colours



24-h Cloud Microphysics

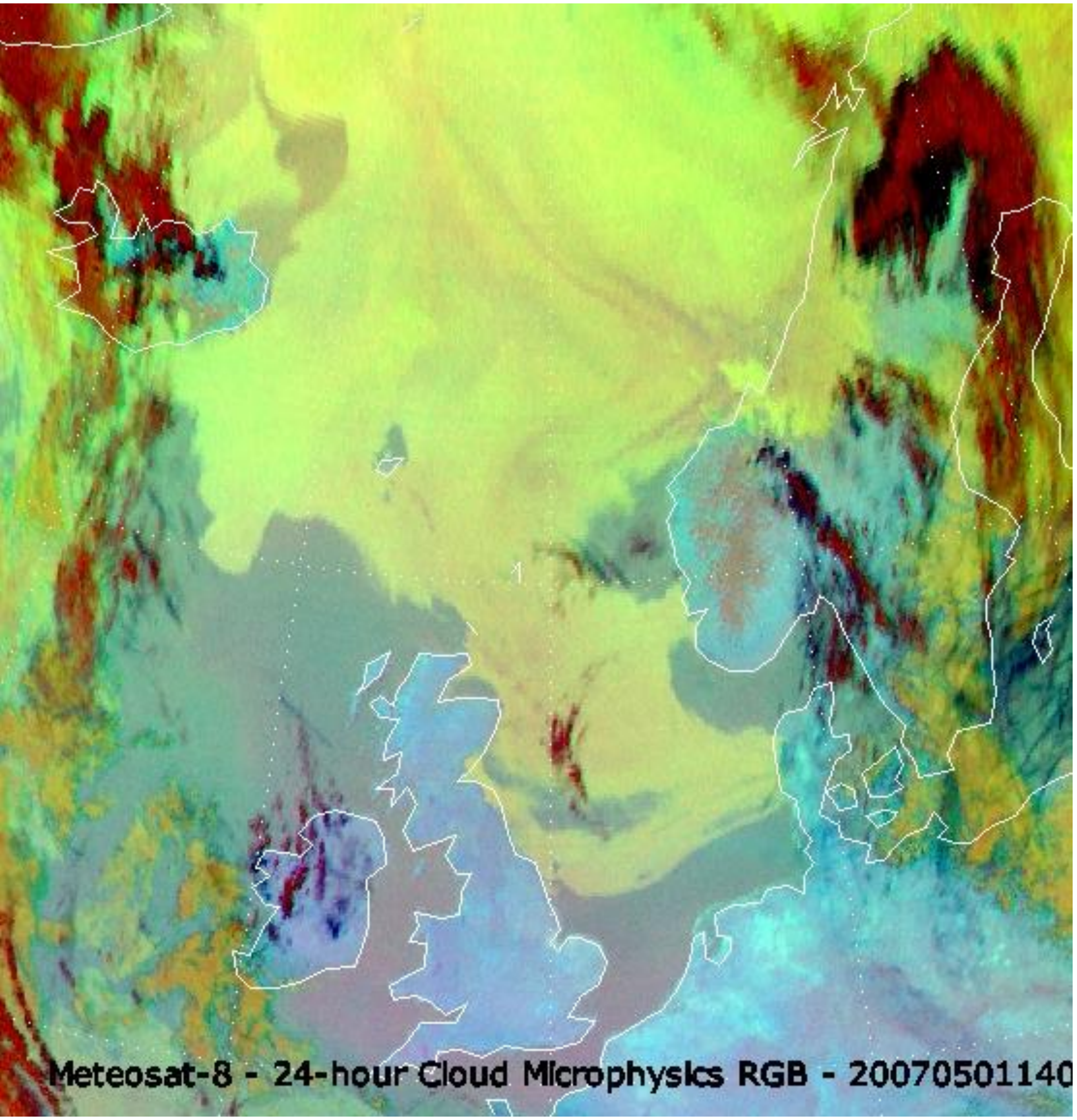
MSG-2, 31 October 2007, 11:00 UTC

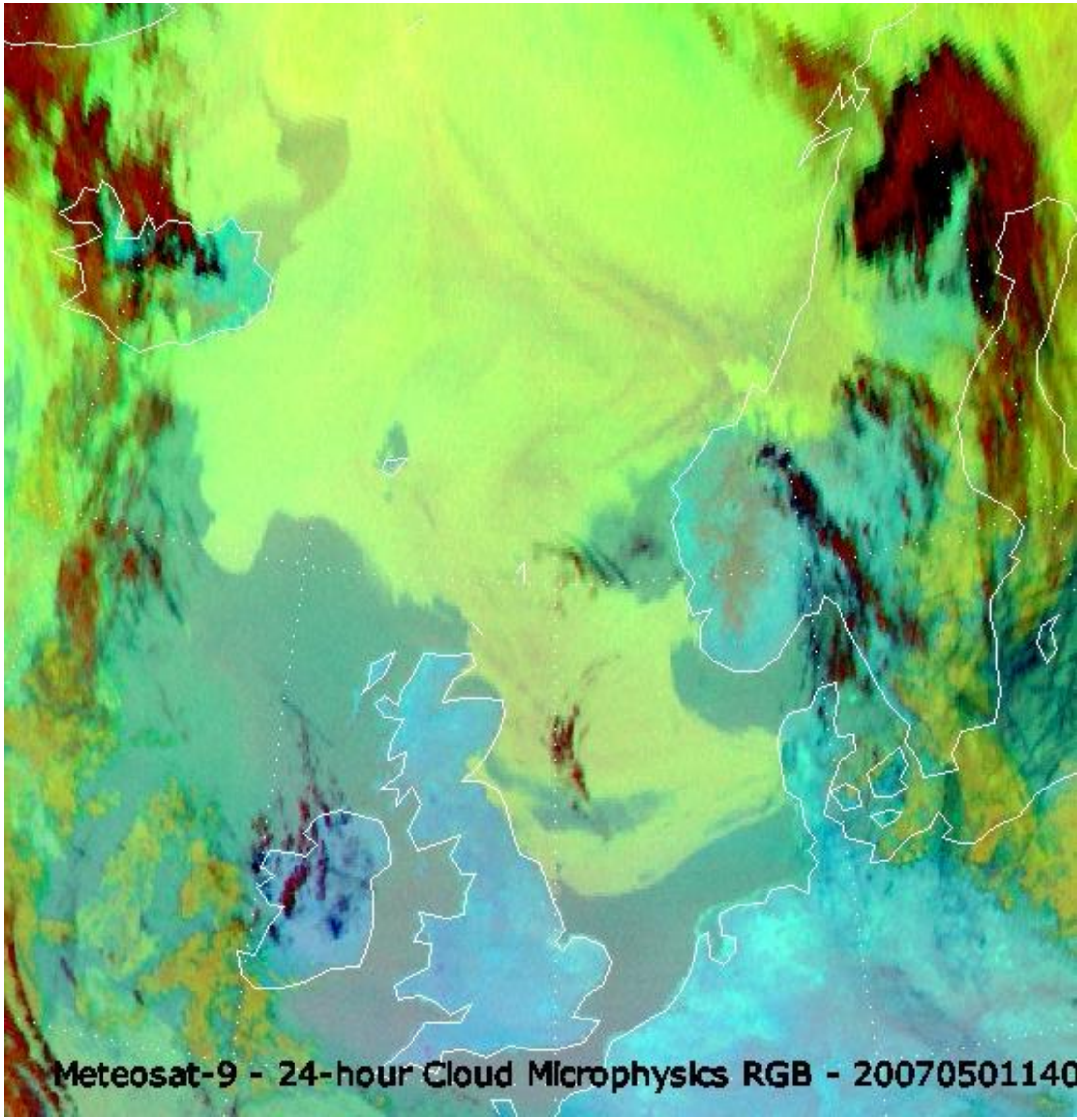
Example: Convective Clouds



MSG-1, 16 May 2005, 13:15 UTC

Comparison Met-8 vs Met-9

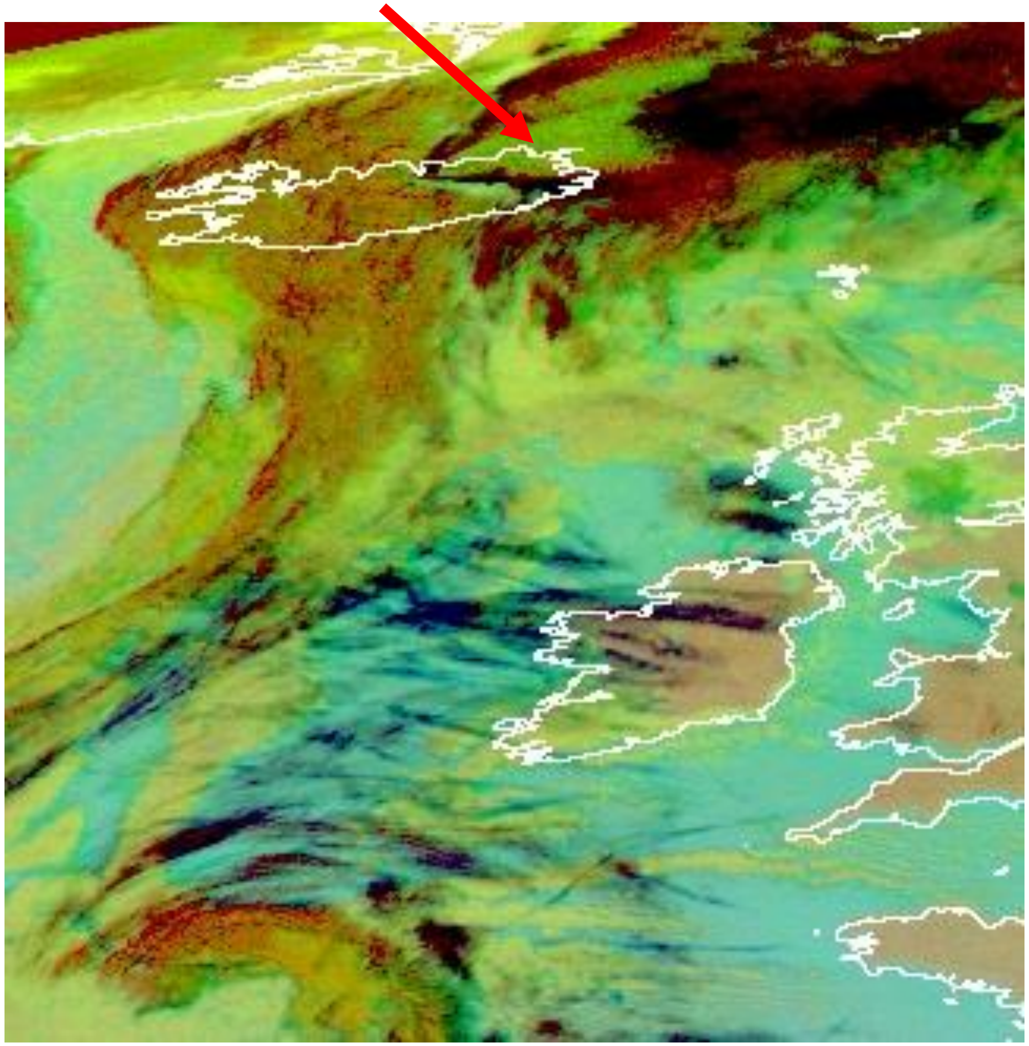




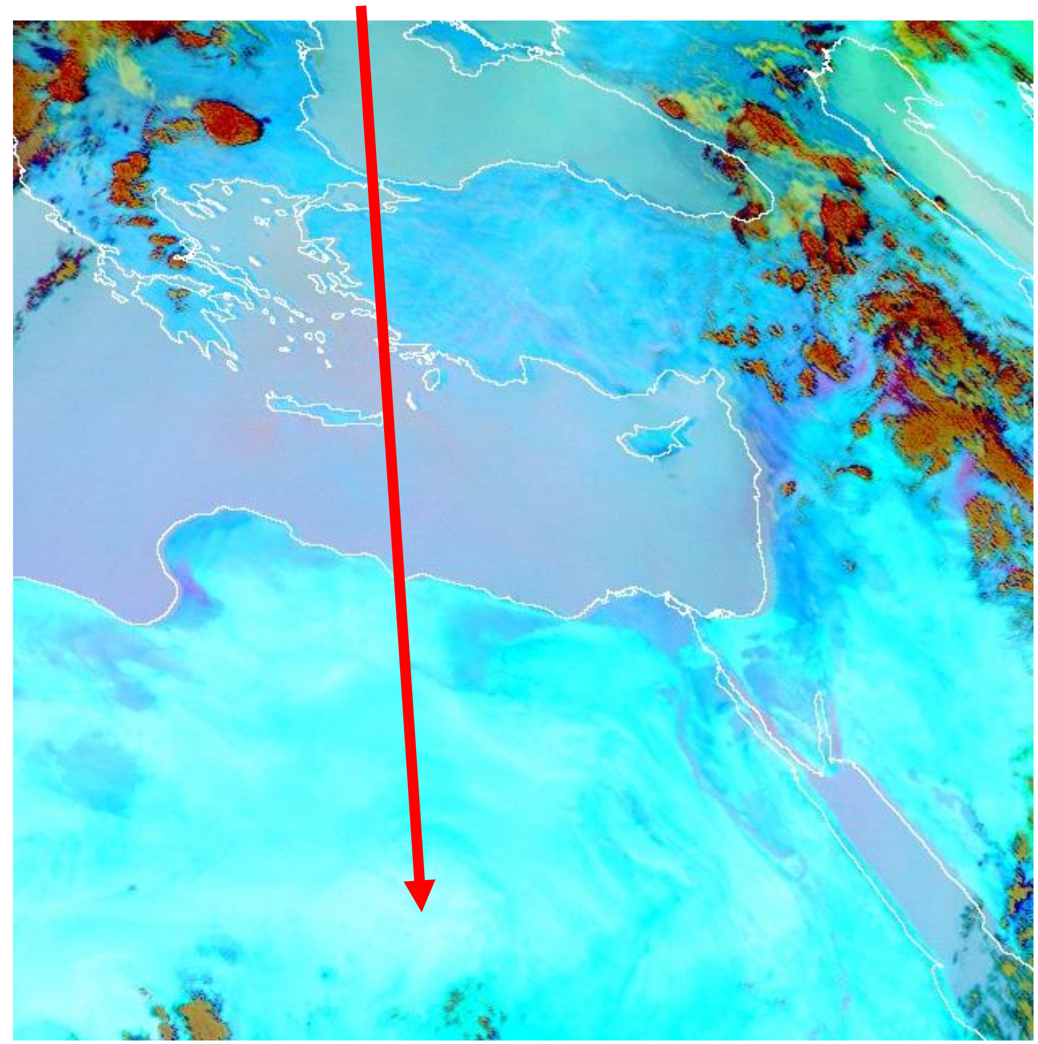
CLICK HERE

1 May 2007, 14:00 UTC

Unusual colours because of:



3 November 2006, 06:00 UTC

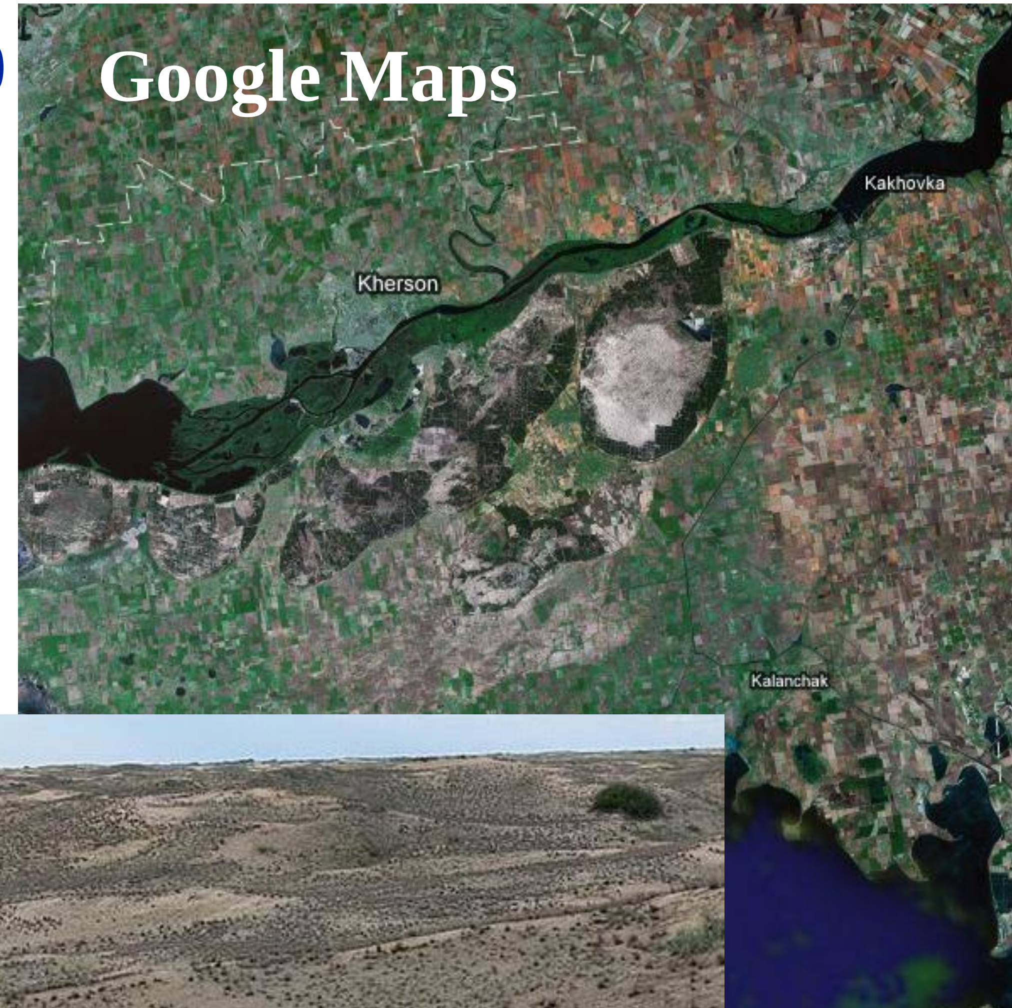


21 August 2006, 12:00 UTC

Unusual colours because of:

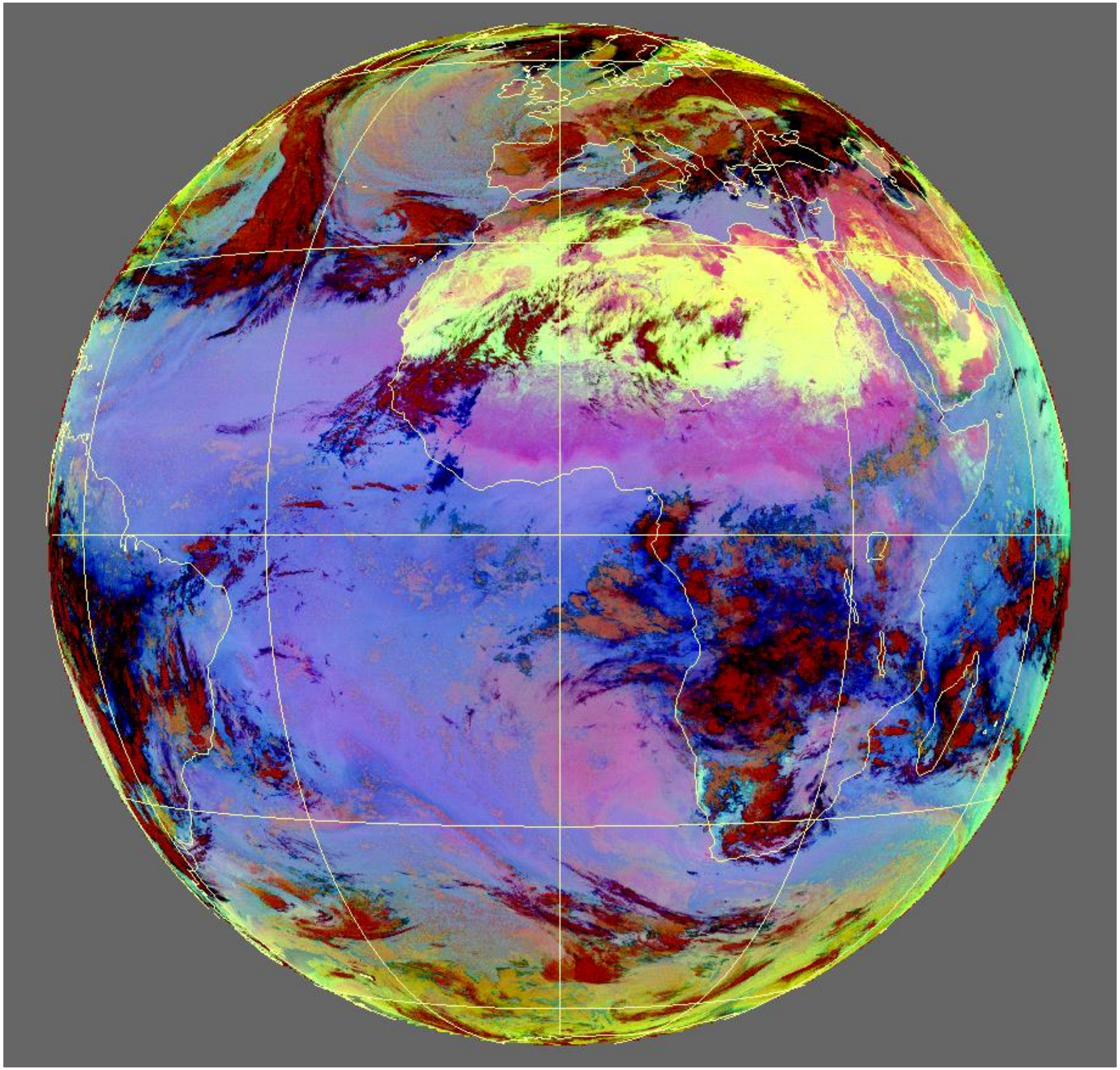
low surface emissivity (sand surface)

5 January 2008, 09:15 UTC



Google Maps

Picture from Google Earth (Jurarafal)



RGB
24-hour
Cloud
Microphysics
Global View

MSG-1
25 January 2007
04:00 UTC

RGB 24-hour Cloud Microphysics: Interpretation of Colours for High-level Clouds

Cold, thick, high-level clouds

Thin Cirrus clouds / Contrails

over vegetated land / ocean

over sand desert

Ocean

Warm Desert

Warm Land

Cold Land

Very Cold Land

snow

RGB 24-hour Cloud Microphysics Interpretation of Colours for Low/Mid-level Clouds

Thick, mid-level cloud

Thin, mid-level cloud

Low-level cloud (cold atmosphere, Central Europe)

Low-level cloud (very cold atmosphere, Scandinavia)

Ocean | Warm Desert | Warm Land | Cold Land | Very Cold Land

snow

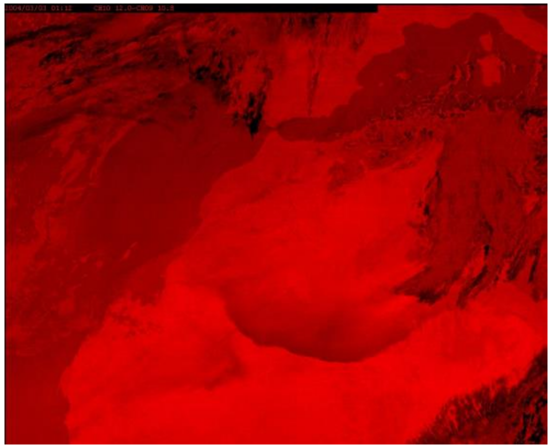
1b. RGB 10-09, 09-07, 09 (“24-hour Dust Microphysics")

devised by: D. Rosenfeld

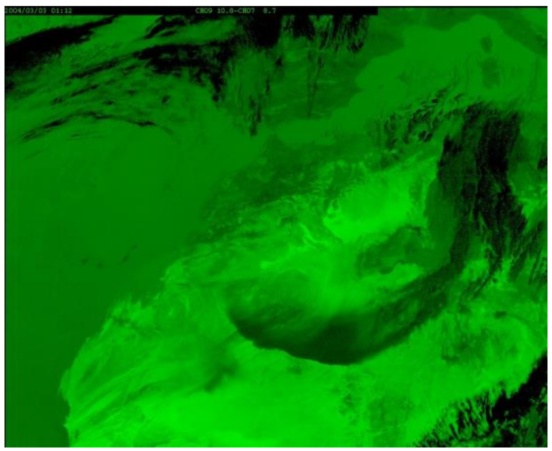
Recommended Range and Enhancement:

Beam	Channel	Range	Gamma
Red	IR12.0 - IR10.8	-4 … +2 K	1.0
Green	IR10.8 - IR8.7	0 … +15 K	2.5
Blue	IR10.8	+261 … +289 K	1.0

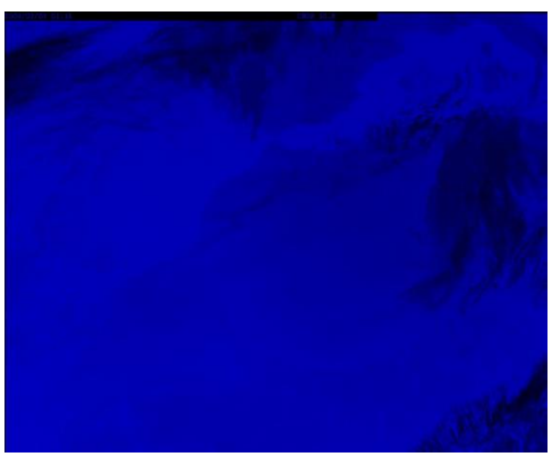
Ch.10
-Ch.09

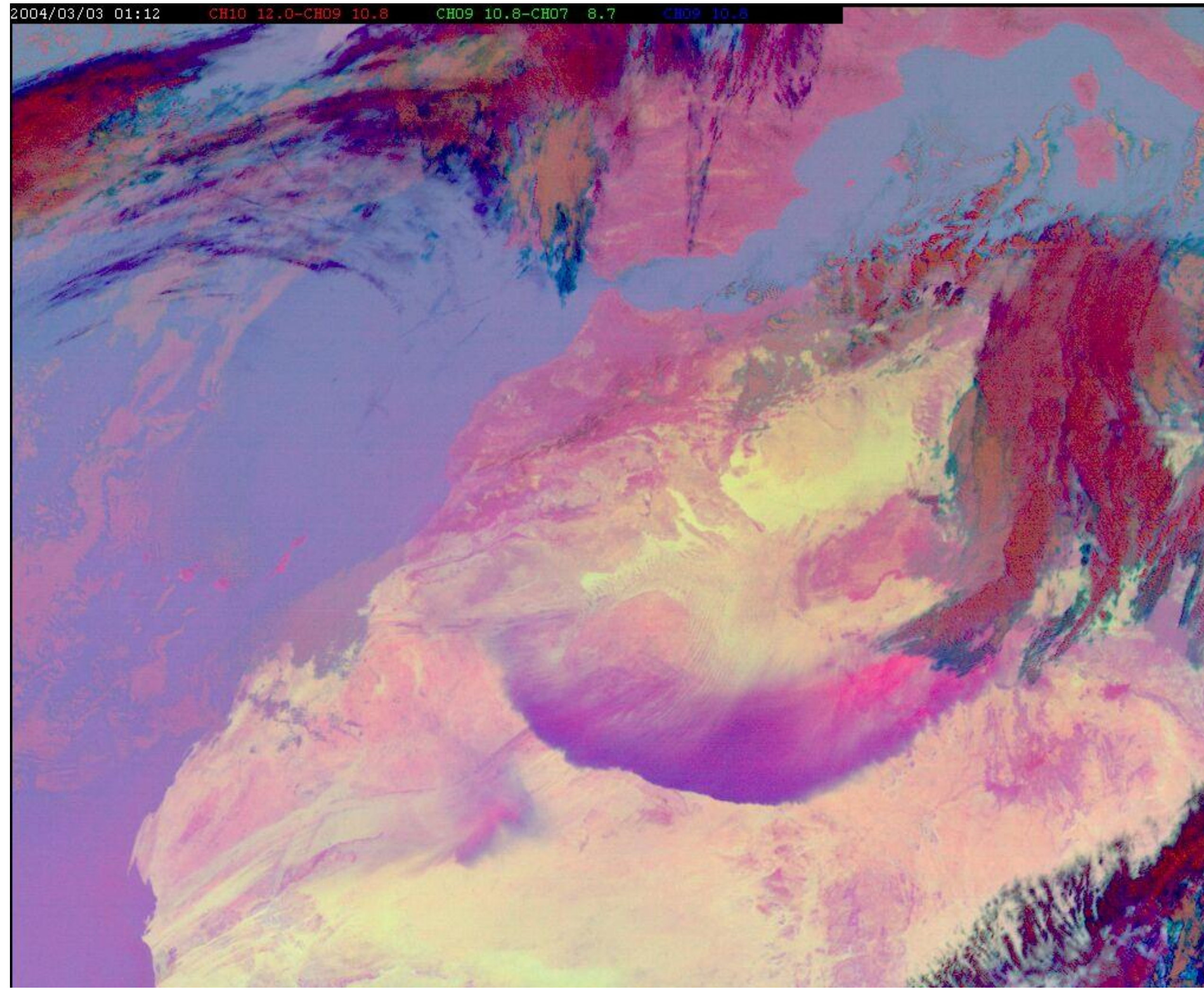


Ch.09
-Ch.07



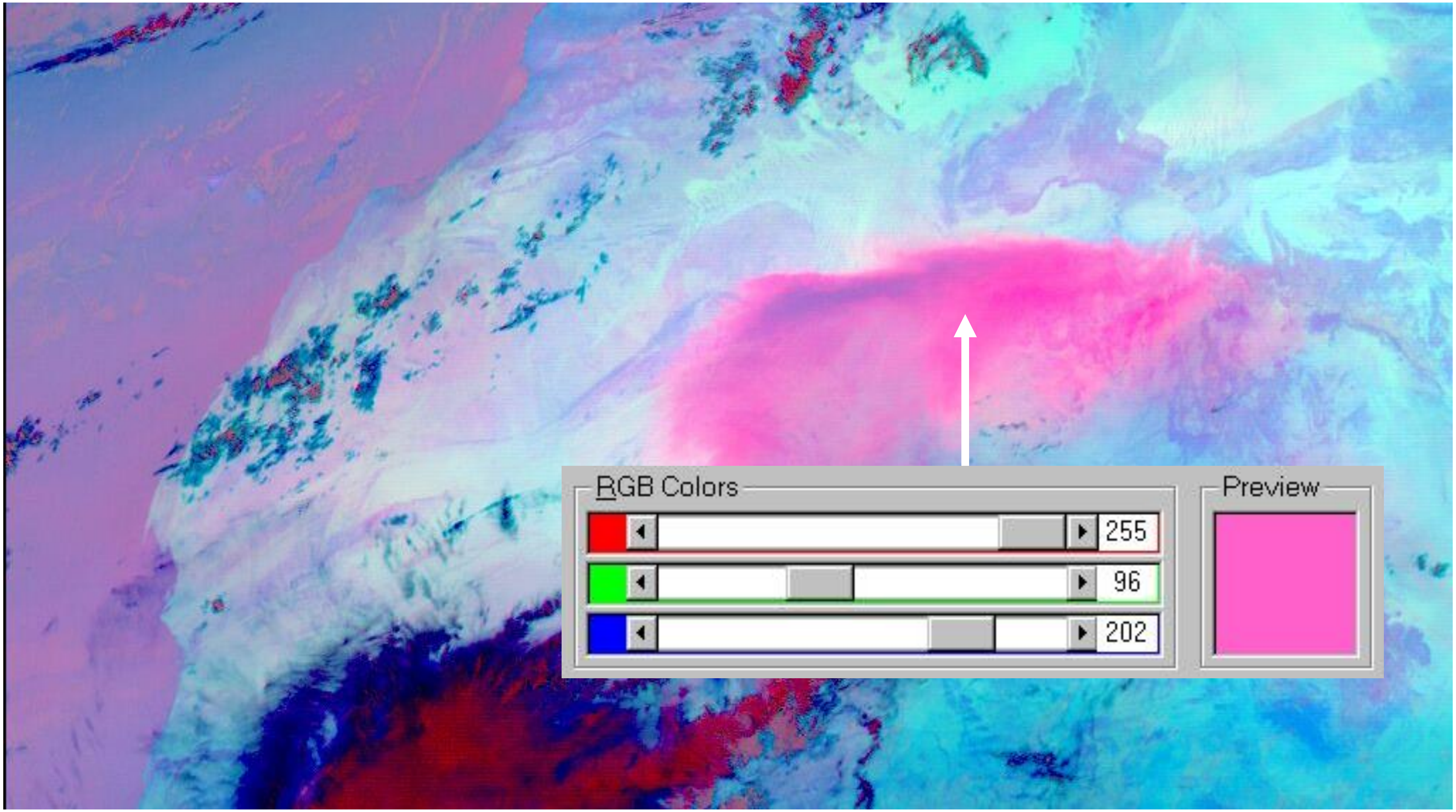
Ch.09





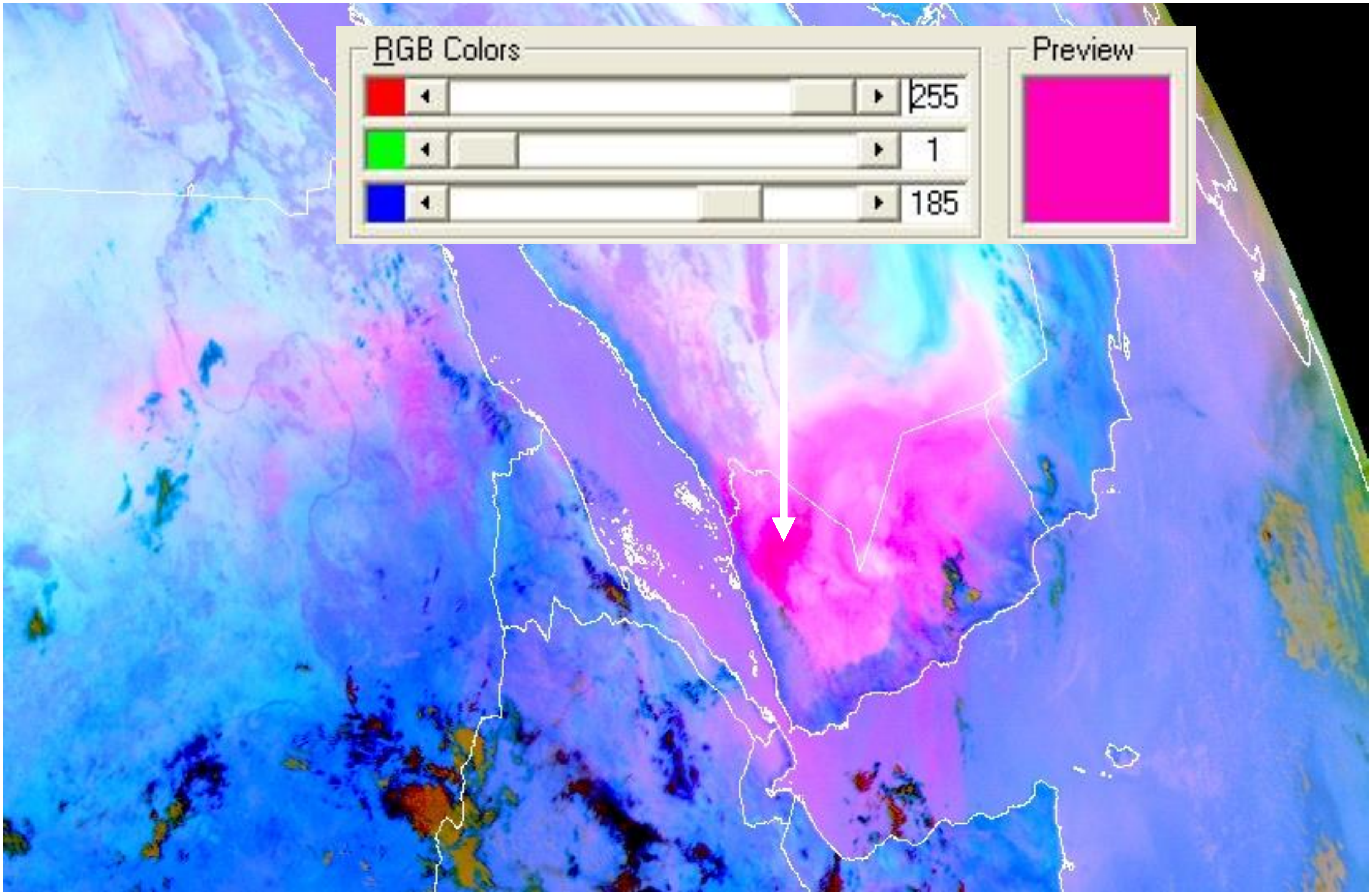
MSG-1, 3 March 2004, 01:00 UTC
RGB Composite 10-09, 09-07, 09

Example: Dust (Day)



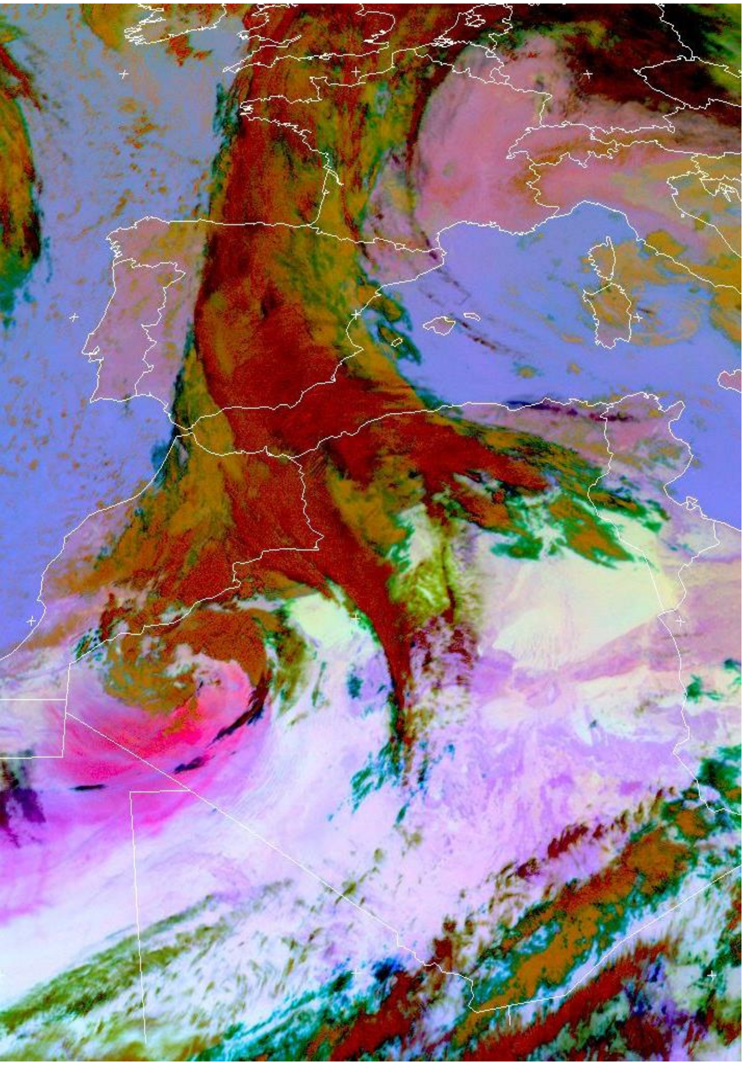
MSG-1, 14 July 2003, 10:00 UTC

Example: Dust (Day)

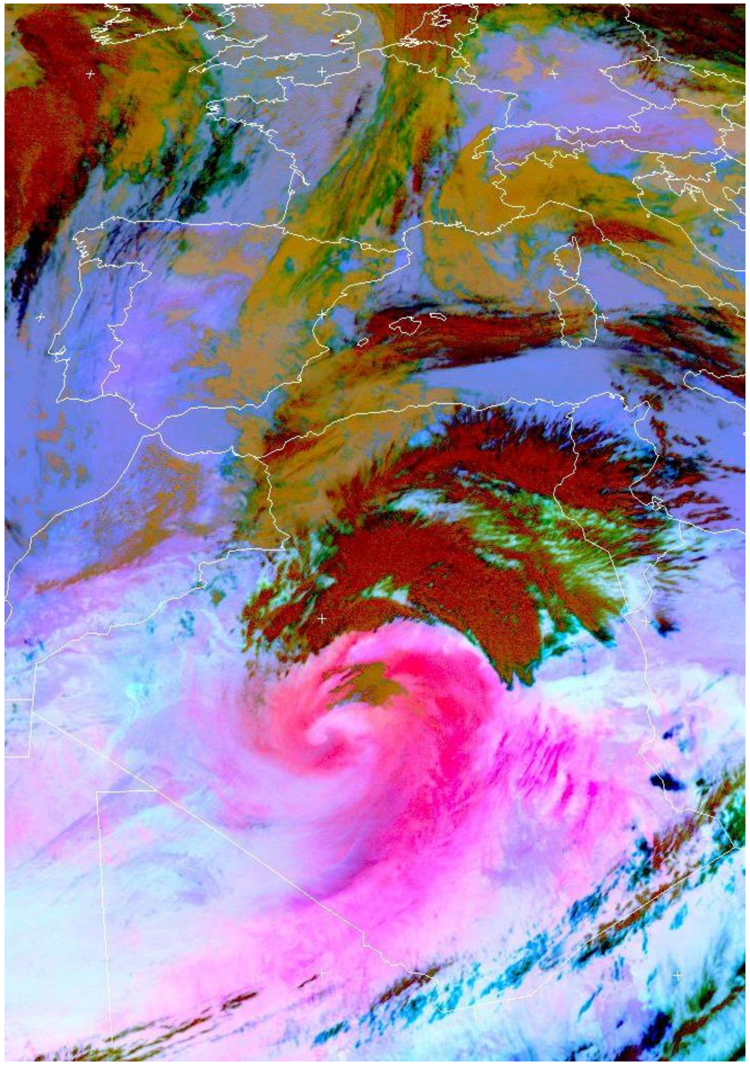


MSG-1, 14 June 2006, 08:00 UTC

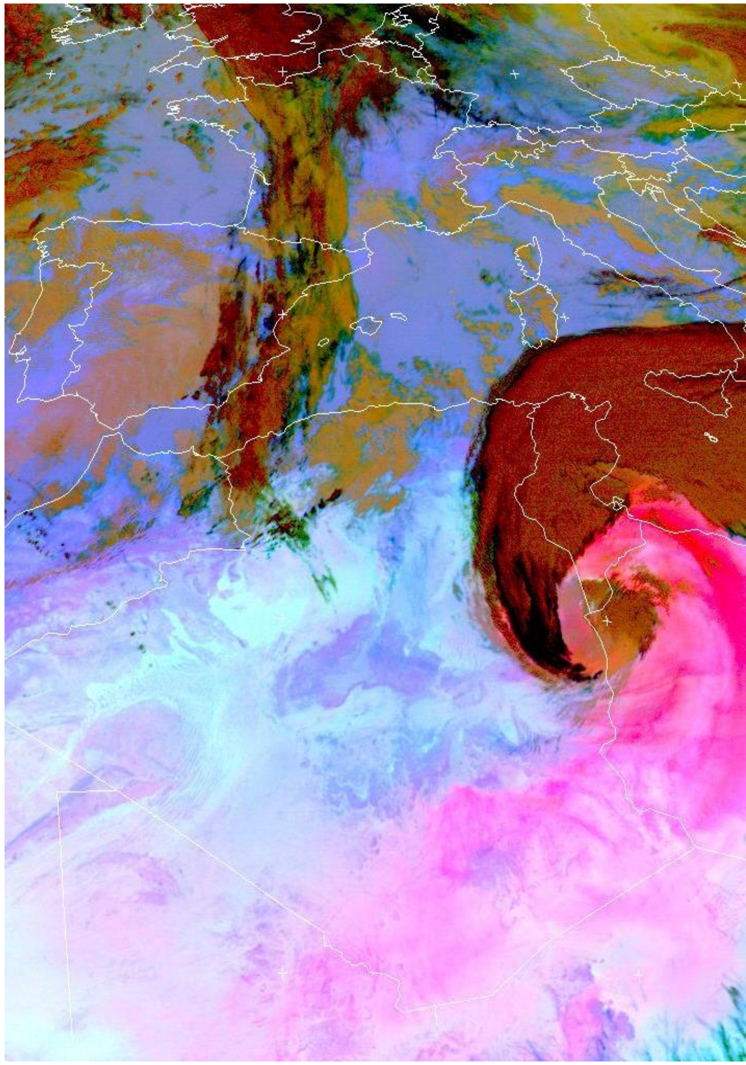
Example: Dust (Day)



20 Feb 18:00 UTC

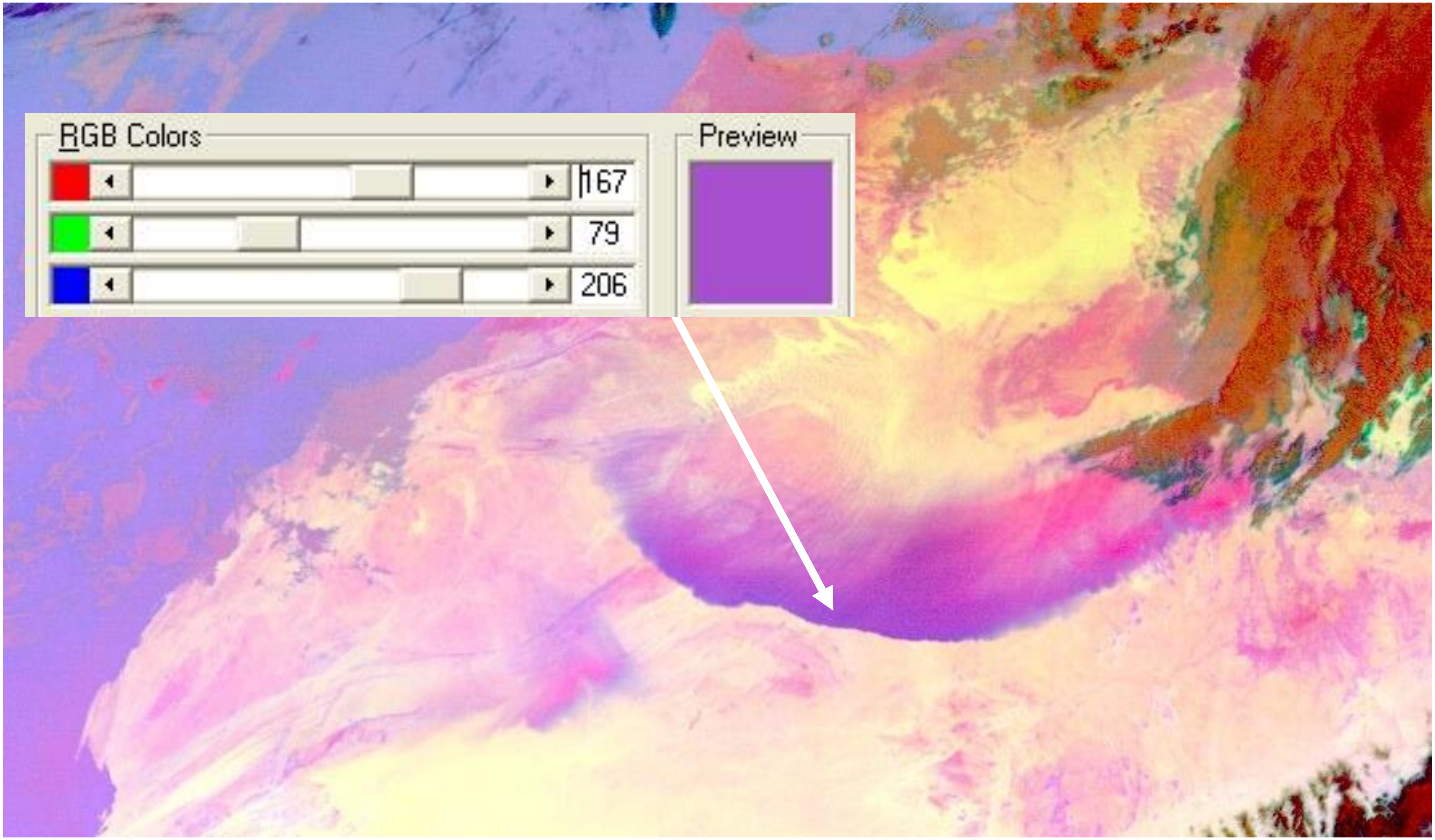


21 Feb 12:00 UTC



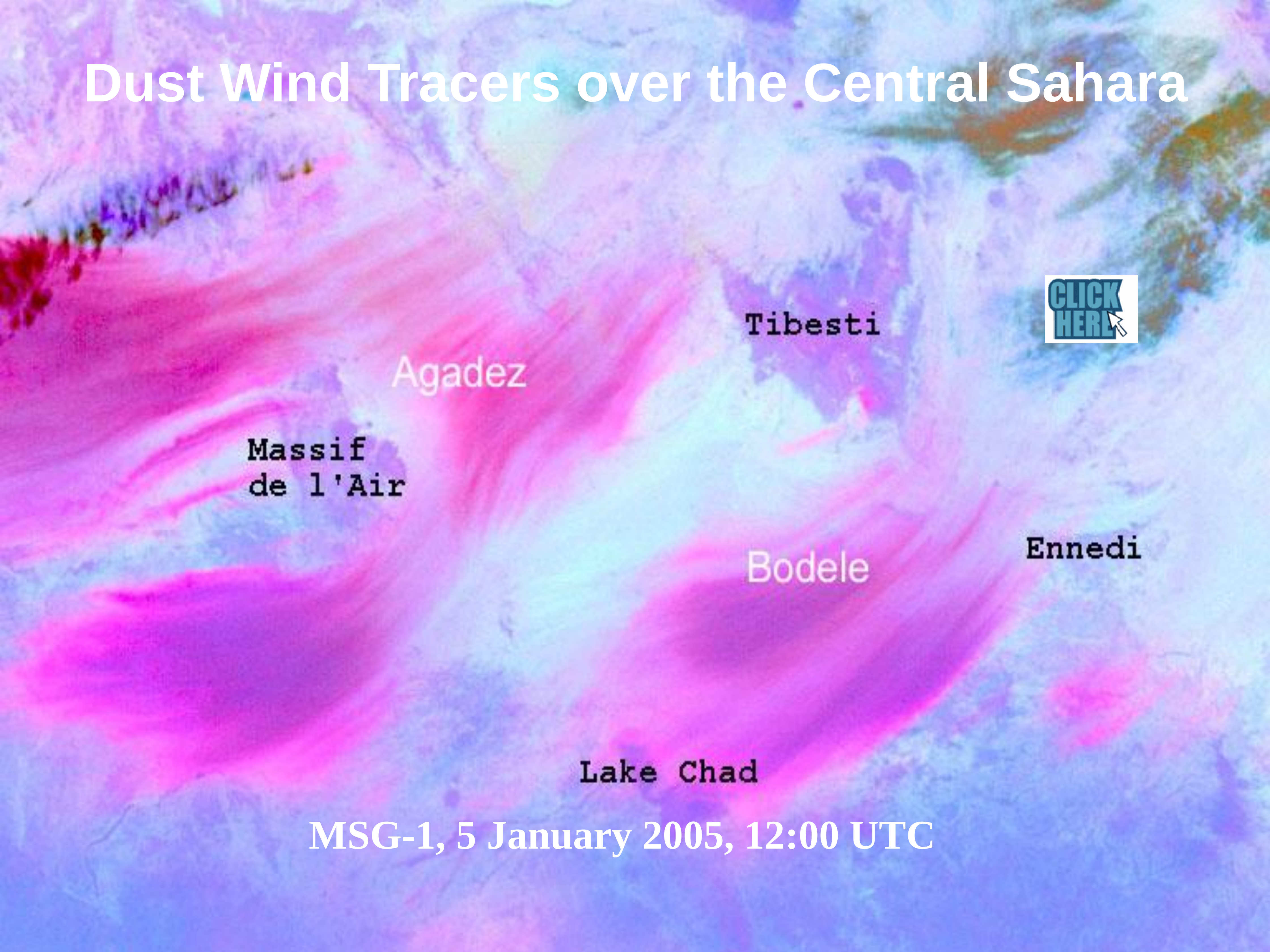
22 Feb 12:00 UTC

Example: Dust (Night)



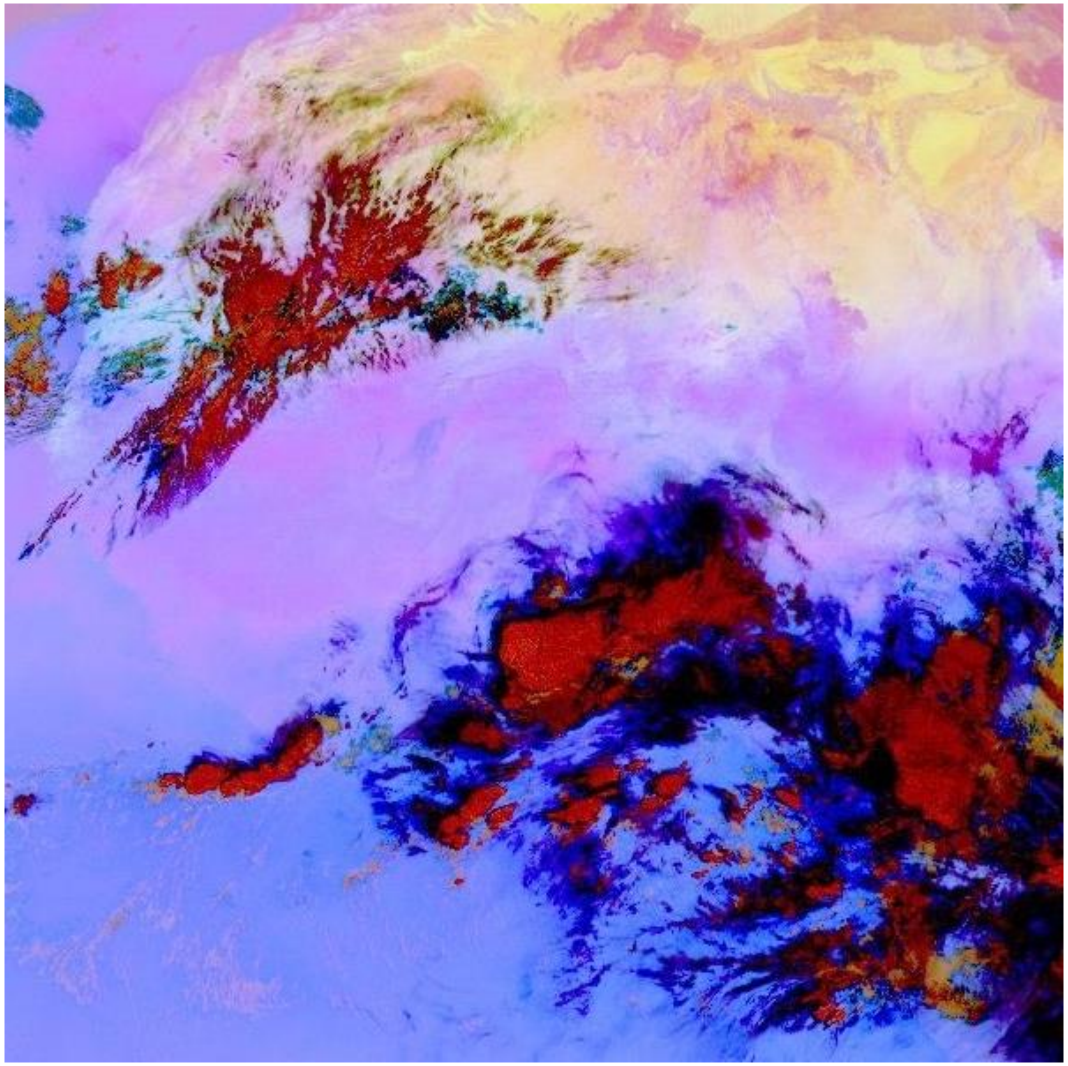
MSG-1, 3 March 2004, 00:00 UTC

Dust Wind Tracers over the Central Sahara

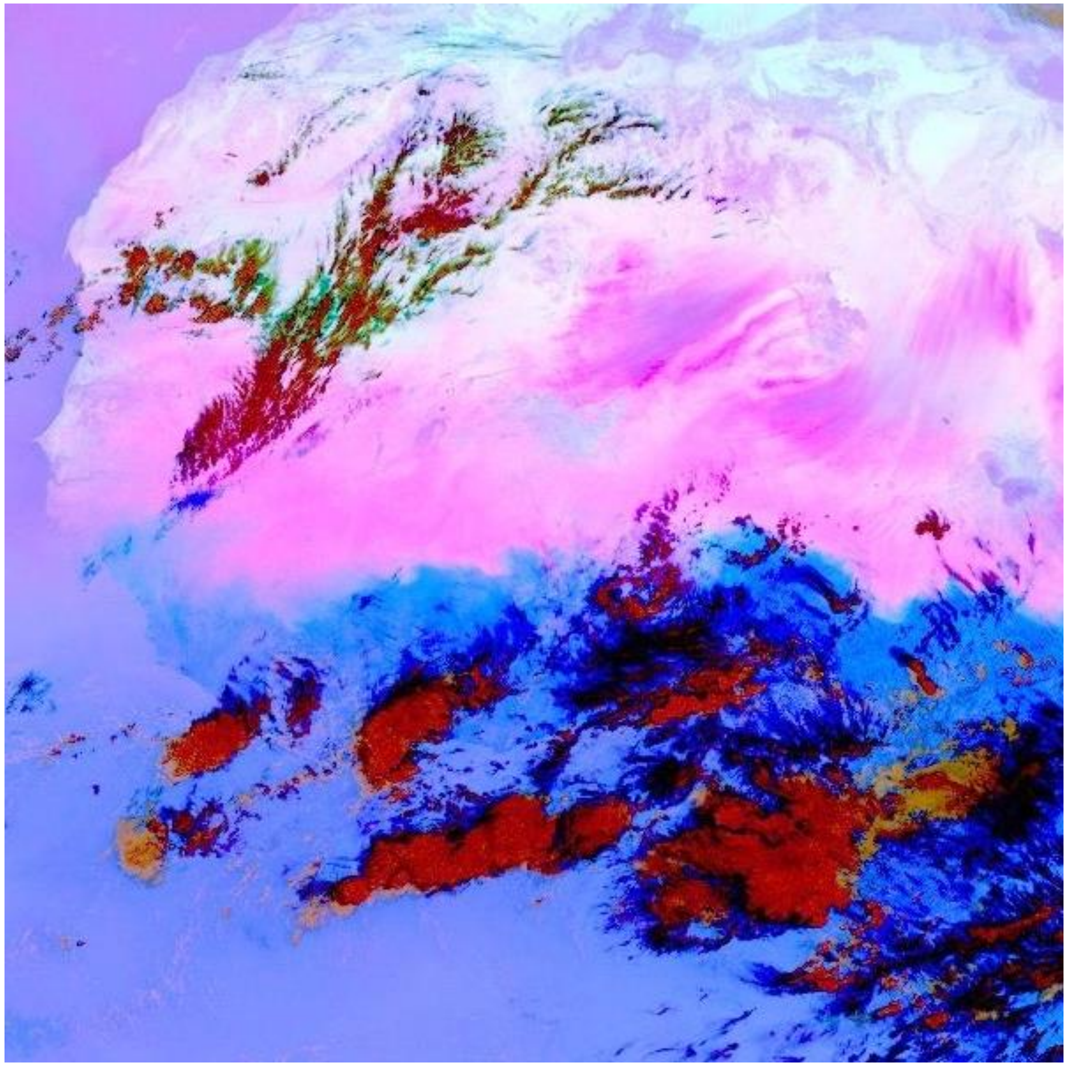


MSG-1, 5 January 2005, 12:00 UTC

Comparison: Night vs Day



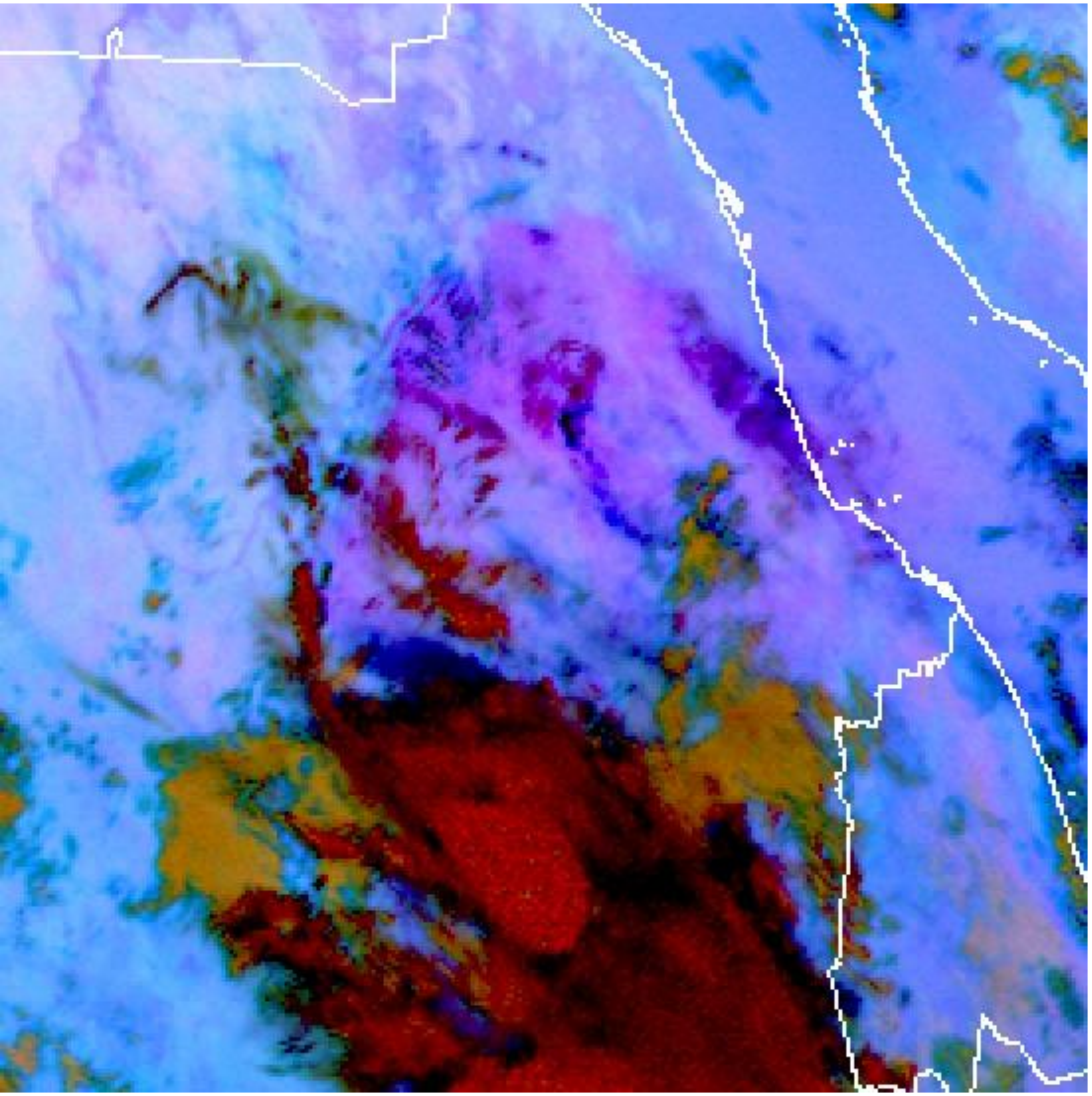
00:00 UTC



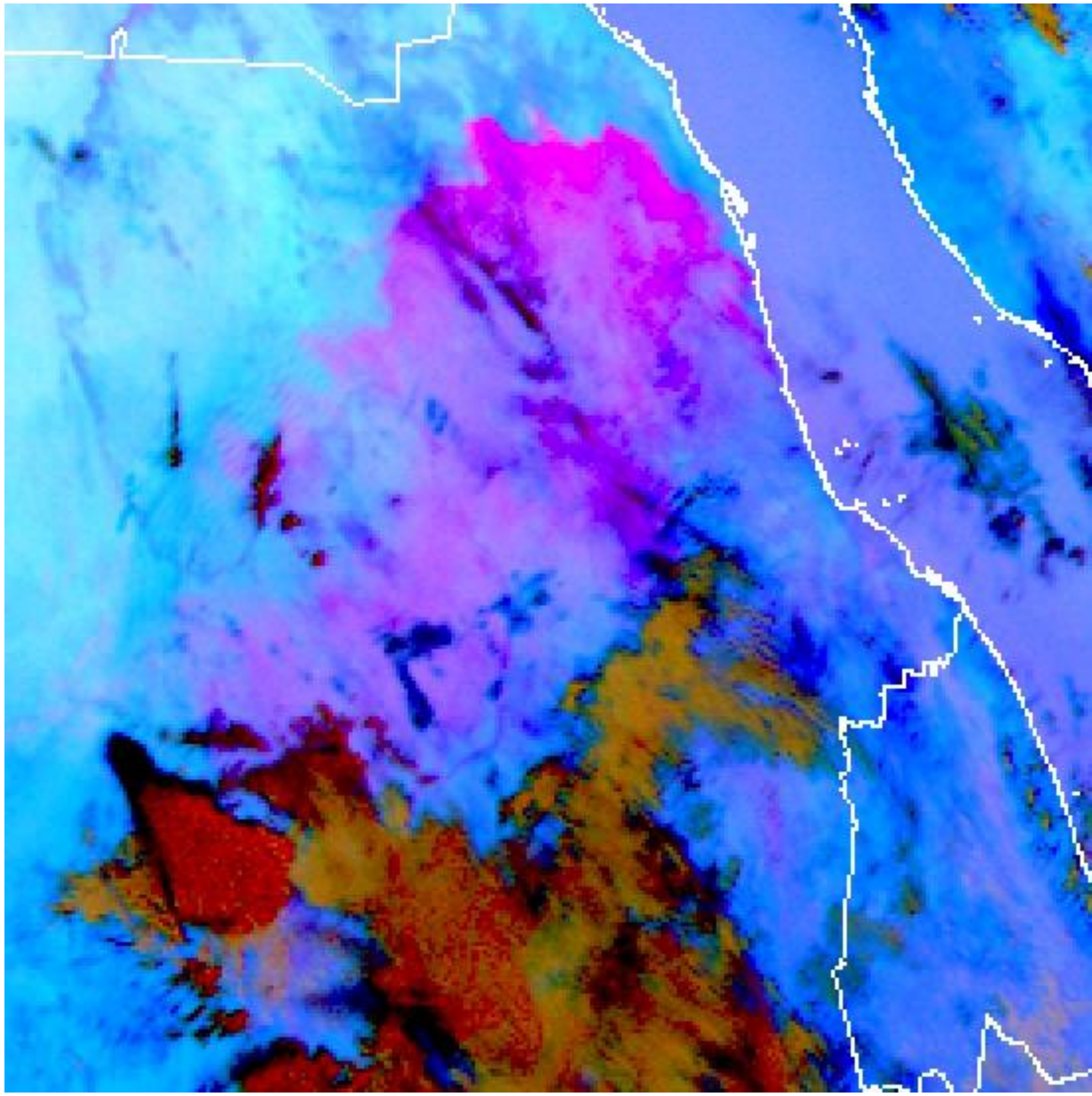
12:00 UTC

MSG-1, 8 March 2006

Comparison: Night vs Day



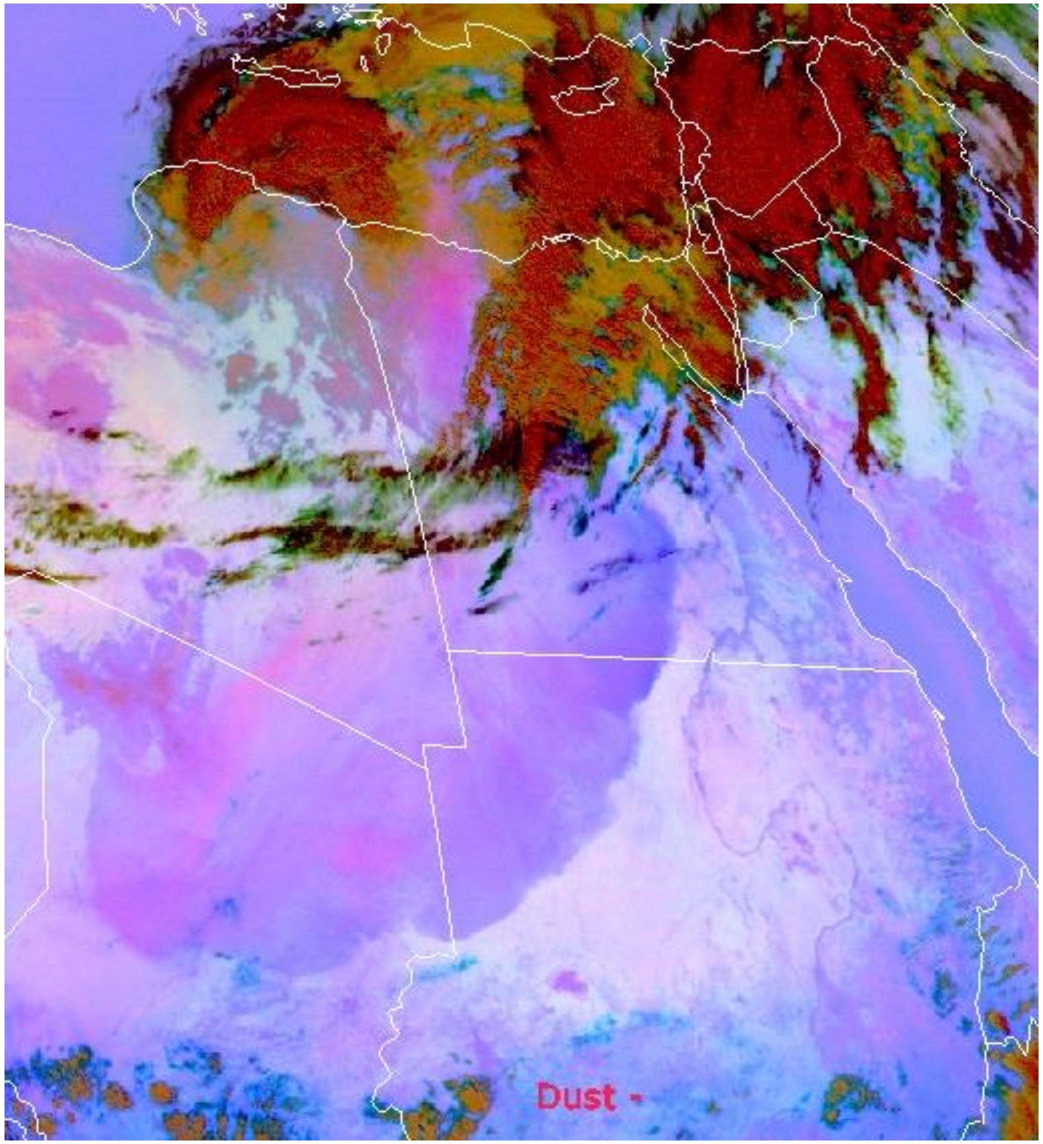
05:00 UTC



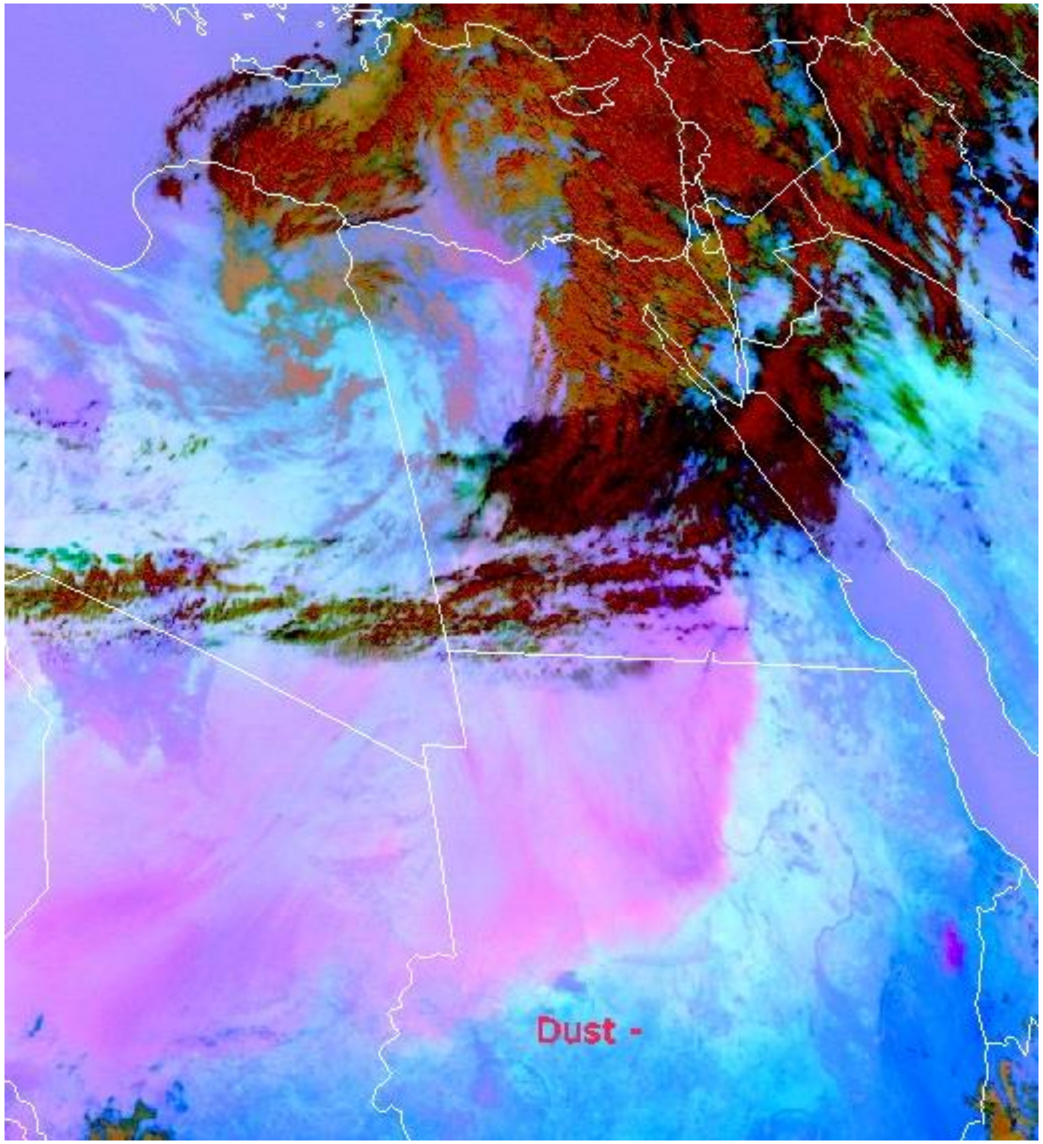
09:00 UTC

MSG-1, 8 March 2006

Comparison: Night vs Day



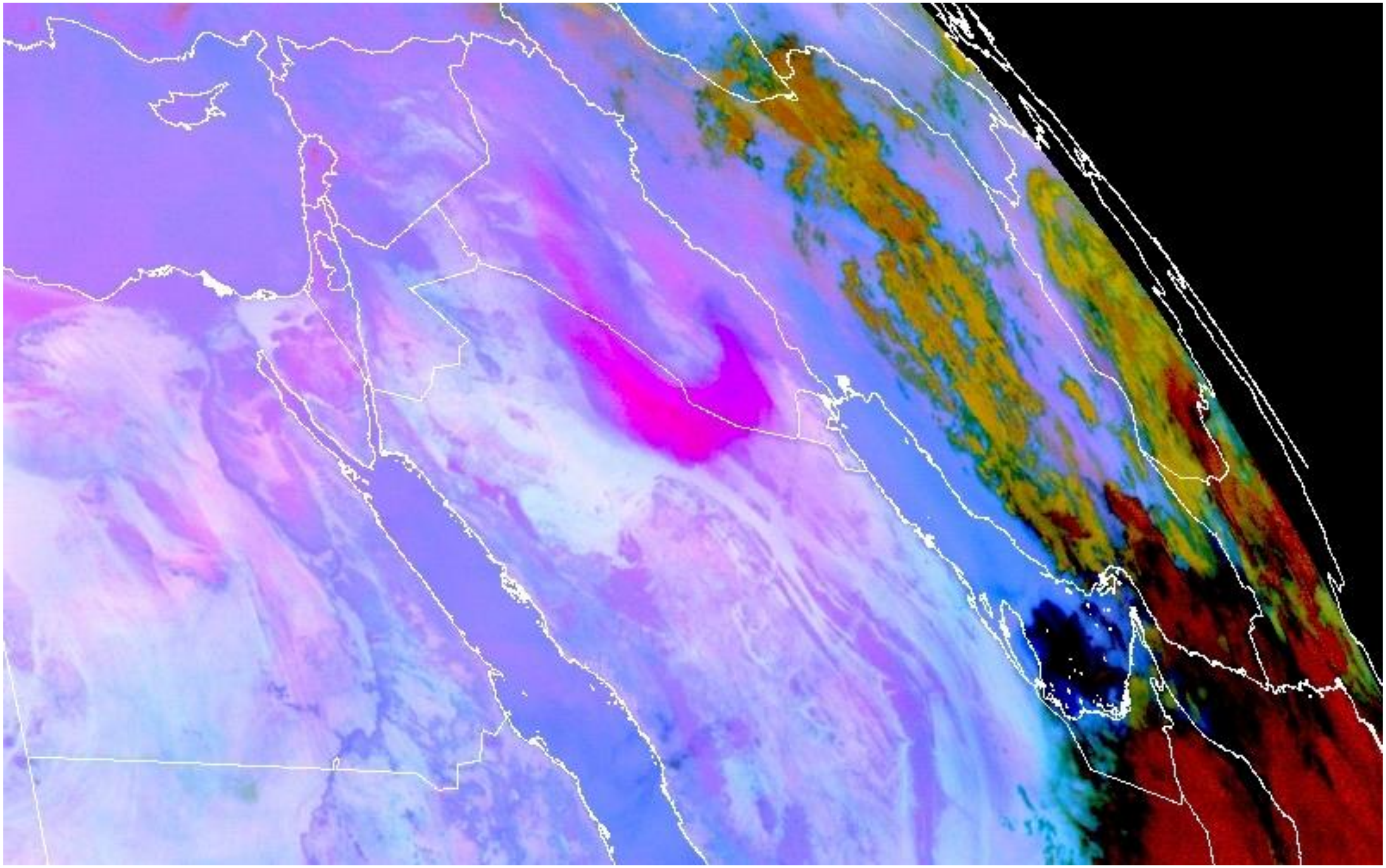
00:00 UTC



07:15 UTC

MSG-1, 10 May 2007

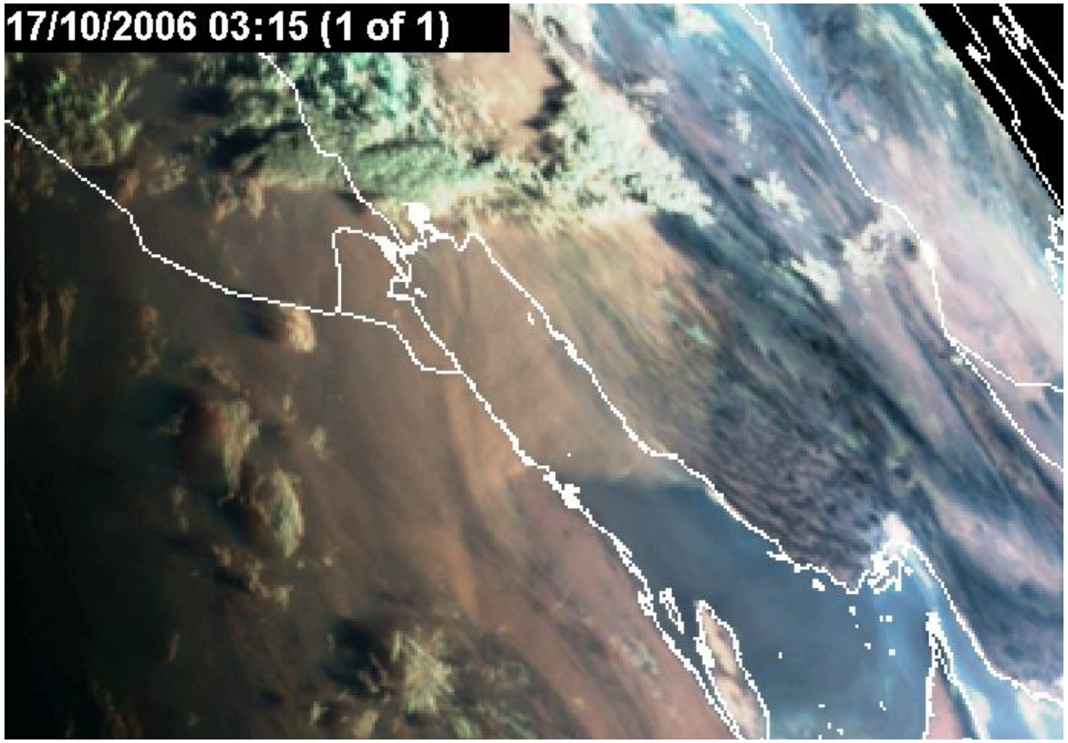
Comparison: Night vs Day



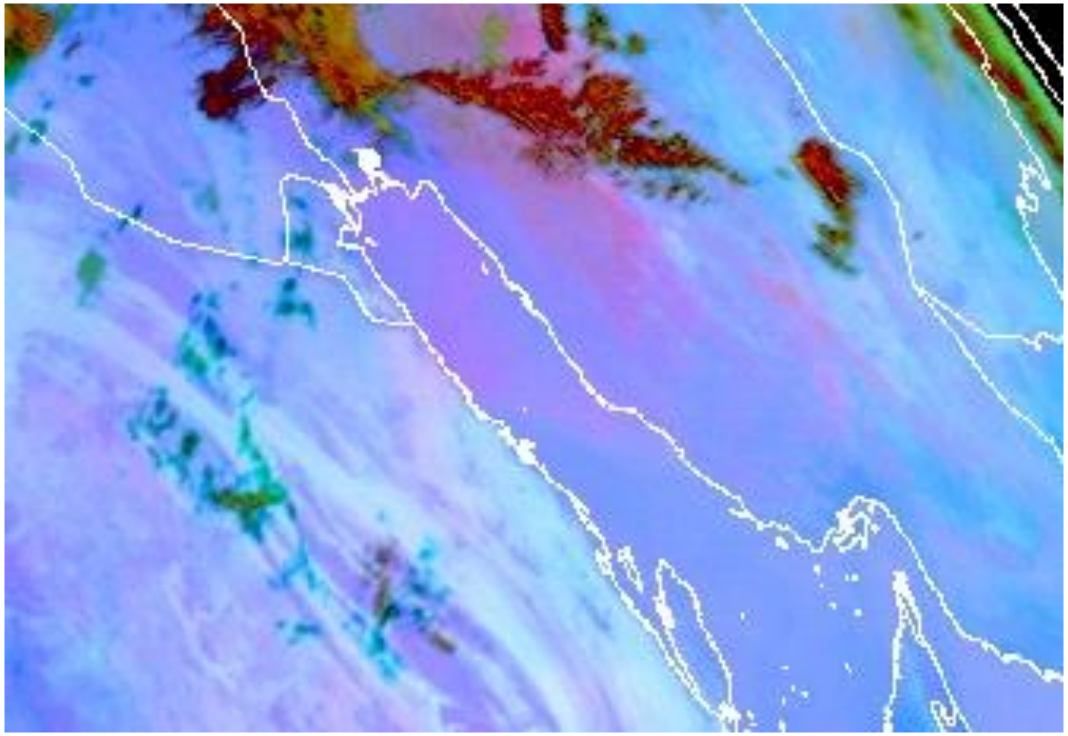
MSG-2, 25 June 2007, 19:15 UTC

CLICK HERE

Example: Dust (Morning)



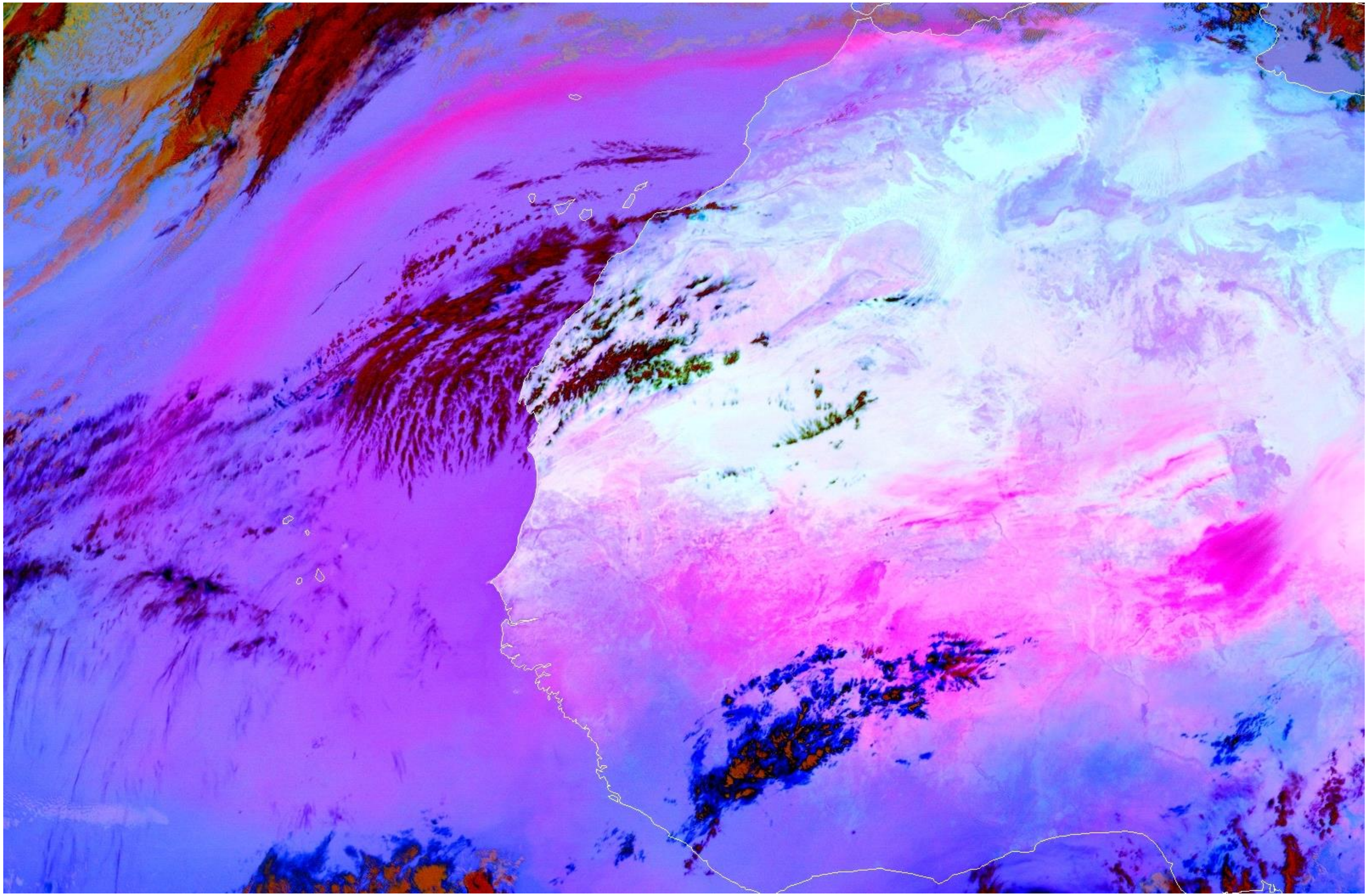
03:15 UTC
Natural Colours RGB



05:00 UTC
Dust RGB

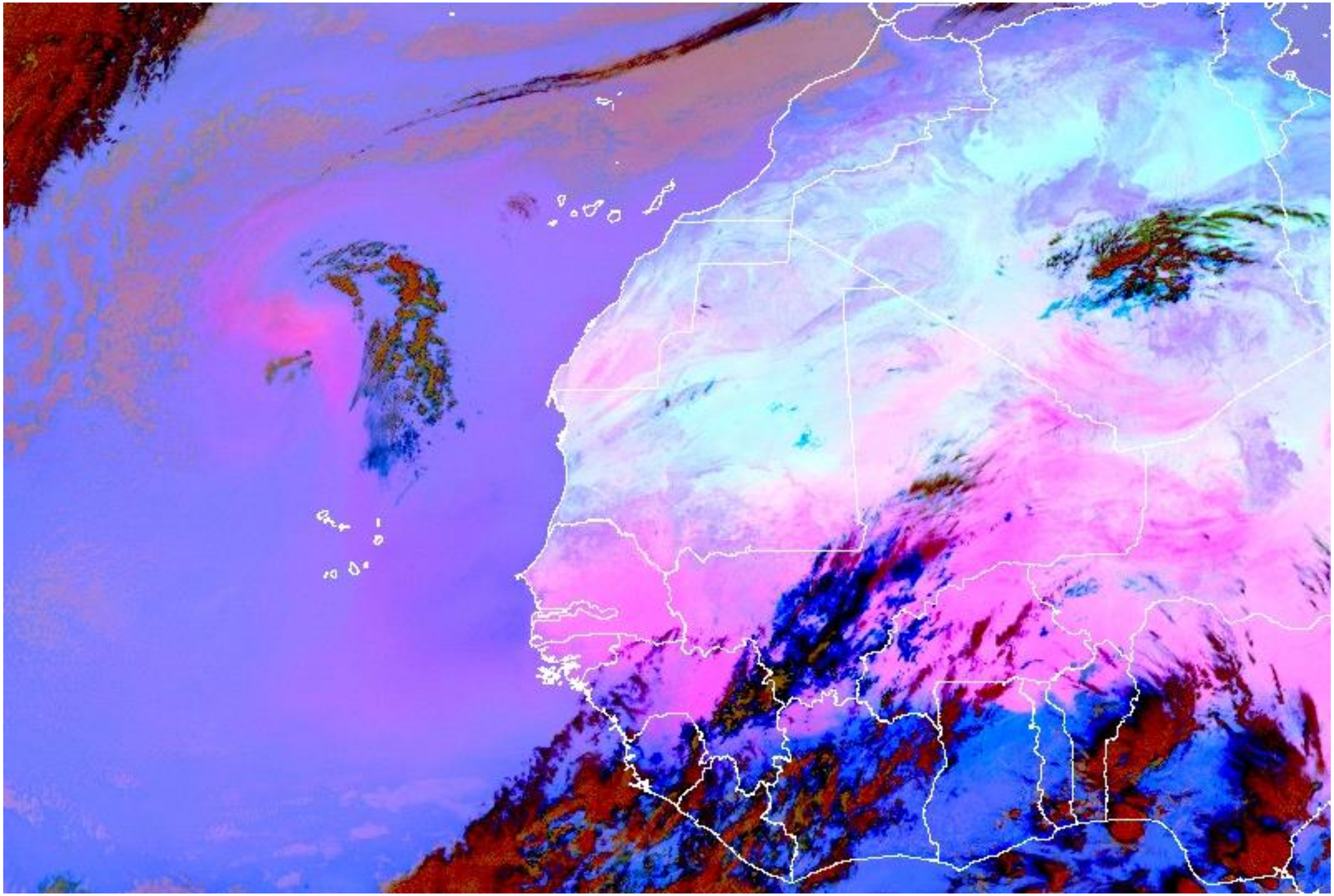
MSG-1, 17 October 2006

Example: Dust over Ocean



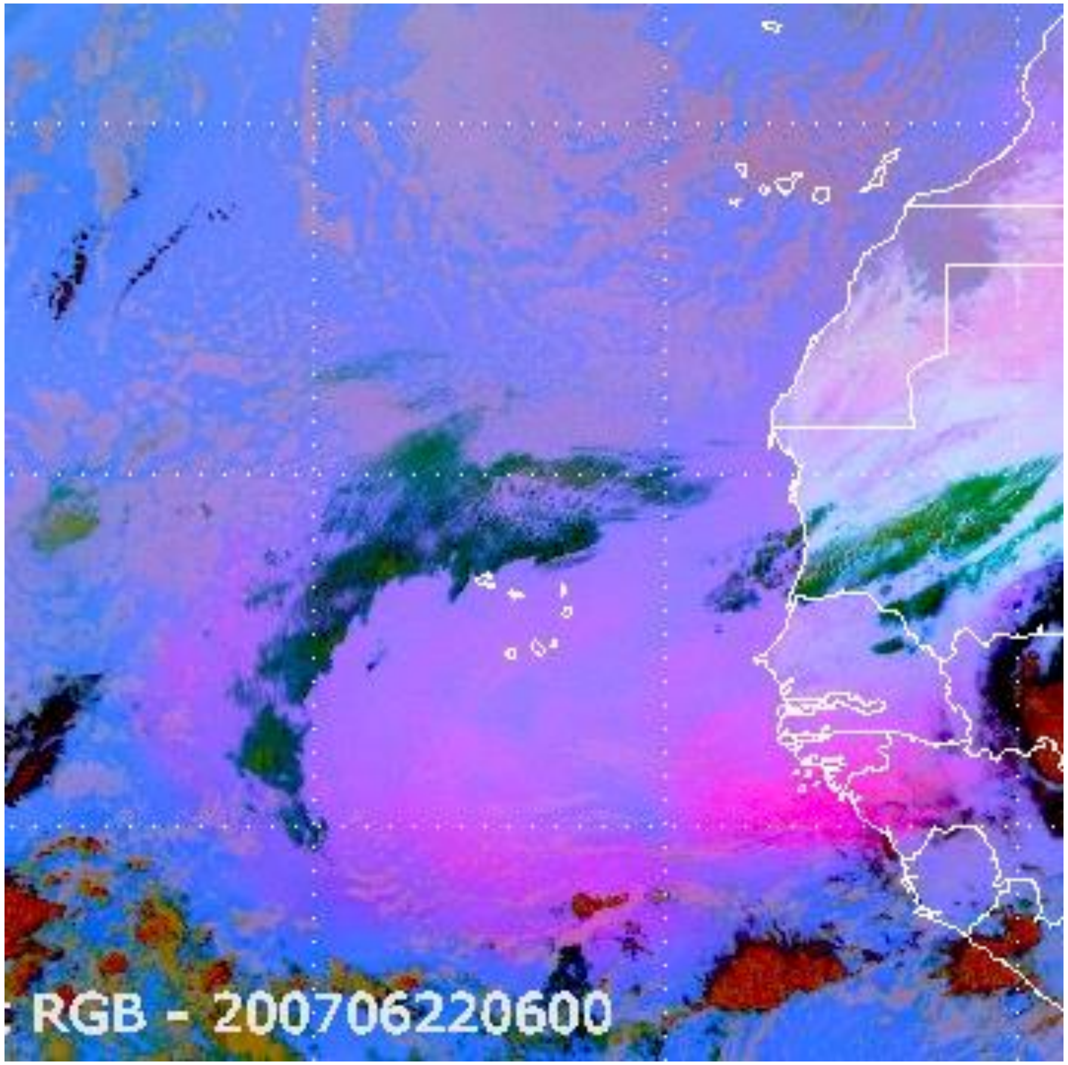
MSG-1, 6 March 2004, 12:00 UTC

Example: Dust over Ocean

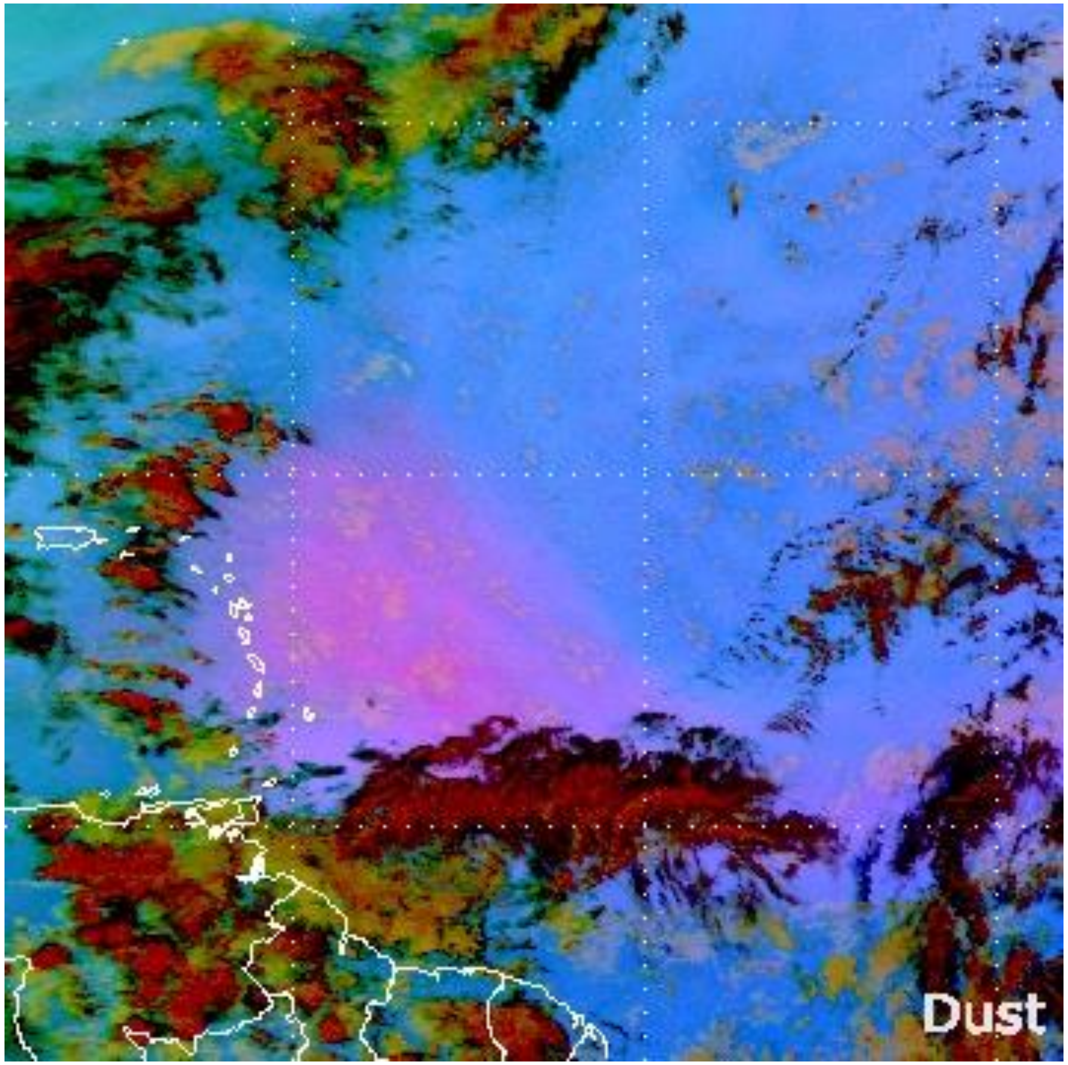


MSG-1, 9 March 2006, 12:45 UTC

Example: Dust crosses the Atlantic Ocean



22 June 06:00 UTC

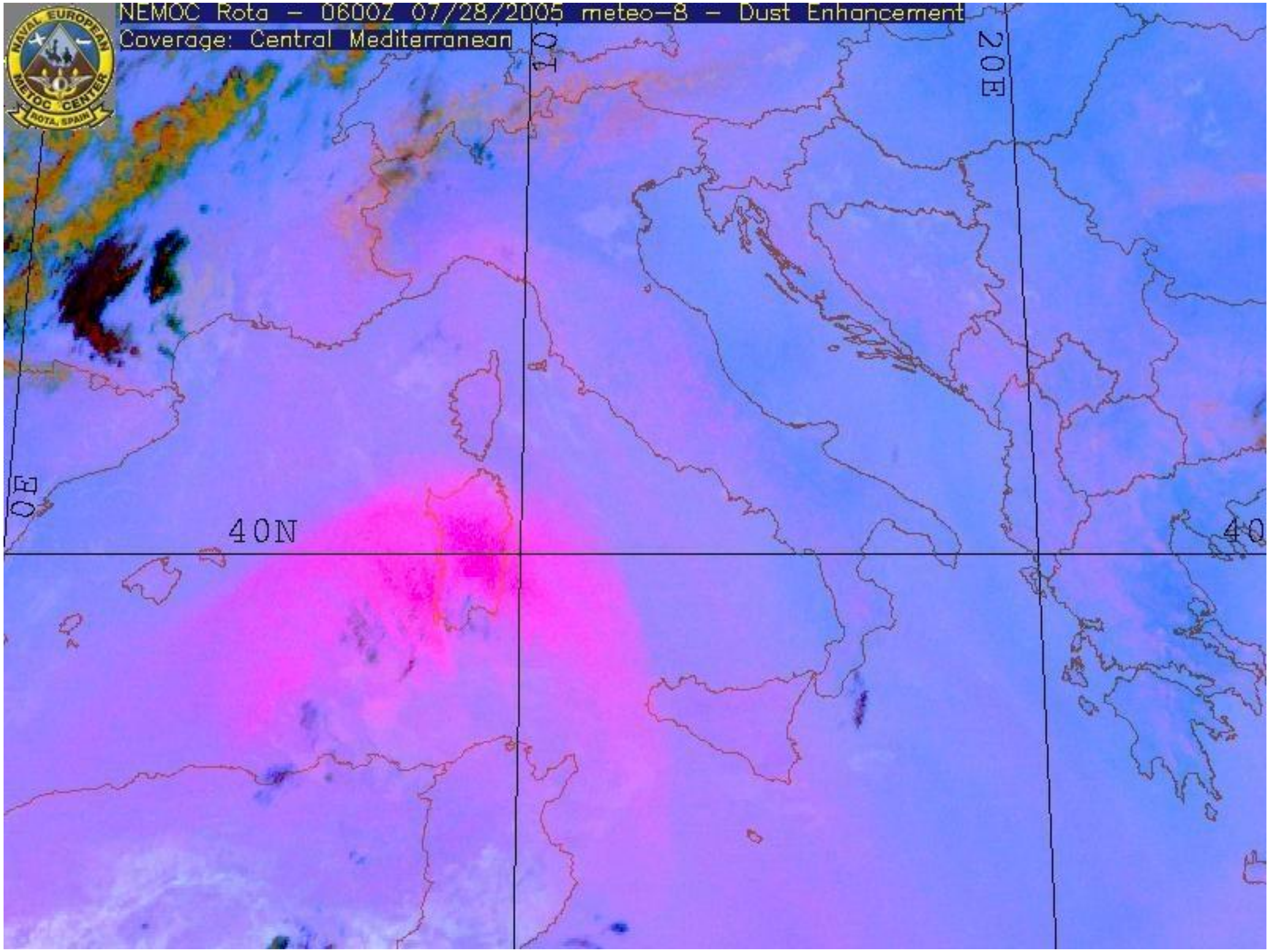


26 June 00:00 UTC

MSG-2, 20-26 June 2007

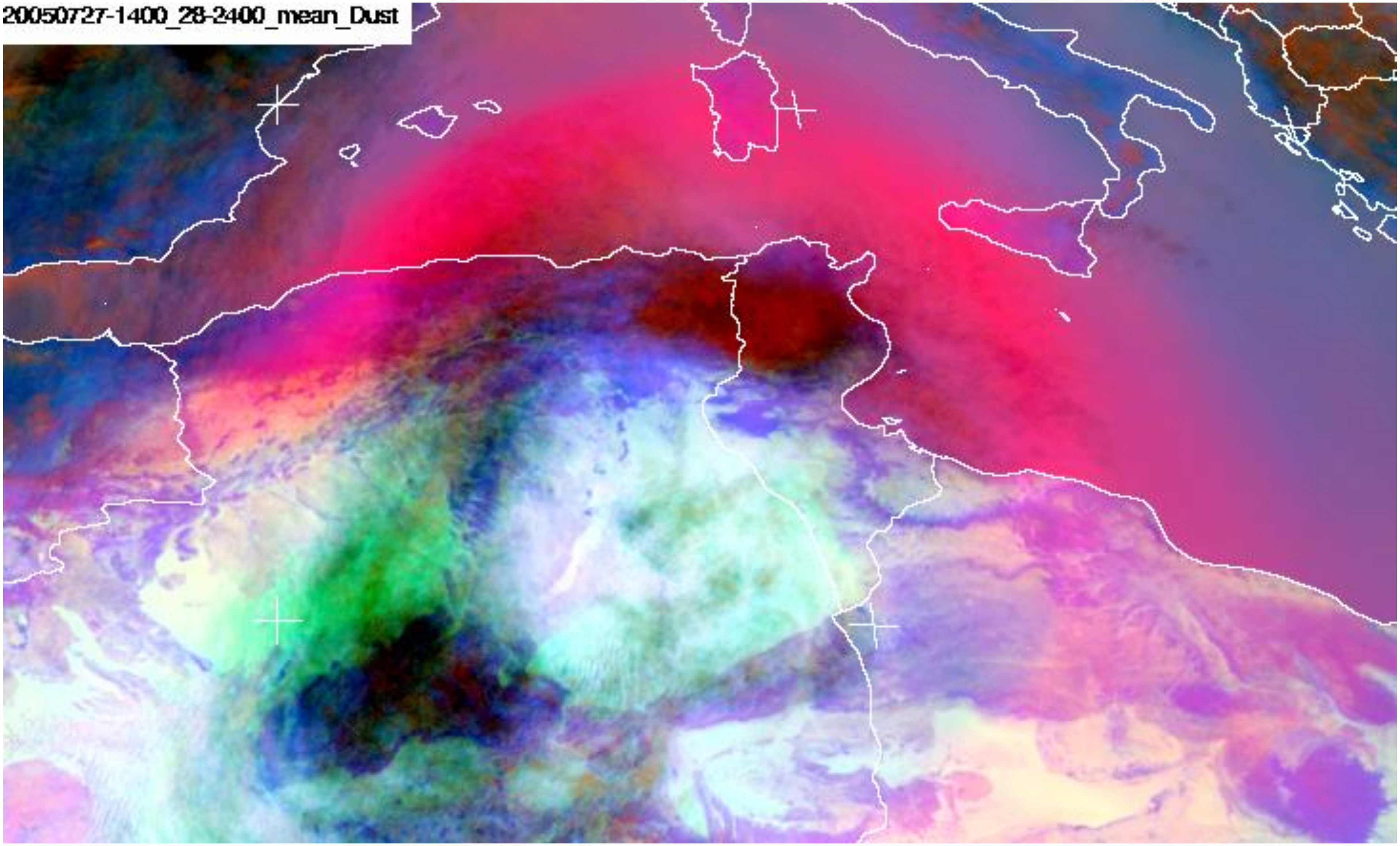
CLICK HERE

Example: Dust over Ocean



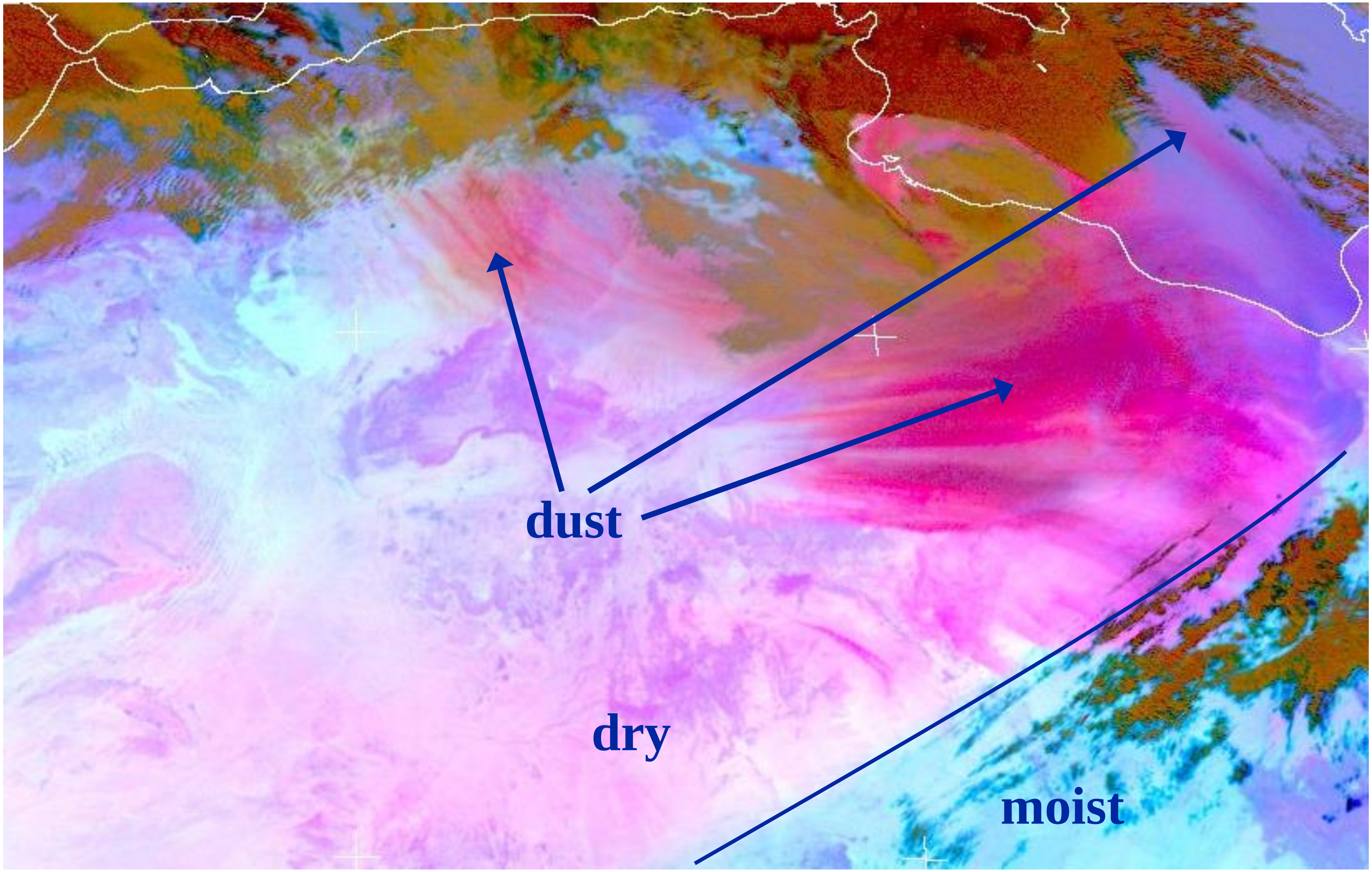
MSG-1, 28 July 2005, 06:00 UTC

Example: Time Average



MSG-1, 27 July 2005 06:00 UTC – 28 July 2005 24:00 UTC

Airmass/Moisture Boundary over N. Africa



MSG-1, 23 February 2006, 12:00 UTC

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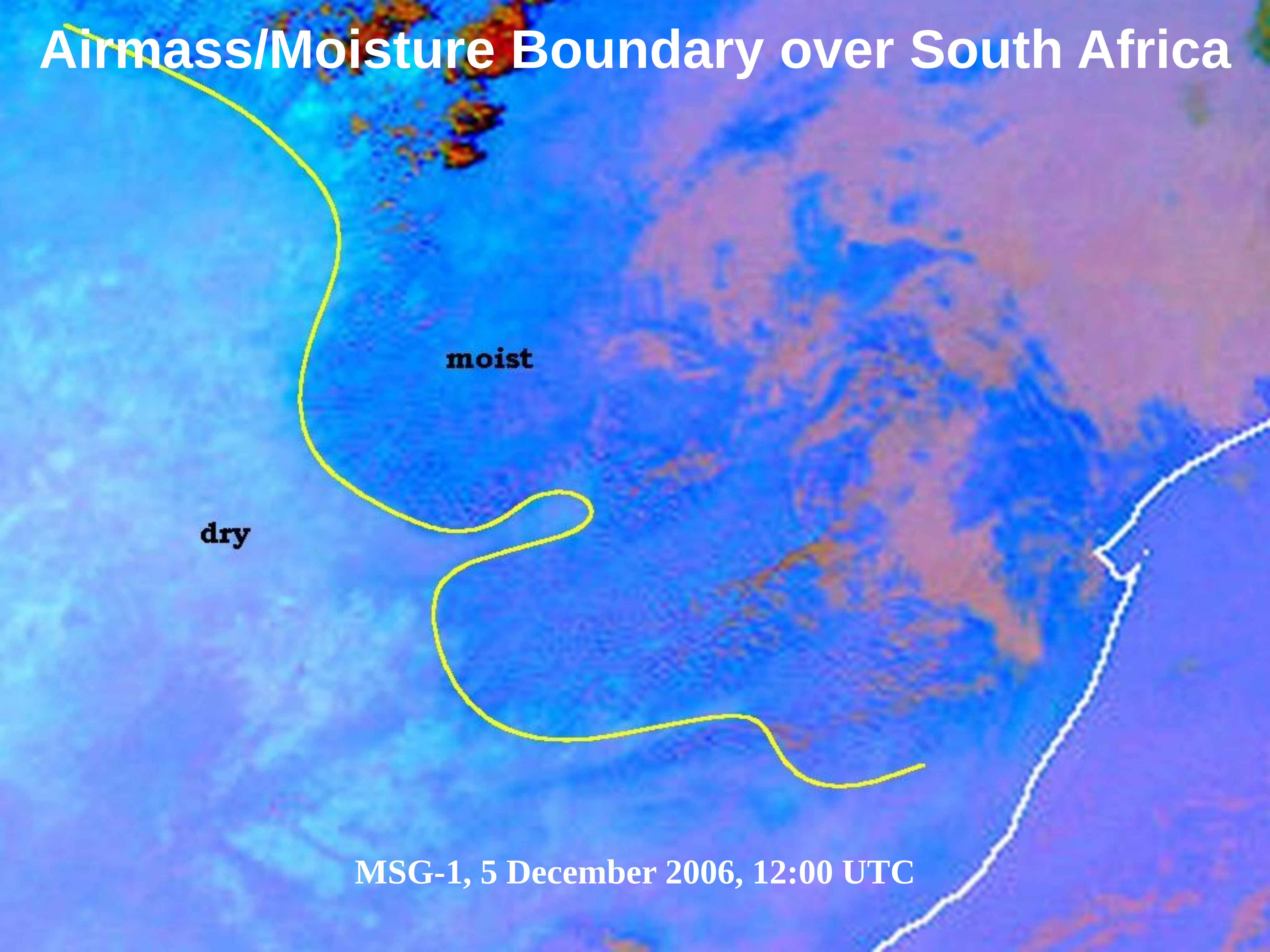
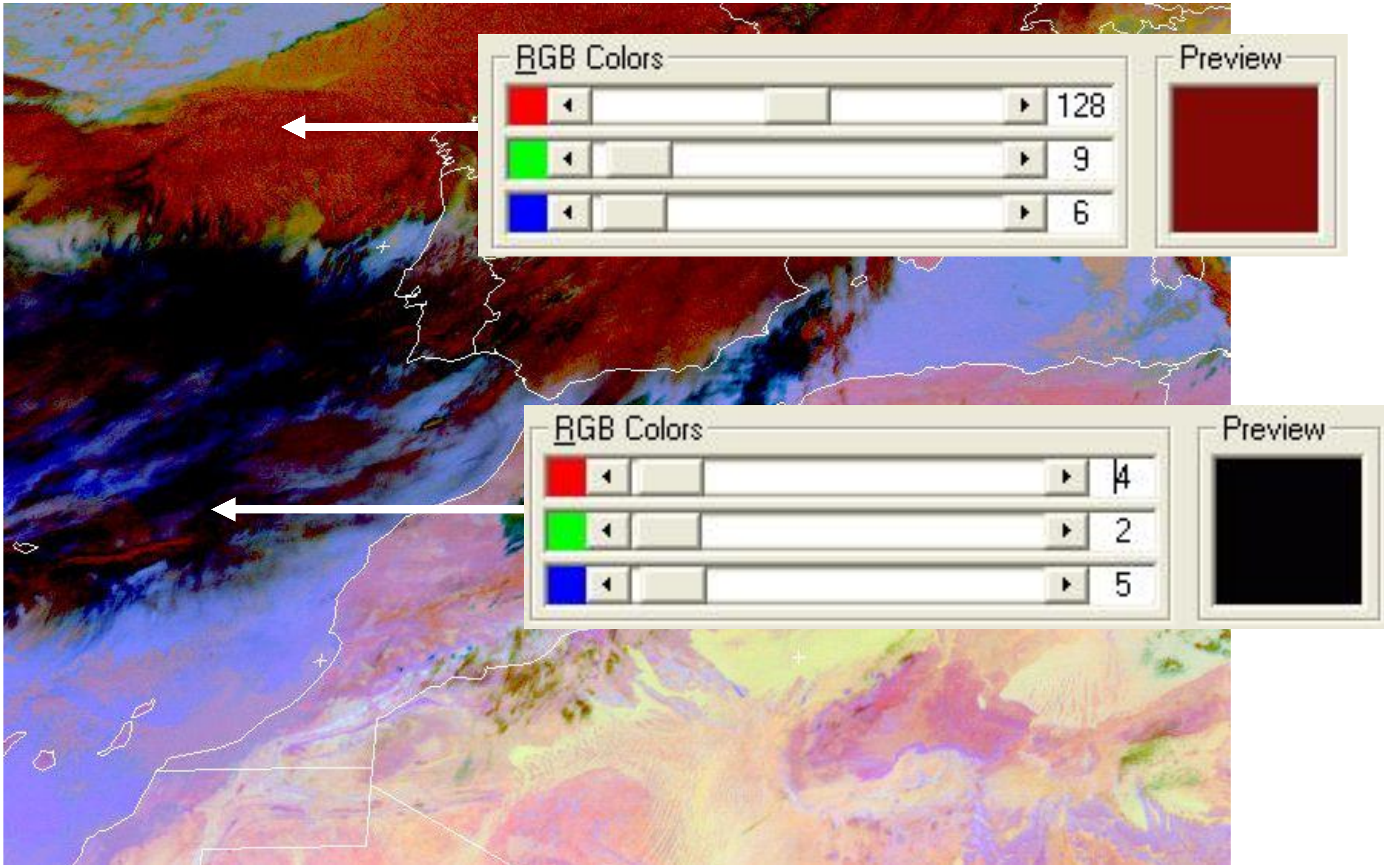
Airmass/Moisture Boundary over South Africa



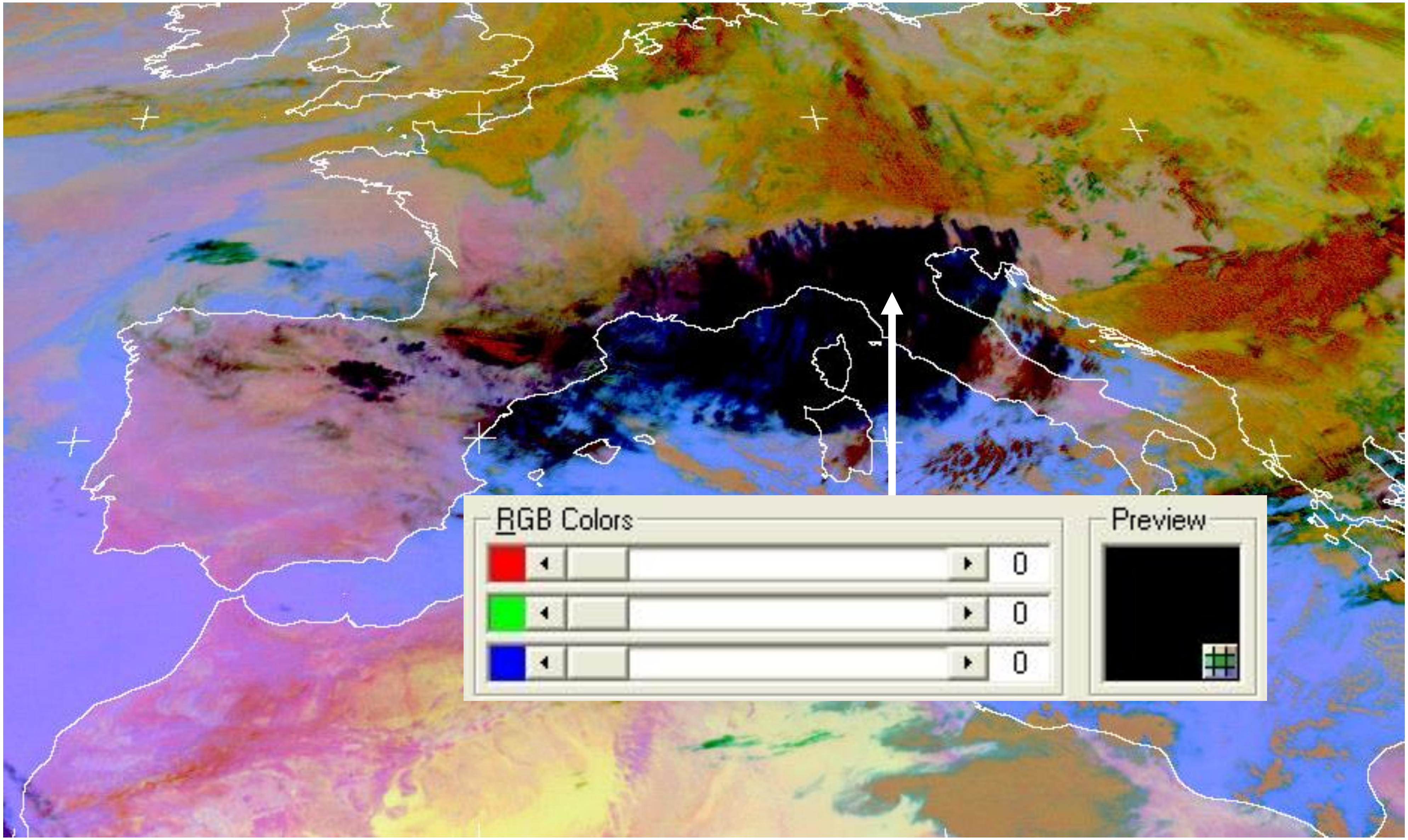
MSG-1, 5 December 2006, 12:00 UTC

Example: Thin/Thick Ice Clouds over Ocean



MSG-1, 06 March 2007, 04:00 UTC

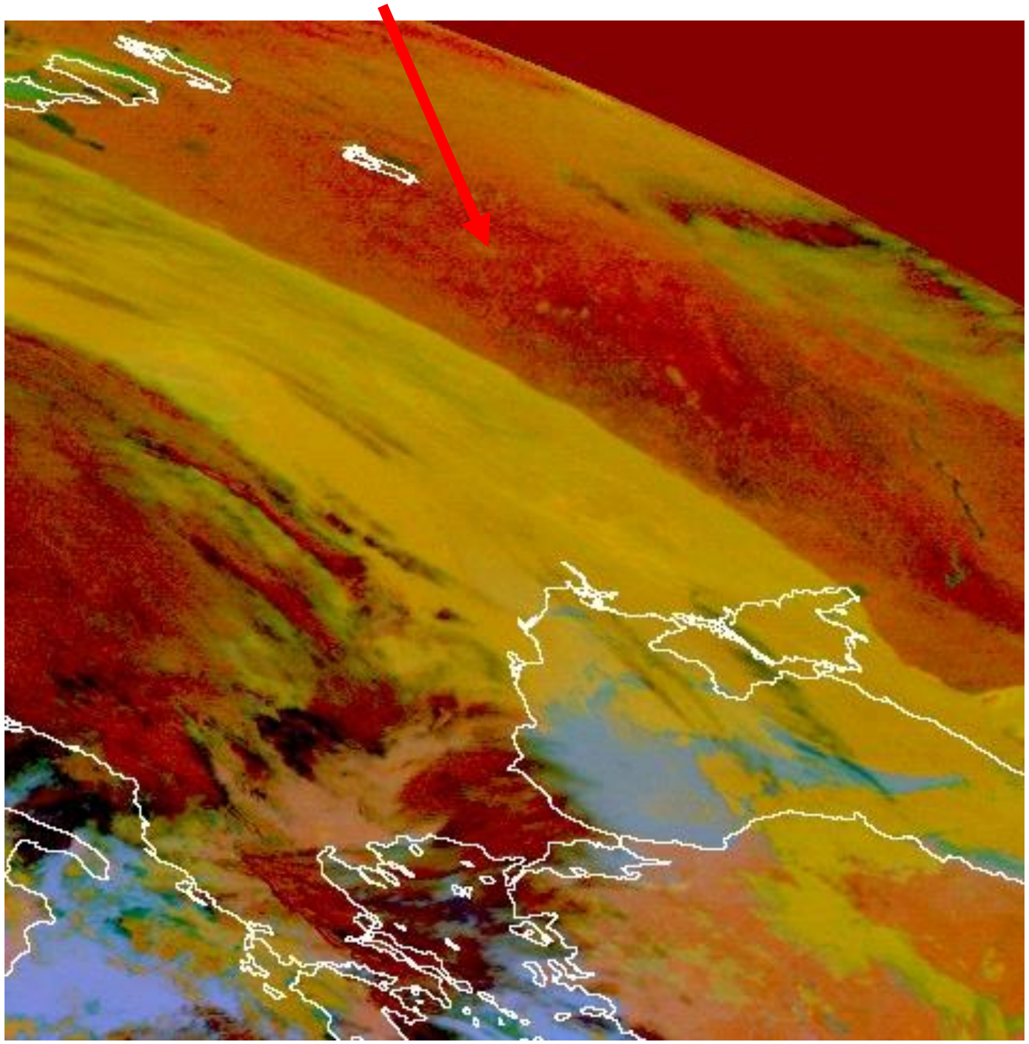
Example: Thin Ice Clouds over Land



MSG-1, 12 November 2006, 23:00 UTC

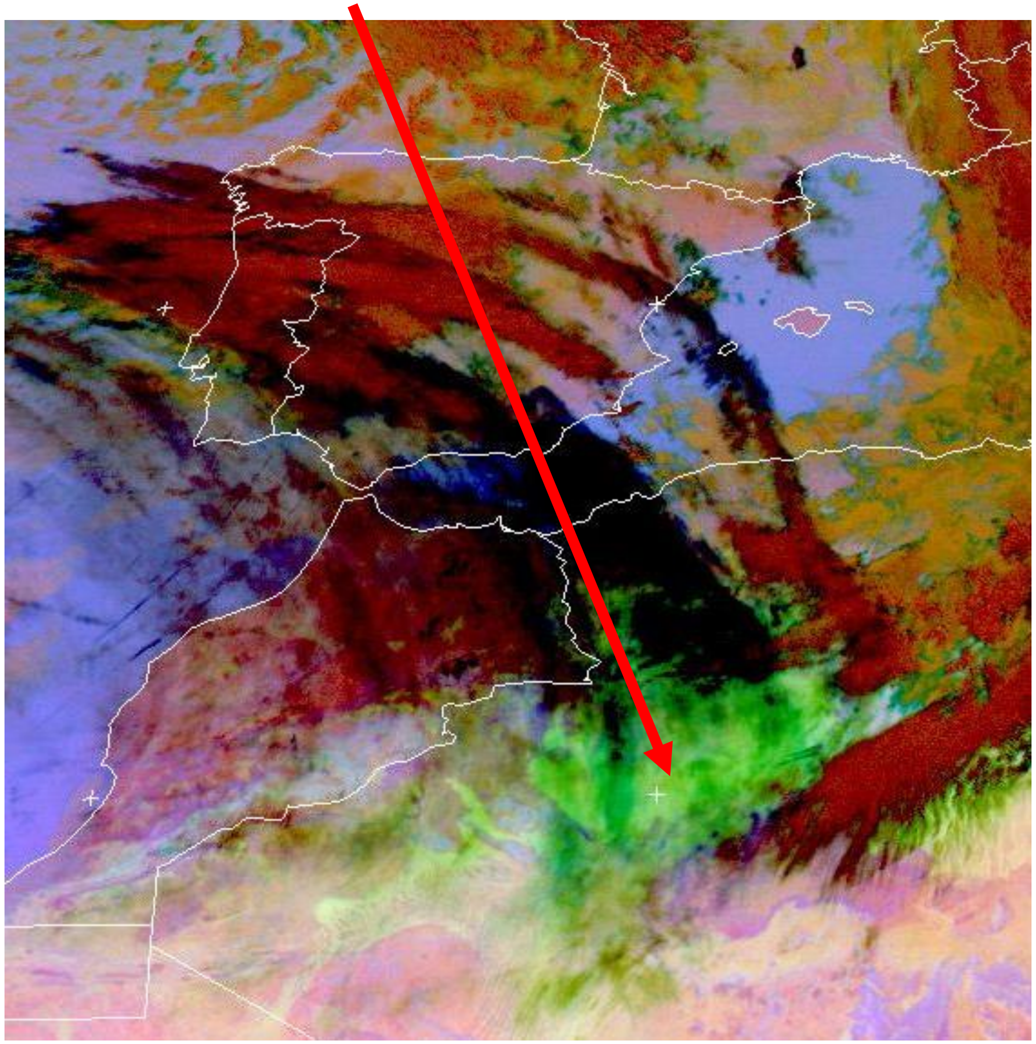
Unusual colours because of:

very cold snow surface



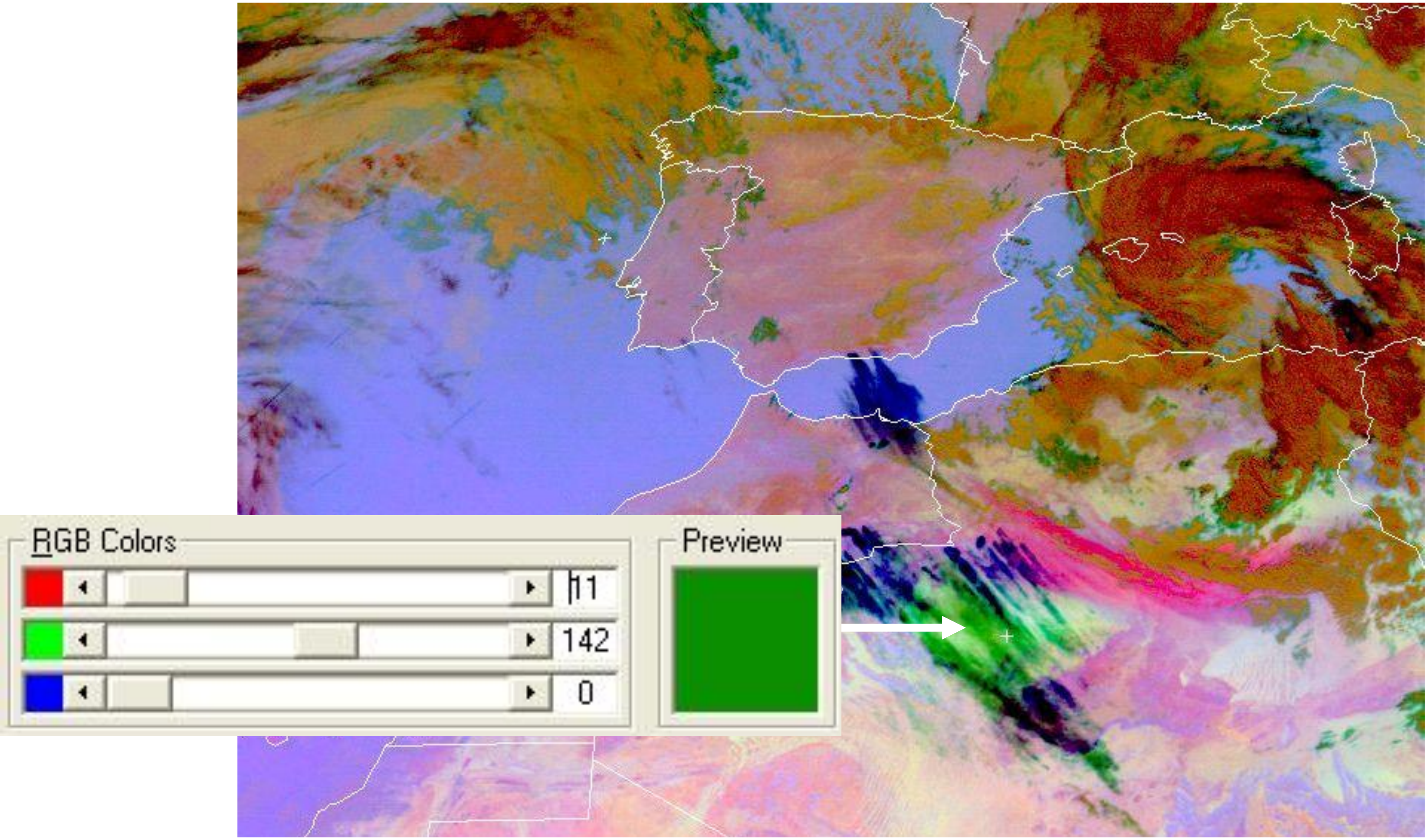
18 January 2006, 04:00 UTC

thin ice clouds over sand desert



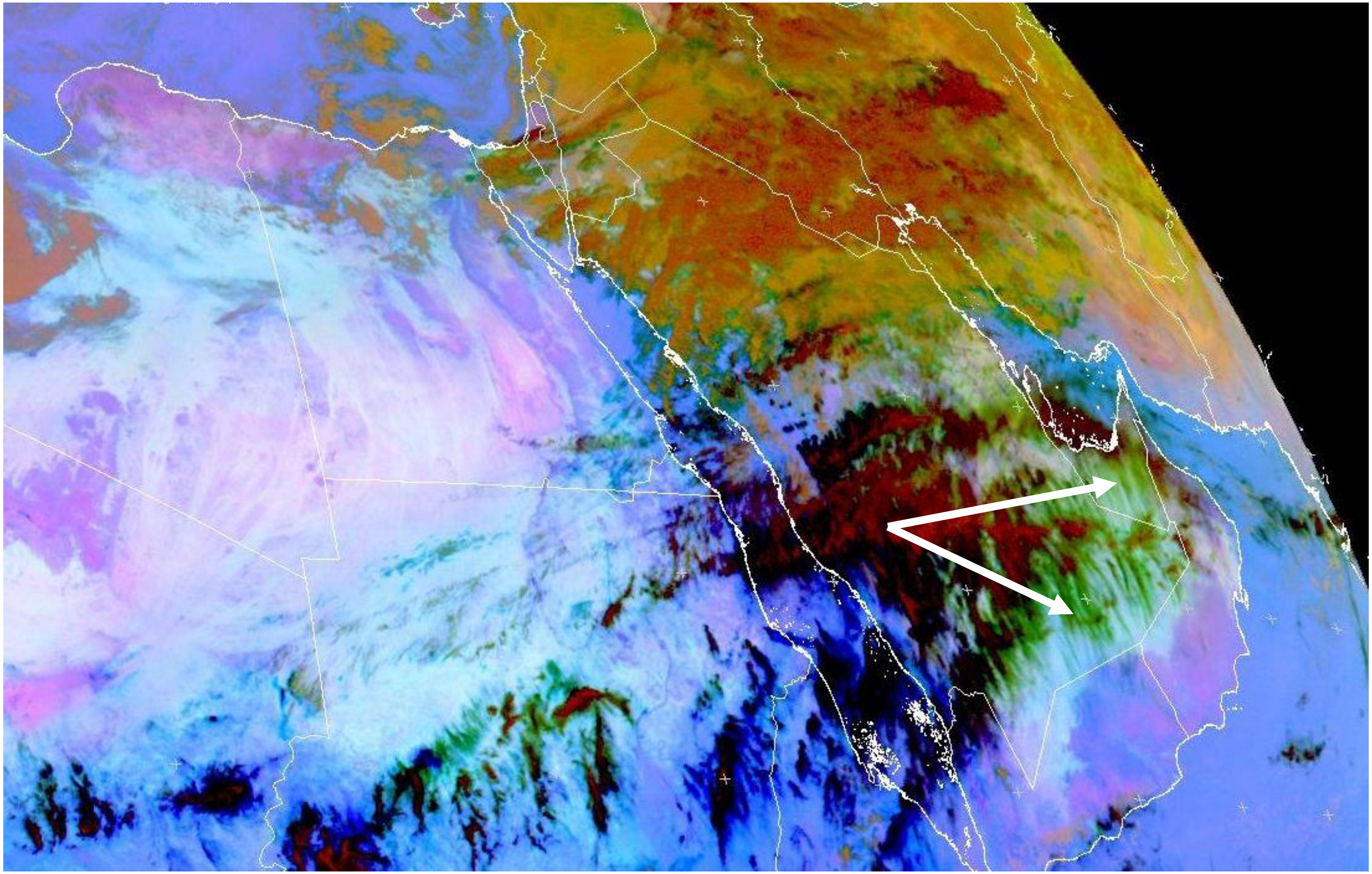
7 March 2007, 04:00 UTC

Thin Ice Clouds over Sand Desert

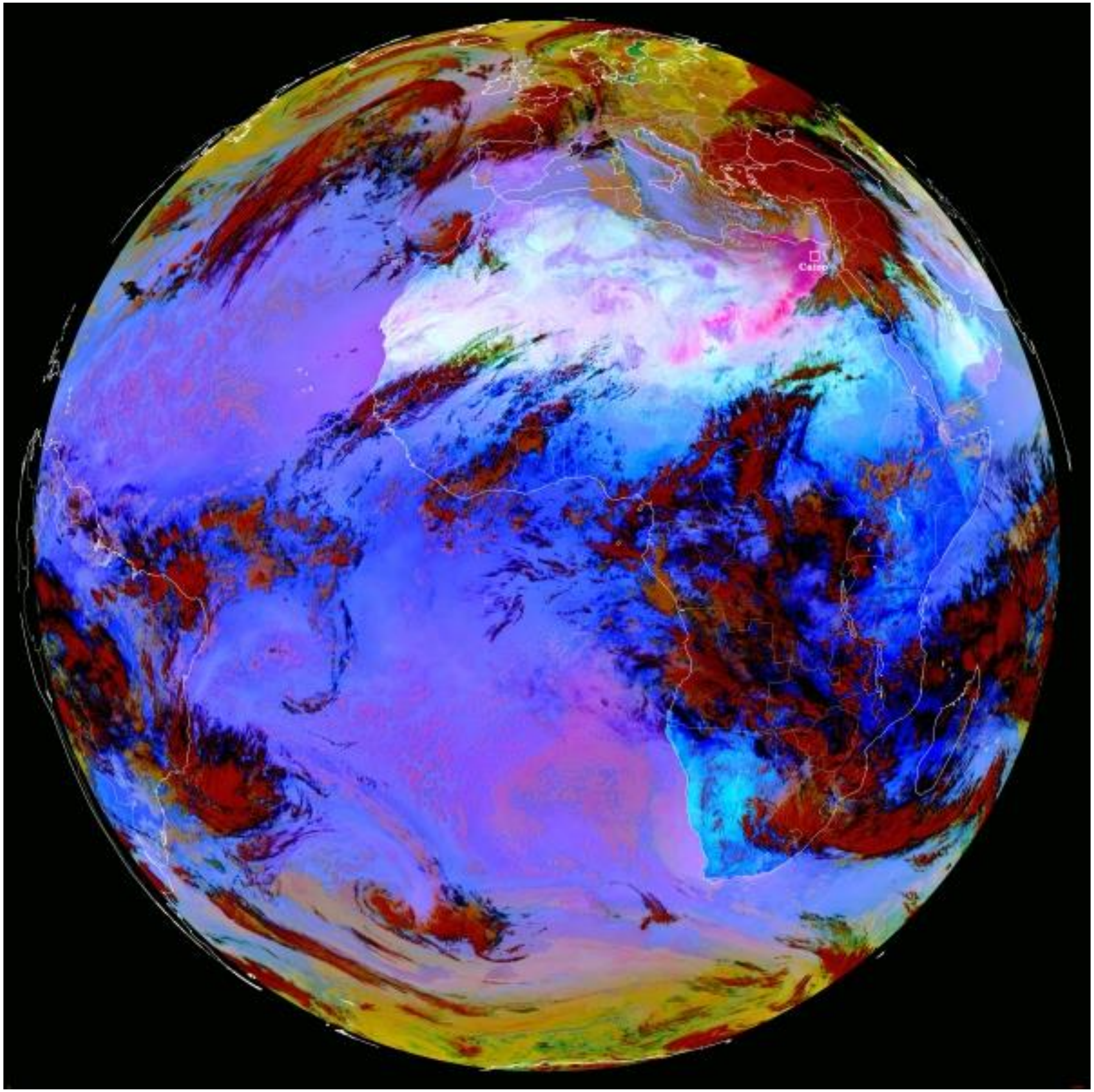


MSG-1, 08 March 2007, 04:00 UTC

Thin Ice Clouds over Sand Desert



MSG-2, 10 January 2008, 14:00 UTC



RGB 24-hour Dust Microphysics Global View

MSG-1
22 January 2004
12:00 UTC

EUMETSAT

RGB 24-hour Dust Microphysics: Interpretation of Colours for High-level Clouds

Cold, thick, high-level clouds

Thin Cirrus clouds / Contrails

over vegetated land / ocean

over sand desert

RGB 24-hour Dust Microphysics: Interpretation of Colours for Low/Mid-level Clouds

Ocean	Warm Desert	Cold Desert	Warm Land	Cold Land
Thick, mid-level cloud	Thin, mid-level cloud	Low-level cloud (cold atmosphere, Europe)	Low-level cloud (warm atmosphere, Africa)	Dust Storm (day / night)

EUMETSAT

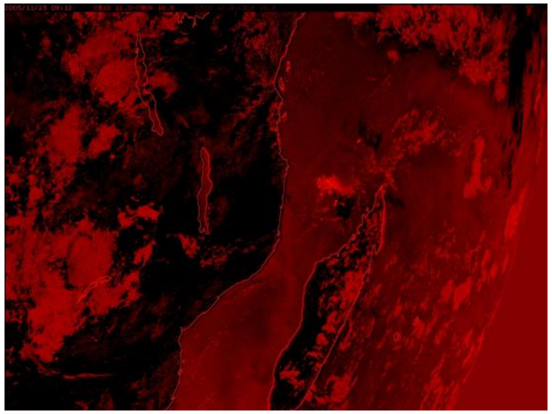
1c. RGB 10-09, 09-07, 09
(“24-hour Ash Microphysics")

devised by: J. Kerkmann

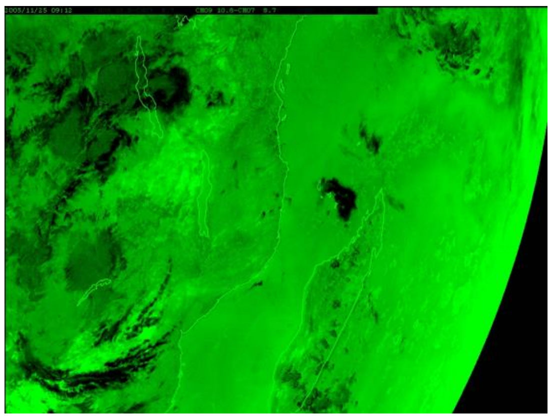
Recommended Range and Enhancement:

Beam	Channel	Range	Gamma
Red	IR12.0 - IR10.8	-4 … +2 K	1.0
Green	IR10.8 - IR8.7	-4 … +5 K	1.0
Blue	IR10.8	+243 … +303 K	1.0

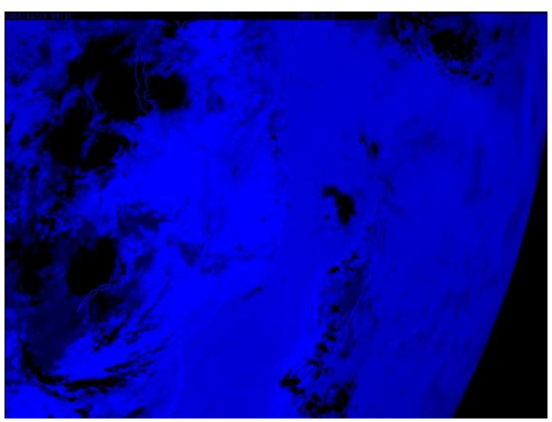
Ch.10
-Ch.09

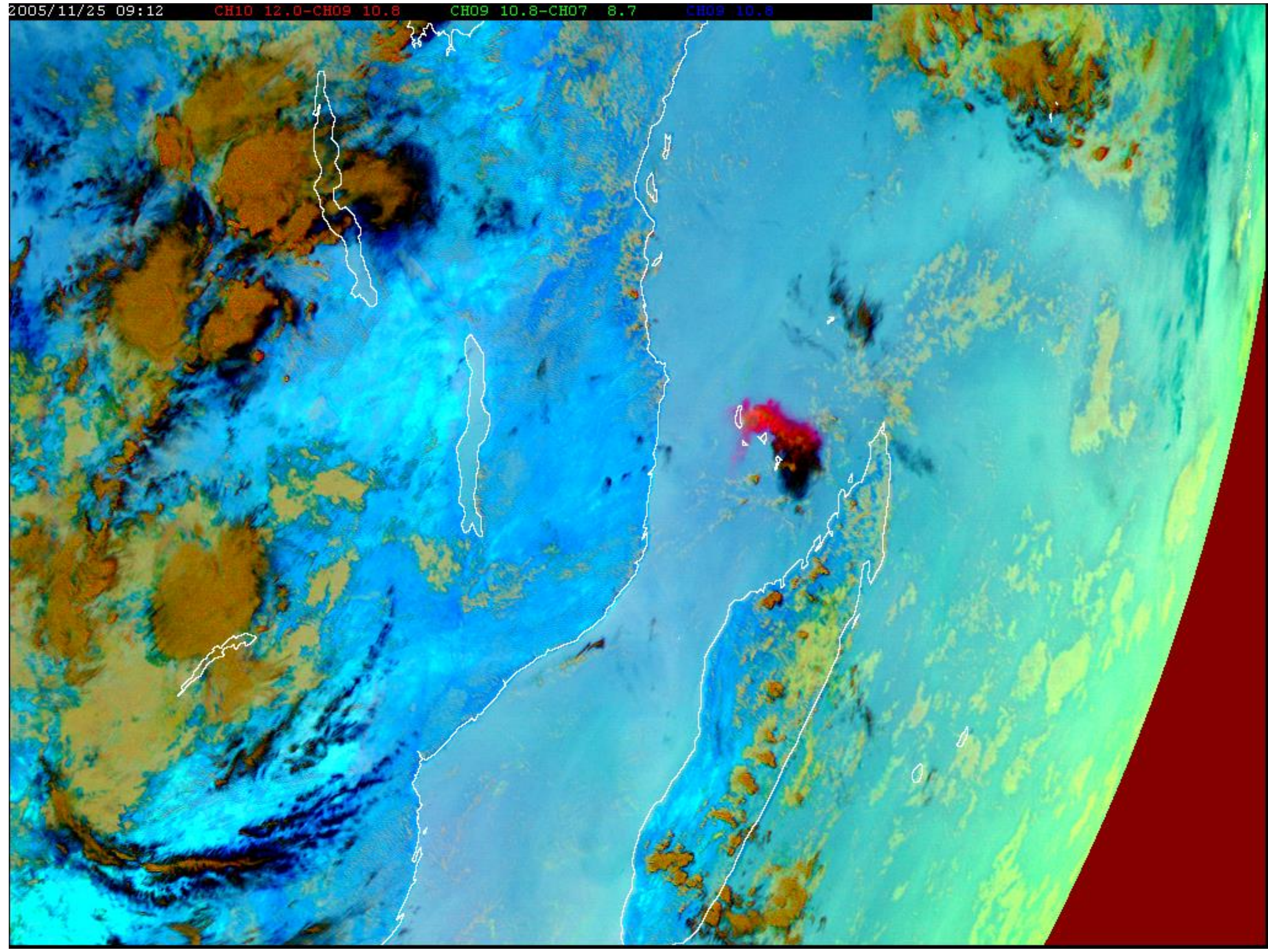


Ch.09
-Ch.07



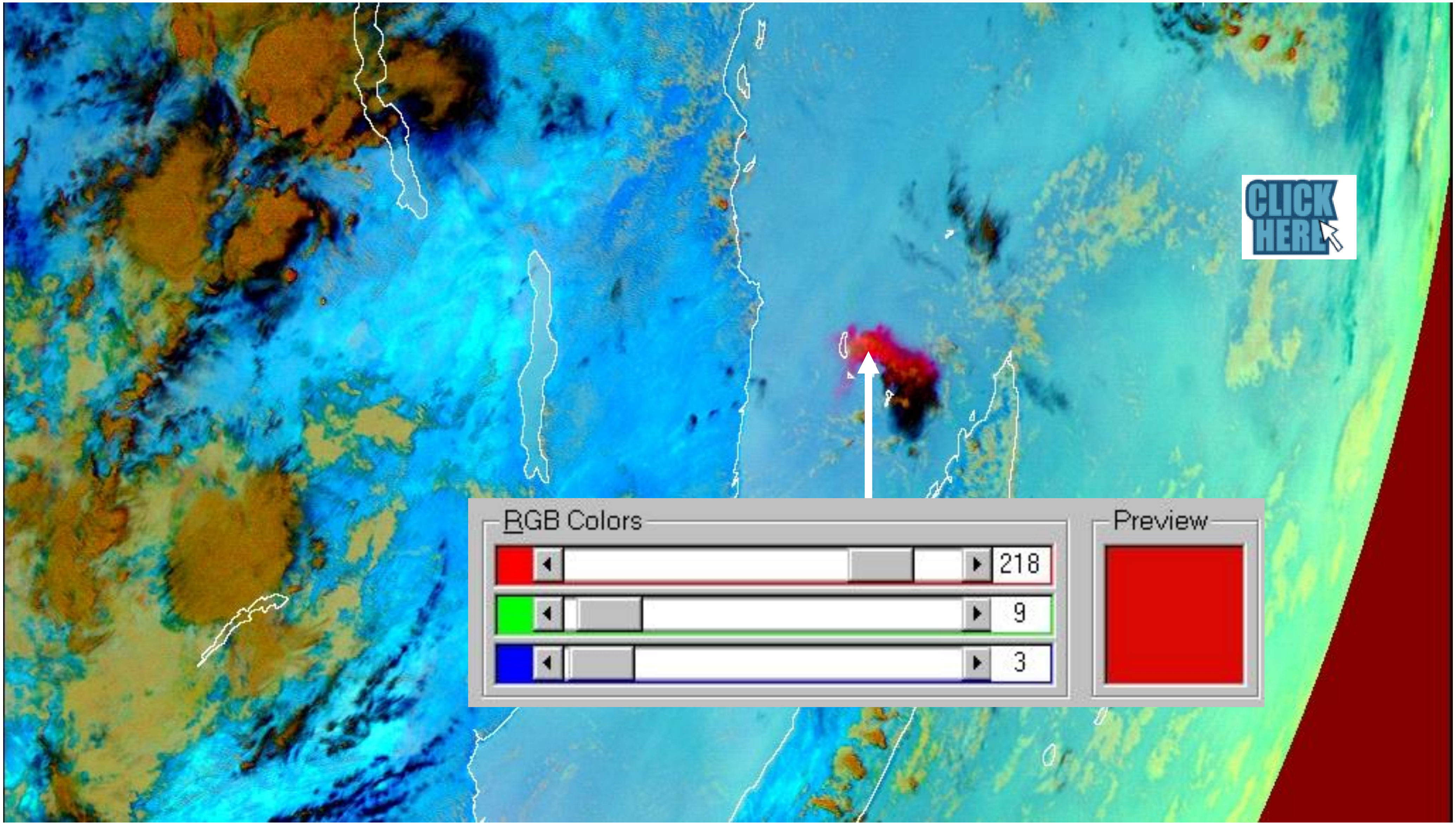
Ch.09





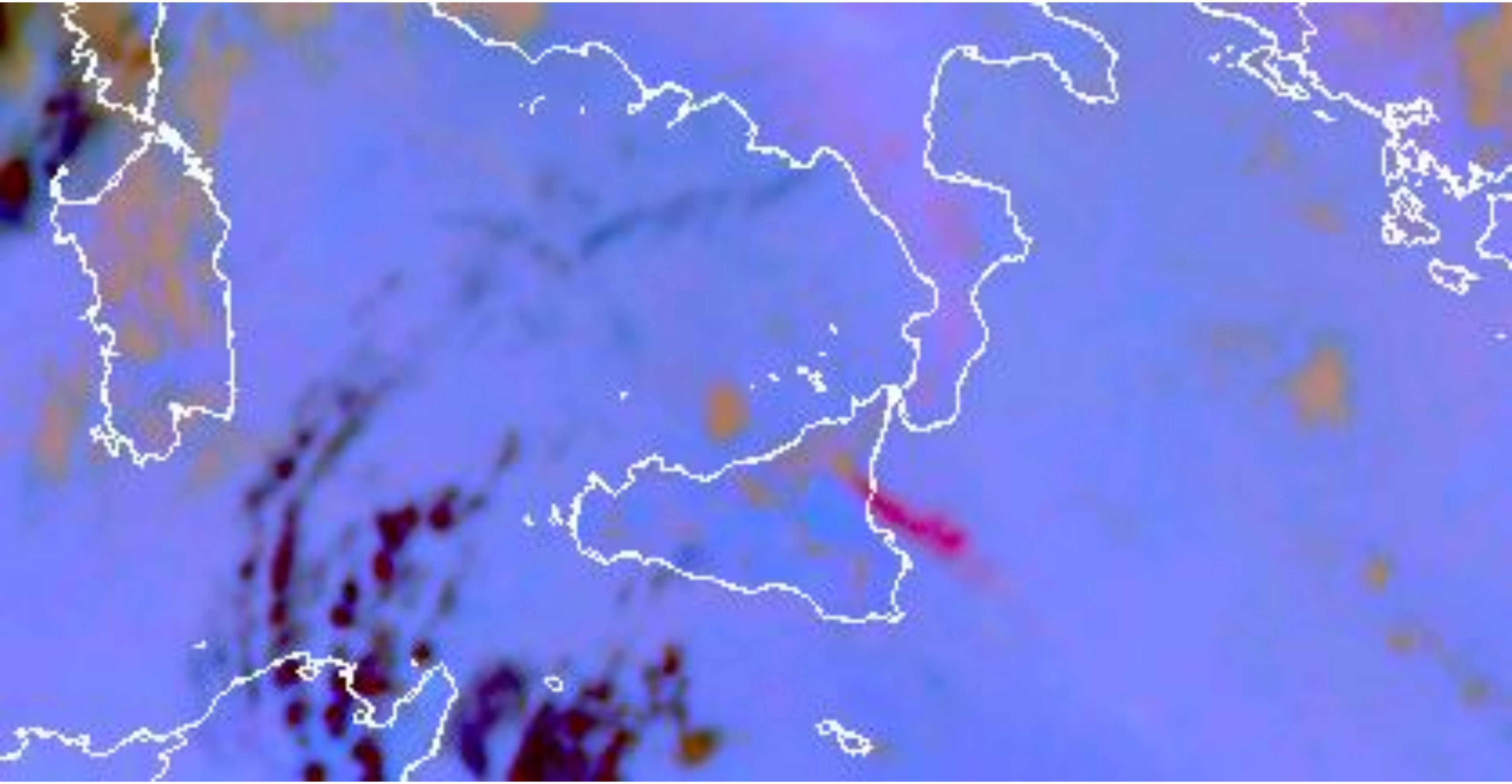
MSG-1, 25 November 2005, 09:00 UTC
RGB Composite 10-09, 09-07, 09

Example: Volcanic Ash



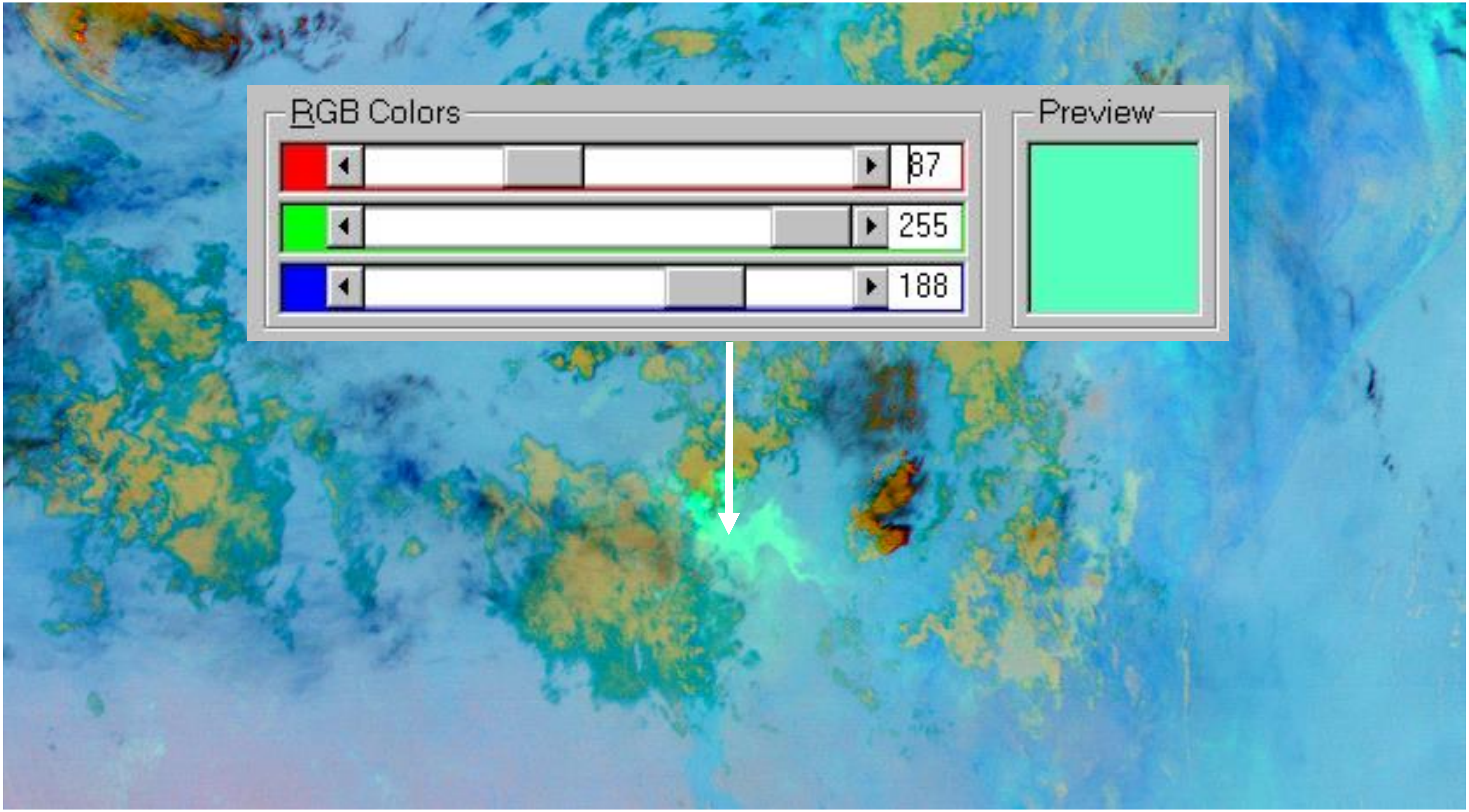
MSG-1, 25 November 2005, 09:00 UTC

Example: Volcanic Ash



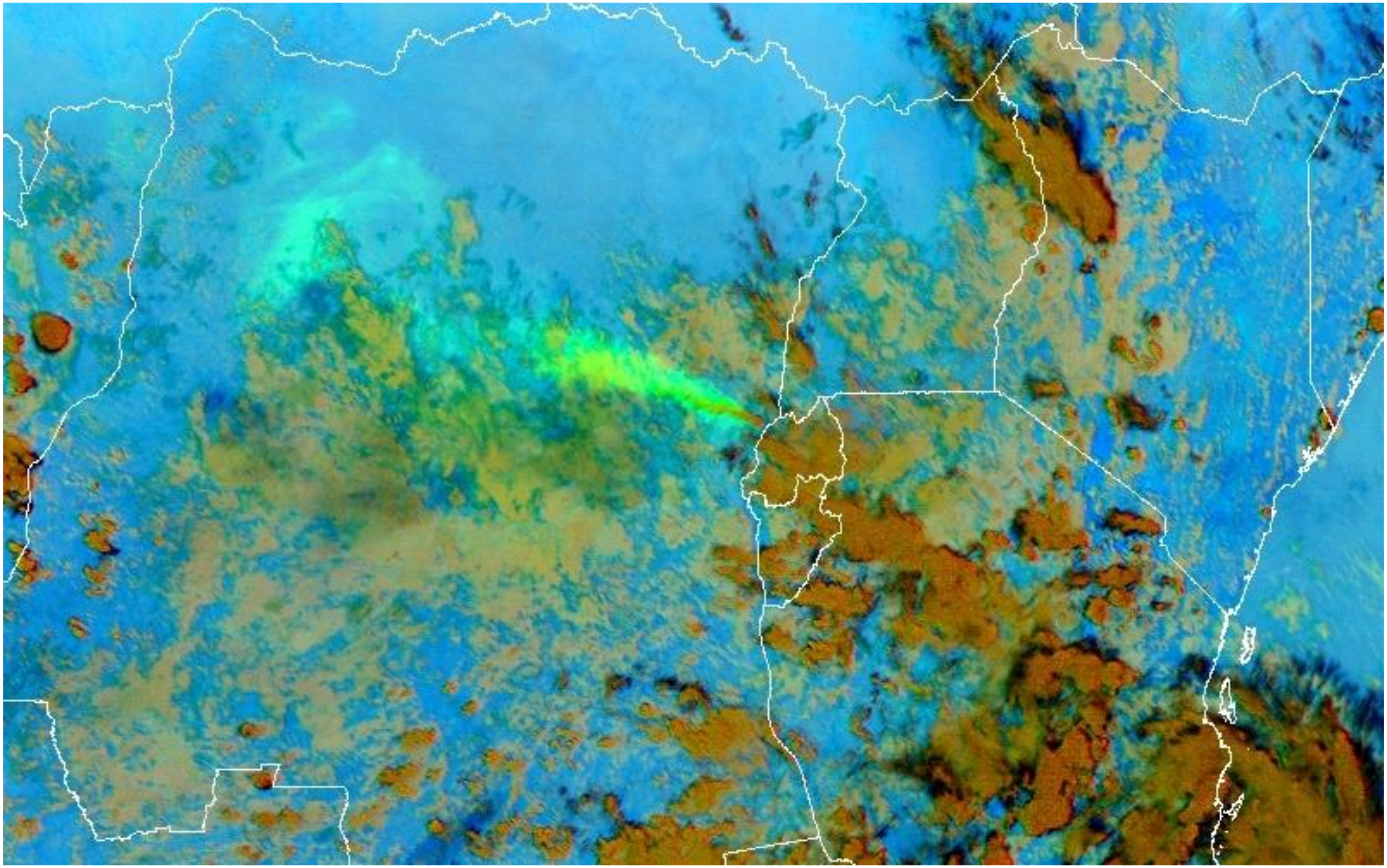
MSG-1, 24 November 2006, 12:00 UTC

Example: Volcanic SO2



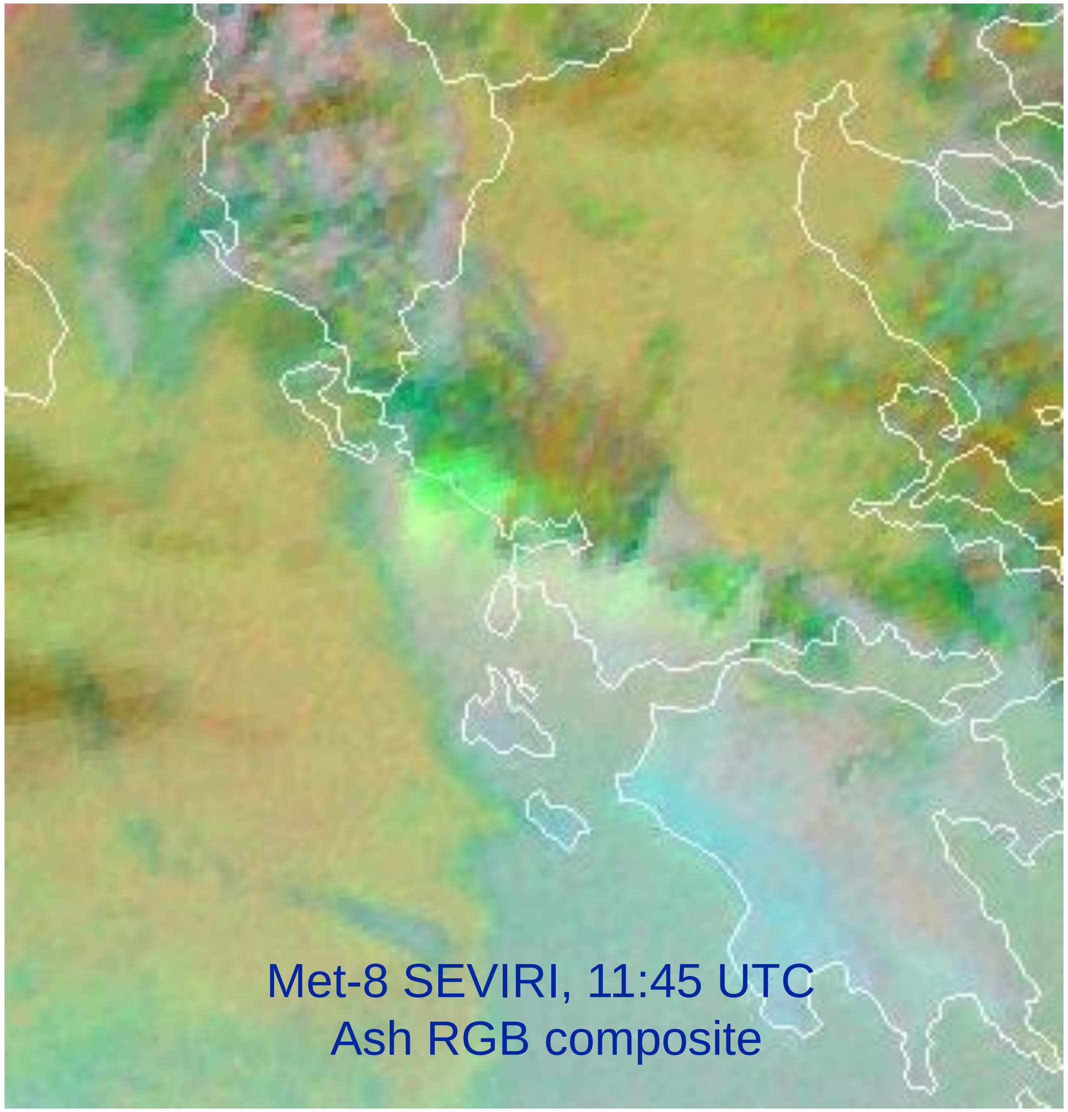
MSG-1, 10 May 2004, 06:00 UTC

Example: Volcanic SO2

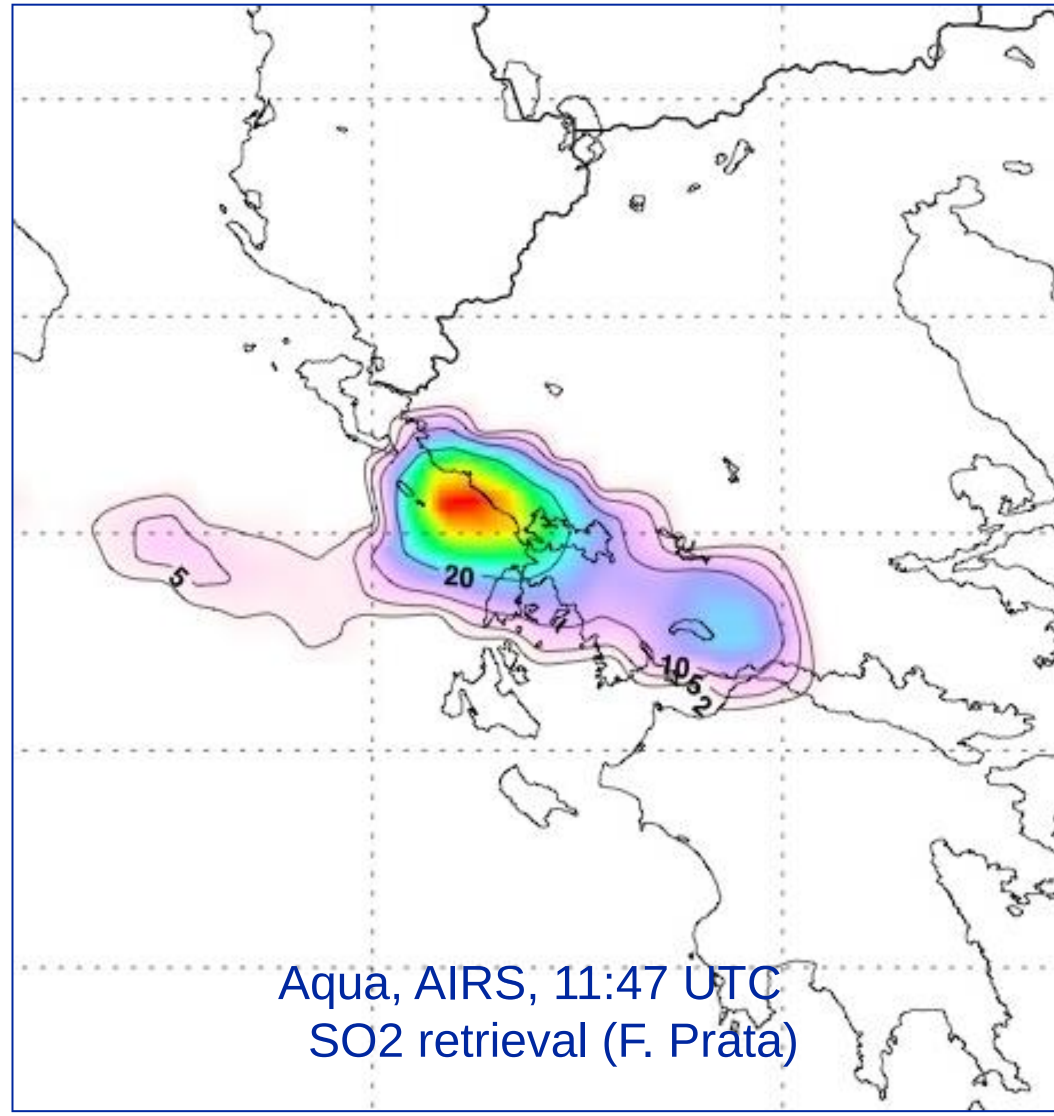


MSG-1, 28 November 2006, 11:45 UTC

Example: SO2 Plume from Mount Etna



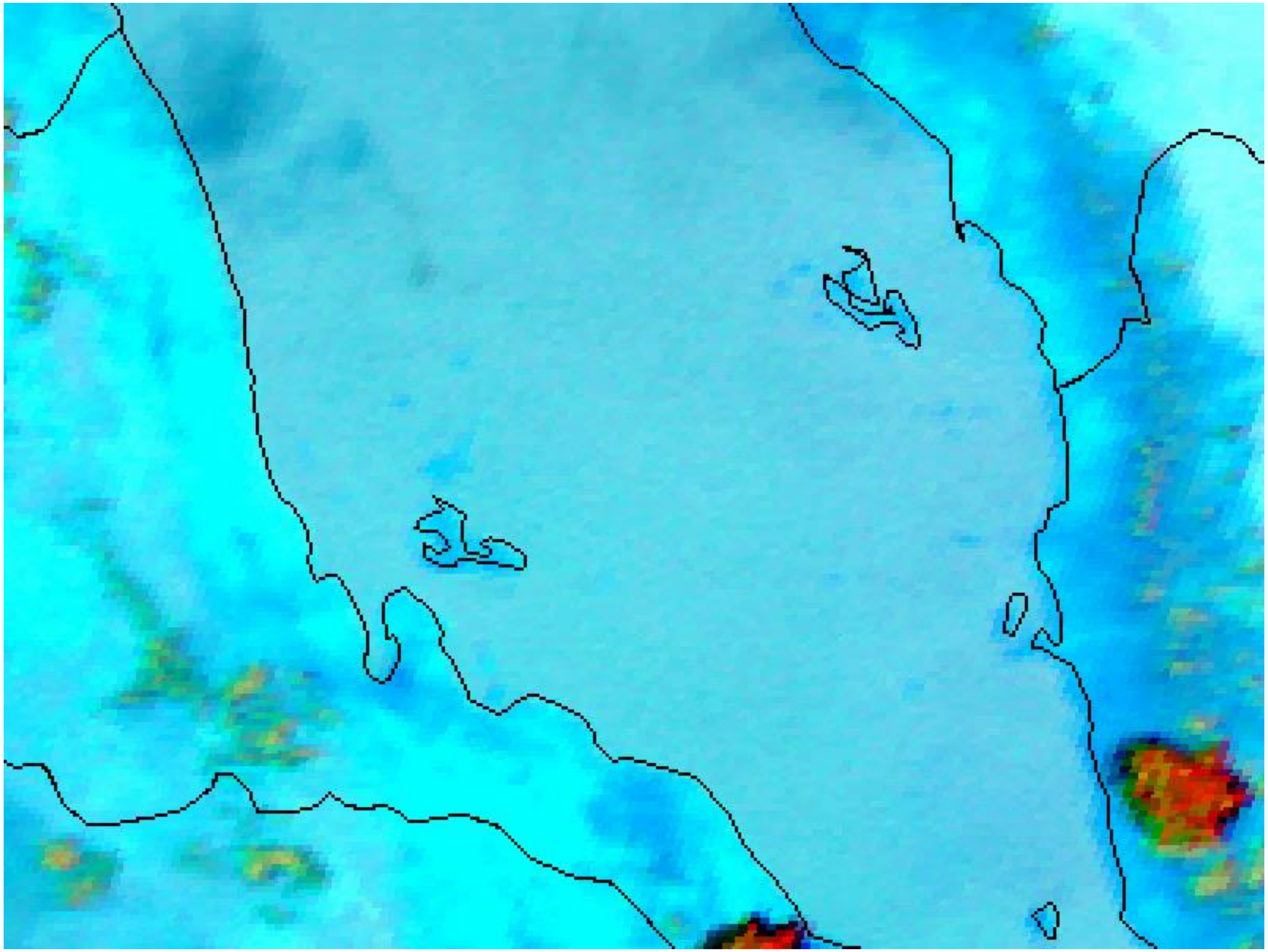
Met-8 SEVIRI, 11:45 UTC
Ash RGB composite



Aqua, AIRS, 11:47 UTC
SO2 retrieval (F. Prata)

29 March 2007

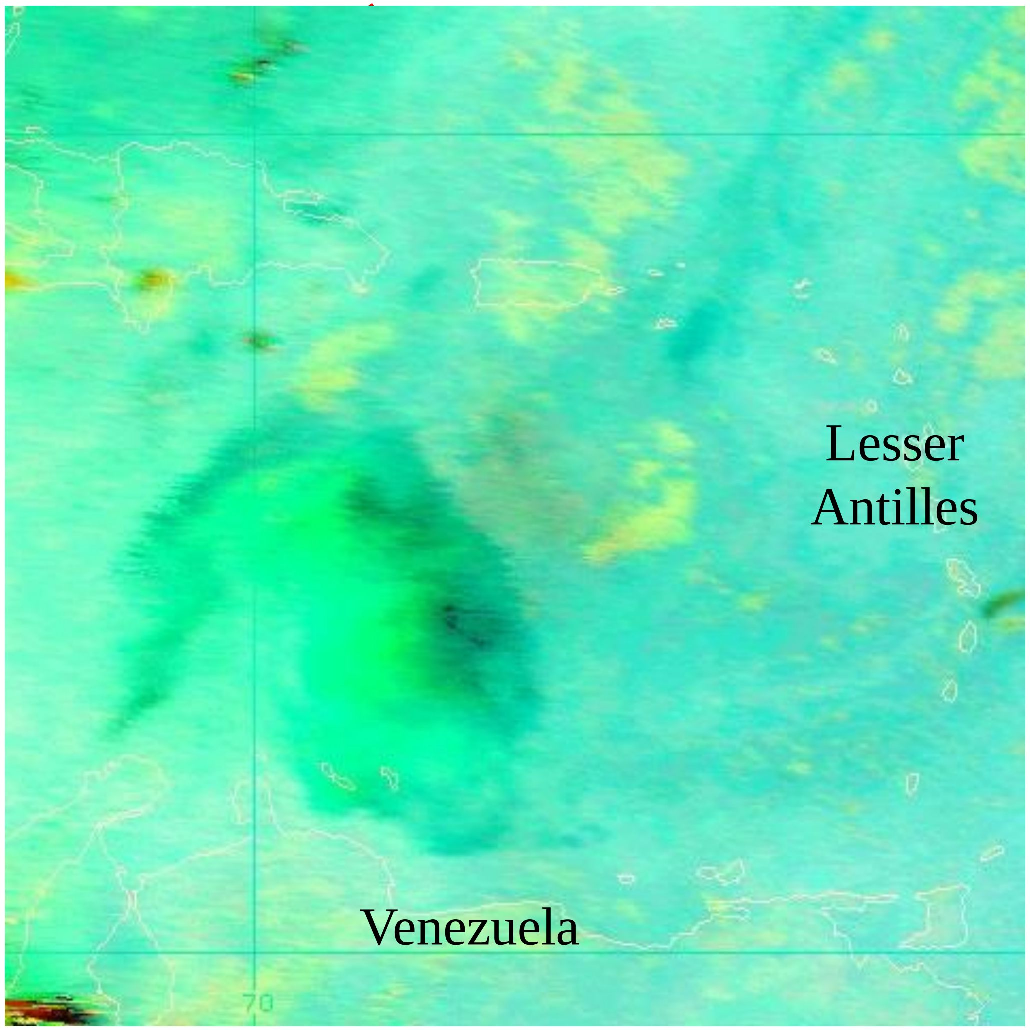
Example: SO2 Plume from Al-Tair Eruption



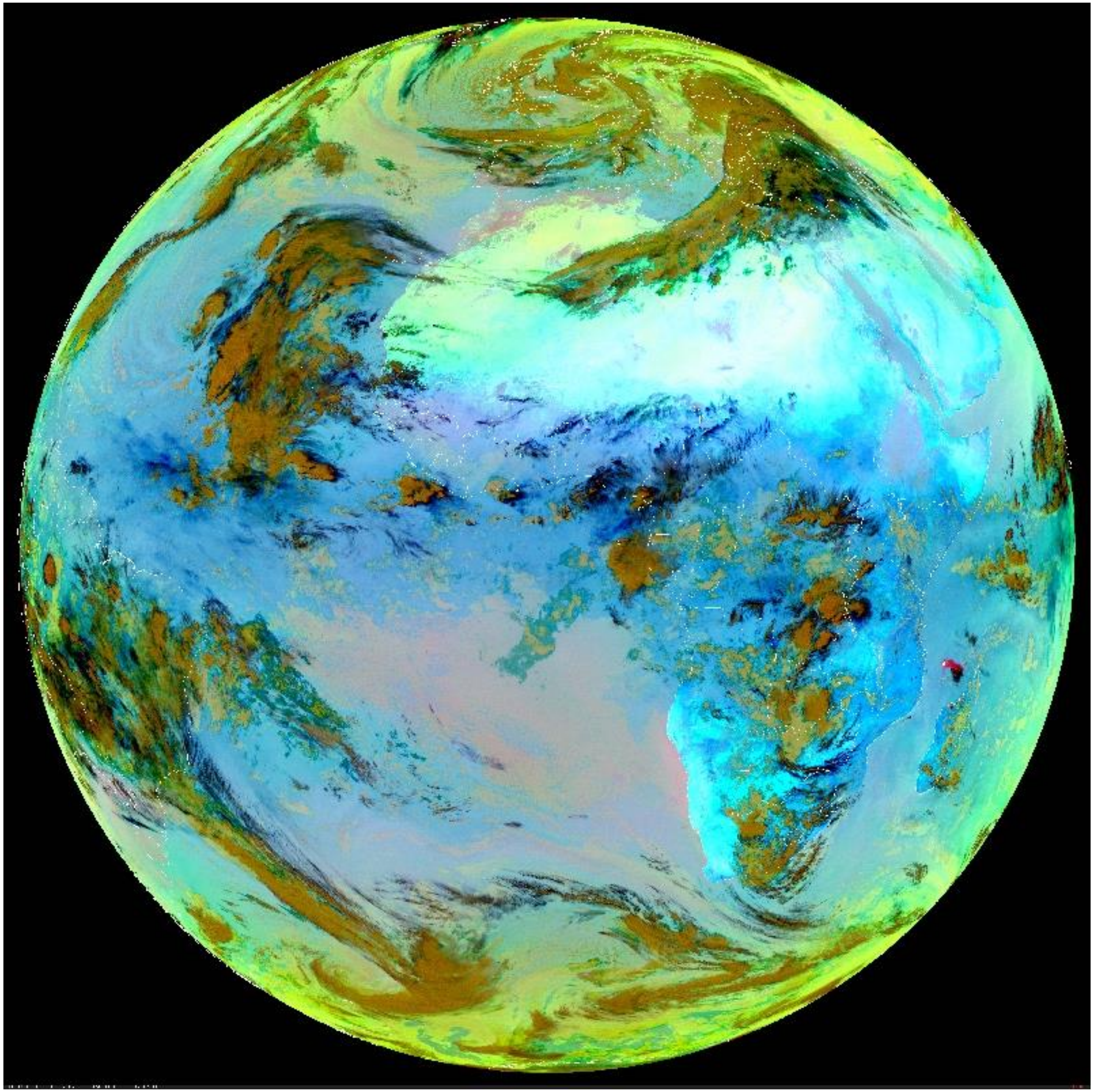
30 September 2007

Unusual colours because of:

high viewing angle (limb cooling)



21 May 2006, 06:00 UTC



RGB 24-hour Ash Microphysics Global View

MSG-1
25 November 2005
09:00 UTC

RGB 24-hours Ash Microphysics Interpretation of Colours

Cold, thick, high-level clouds	Thin Cirrus clouds Contrails	Volcanic SO2 clouds	Volcanic Ash clouds

2. RGB 05-06, 08-09, 05i ("Airmass")

devised by: J. Kerkmann

R = Difference WV6.2 - WV7.3

G = Difference IR9.7 - IR10.8

B = Channel WV6.2i

Applications:	Rapid Cyclogenesis, Jet Stream Analysis, PV Analysis
Area:	Full MSG Viewing Area
Time:	Day and Night
Users:	most European NMSs, South Africa, Oman, Israel

Physical Interpretation (for clouds)

R = Difference WV6.2 – WV7.3
Cloud Height

G = Difference IR9.7 – IR10.8
Cloud Top Temperature, Ozone content

B = Channel WV6.2
Cloud Top Temperature, UTH

Physical Interpretation (for cloud-free)

R = Difference WV6.2 – WV7.3
UTH, MTH

G = Difference IR9.7 – IR10.8
Ozone content (O3-rich polar, O3-poor subtropical), Tsurf, Sat. Viewing

B = Channel WV6.2
UTH

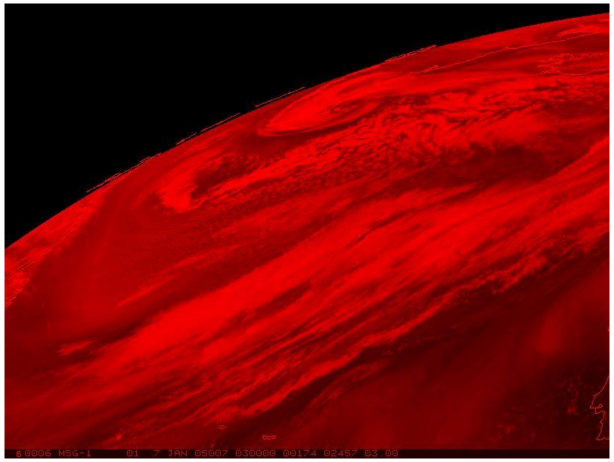
2. RGB 05-06, 08-09, 05i ("Airmass")

devised by: J. Kerkmann

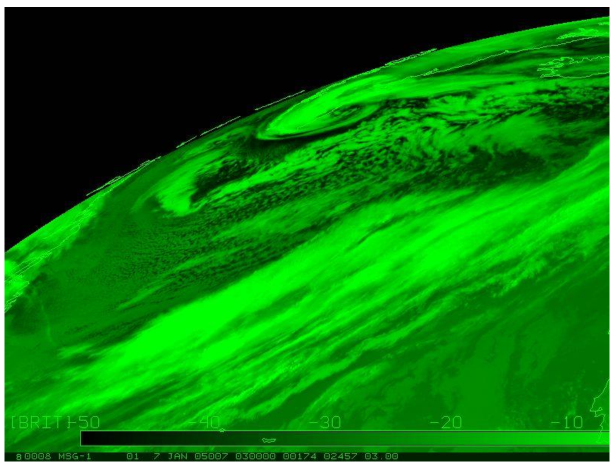
Recommended Range and Enhancement:

Beam	Channel	Range	Gamma
Red	WV6.2 - WV7.3	-25 … 0 K	1.0
Green	IR9.7 - IR10.8	-40 … +5 K	1.0
Blue	WV6.2	+243 … +208 K	1.0

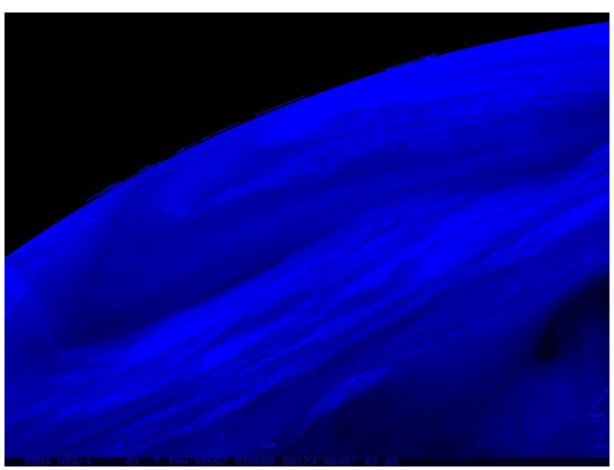
Ch.05 -Ch.06

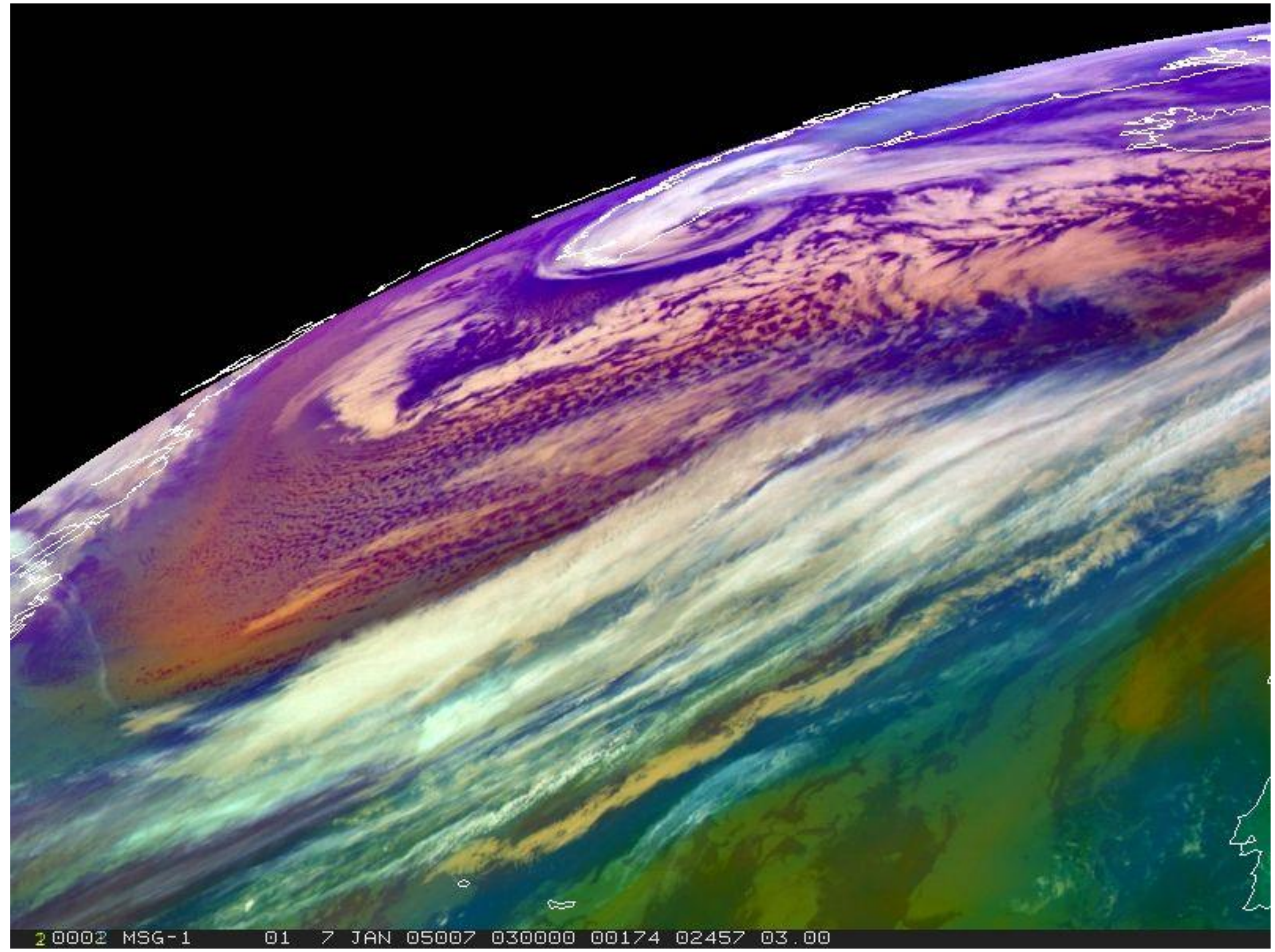


Ch.08 -Ch.09



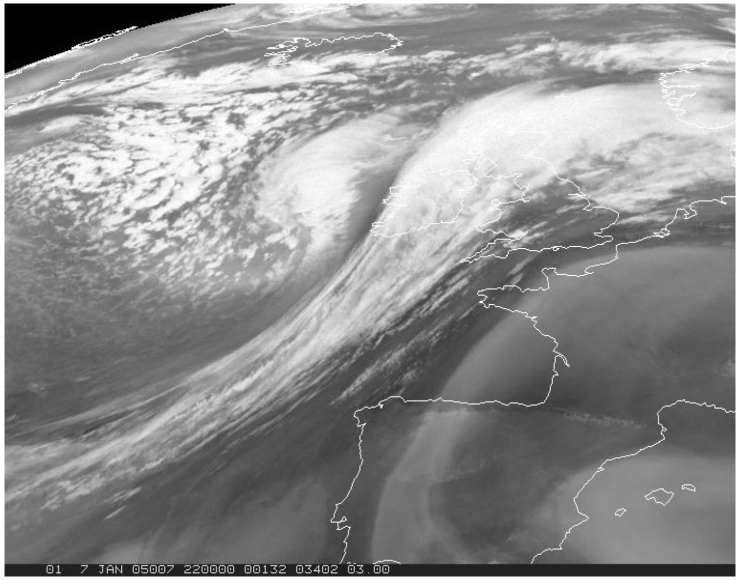
Ch.05i



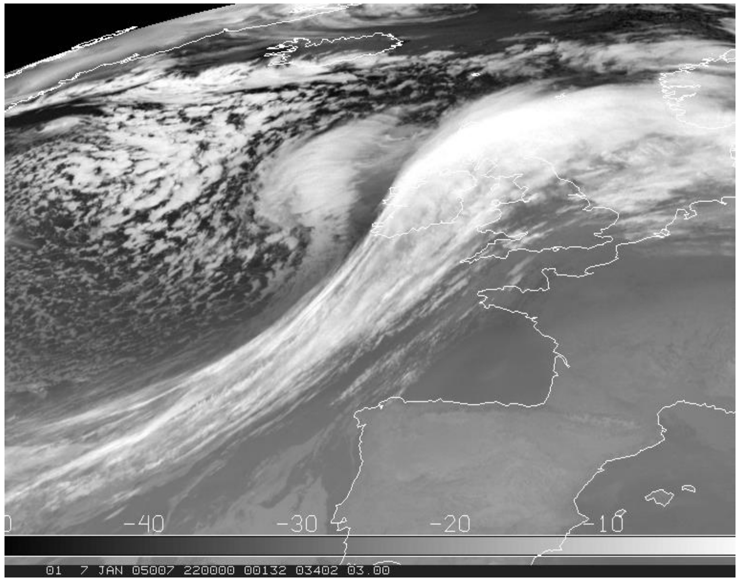


MSG-1, 7 January 2005, 03:00 UTC
RGB Composite 05-06, 08-09, 05i

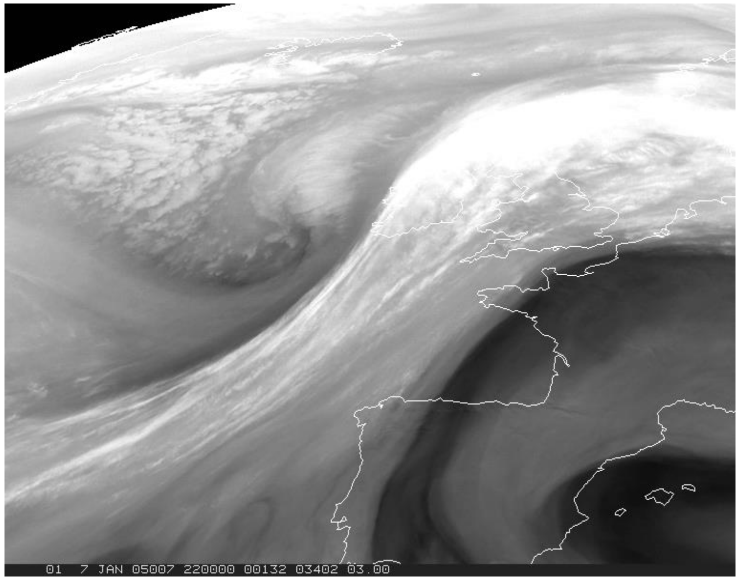
Airmass RGB: Colour Inputs



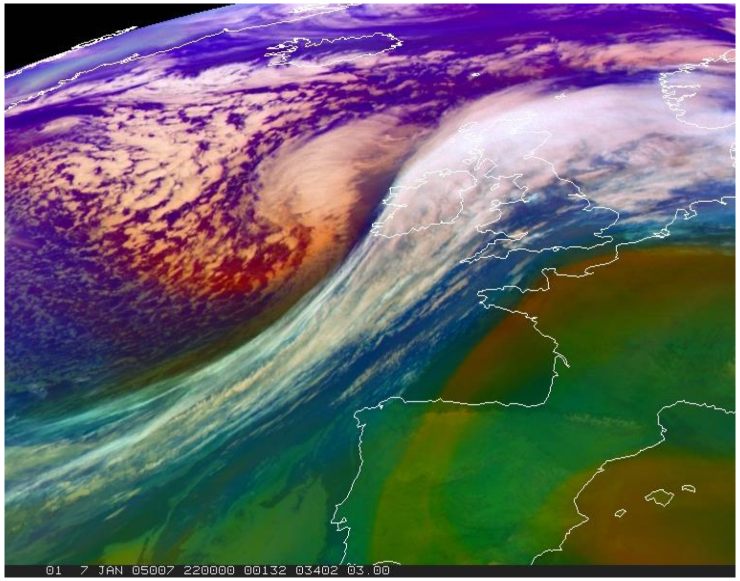
Red = WV6.2 - WV7.3



Green = IR9.7 - IR10.8

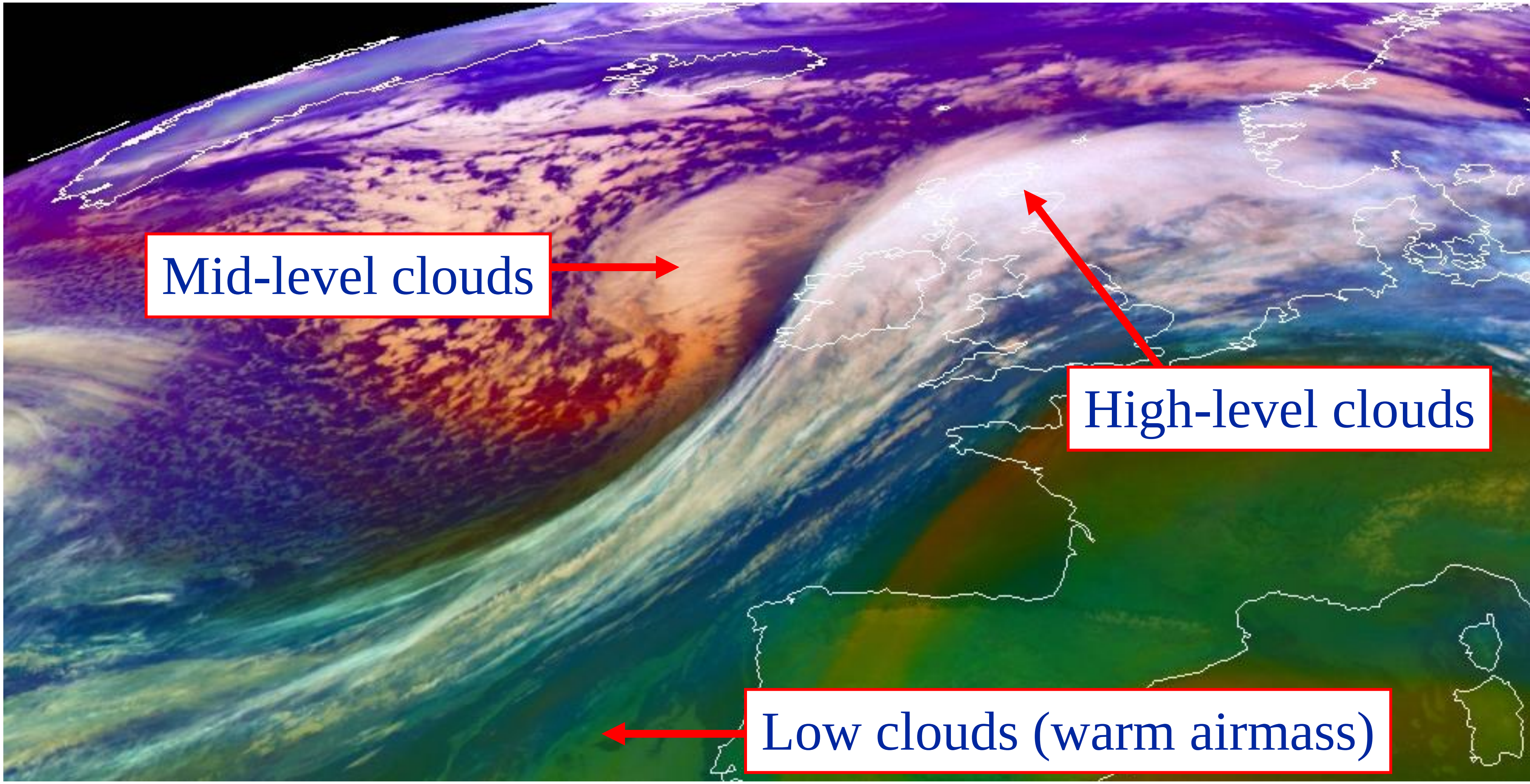


Blue = WV6.2i



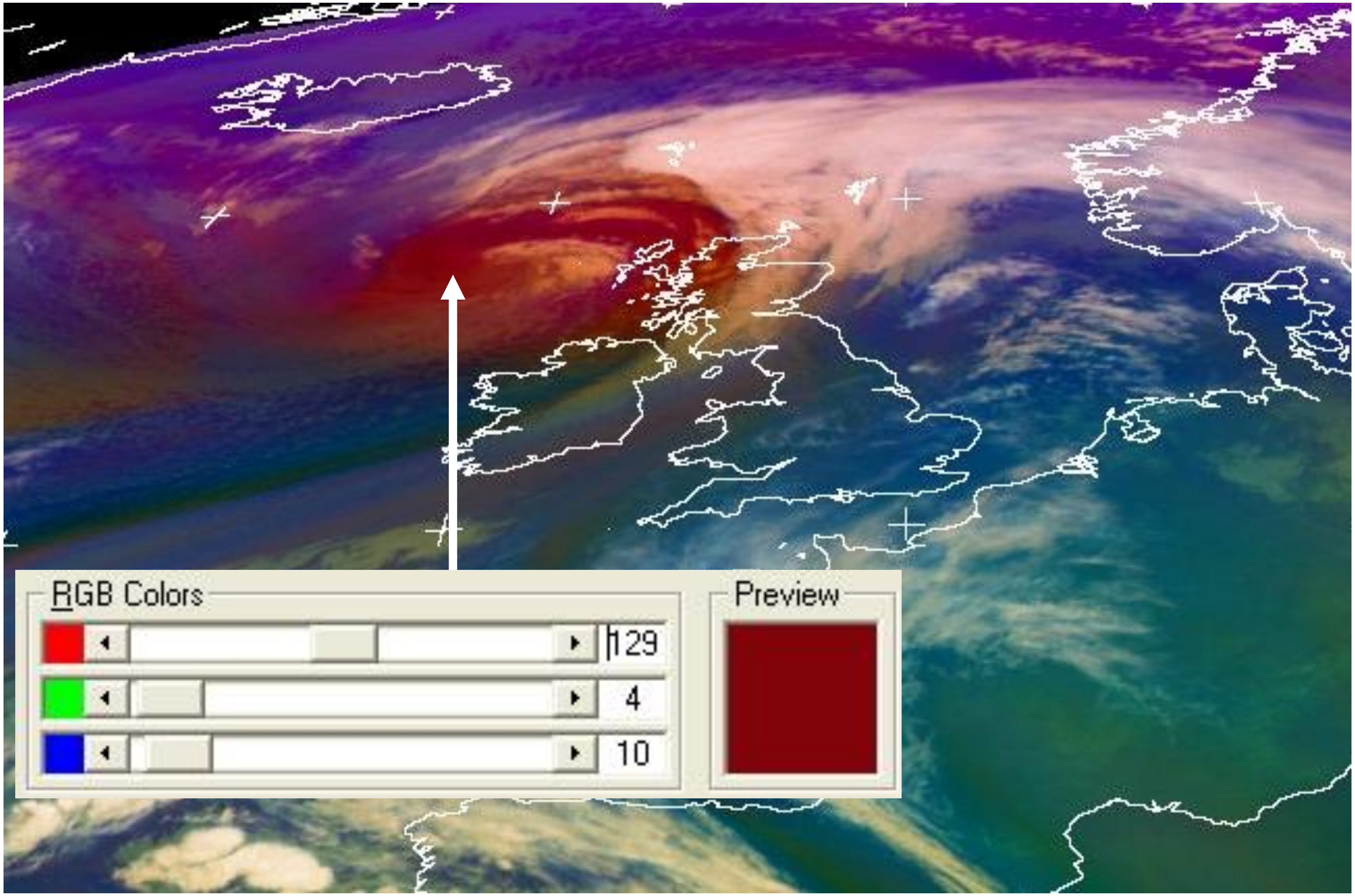
RGB

Example: Clouds



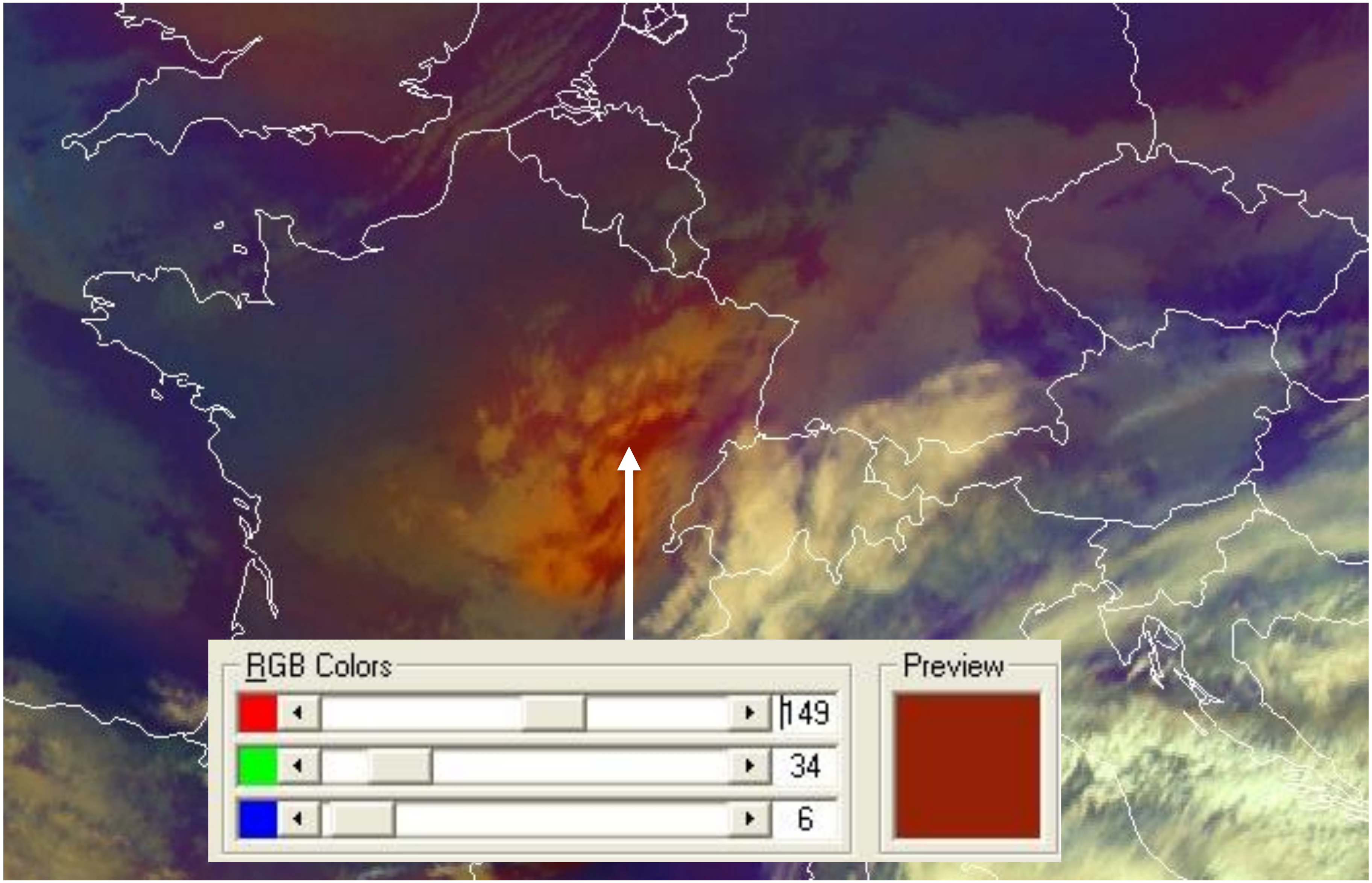
MSG-1, 7 January 2005, 22:00 UTC

Example: PV Anomaly



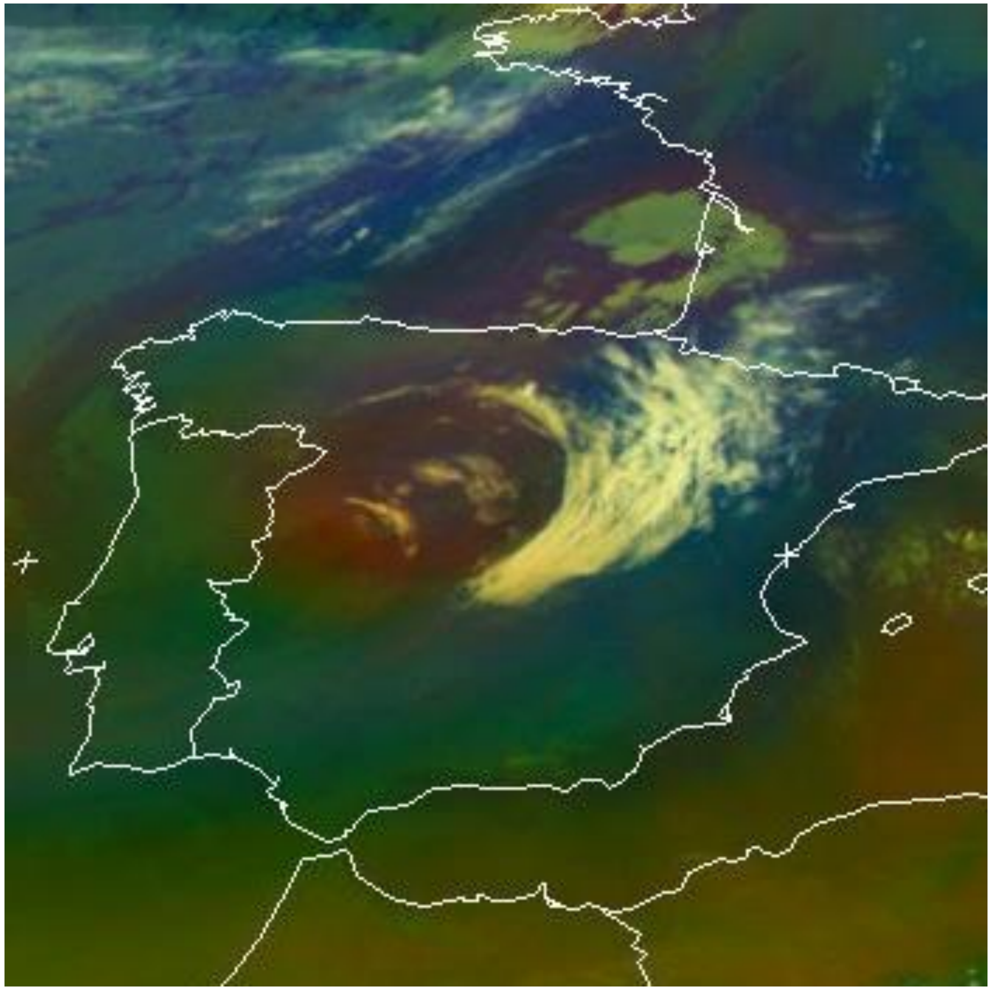
MSG-1, 30 October 2006, 20:00 UTC

Example: PV Anomaly

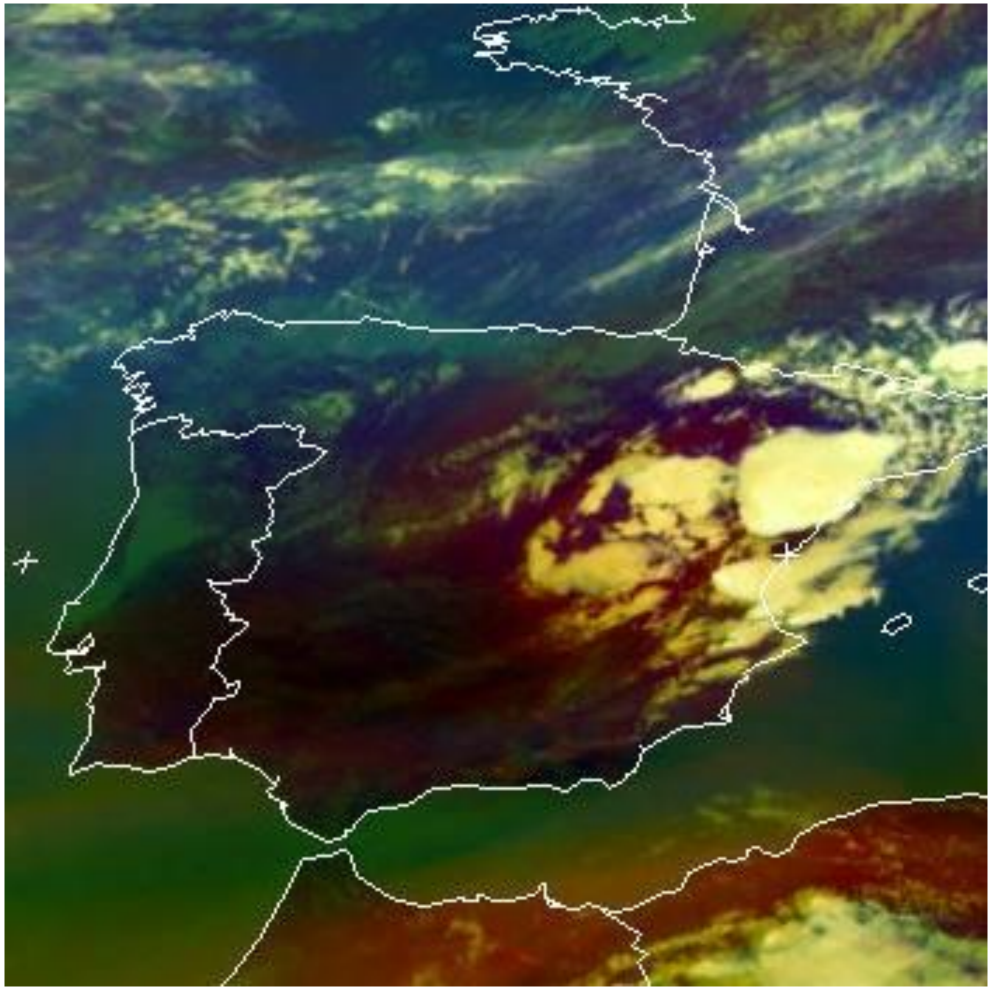


MSG-1, 4 April 2007, 05:45 UTC

Example: PV Anomaly



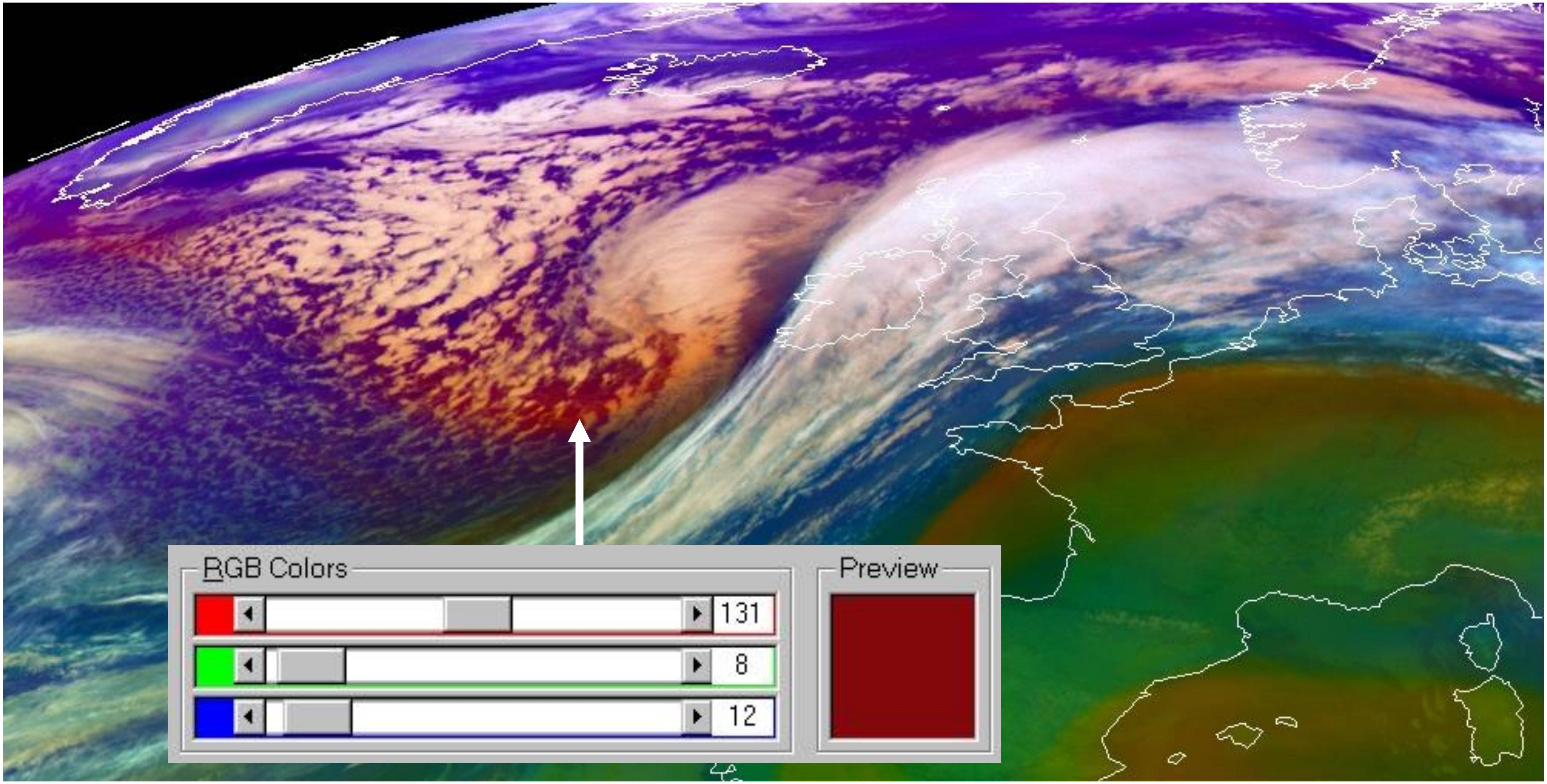
06:00 UTC



14:00 UTC

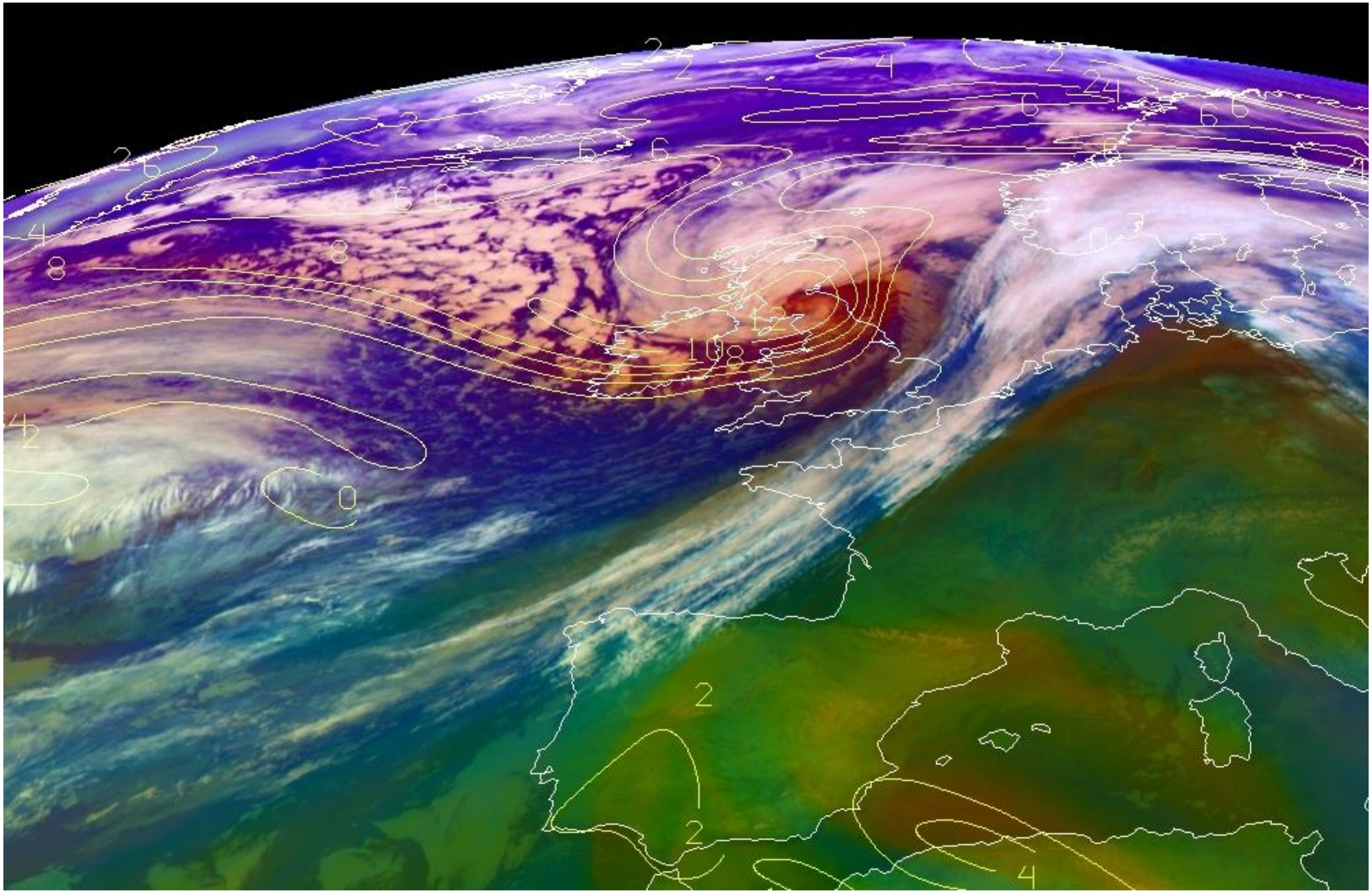
MSG-2, 12 August 2007

Example: Advection Jet



MSG-1, 7 January 2005, 22:00 UTC

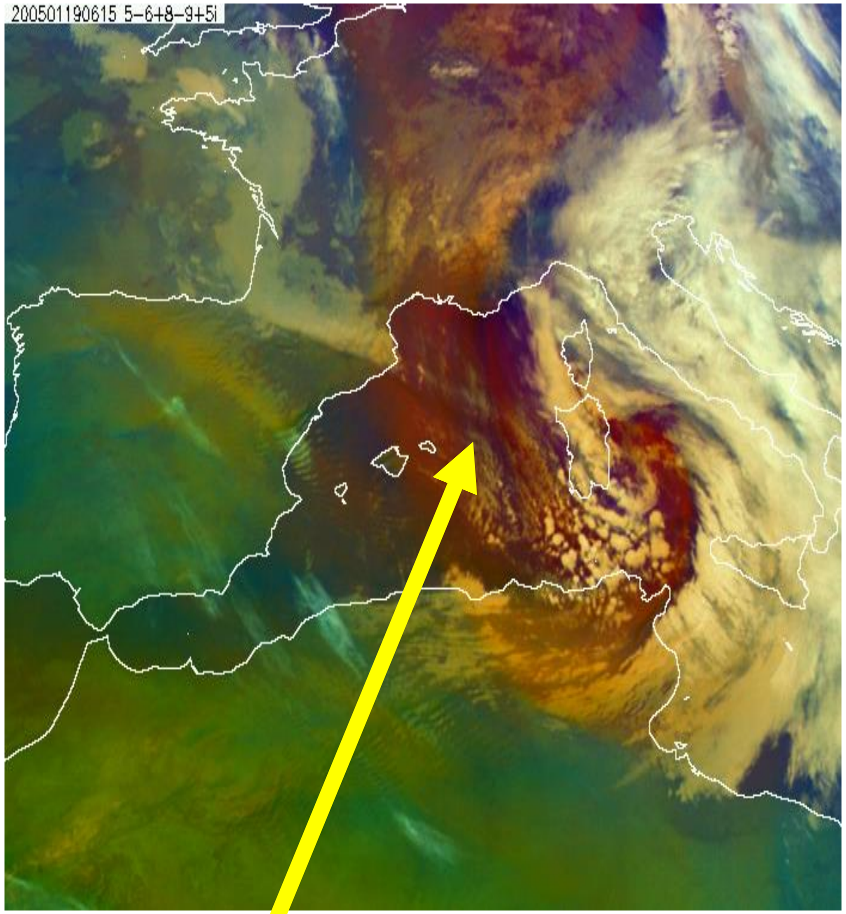
Airmass RGB as PV Proxy

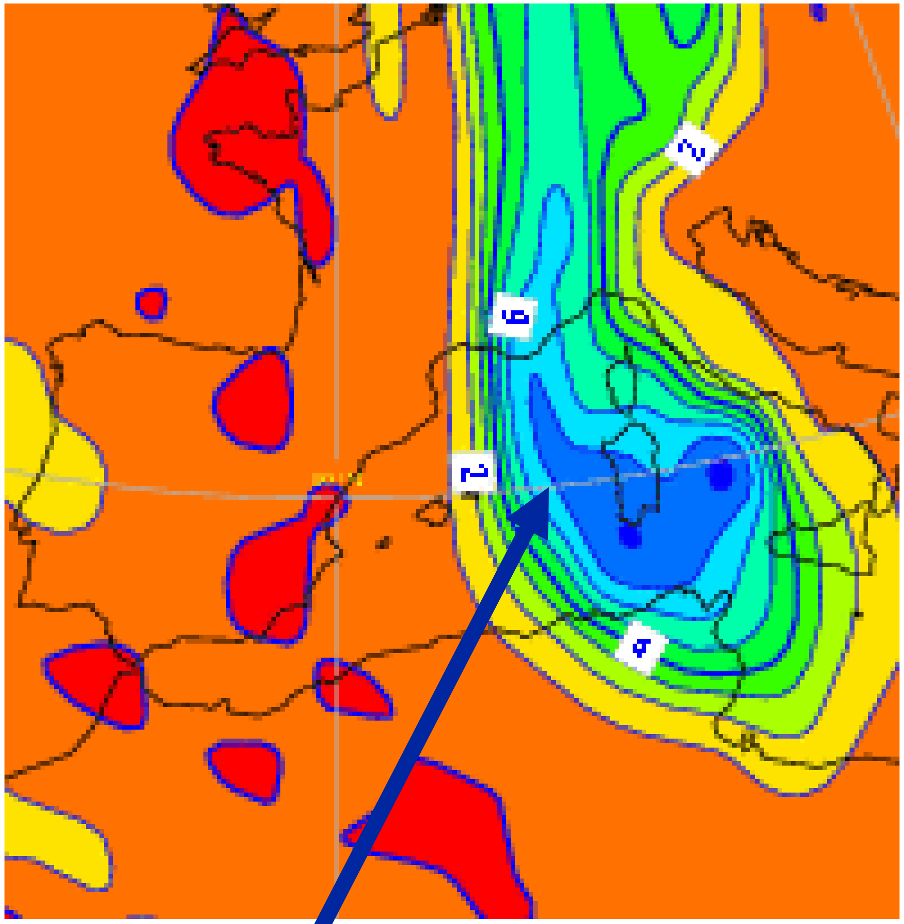


MSG-1, 8 January 2005, 06:00 UTC

CLICK HERE

Airmass RGB as PV Proxy



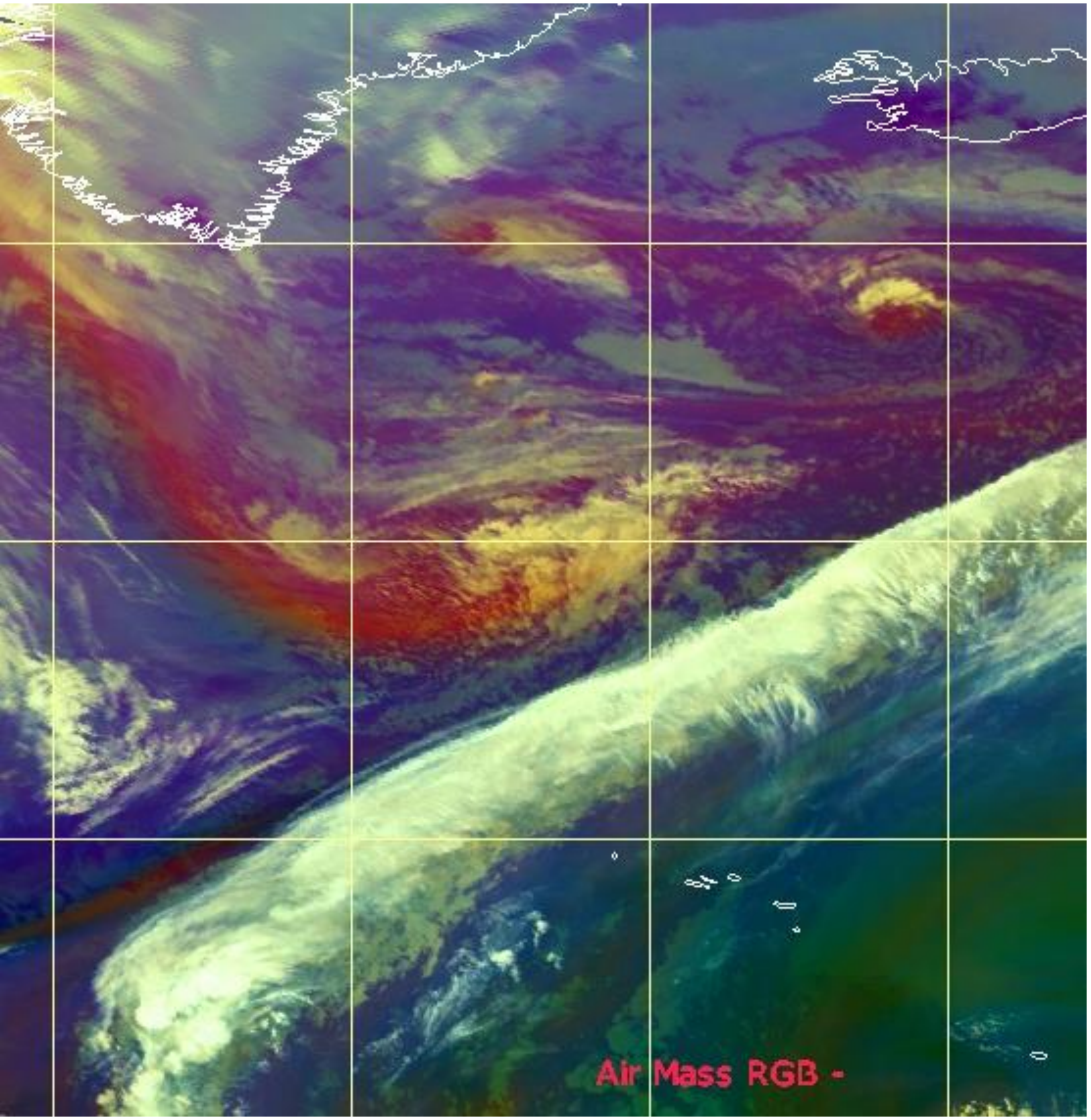


reddish areas

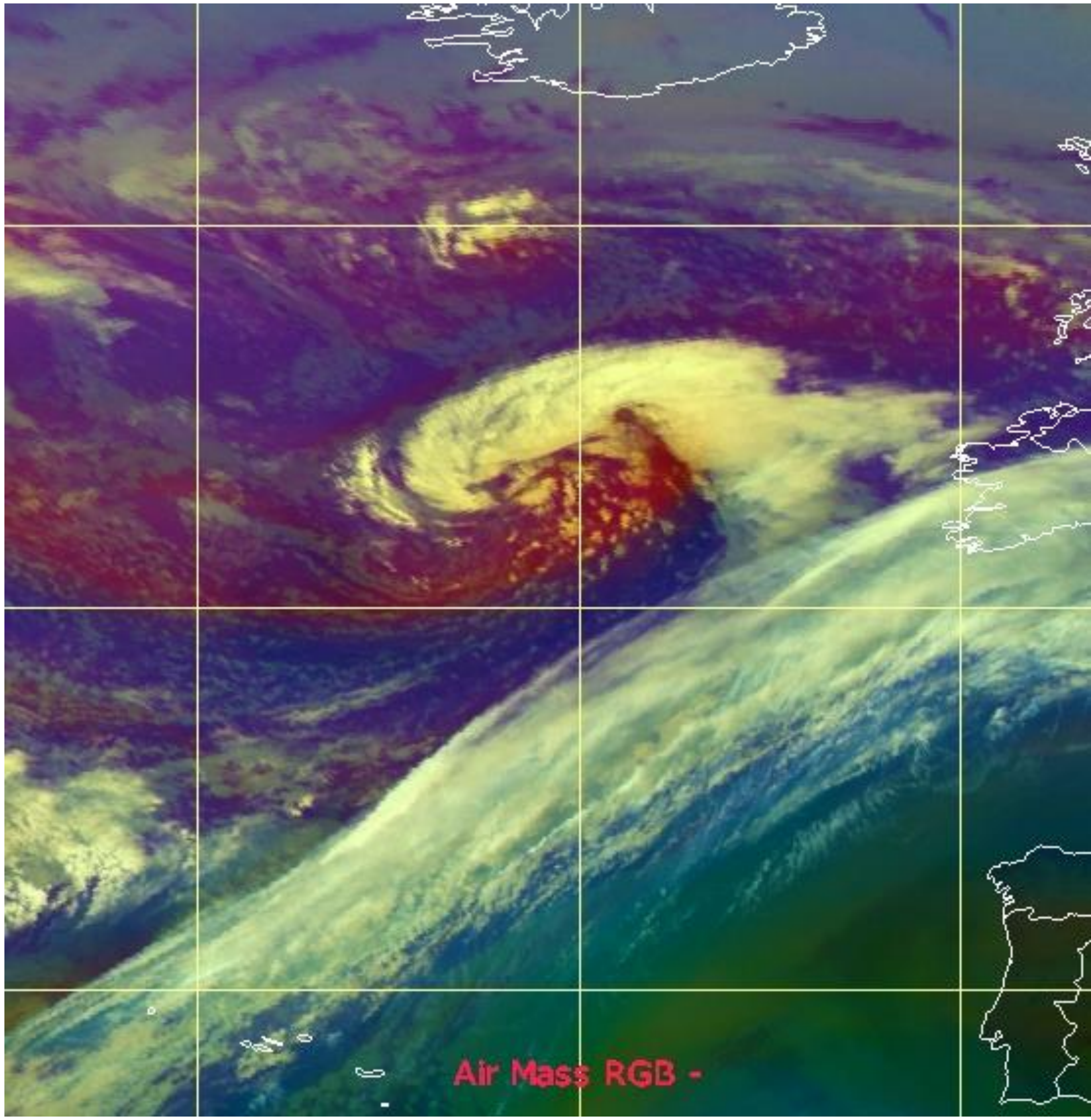
high PV values

19 January 2005, 06:15 UTC

Cyclogenesis Northern Hemisphere

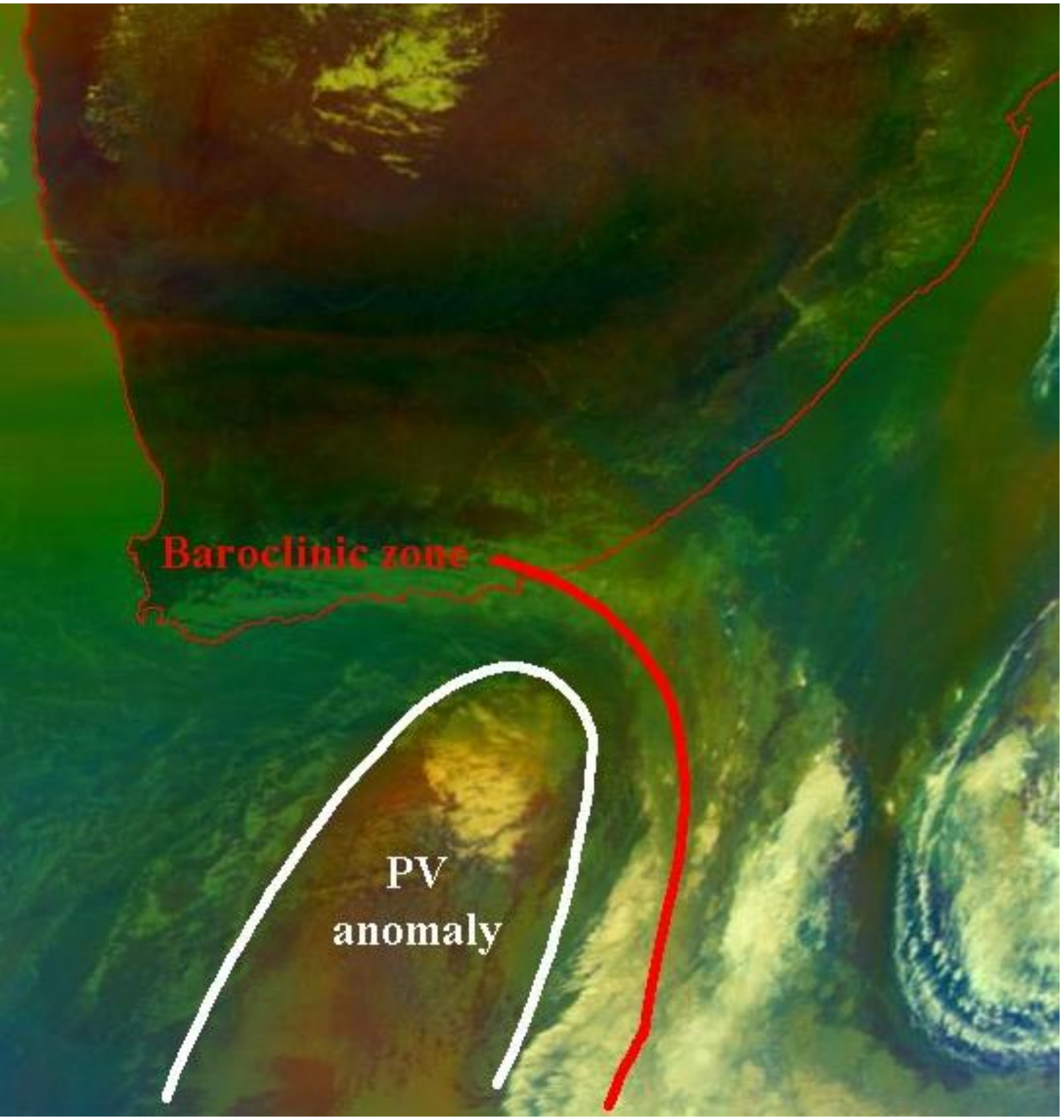


8 May 2007, 11:00 UTC

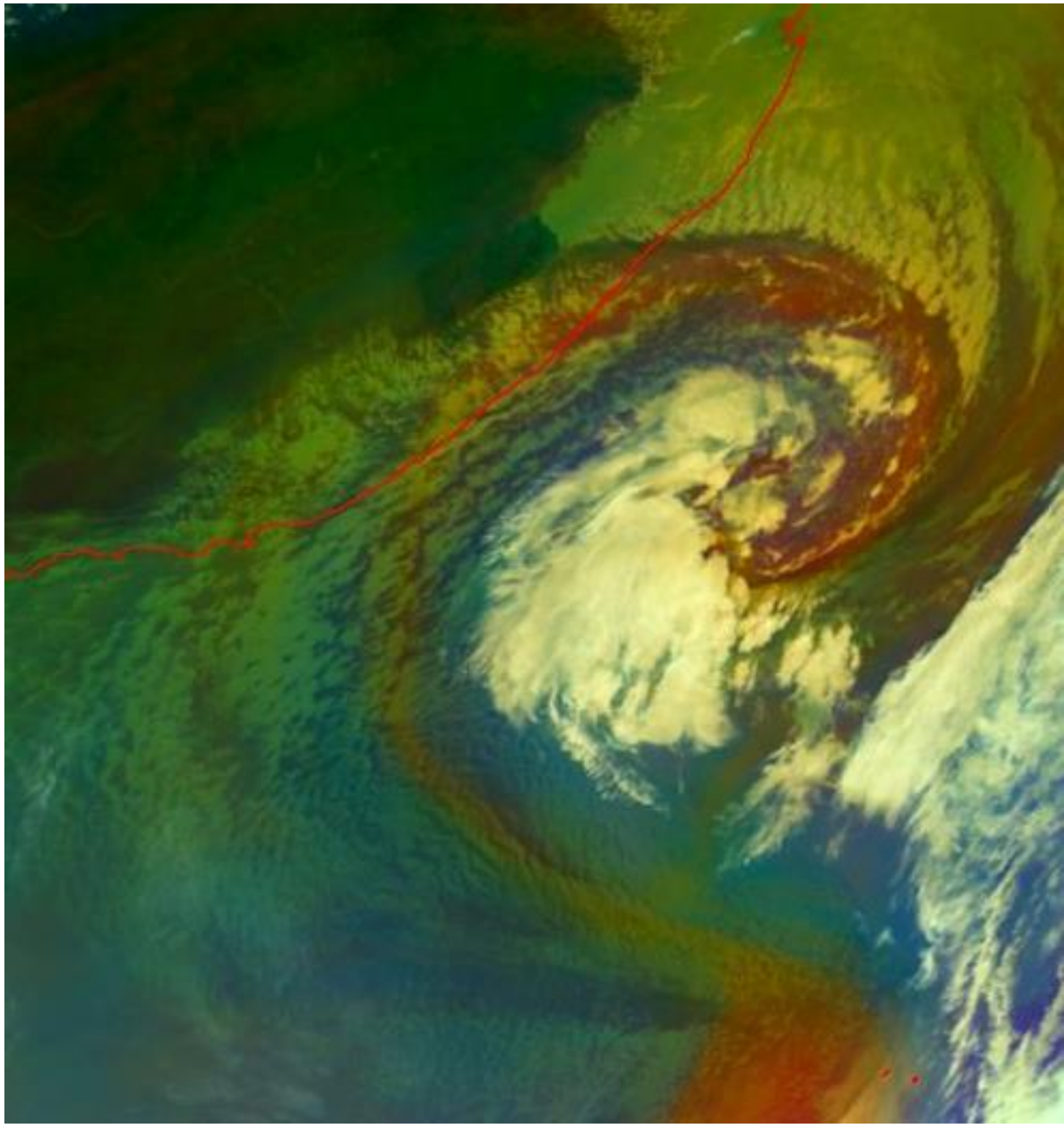


9 May 2007, 8:00 UTC

Cyclogenesis Southern Hemisphere

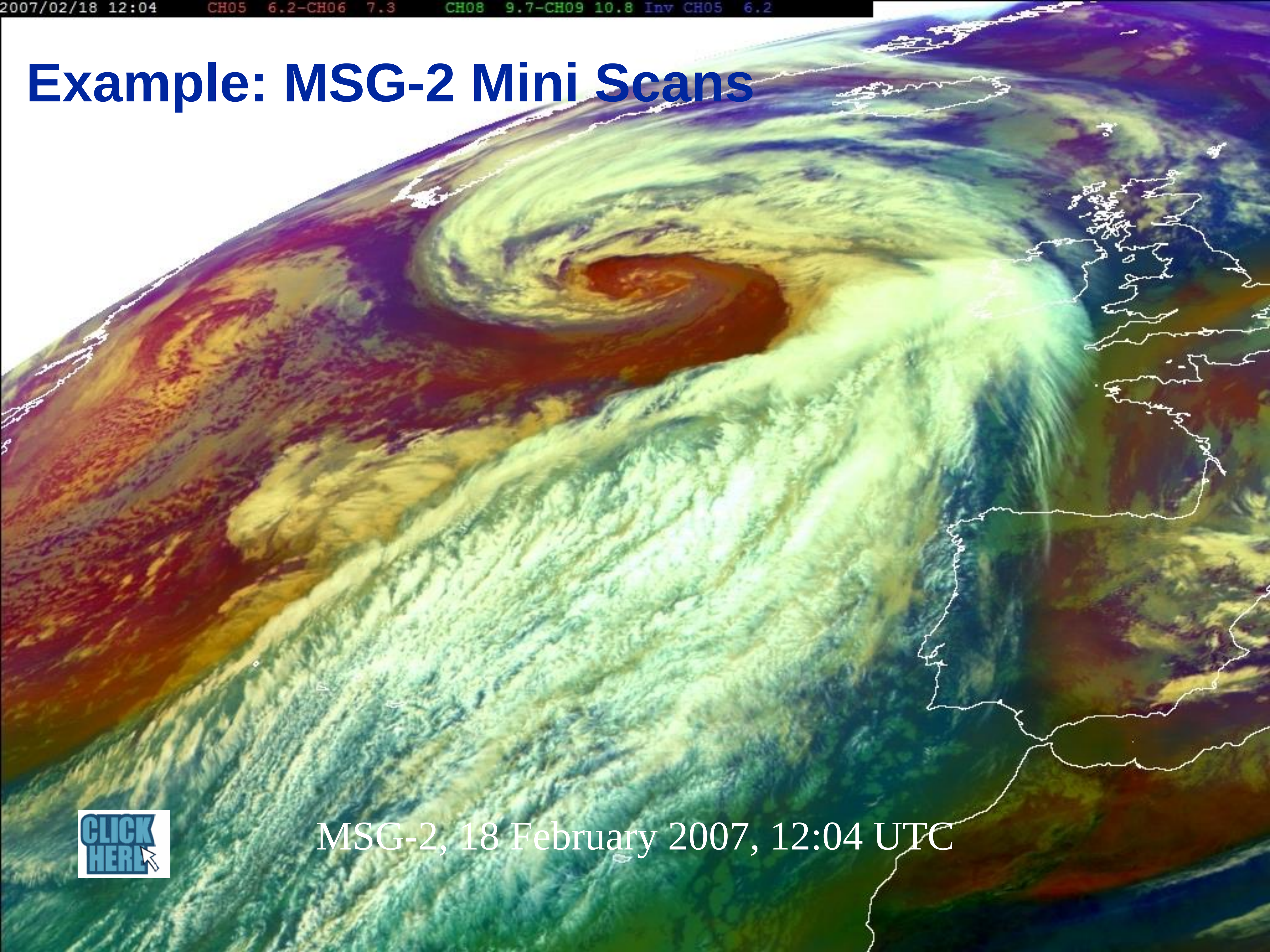


17 March 2007, 12:00 UTC

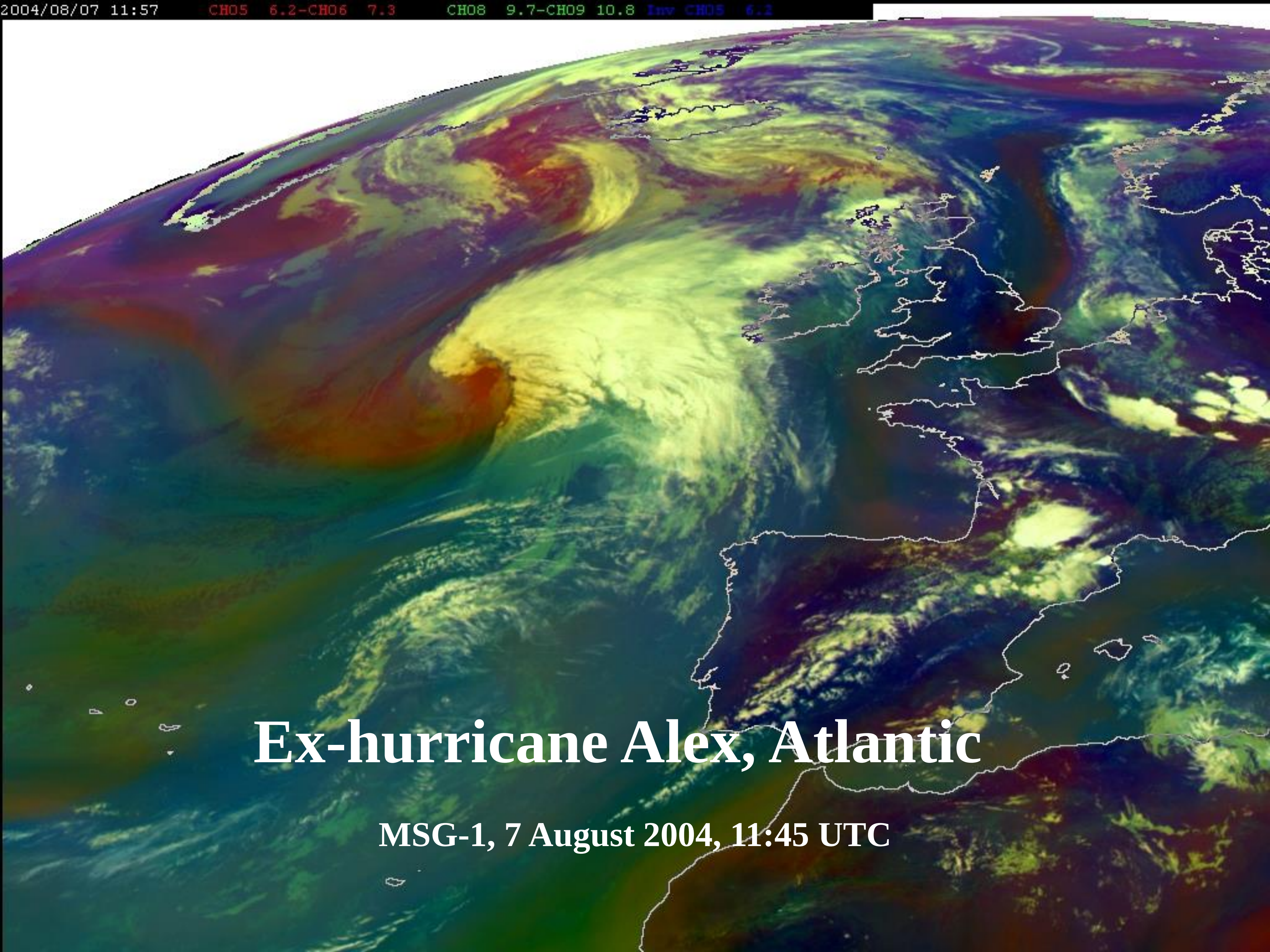


18 March 2007, 12:00 UTC

Example: MSG-2 Mini Scans



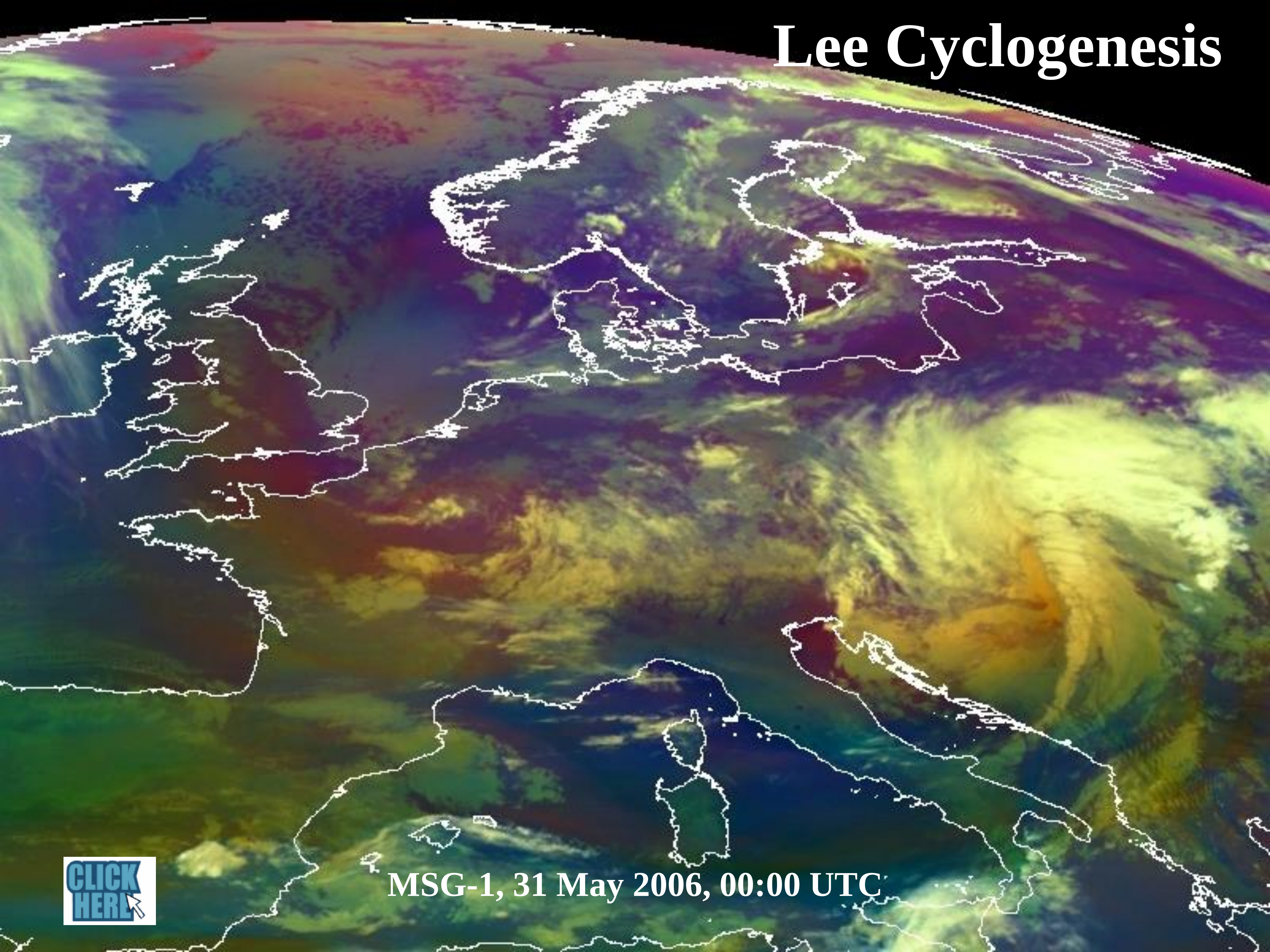
MSG-2, 18 February 2007, 12:04 UTC



Ex-hurricane Alex, Atlantic

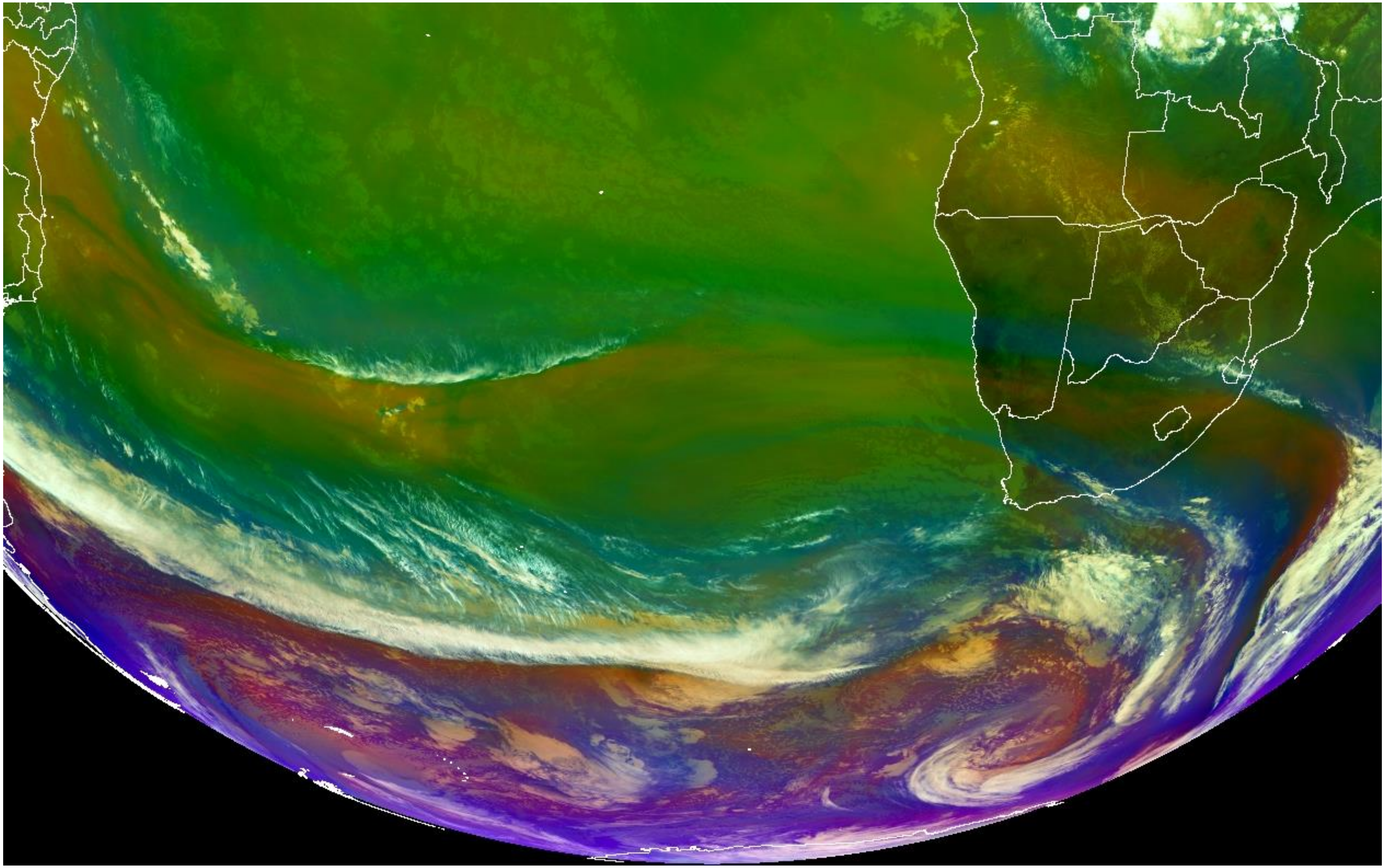
MSG-1, 7 August 2004, 11:45 UTC

Lee Cyclogenesis



MSG-1, 31 May 2006, 00:00 UTC

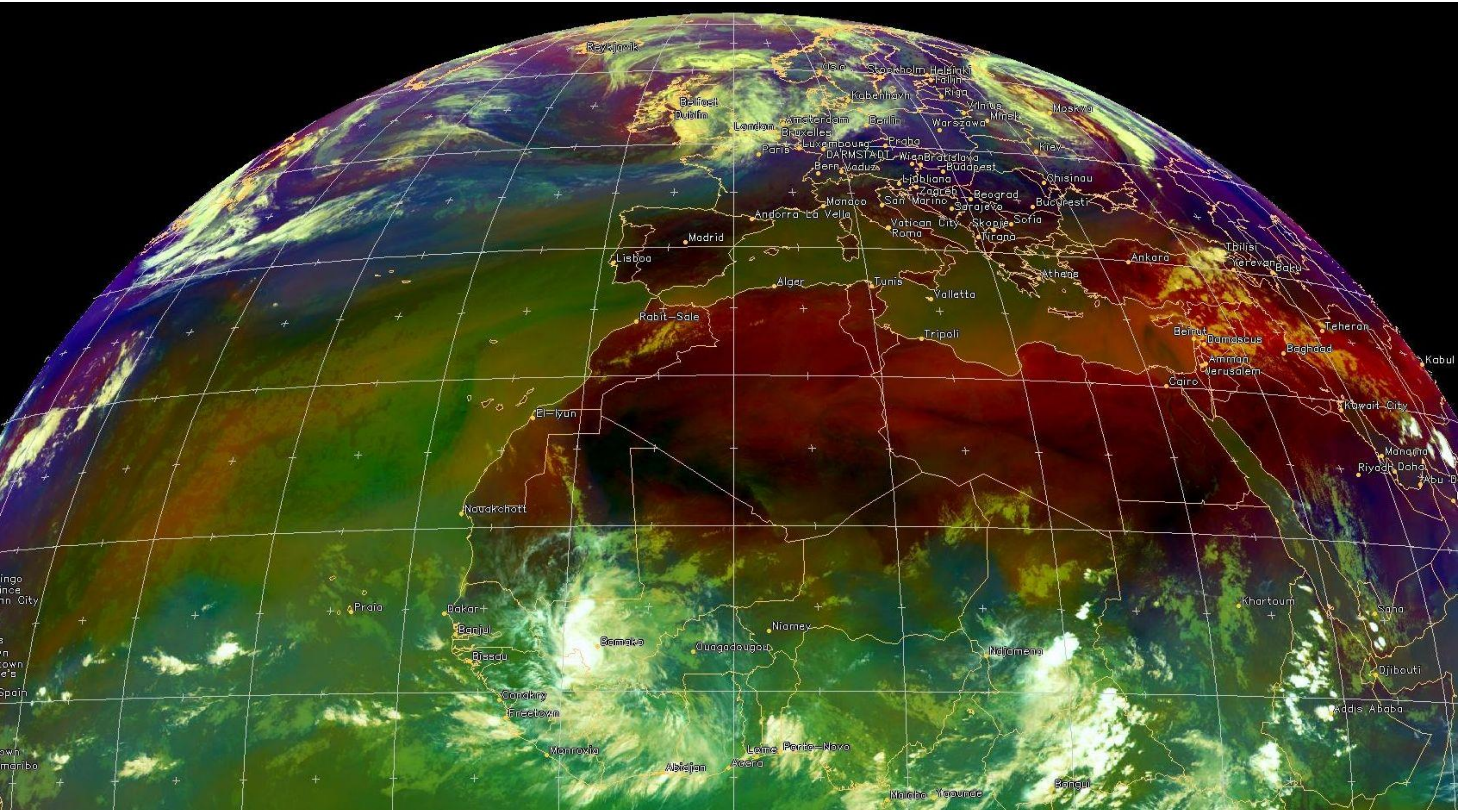
Jets South Atlantic



CLICK HERE

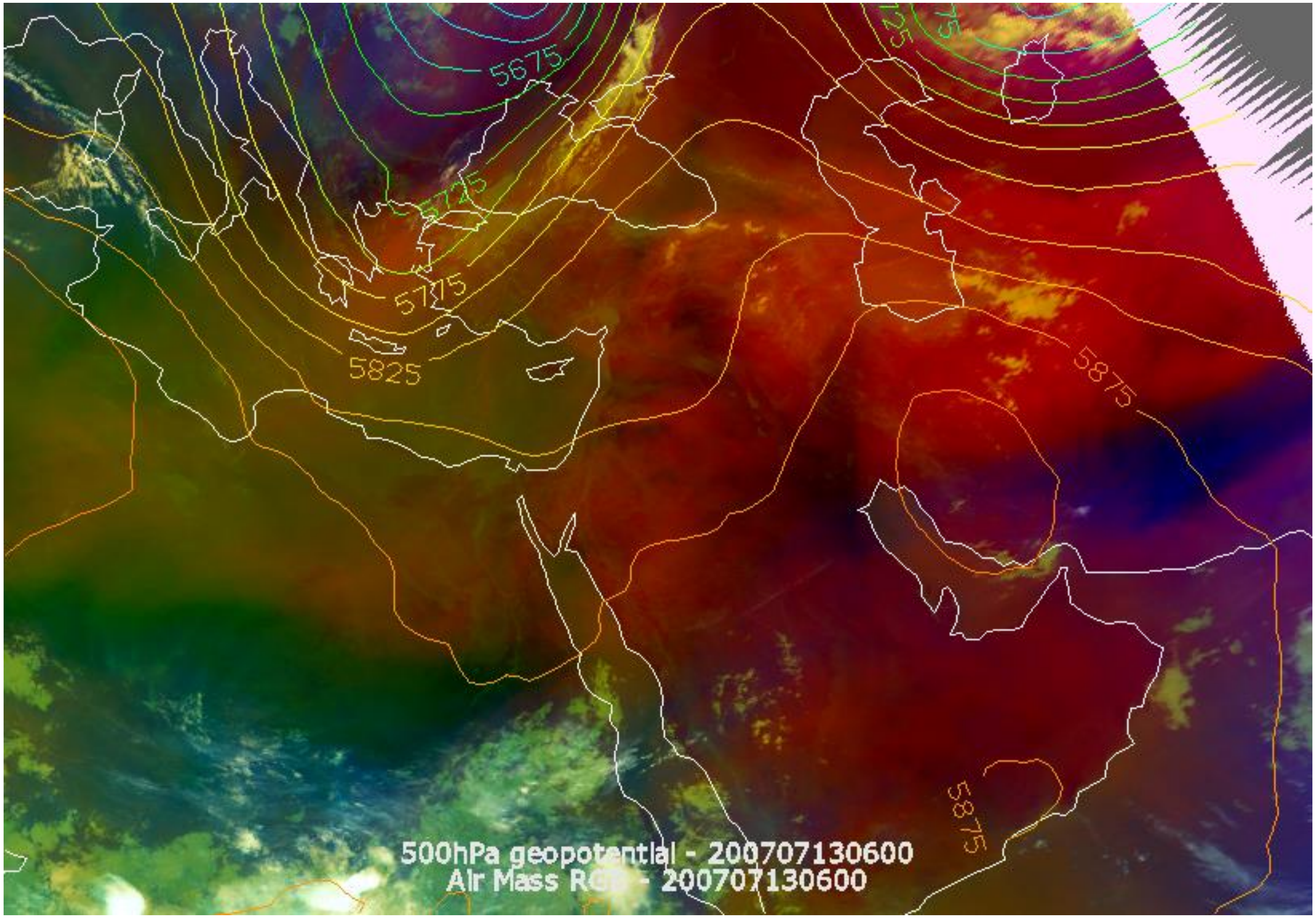
MSG-1, 7 May 2005

Subtropical High Pressure Belt NH



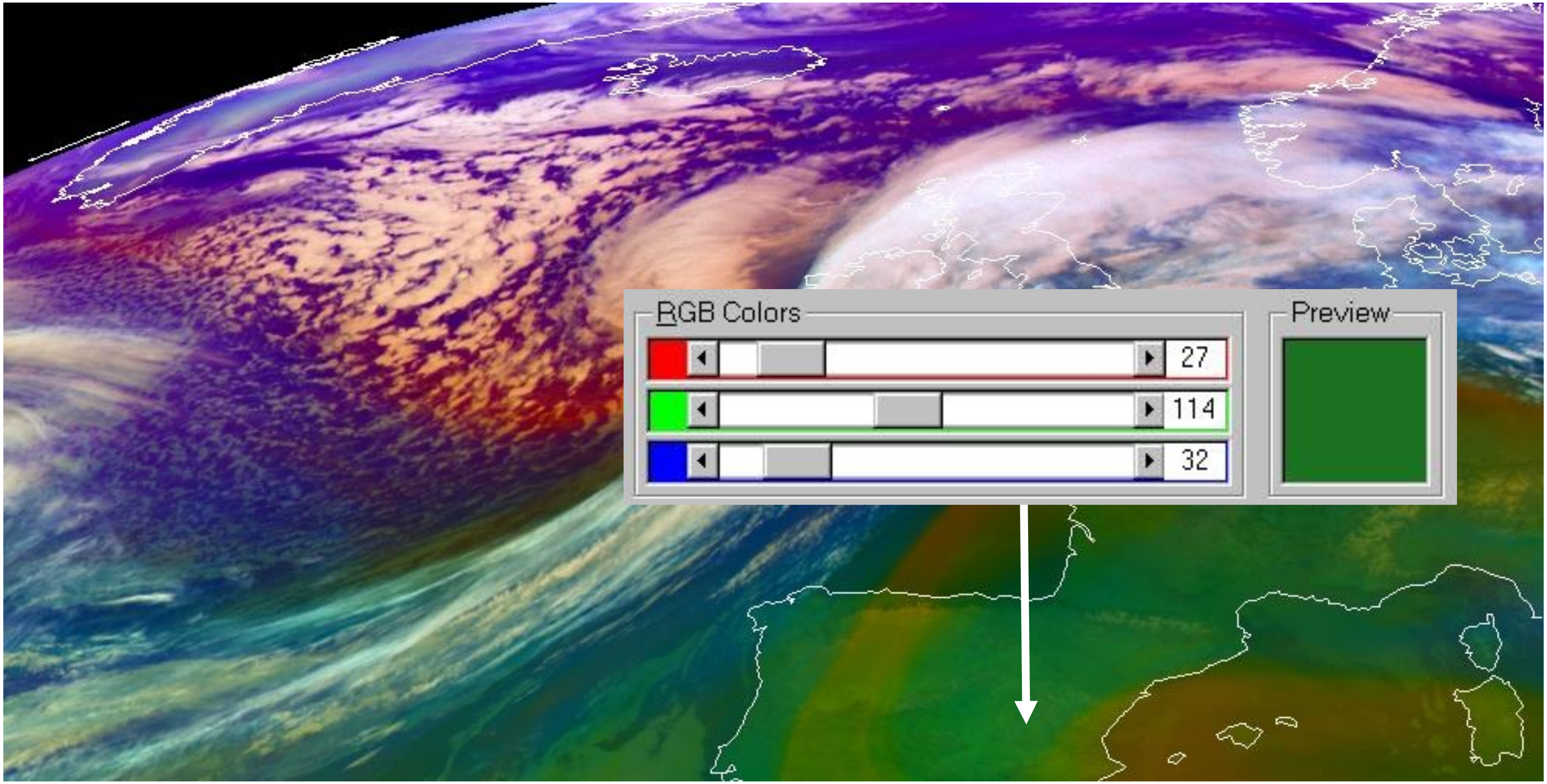
MSG-2, 26 July 2007, 12:00 UTC

Subtropical High Pressure Belt NH



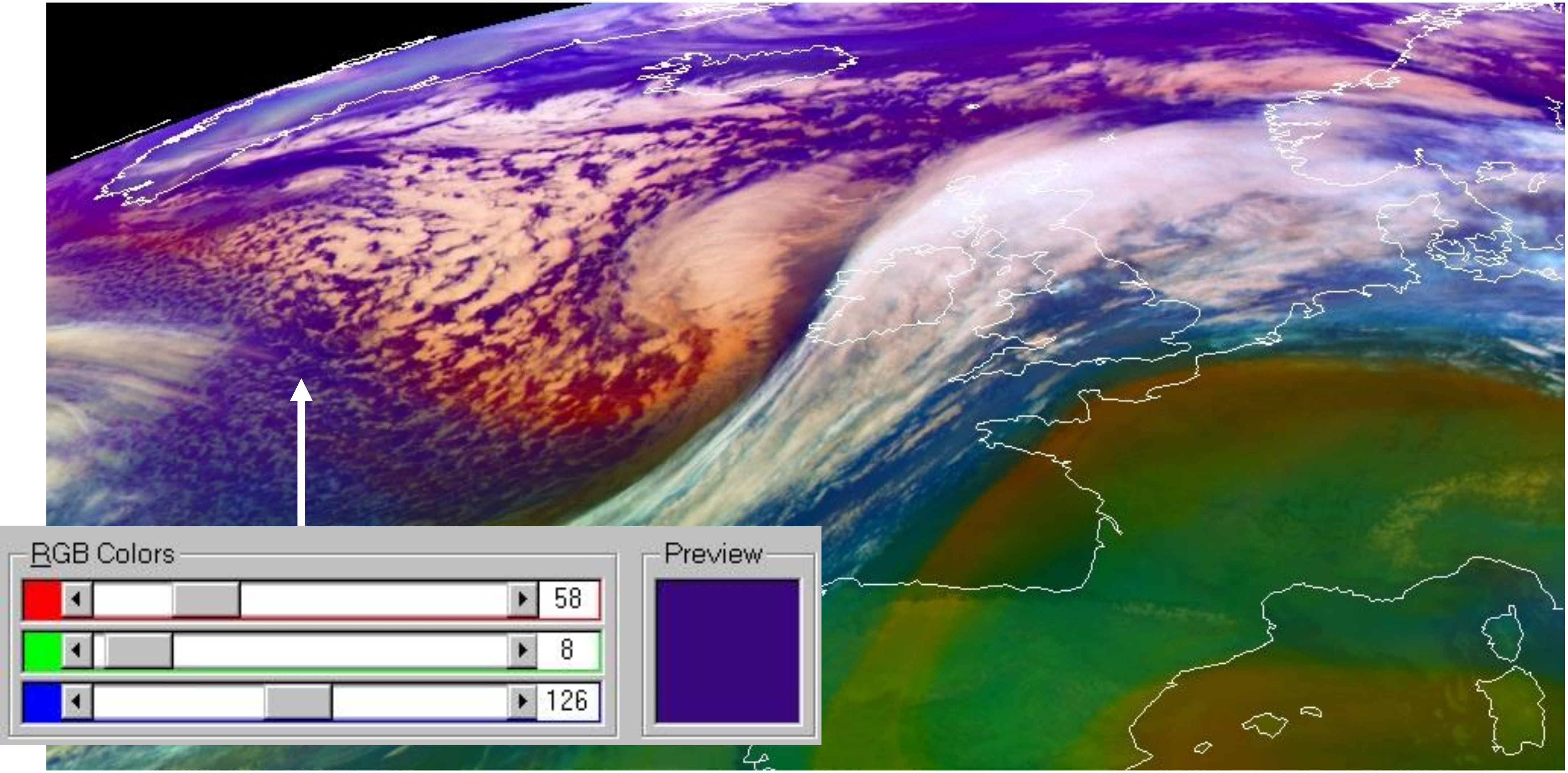
MSG-2, 13 July 2007, 06:00 UTC

Example: Warm Airmass



MSG-1, 7 January 2005, 22:00 UTC

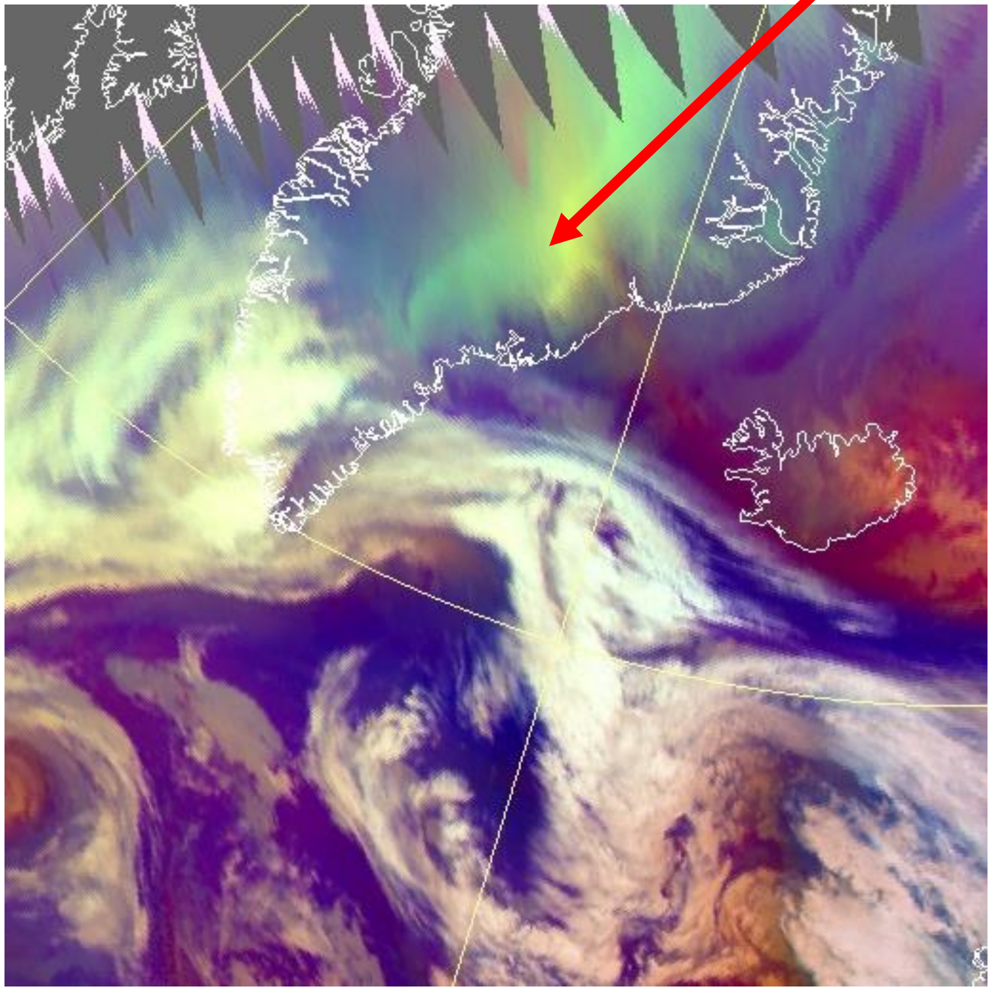
Example: Cold Airmass



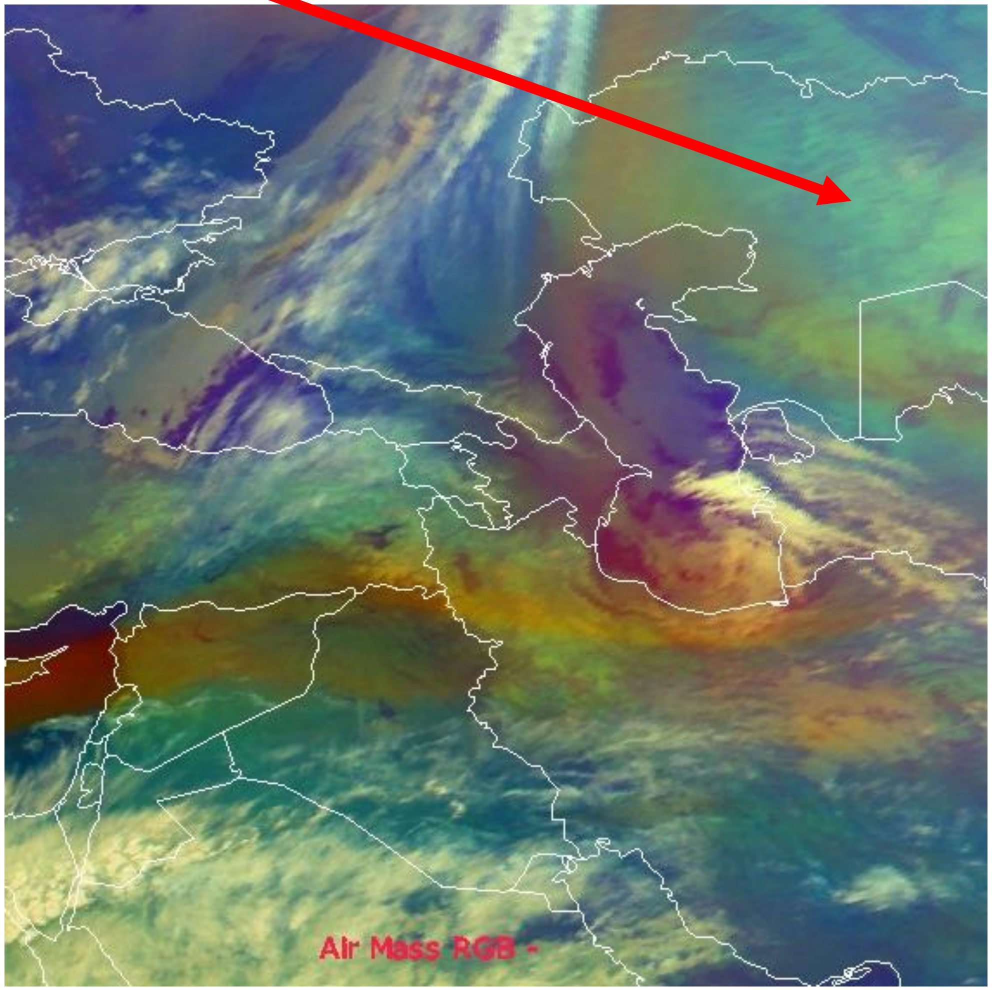
MSG-1, 7 January 2005, 22:00 UTC

Unusual colours because of:

very low surf. temperatures



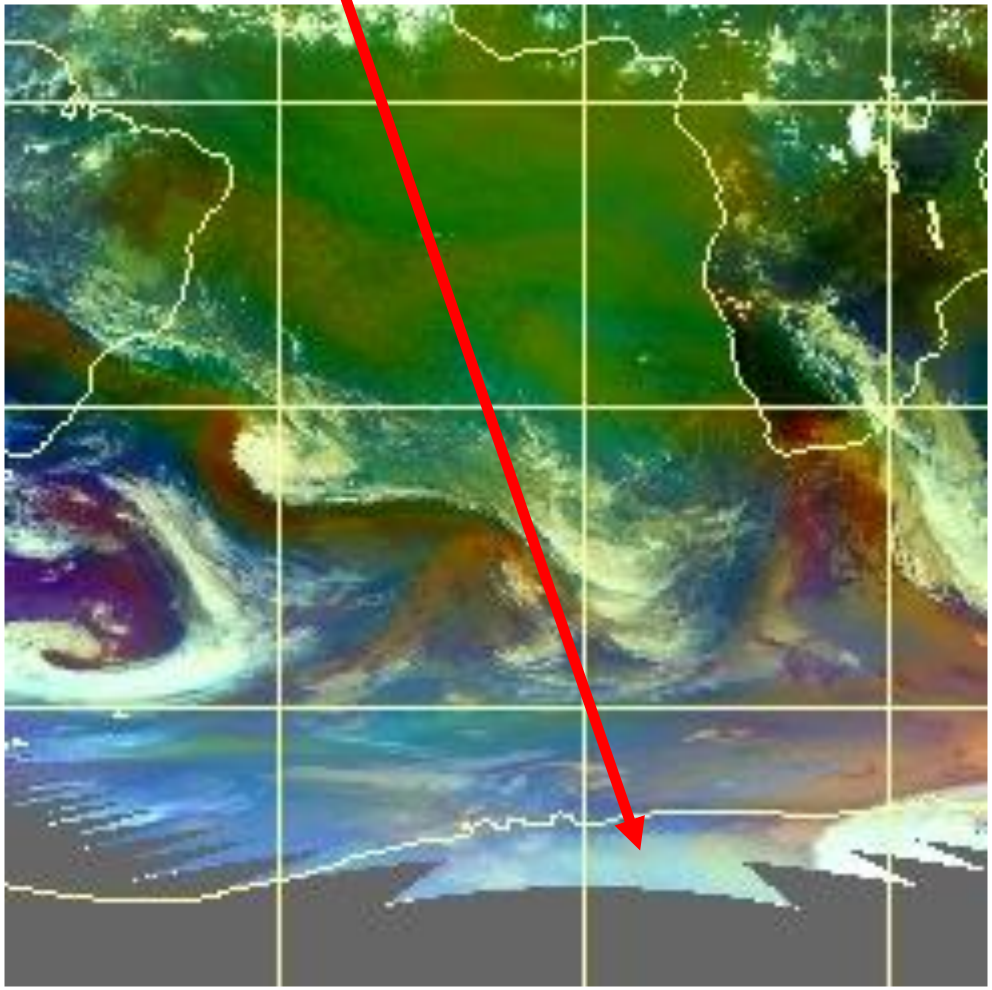
28 February 2007, 04:00 UTC



20 January 2008, 23:00 UTC

Unusual colours because of:

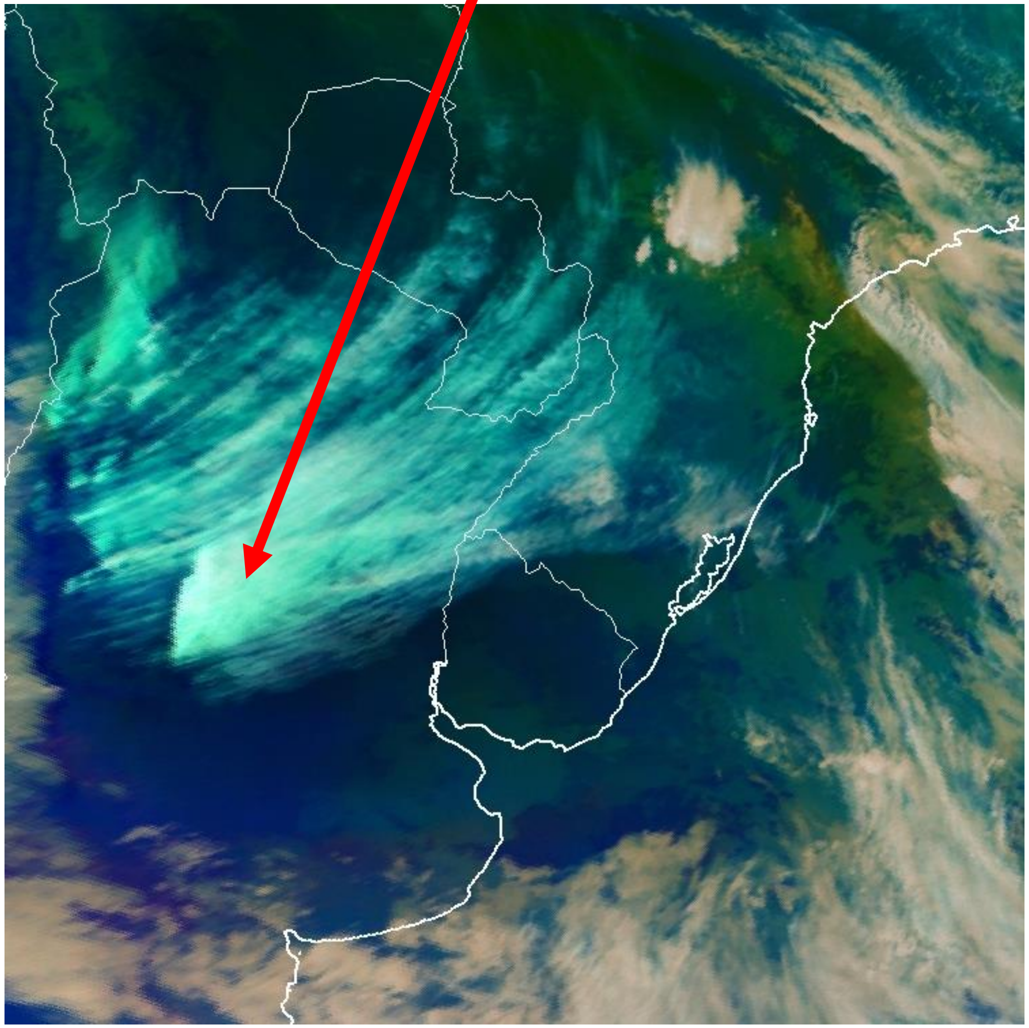
very low Ozone content



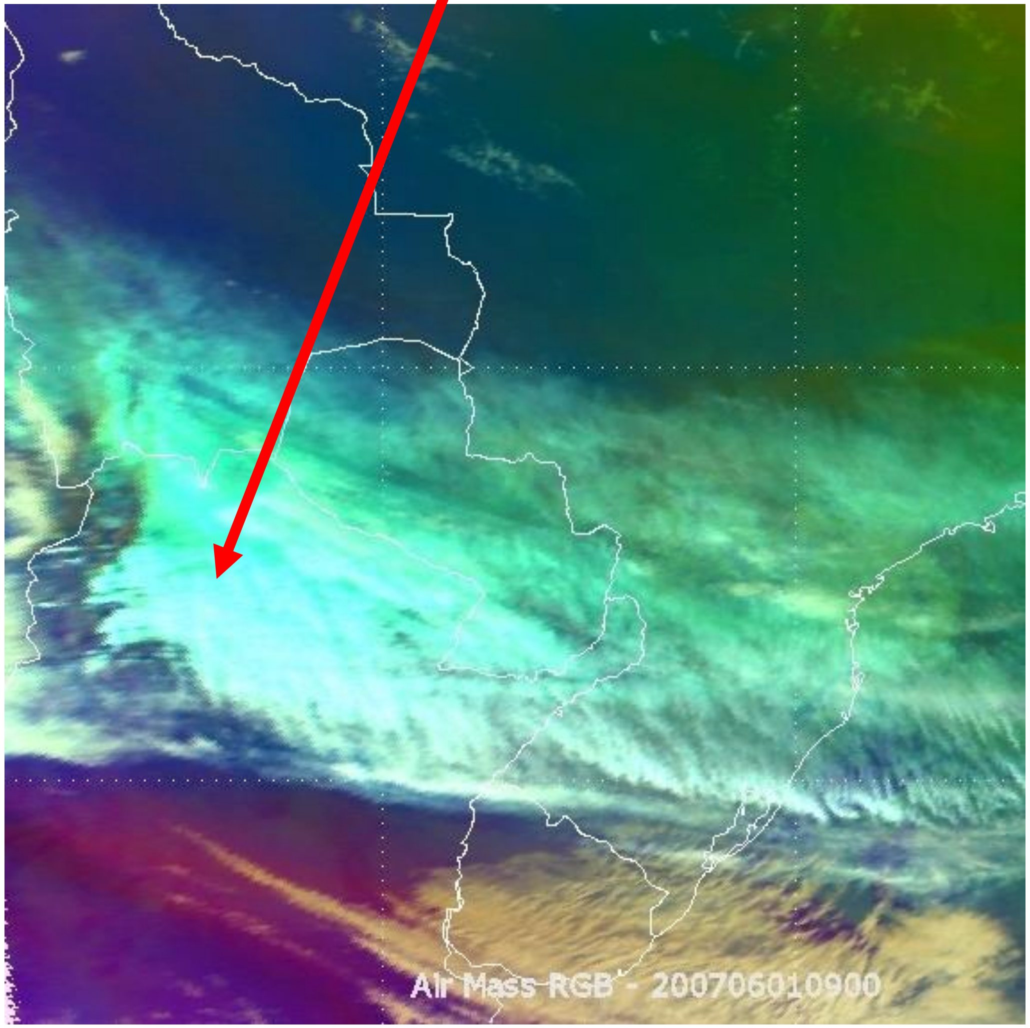
9 October 2006, 12:00 UTC

Unusual colours because of:

very high wave clouds with small ice particles



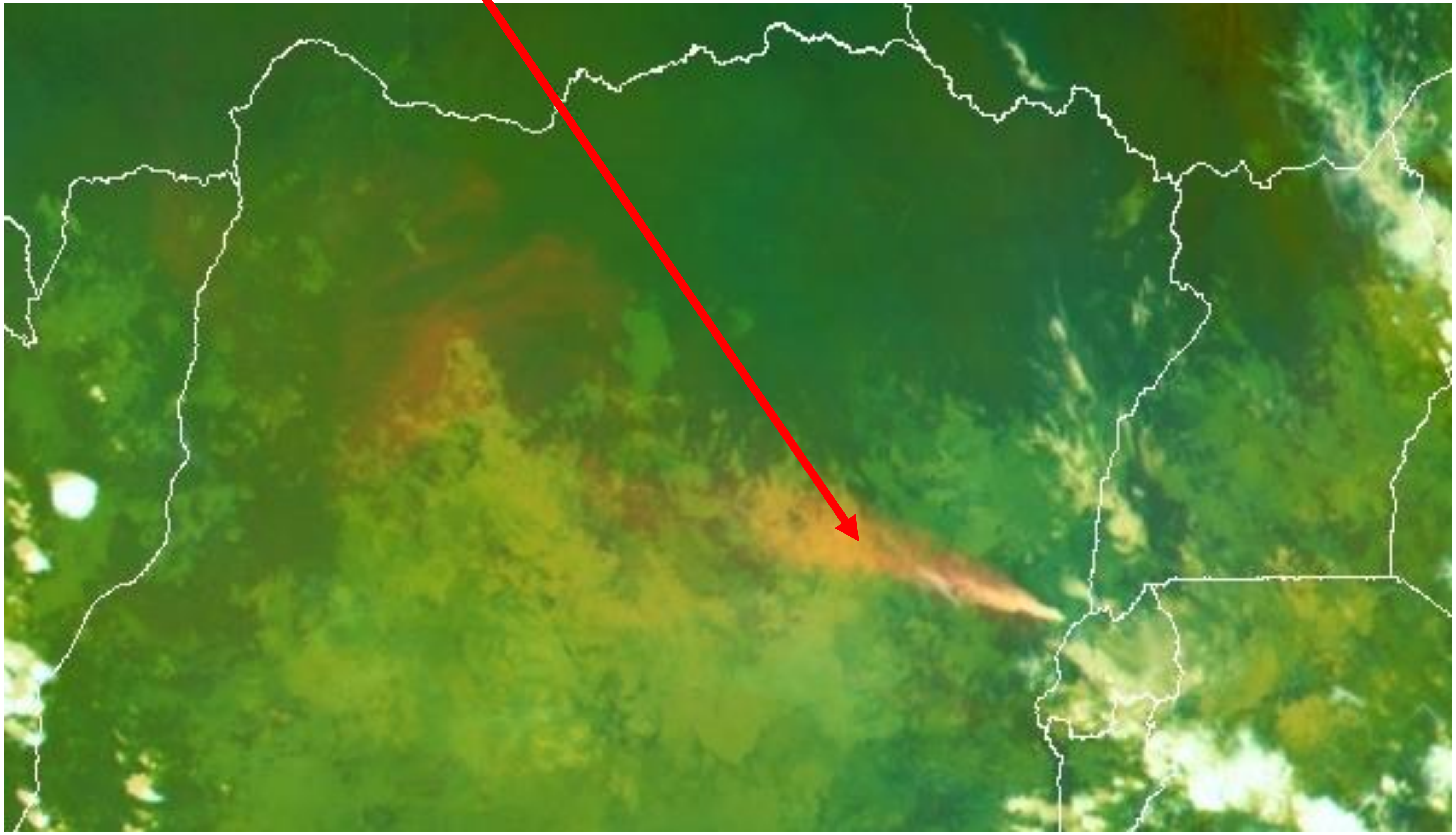
29 June 2005, 12:15 UTC



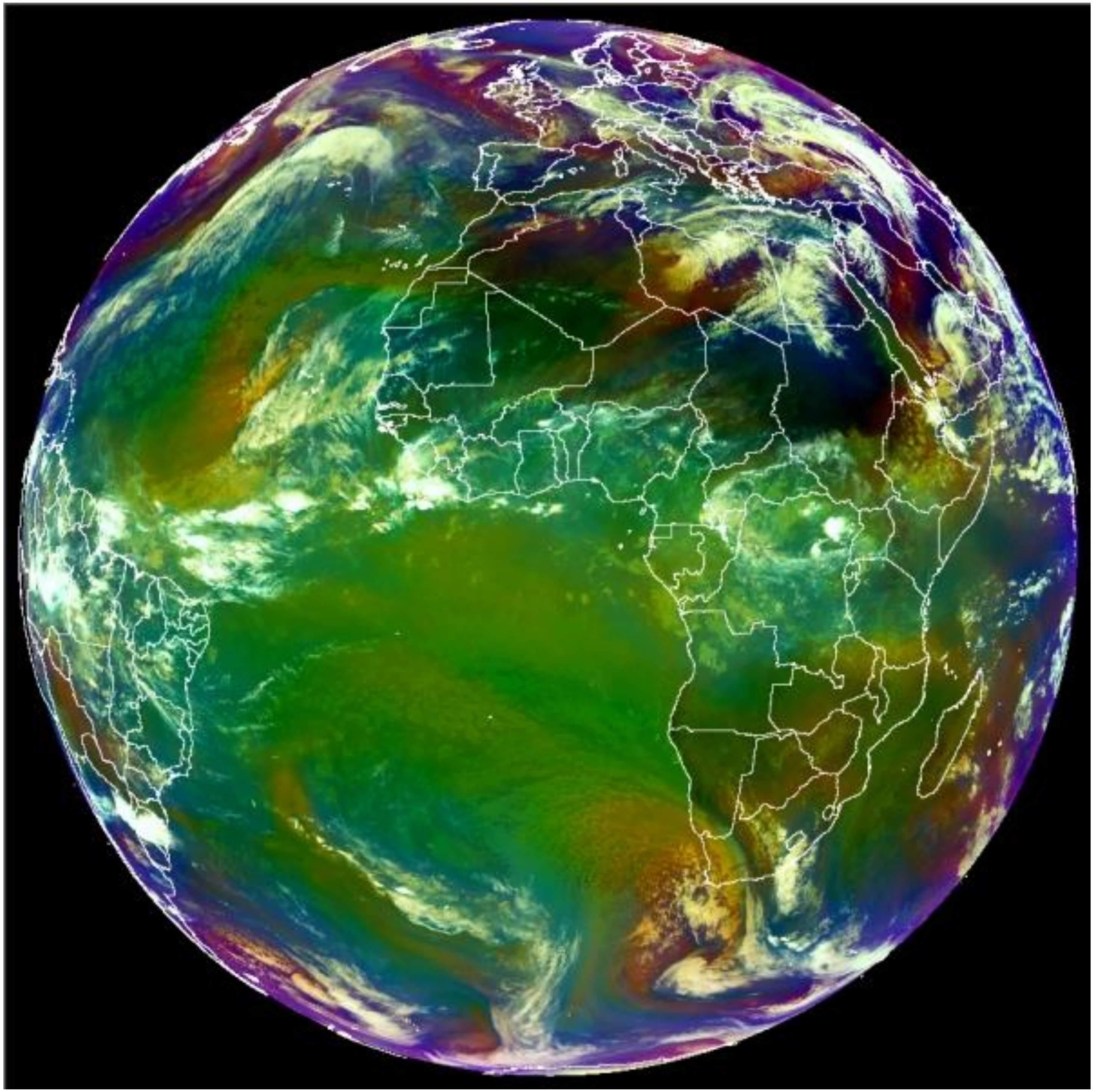
1 June 2007, 09:00 UTC

Unusual colours because of:

SO2 plume (Nyamuragira eruption)



MSG-1, 29 November 2006, 11:00 UTC

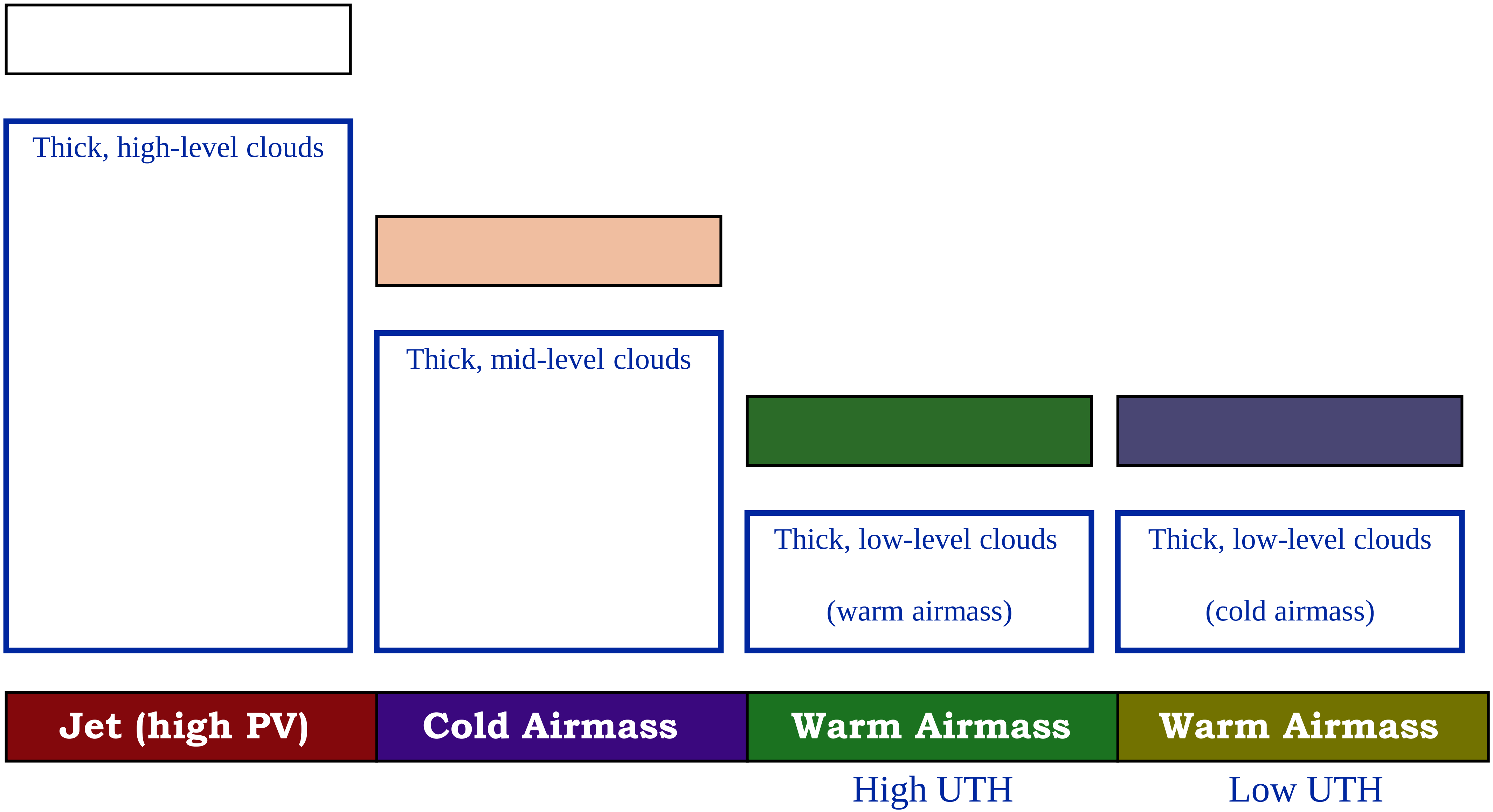


RGB Airmass Global View

Note: warm airmasses seen at a high satellite viewing angle appear with a bluish colour (limb cooling effect) !

MSG-1
19 April 2005
10:00 UTC

RGB Airmass: Interpretation of Colours



3a. RGB 10-09, 09-04, 09 ("Night Microphysics")

devised by: D. Rosenfeld

R = Difference IR12.0 - IR10.8
G = Difference IR10.8 - IR3.9
B = Channel IR10.8

Applications:	Cloud Analysis, Fog, Contrails, Snow
Area:	Full MSG Viewing Area
Time:	Night-Time
Users:	most European & African NMSs, Middle East

Physical Interpretation
(for dust/ash/water/ice clouds)

R = Difference IR12.0 - IR10.8
Optical Thickness, Tsurf-Tcloud

G = Difference IR10.8 – IR3.9
Optical Thickness, Tsurf-Tcloud, Phase, Particle Size

B = Channel IR10.8
Top Temperature

3a. RGB 10-09, 09-04, 09 ("Night Microphysics")

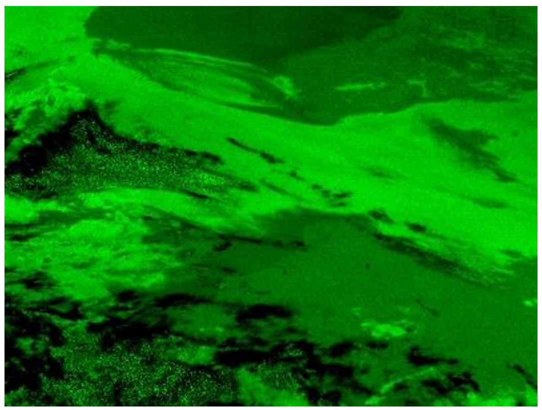
devised by: D. Rosenfeld

Recommended Range and Enhancement:

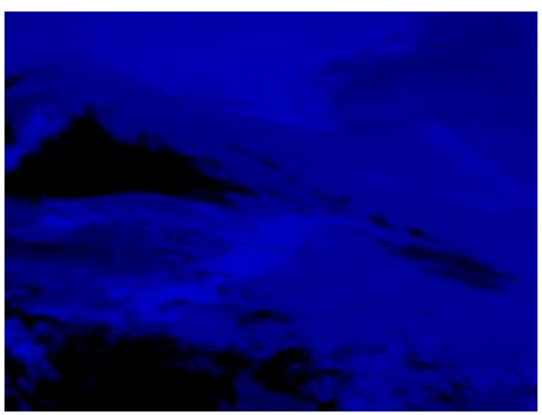
Beam	Channel	Range	Gamma
Red	IR12.0 - IR10.8	-4 … +2 K	1.0
Green	IR10.8 - IR3.9	0 … +10 K	1.0
Blue	IR10.8	+243 … +293 K	1.0

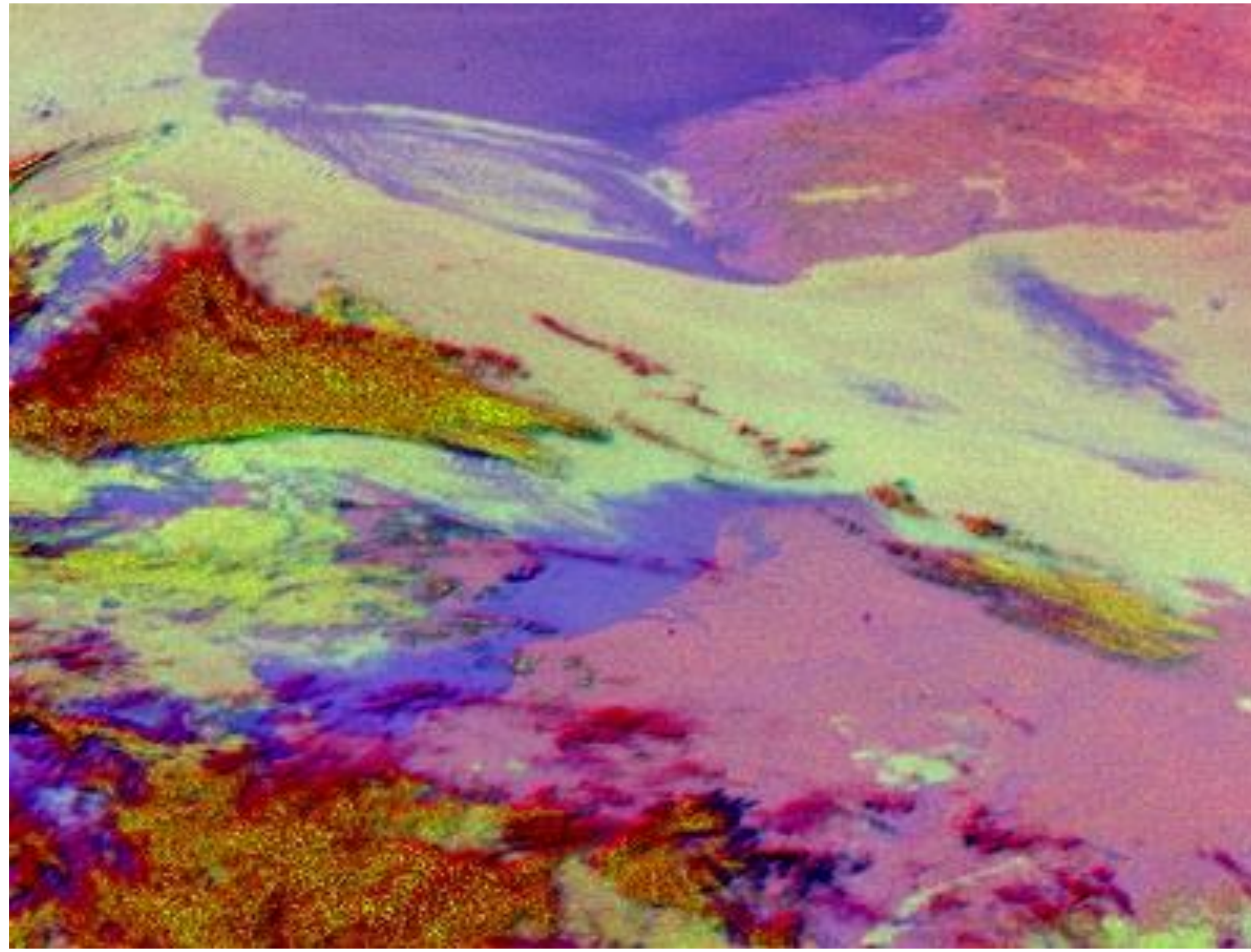
Ch.10
-Ch.09

Ch.09
-Ch.04



Ch.09

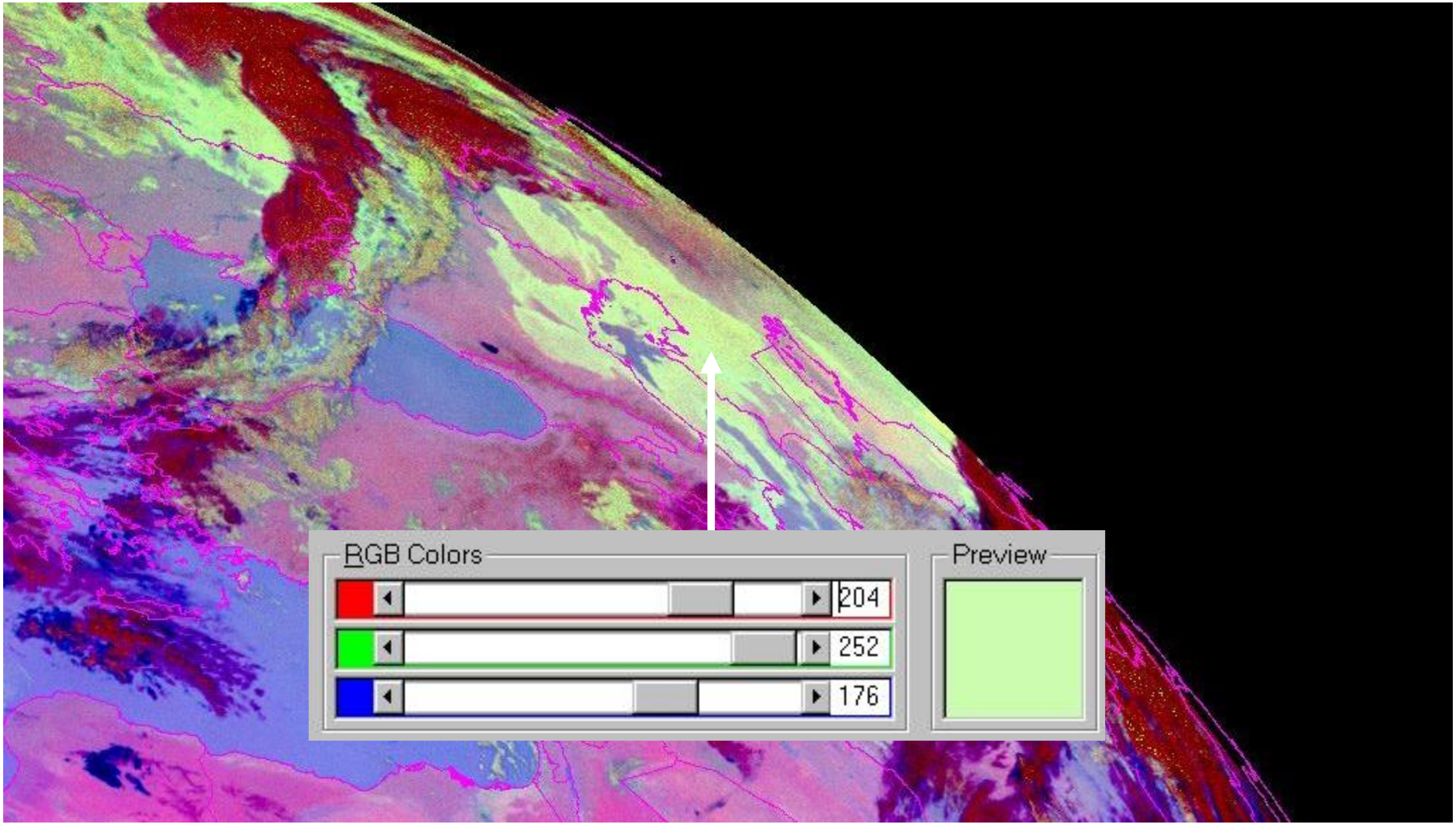




MSG-1, 9 November 2003, 02:45 UTC
RGB Composite 10-09, 09-04, 09

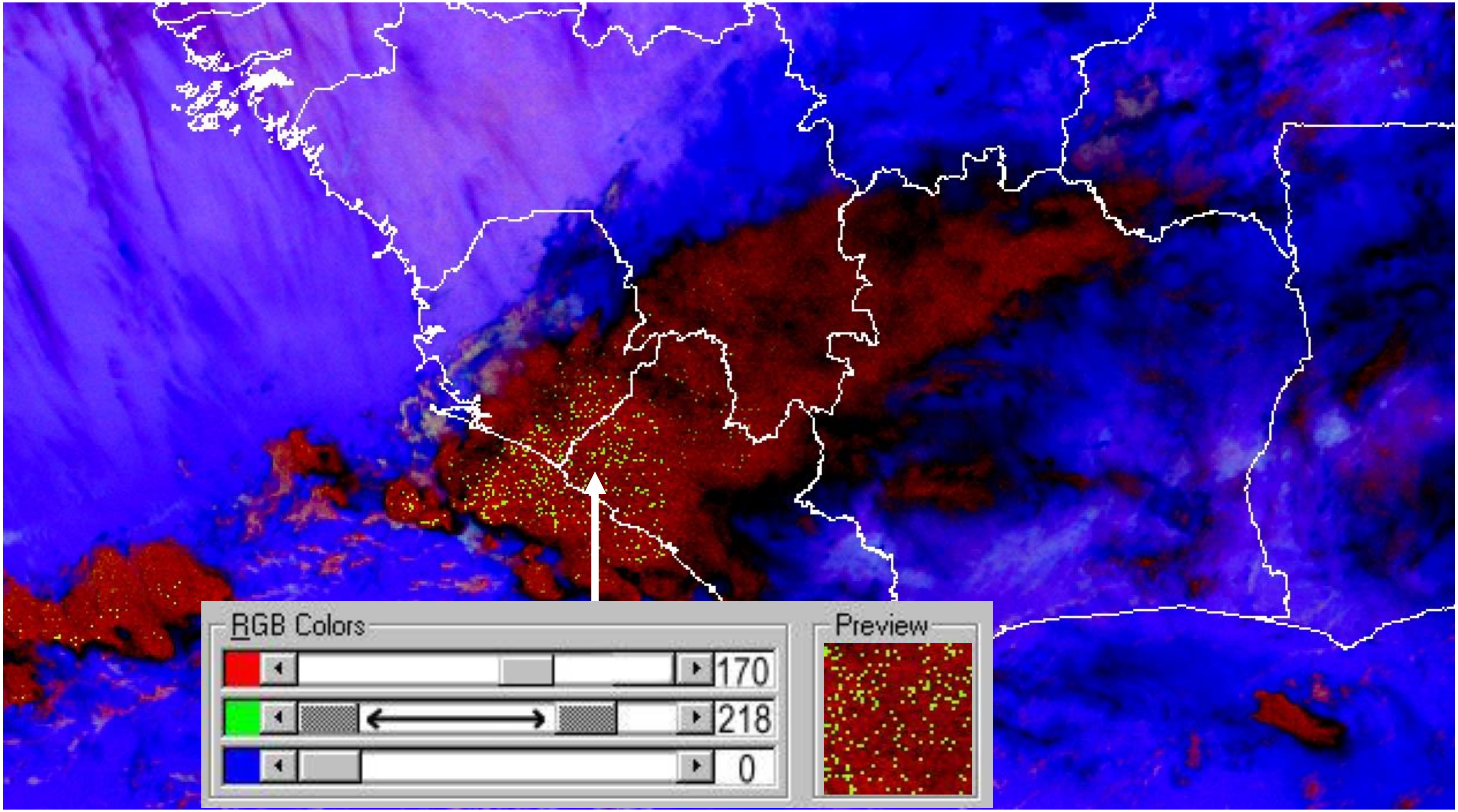
EUMETSAT

Example: Fog



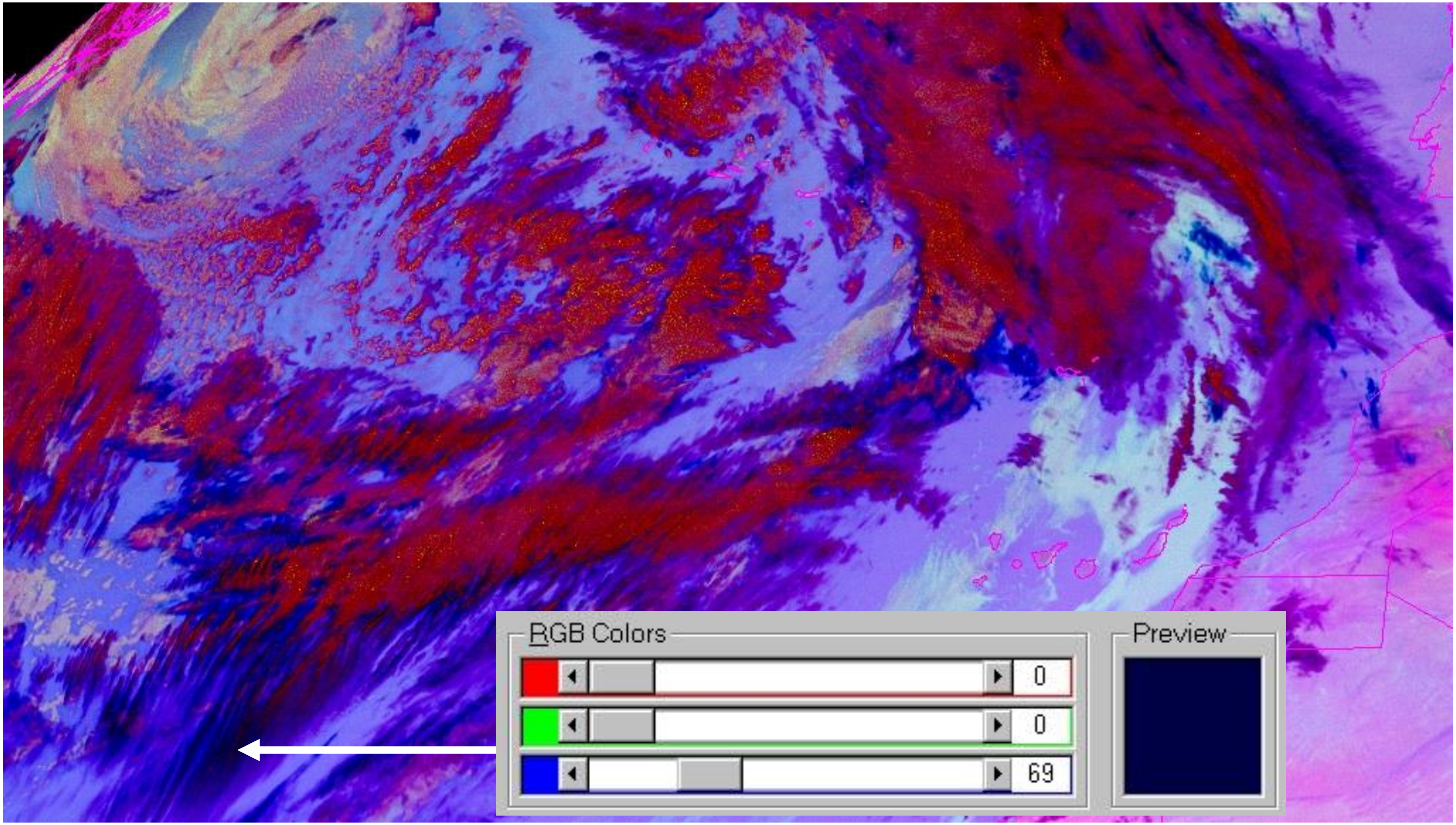
MSG-1, 14 March 2005, 00:00 UTC

Example: Cb



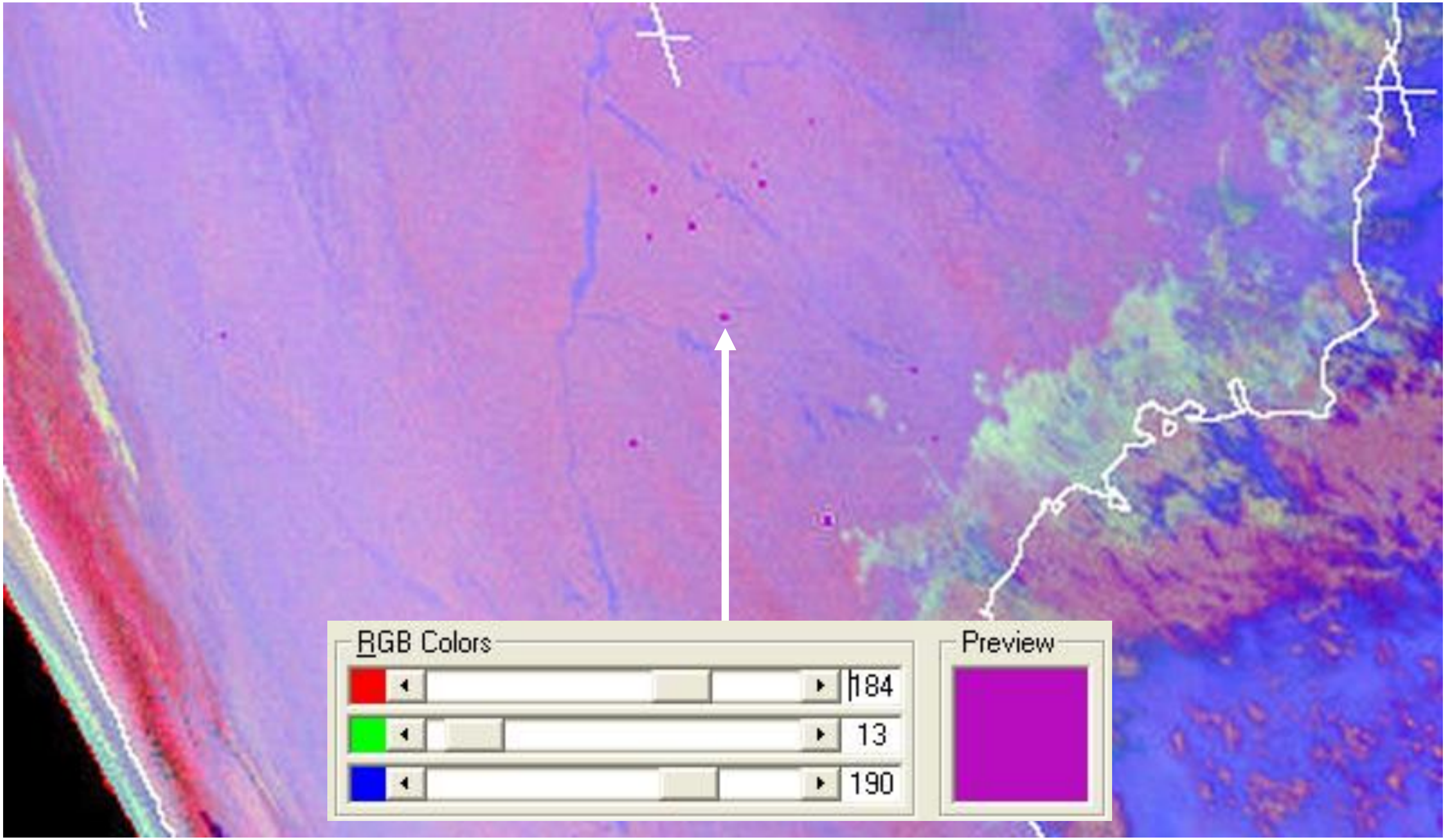
MSG-1, 19 April 2005, 03:15 UTC

Example: Cirrus



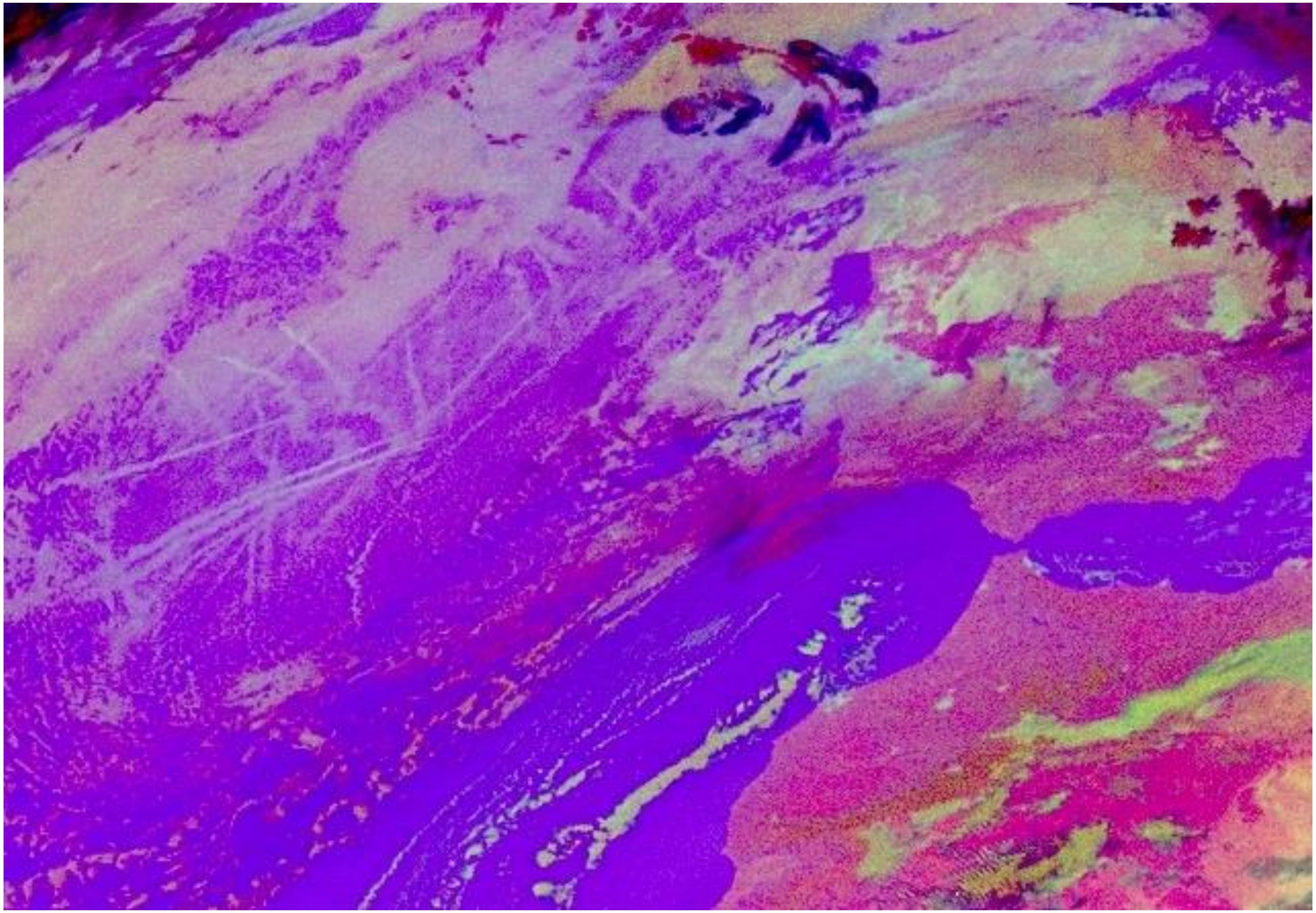
MSG-1, 18 March 2005, 00:00 UTC

Example: Fire



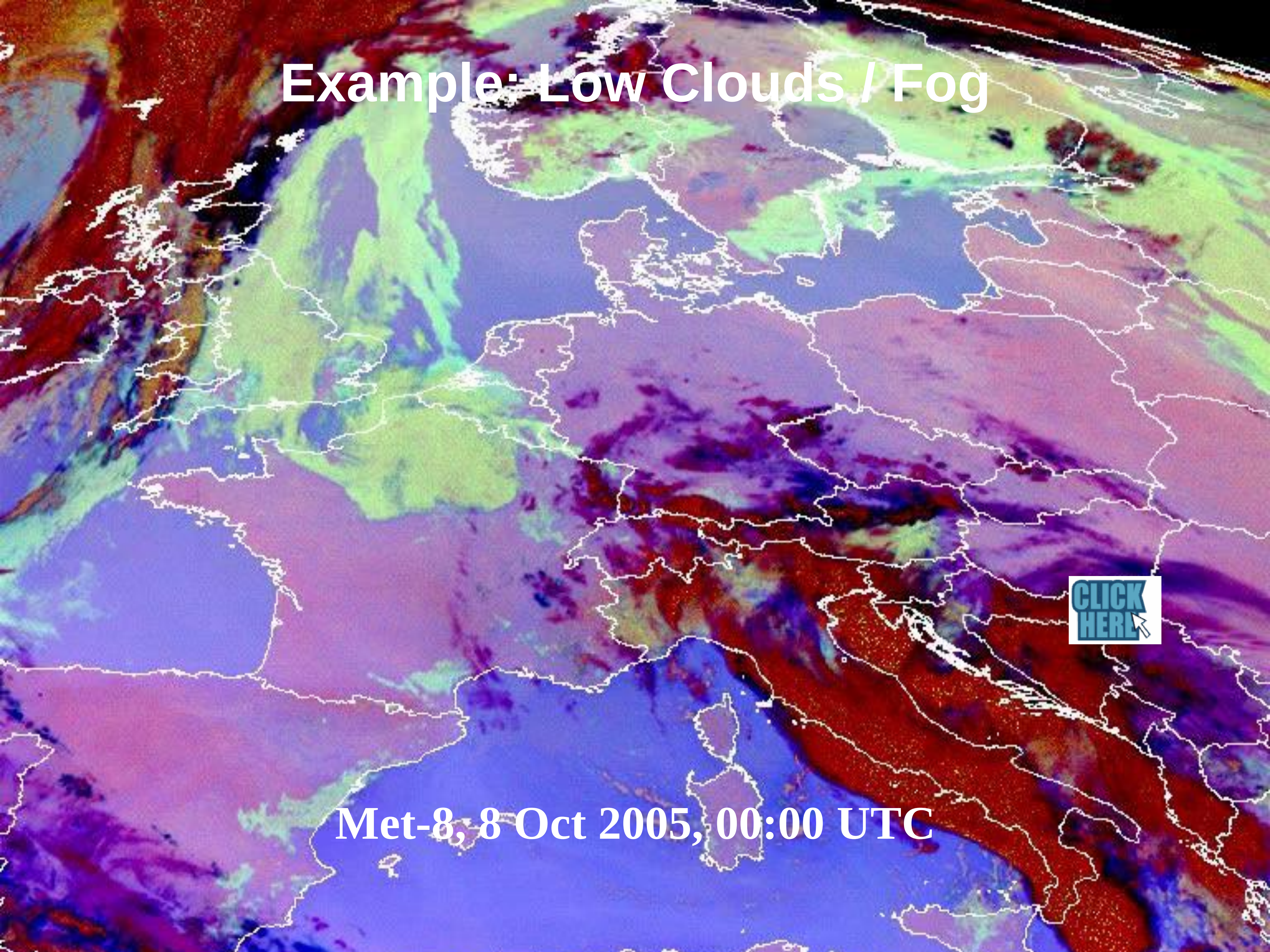
MSG-1, 16 May 2006, 00:00 UTC

Example: Ship Trails

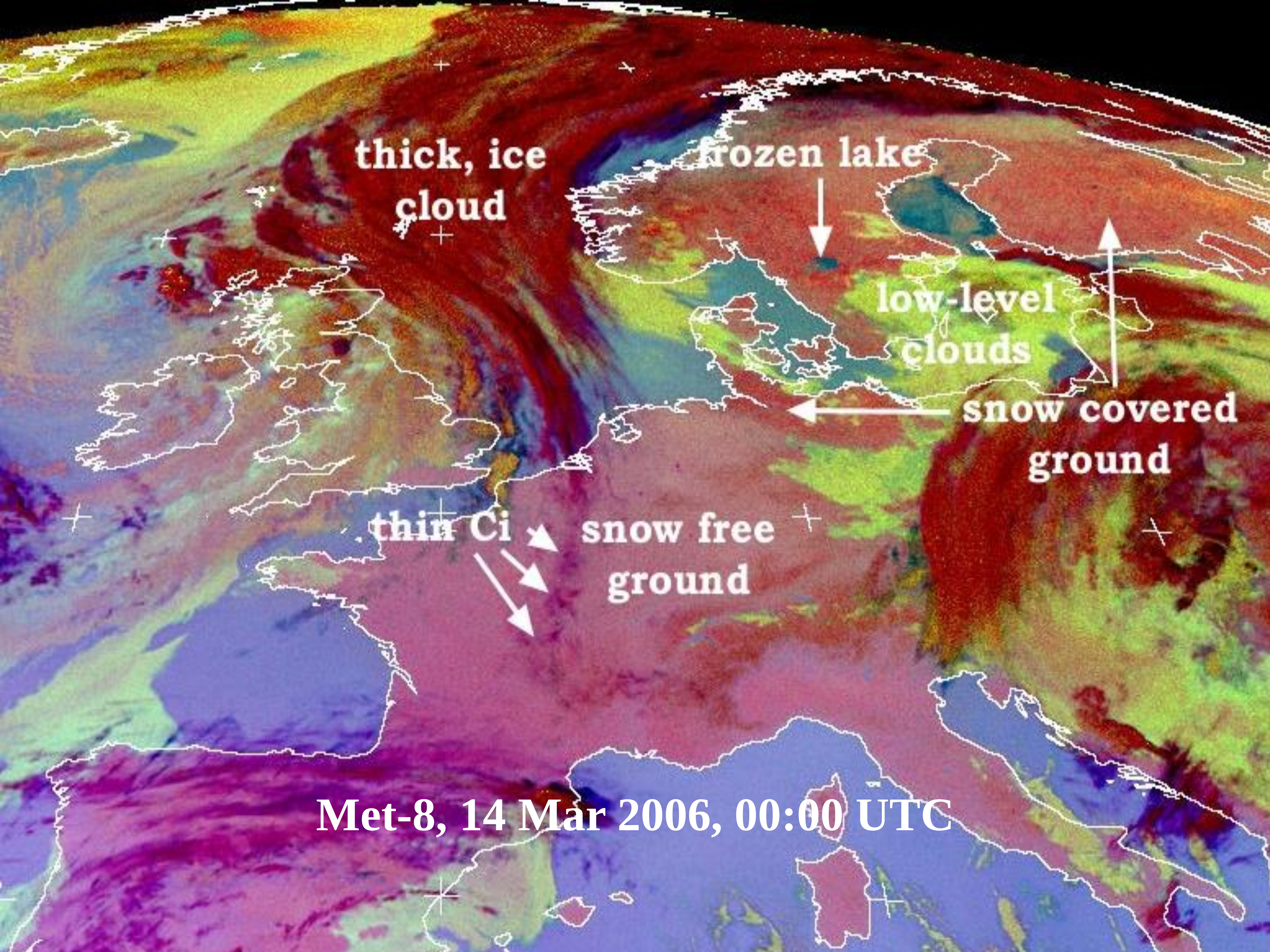


MSG-1, 18 January 2006, 04:00 UTC

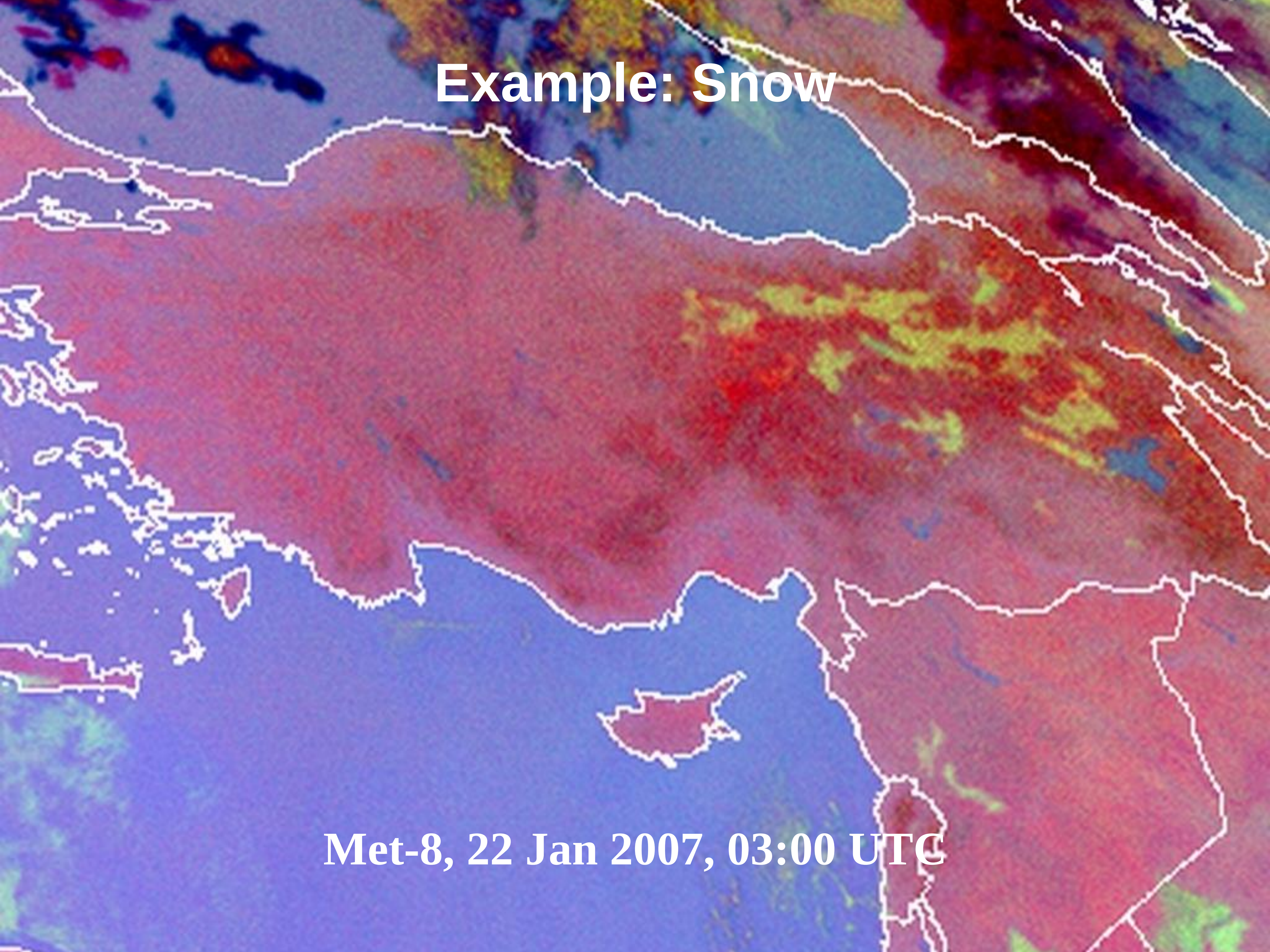
Example: Low Clouds / Fog



Met-8, 8 Oct 2005, 00:00 UTC

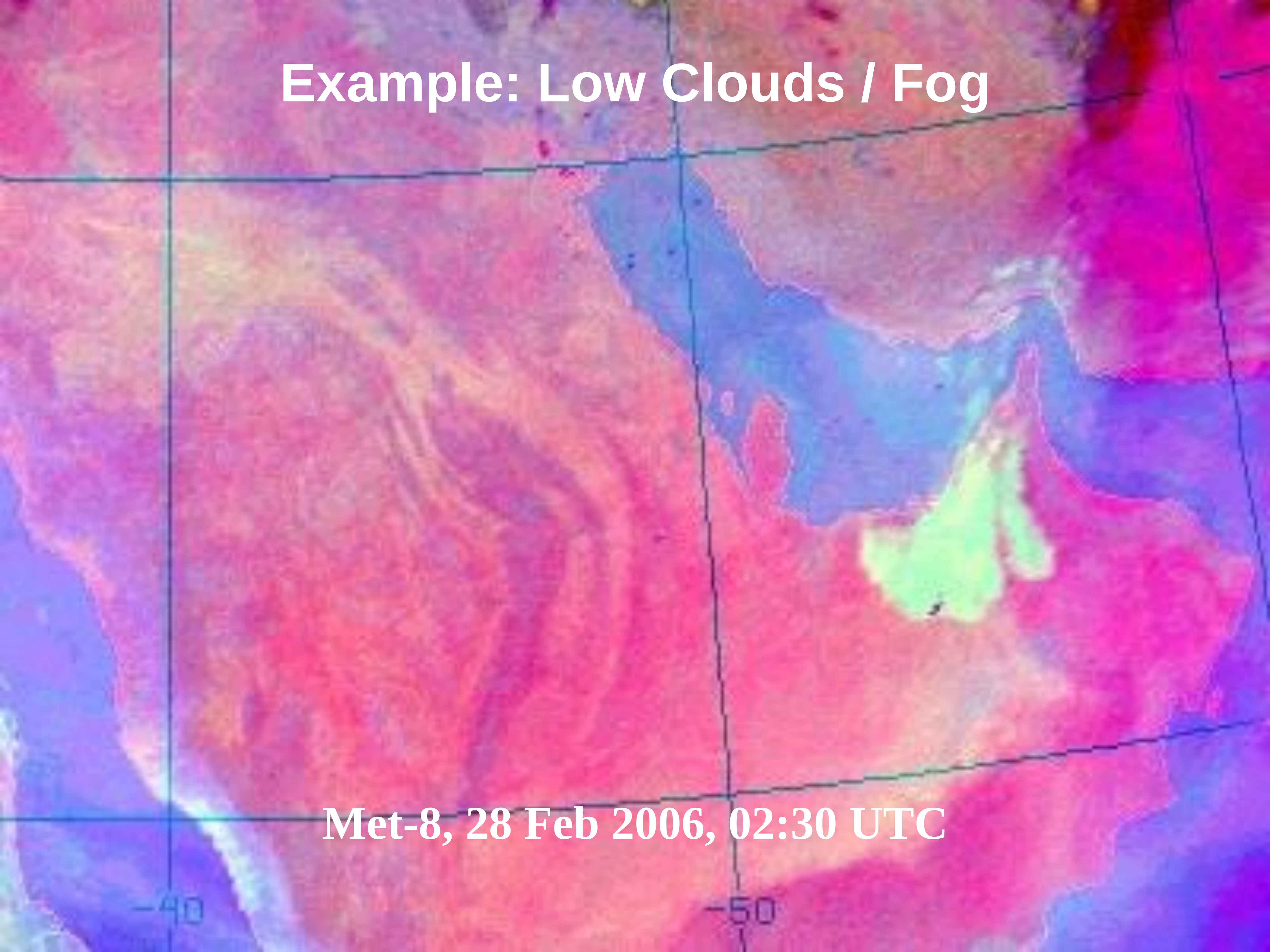

thick, ice cloud
frozen lake
low-level clouds
snow covered ground
thin Ci
snow free ground
Met-8, 14 Mar 2006, 00:00 UTC

Example: Snow



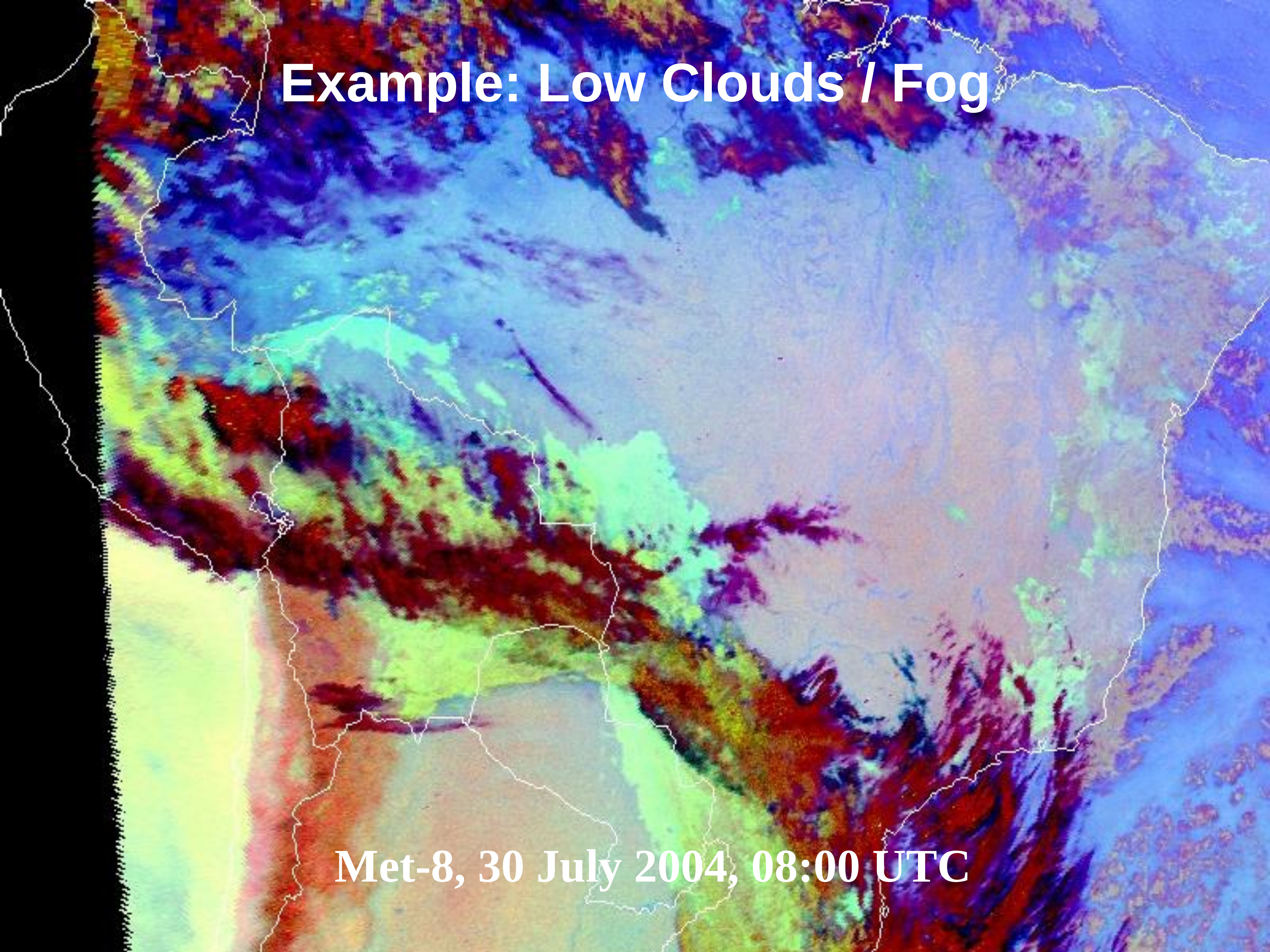
Met-8, 22 Jan 2007, 03:00 UTC

Example: Low Clouds / Fog



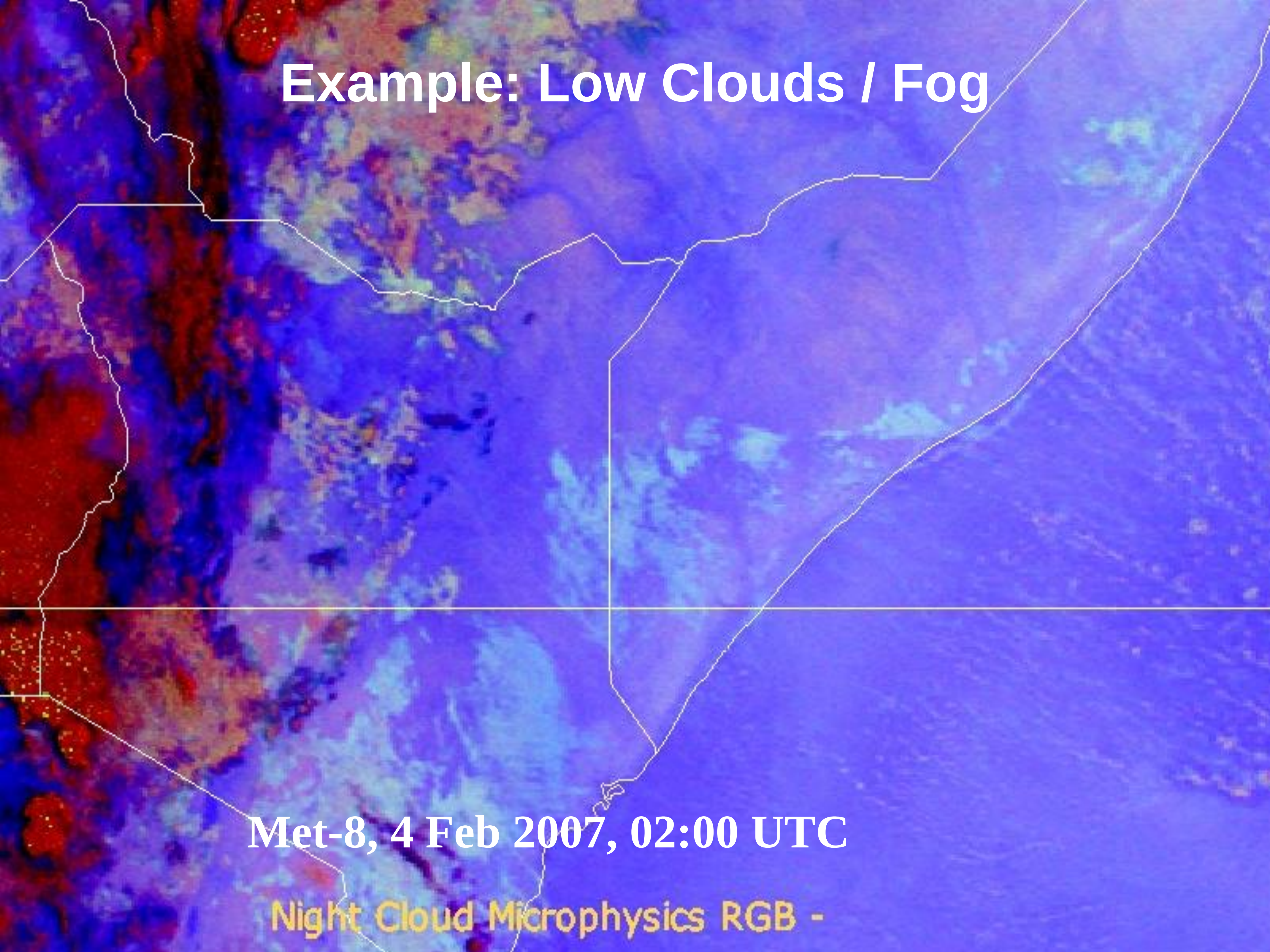
Met-8, 28 Feb 2006, 02:30 UTC

Example: Low Clouds / Fog



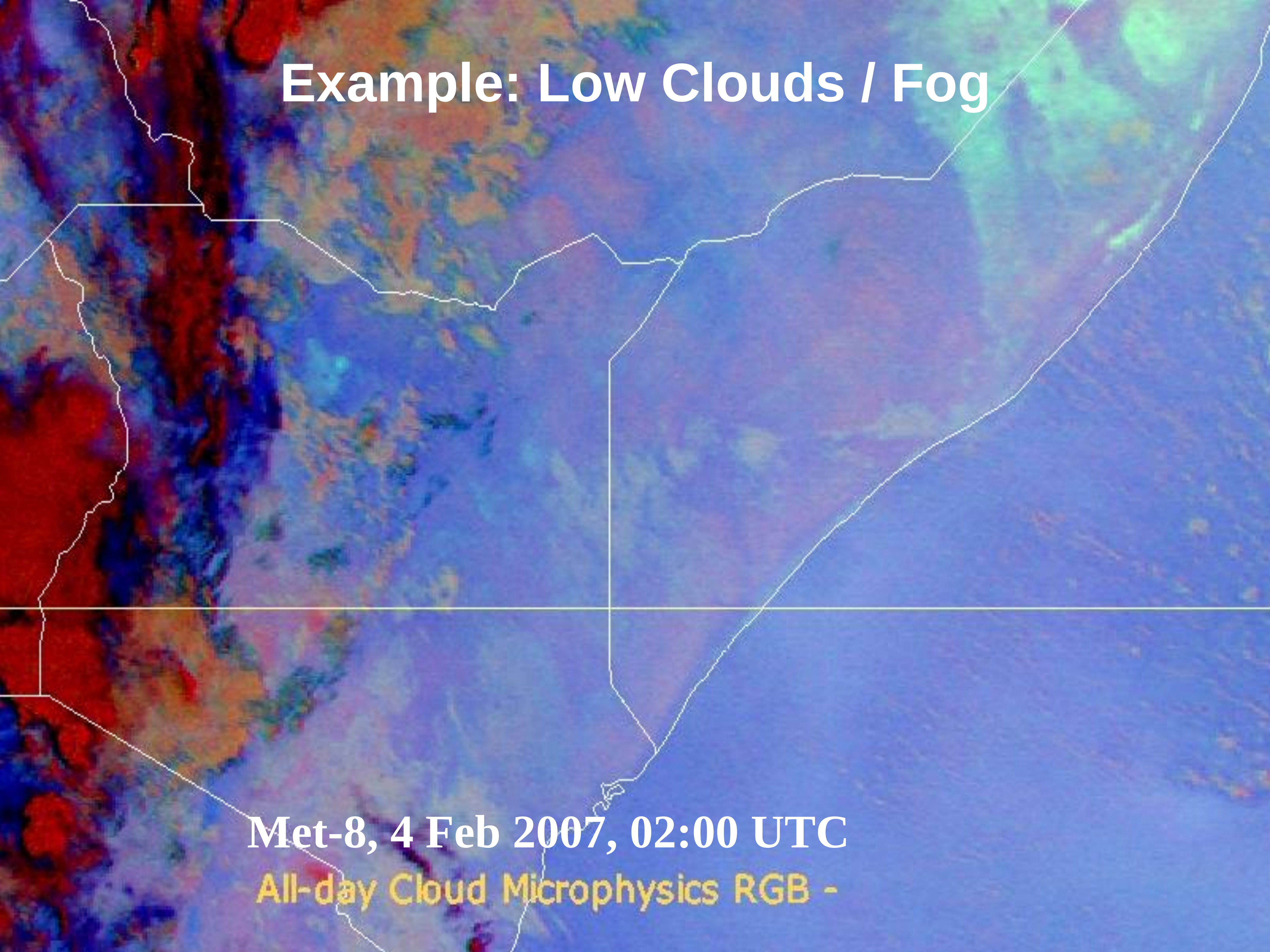
Met-8, 30 July 2004, 08:00 UTC

Example: Low Clouds / Fog



Met-8, 4 Feb 2007, 02:00 UTC

Example: Low Clouds / Fog



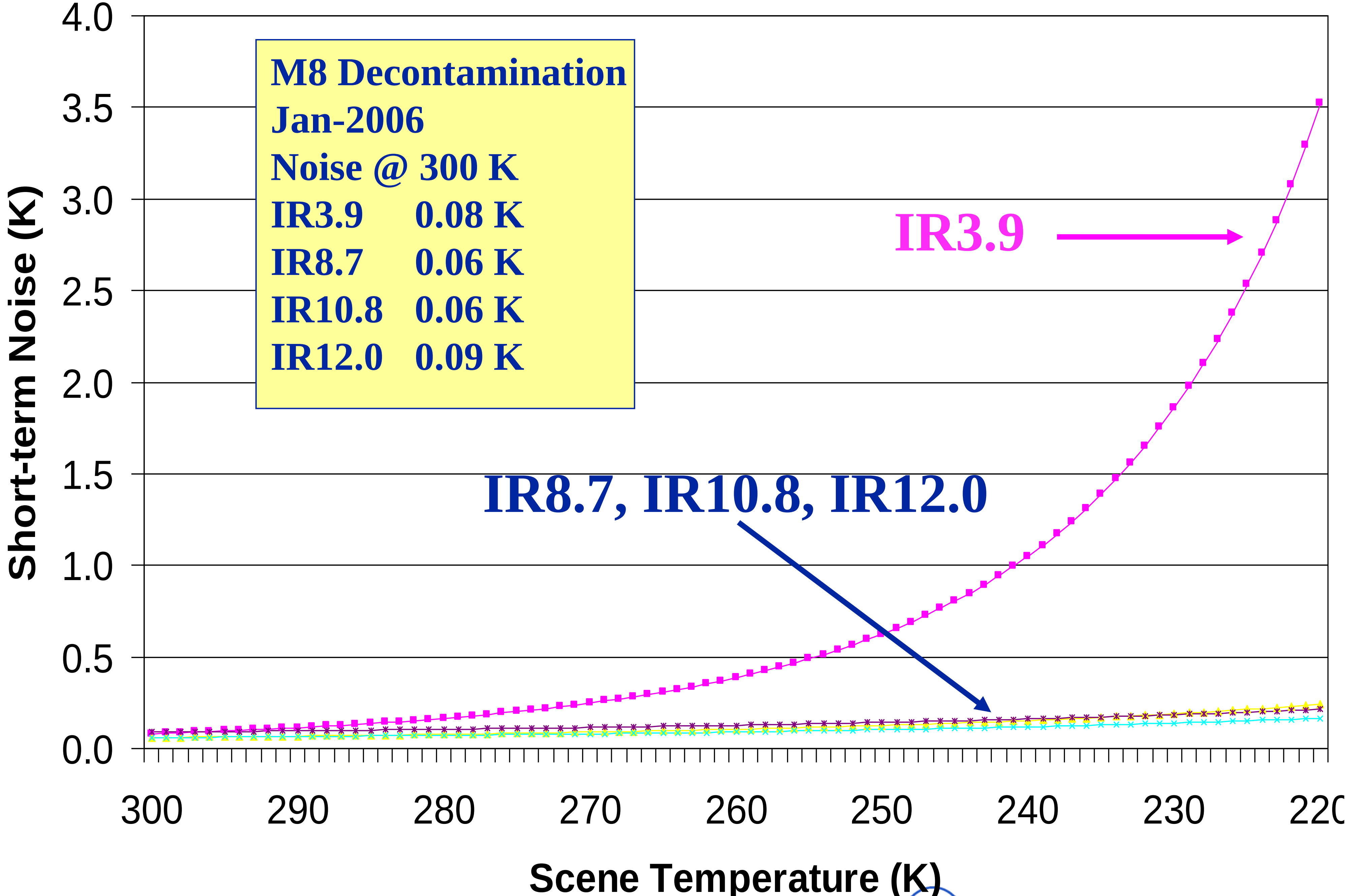
Met-8, 4 Feb 2007, 02:00 UTC

Fog detection in cold winter situations at high latitudes

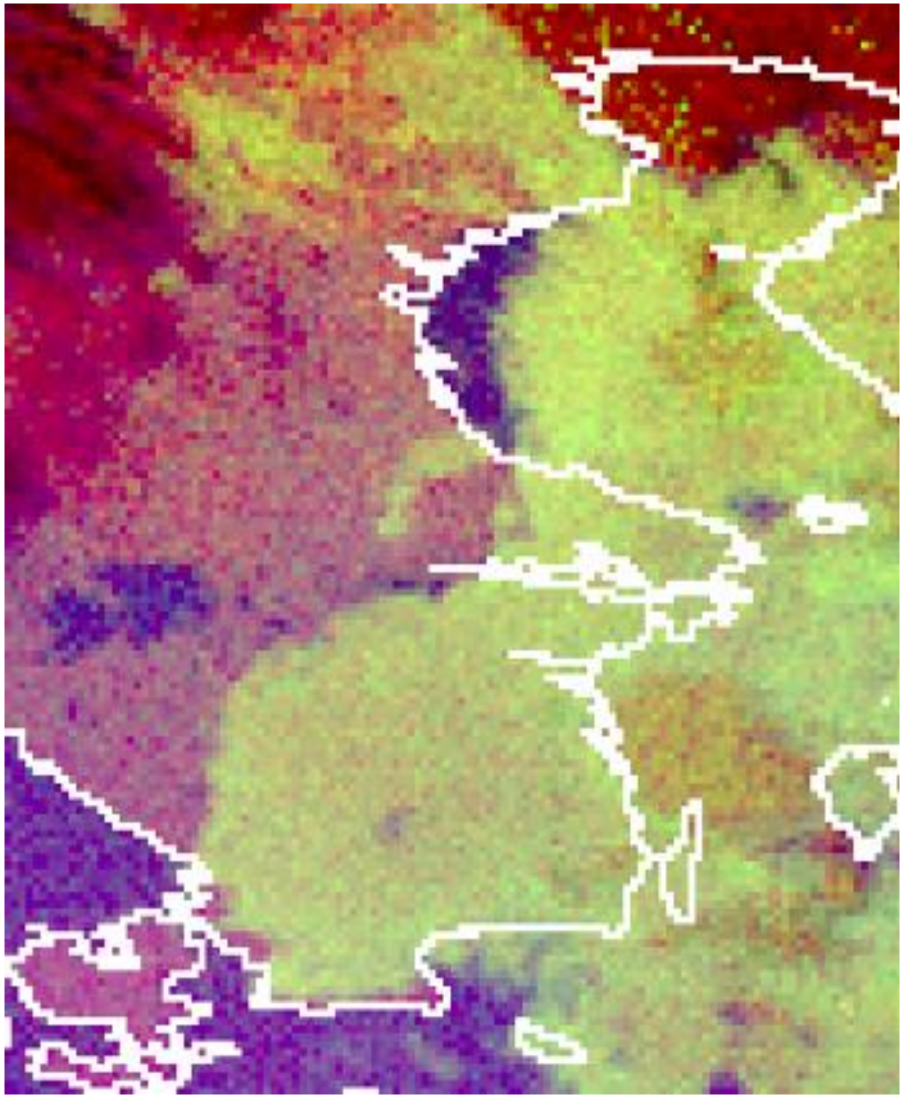
Anna Eronn
Swedish Meteorological and Hydrological Institute

graduate trainee at EUMETSAT
Aug 2006 – May 2007

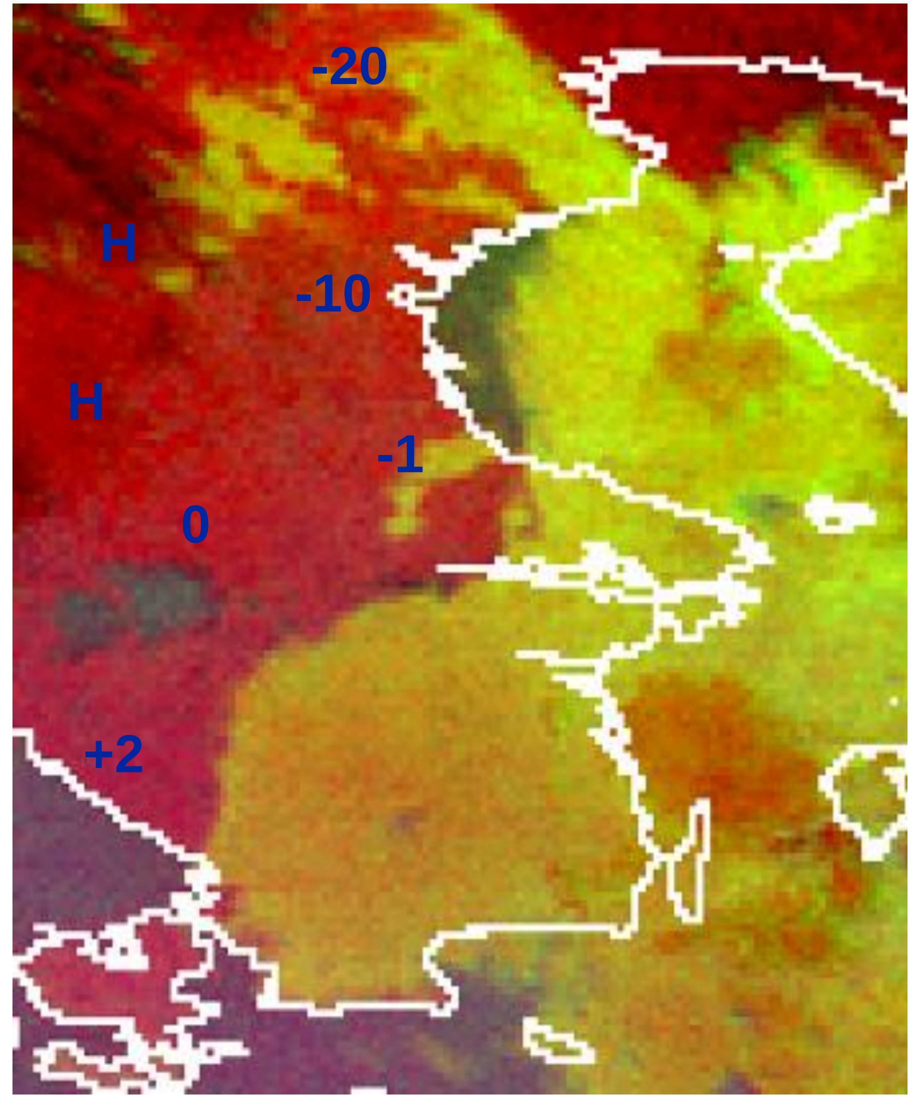
Short-term Noise of IR Channels



Comparison: RGB Night vs RGB 24-hour



RGB Night Microphys. (IR3.9)

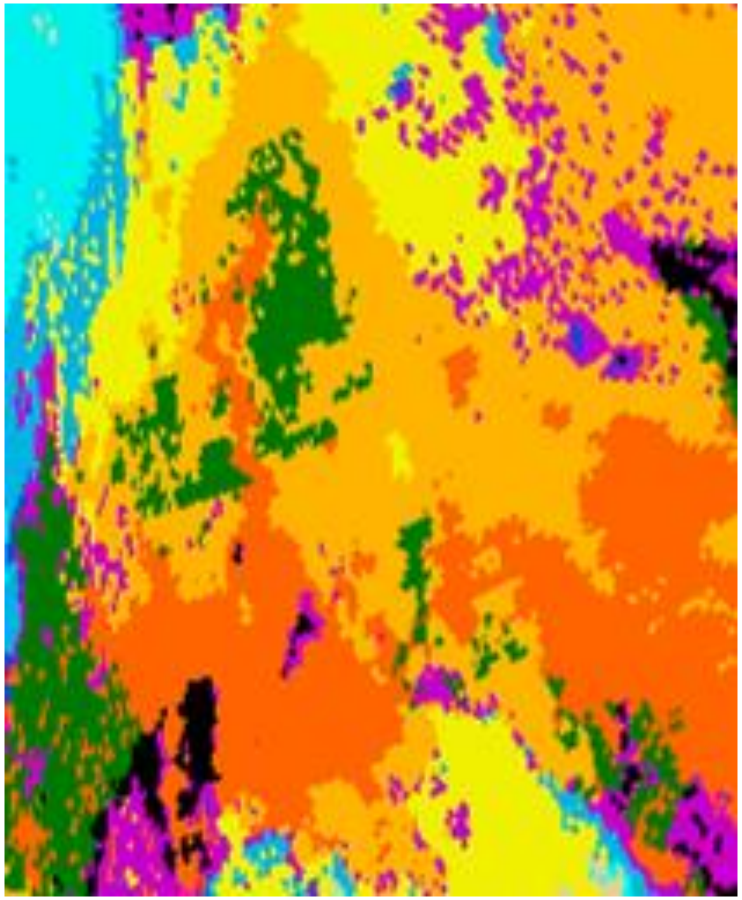


RGB 24-hour Cloud Microphys. (IR8.7)

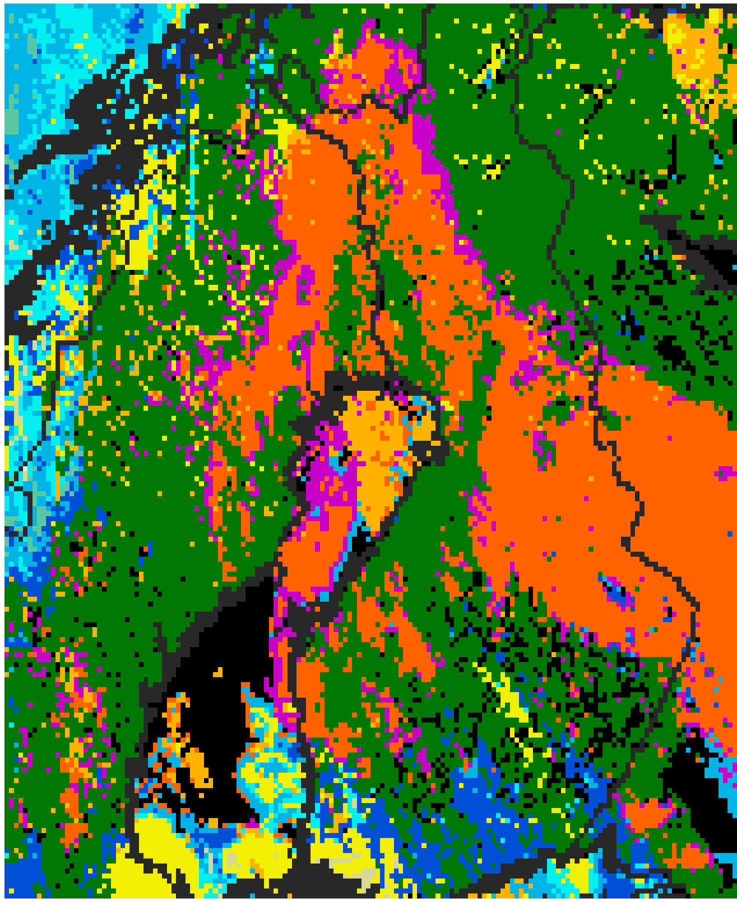
Met-8, 1 Feb 2007, 01:45 UTC

Comparison: RGBs vs Cloud Type Product

24-hour Microphys. RGB



Cloud Type (MSG, SMHI)

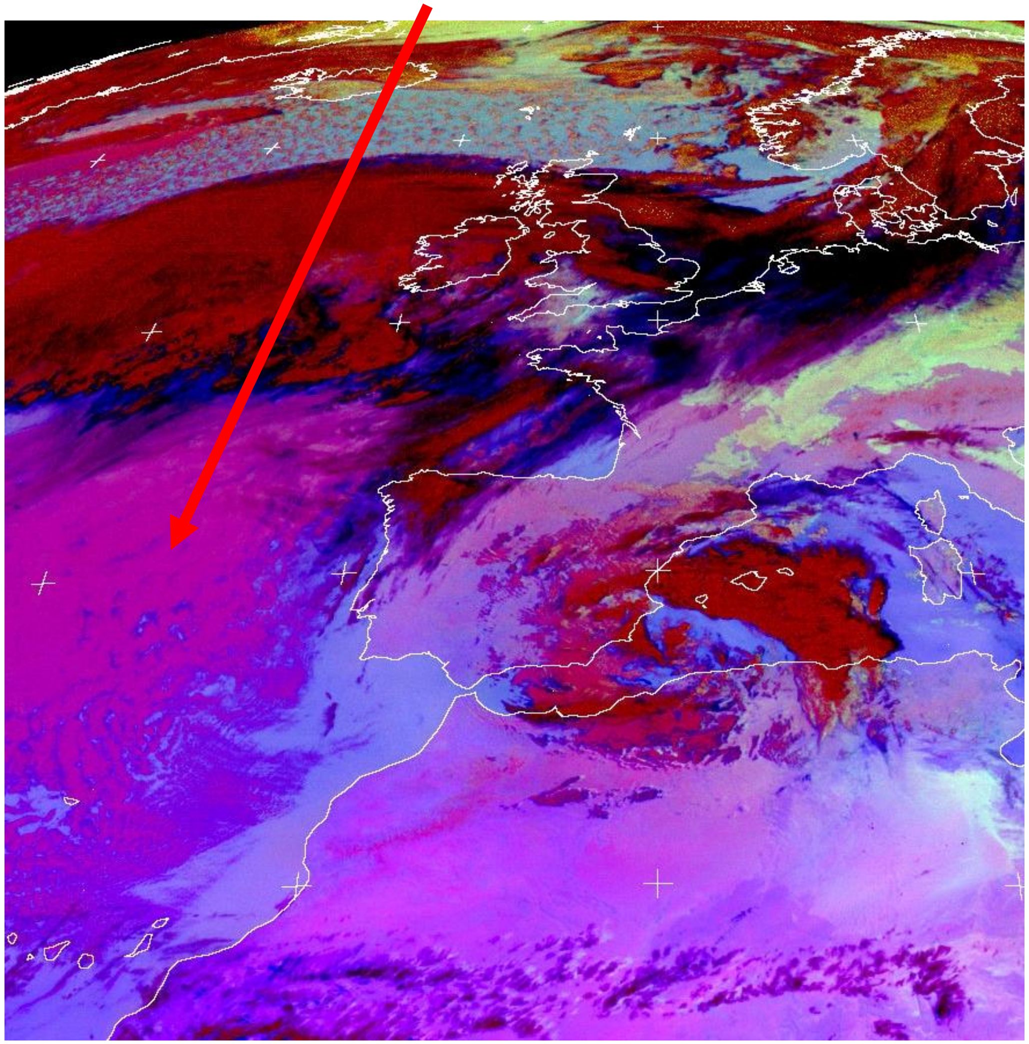


Cloud Type (NOAA, SMHI)

Met-8, 20 Dec 2006, 00:30 UTC; NOAA-18, 20 Dec 2006, 0:22 UTC

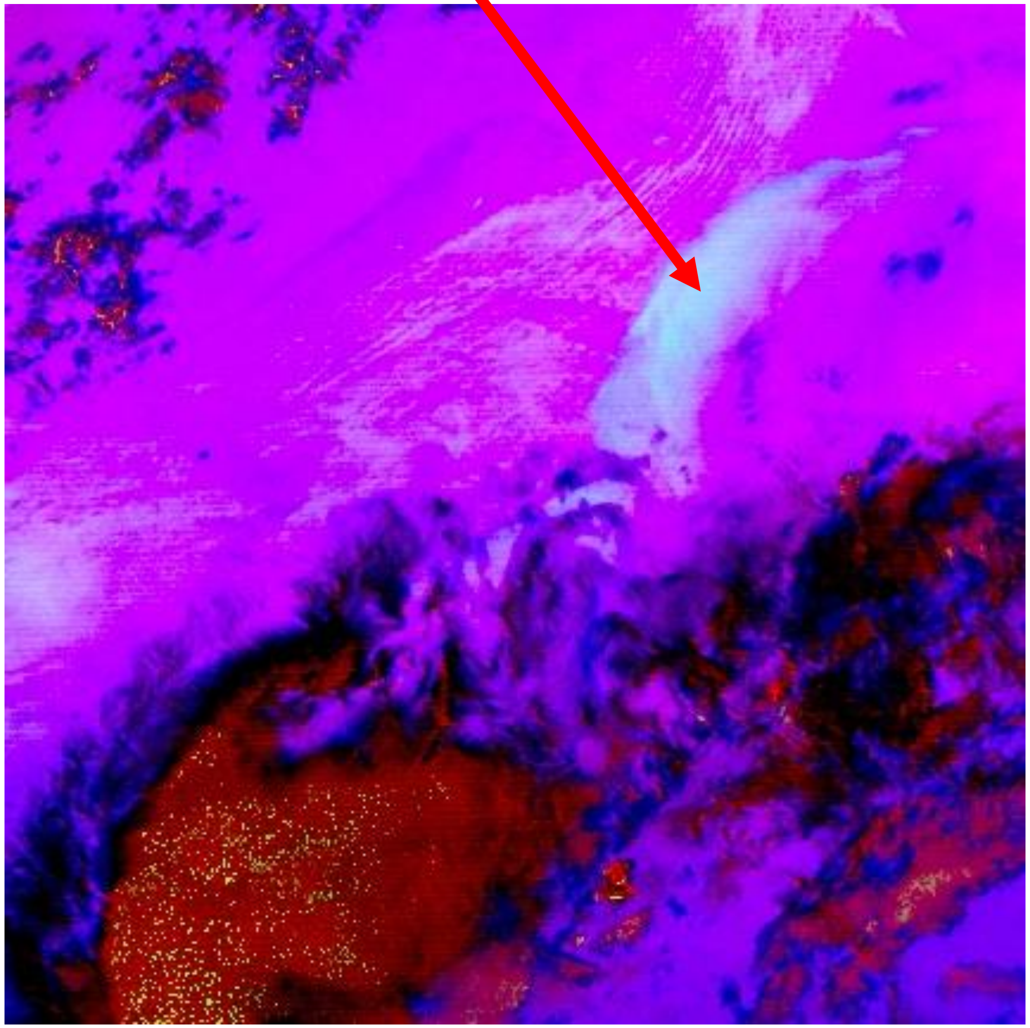
Unusual colours because of:

reflected sun light



10 November 2005, 16:00 UTC

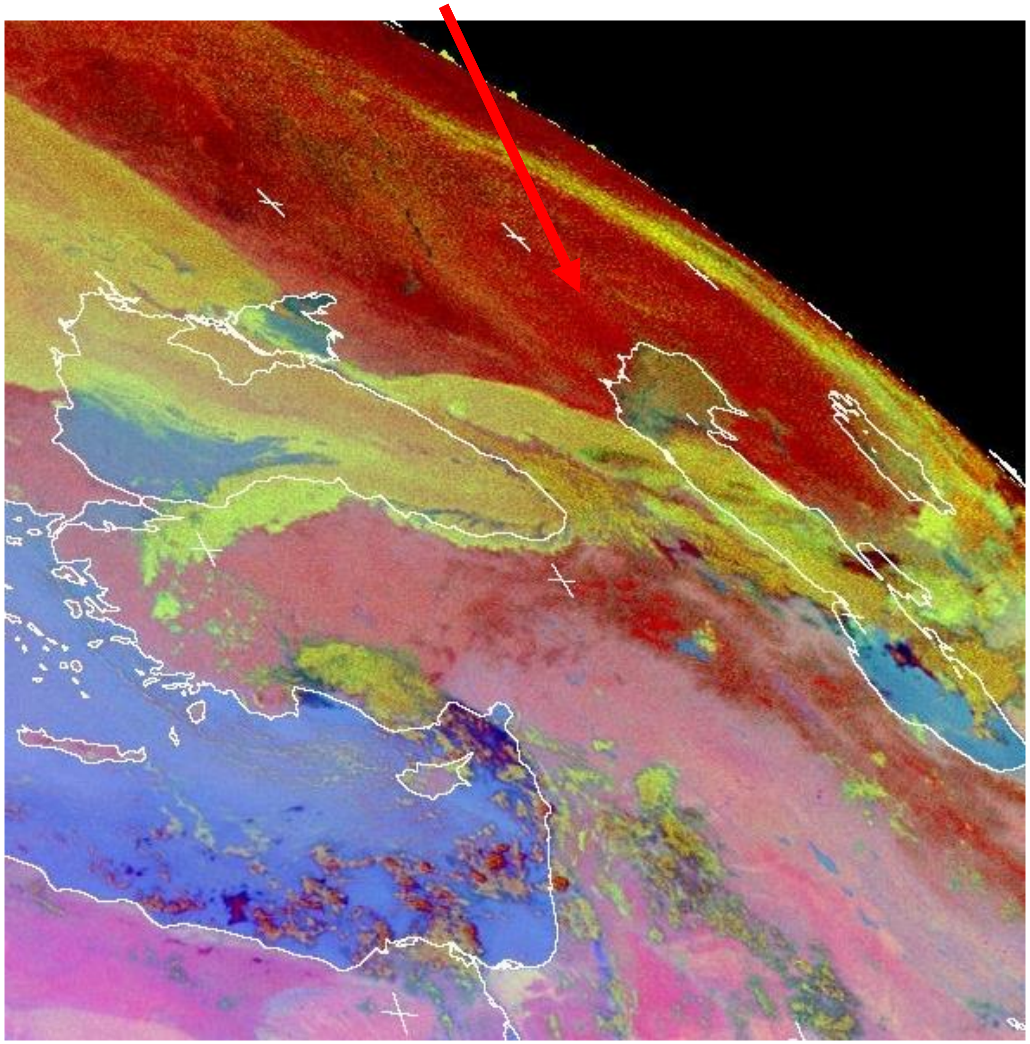
dust cloud



14 July 2003, 02:00 UTC

Unusual colours because of:

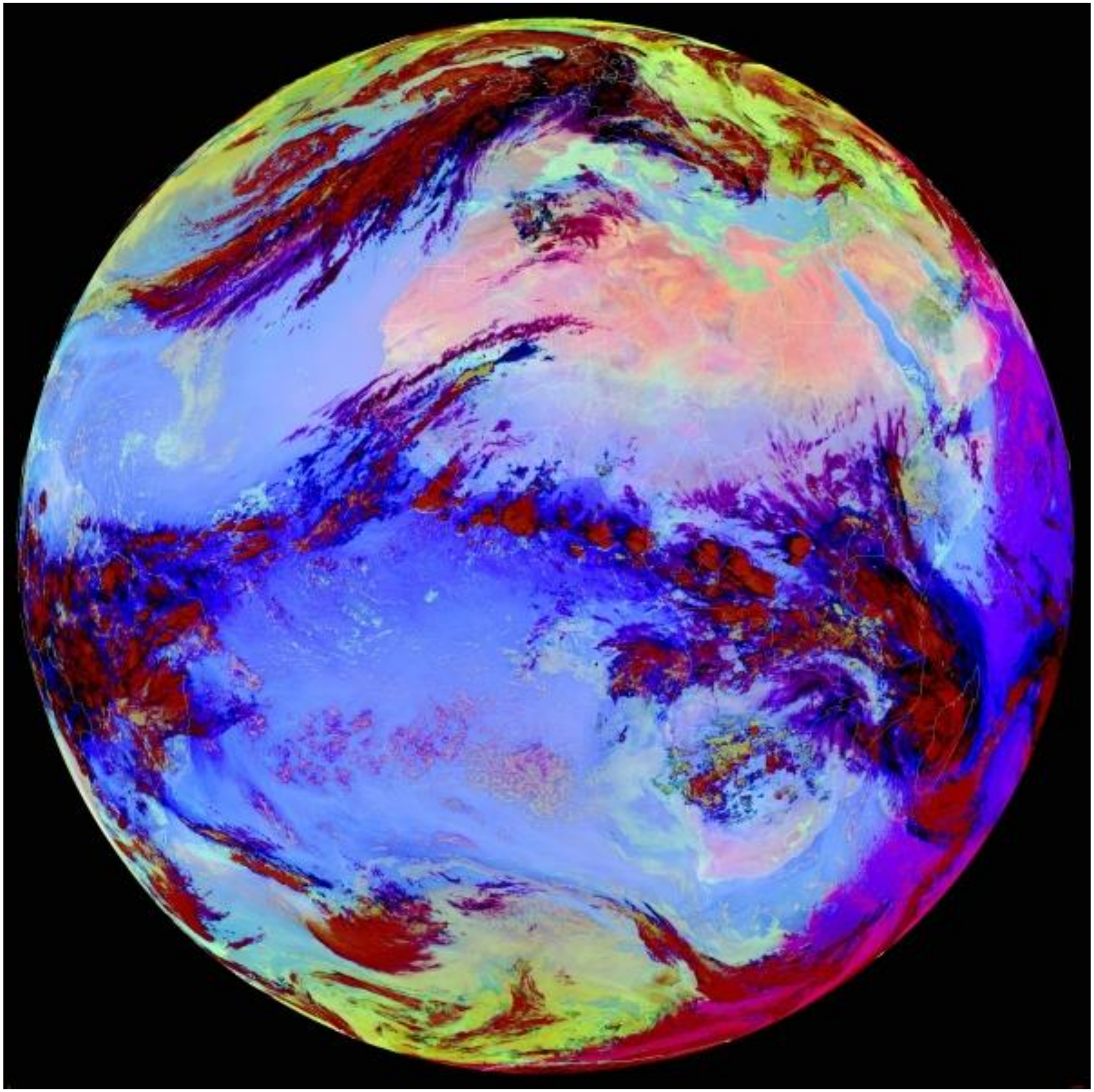
very cold snow surface



17 January 2006, 16:00 UTC

stray light during eclipse

28 August 2006, 00:00 UTC



RGB Night Microphysics Global View

MSG-1
3 February 2004
03:00 UTC

RGB Night Microphysics: Interpretation of Colours for High-level Clouds

Cold, thick, high-level cloud	Very cold (< -50°C), thick, high-level cloud	Thin Cirrus cloud

Ocean	Land

RGB Night Microphysics: Interpretation of Colours for Mid/Low-level Clouds

Thick, mid-level cloud	Thin, mid-level cloud	Low-level cloud (cold atmosphere, Europe)	Low-level cloud (warm atmosphere, Africa)
Ocean	Ocean	Land	Land

3b. RGB 02, 04r, 09
("Day Microphysics")

devised by: D. Rosenfeld

R = Channel 02 (VIS0.8)

G = Channel 04r (IR3.9, solar component)

B = Channel 09 (IR10.8)

Applications:	Cloud Analysis, Convection, Fog, Snow, Fires
Area:	Full MSG Viewing Area
Time:	Day-Time
Users:	Hungary, Israel, South Africa

Physical Interpretation
(for dust/ash/water/ice clouds)

R = Difference VIS0.8
Optical Thickness, Viewing Geometry

G = Difference IR3.9r
Optical Thickness, Phase, Particle Size, Viewing Geometry

B = Channel IR10.8
Top Temperature

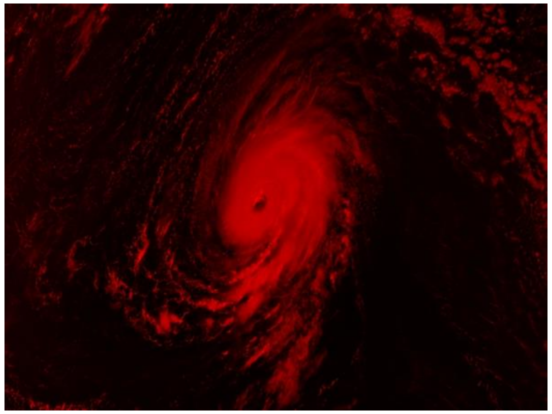
3b. RGB 02, 04r, 09
("Day Microphysics")

devised by: D. Rosenfeld

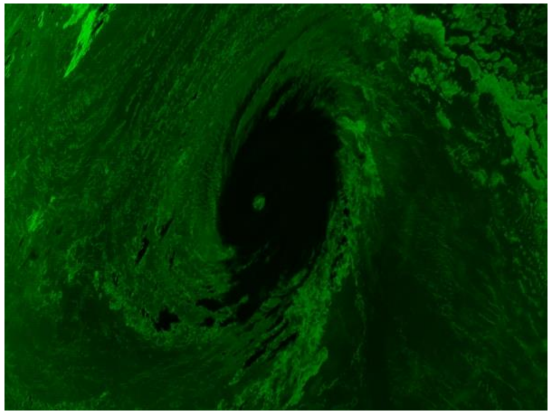
Recommended Range and Enhancement:

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

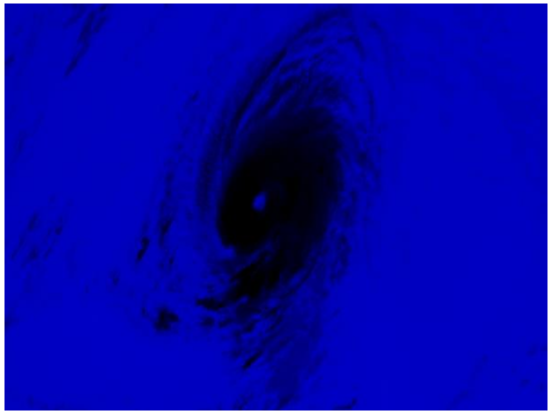
Ch.02
VIS0.8

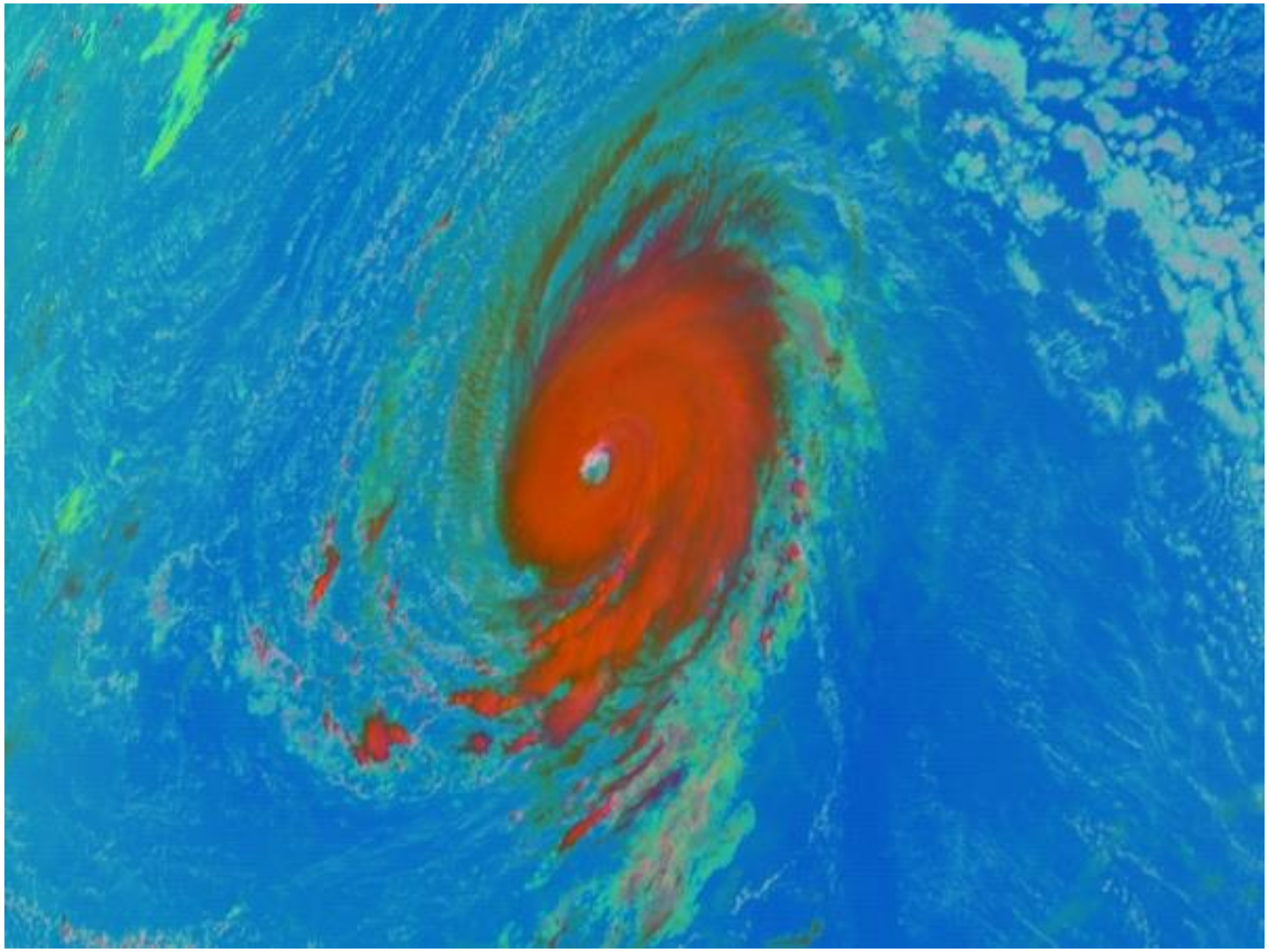


Ch.04r
IR3.9r



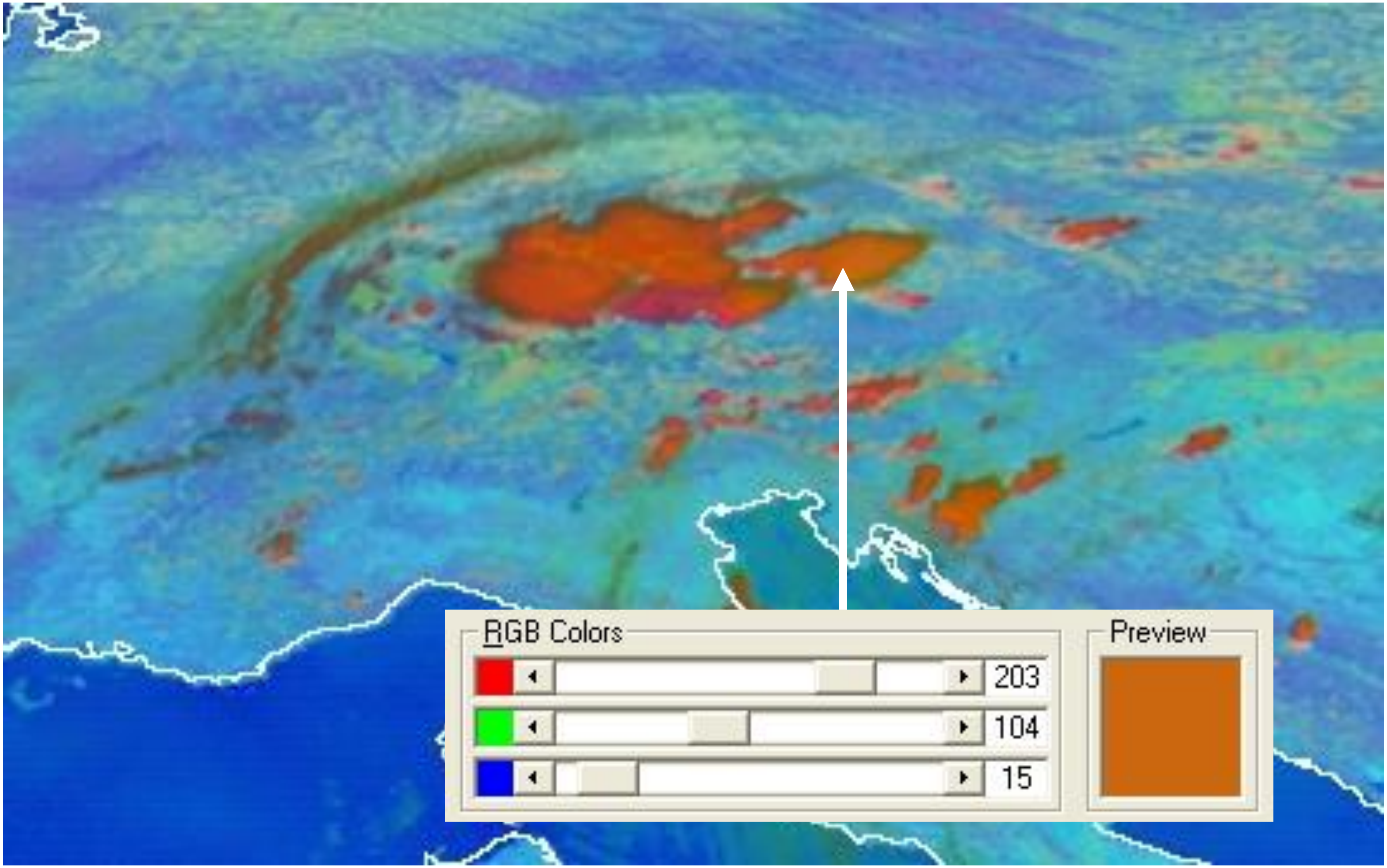
Ch.09
IR10.8





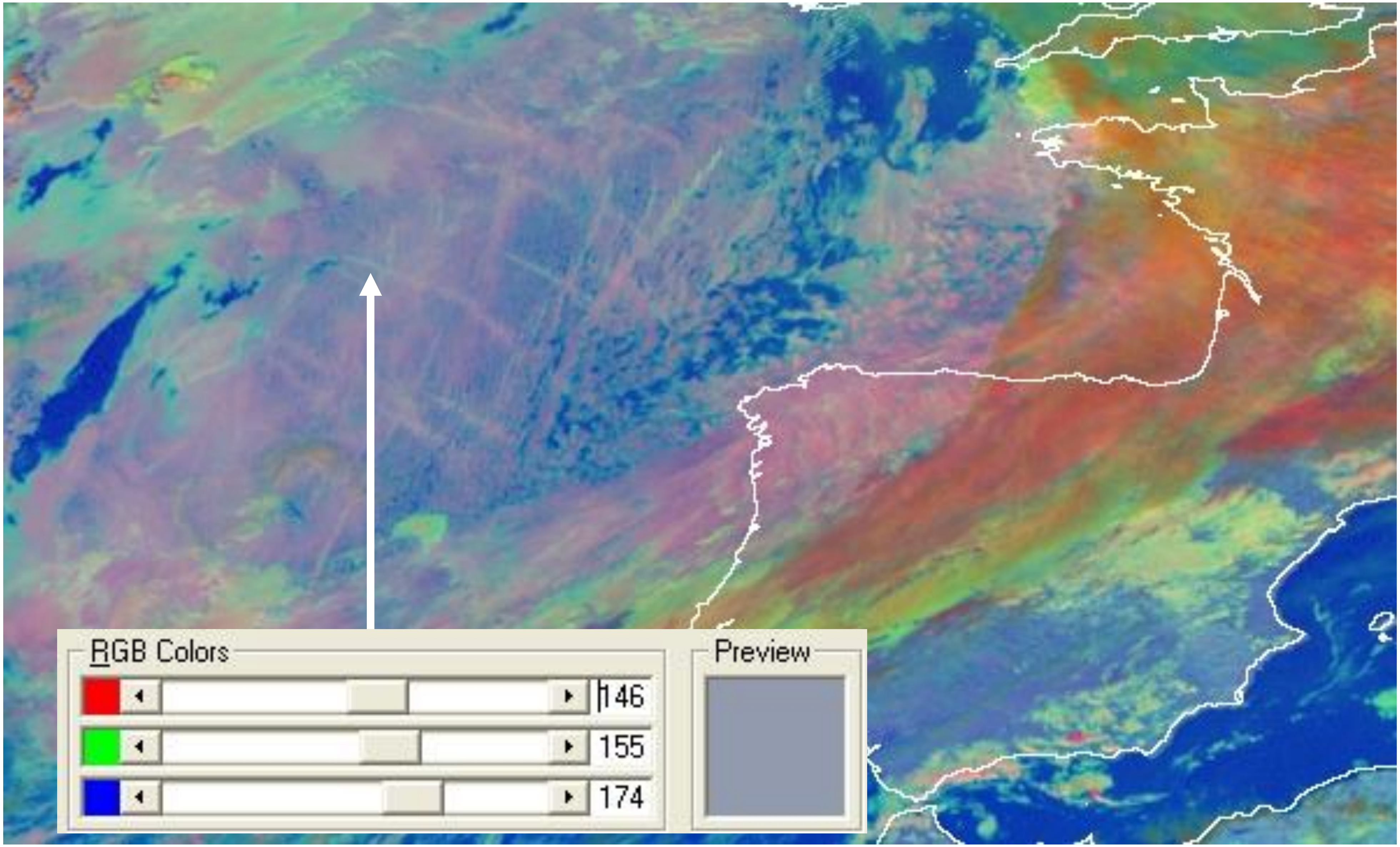
MSG-1, 8 September 2003, 12:00 UTC
RGB Composite 02, 04r, 09

Example: Severe Convection



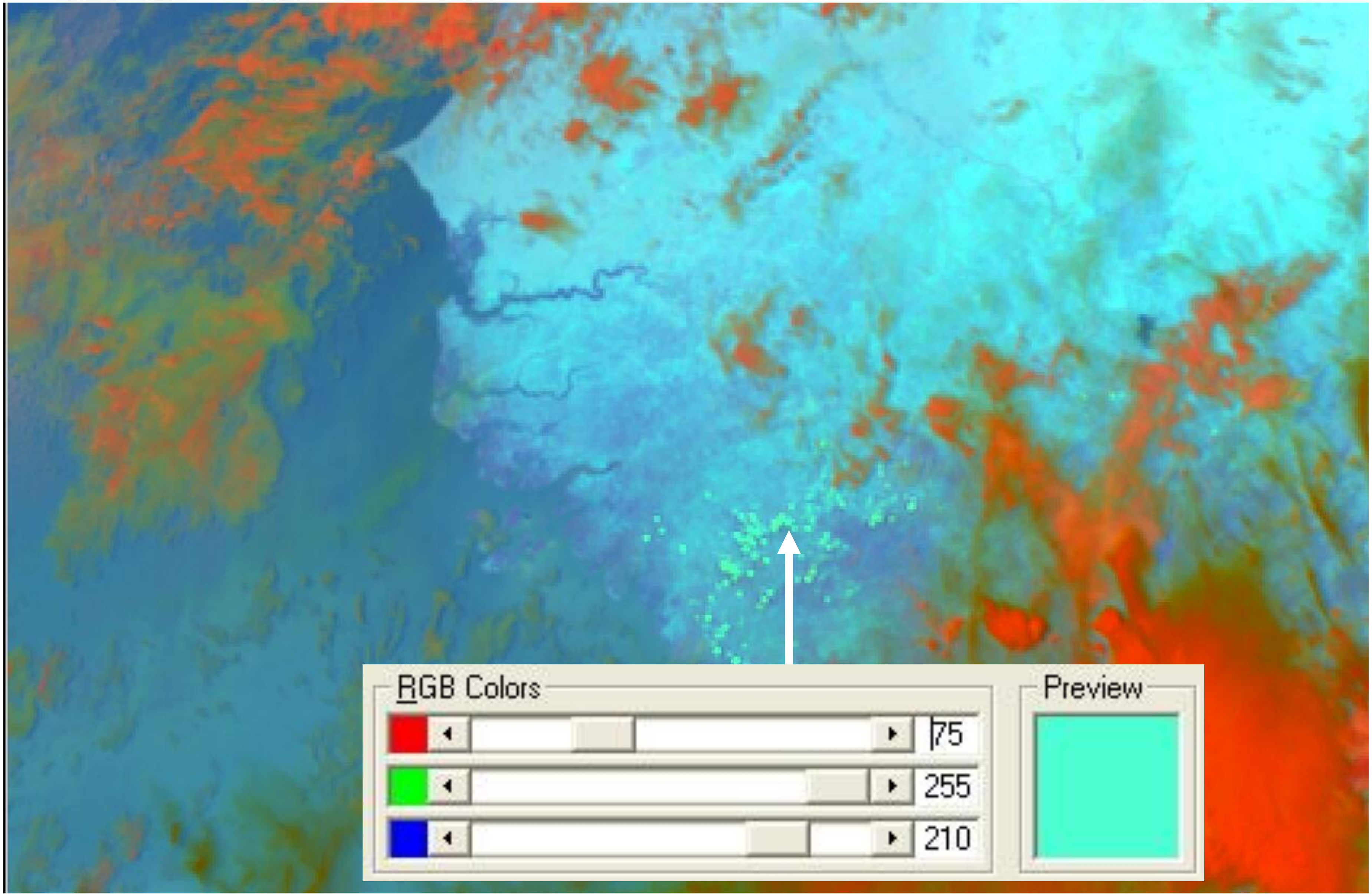
MSG-1, 13 June 2003, 12:00 UTC

Example: Ship Trails



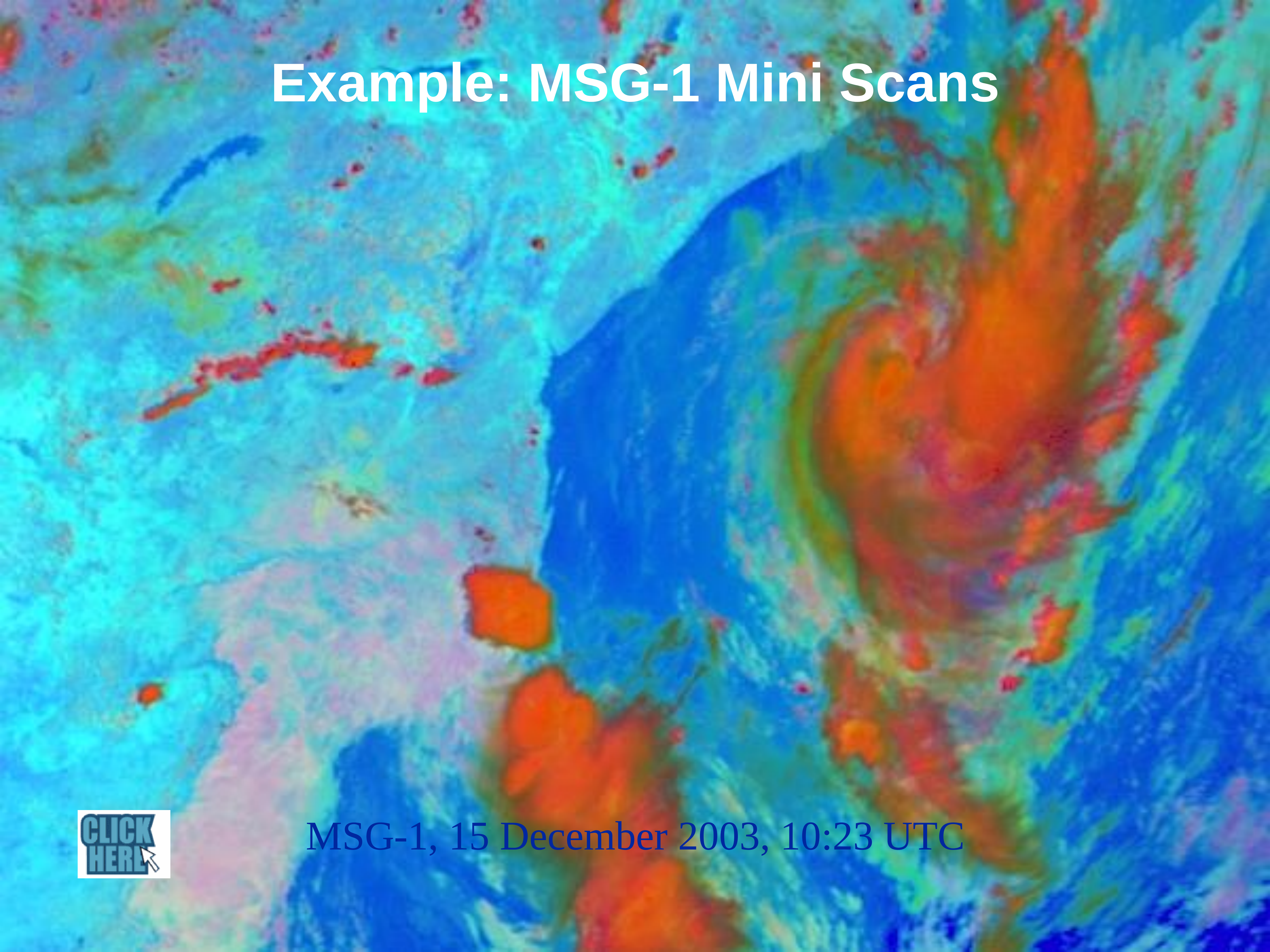
MSG-1, 17 January 2006, 13:00 UTC

Example: Fires



MSG-1, 27 April 2004, 14:15 UTC

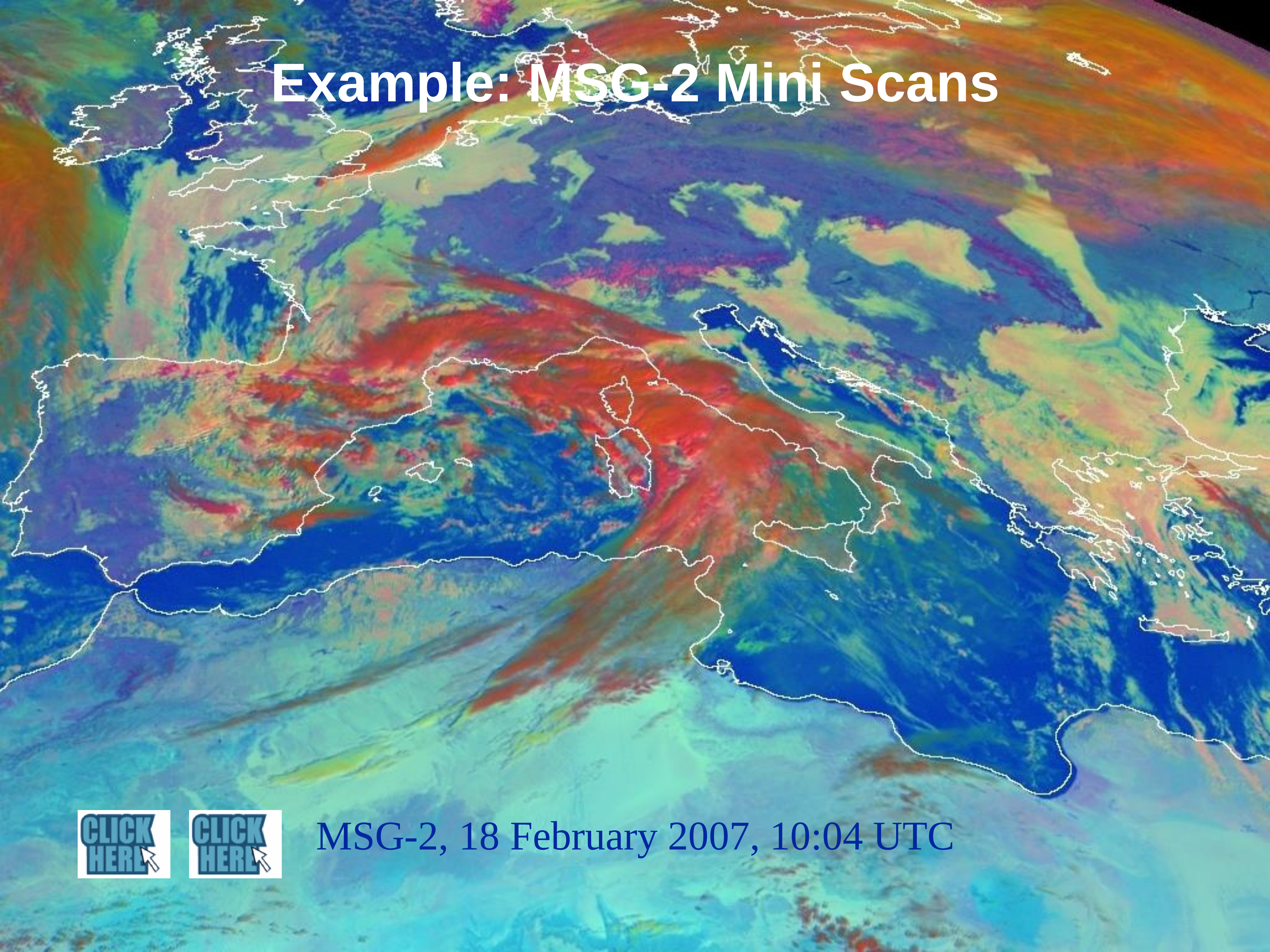
Example: MSG-1 Mini Scans



CLICK HERE

MSG-1, 15 December 2003, 10:23 UTC

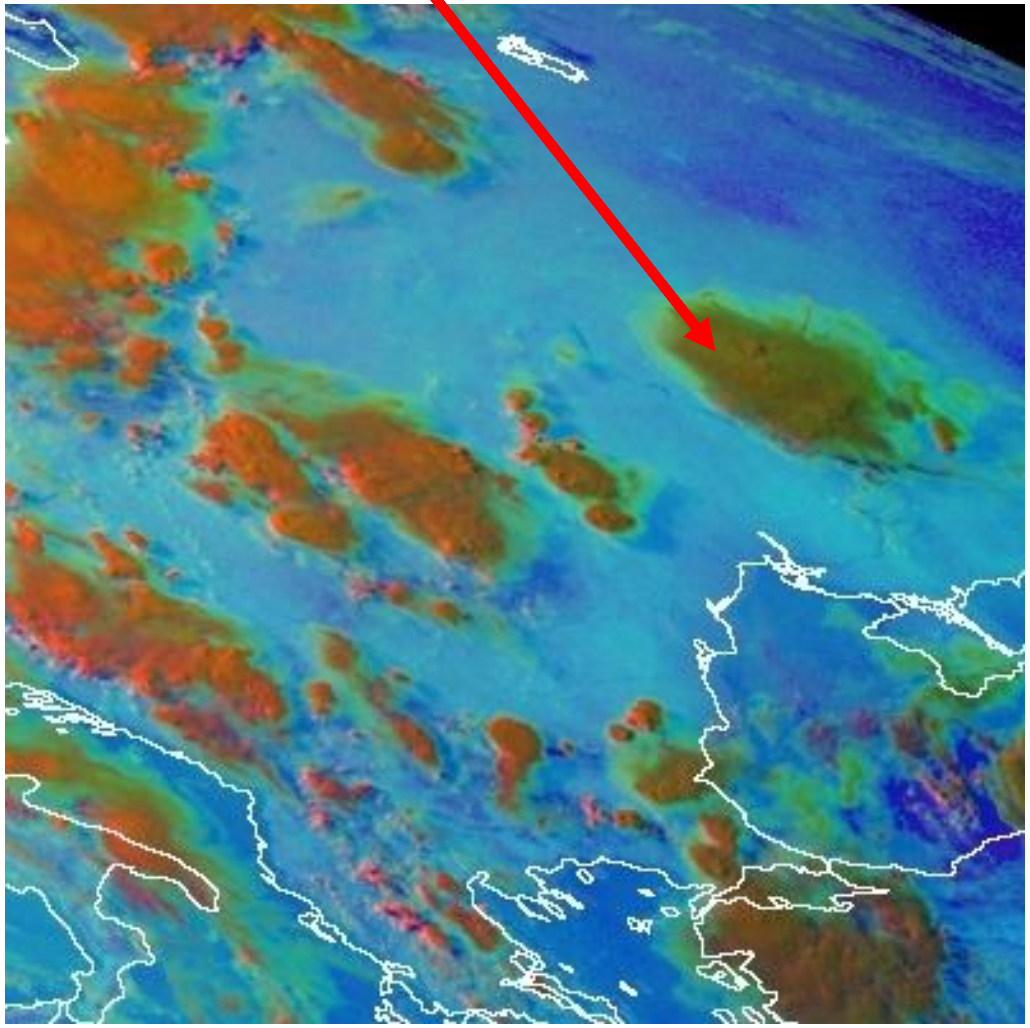
Example: MSG-2 Mini Scans



MSG-2, 18 February 2007, 10:04 UTC

Unusual colours because of:

low light conditions



26 May 2007, 16:29 UTC

RGB Day Microphysics: Interpretation of Colours for High-level Clouds

Red	Orange	Dark red	Green
Deep precipitating cloud (precip. not necessarily reaching the ground) - bright, thick - large ice particles - cold cloud	Deep precipitating cloud (Cb cloud with strong updrafts and severe weather)* - bright, thick - small ice particles - cold cloud *or thick, high-level lee cloudiness with small ice particles	Thin Cirrus cloud (large ice particles)	Thin Cirrus cloud (small ice particles)

Ocean	Veg. Land	Fires / Desert	Snow

RGB Day Microphysics: Interpretation of Colours for Mid-level Clouds

Supercooled, thick water cloud - bright, thick - large droplets	Supercooled, thick water cloud - bright, thick - small droplets	Supercooled thin water cloud with large droplets	Supercooled, thin water cloud with small droplets *

* or, in rare occasions, thin Ci cloud with small ice particles

Ocean	Veg. Land	Fires / Desert	Snow

RGB Day Microphysics: Interpretation of Colours for Low-level Clouds

Thick water cloud (warm rain cloud)	Thick water cloud (no precipitation)	Thin water cloud with large droplets	Thin water cloud with small droplets
- bright, thick - large droplets	- bright, thick - small droplets		

Ocean	Veg. Land	Fires / Desert	Snow

4. RGB 05-06, 04-09, 03-01 ("Day Convective Storms")

devised by: J. Kerkmann

R = Difference WV6.2 - WV7.3
G = Difference IR3.9 - IR10.8
B = Difference NIR1.6 - VIS0.6

Applications:	Severe Convective Storms, Hurricanes
Area:	Full MSG Viewing Area
Time:	Day-Time
Users:	Italy, Czech Republic, Austria, Croatia, Israel, Finland, South Africa, Hungary ...

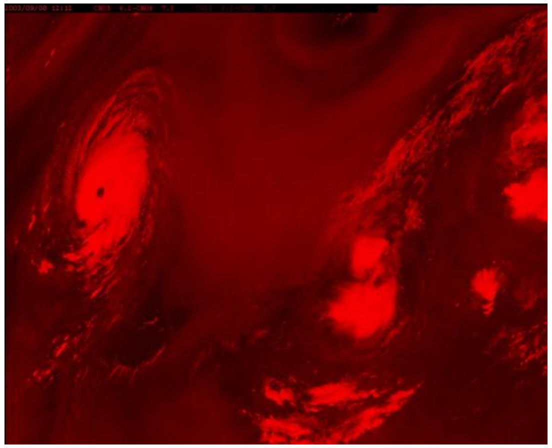
4. RGB 05-06, 04-09, 03-01
("Day Convective Storms")

devised by: J. Kerkmann

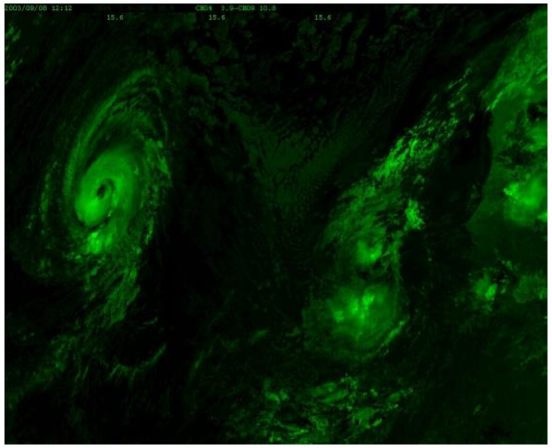
Recommended Range and Enhancement:

Beam	Channel	Range	Gamma
Red	WV6.2 - WV7.3	-35 … +5 K	1.0
Green	IR3.9 - IR10.8	-5 … +60 K	0.5
Blue	NIR1.6 - VIS0.6	-75 … +25 %	1.0

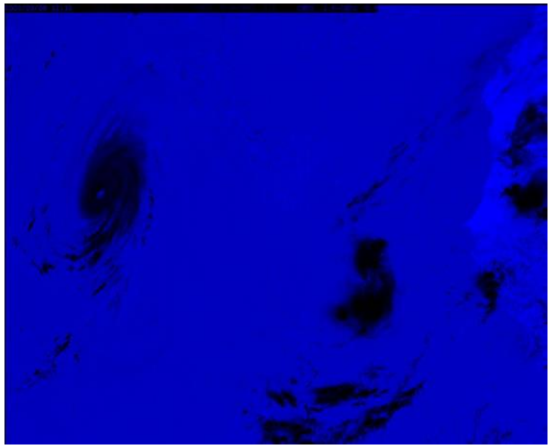
Ch.05 -Ch.06

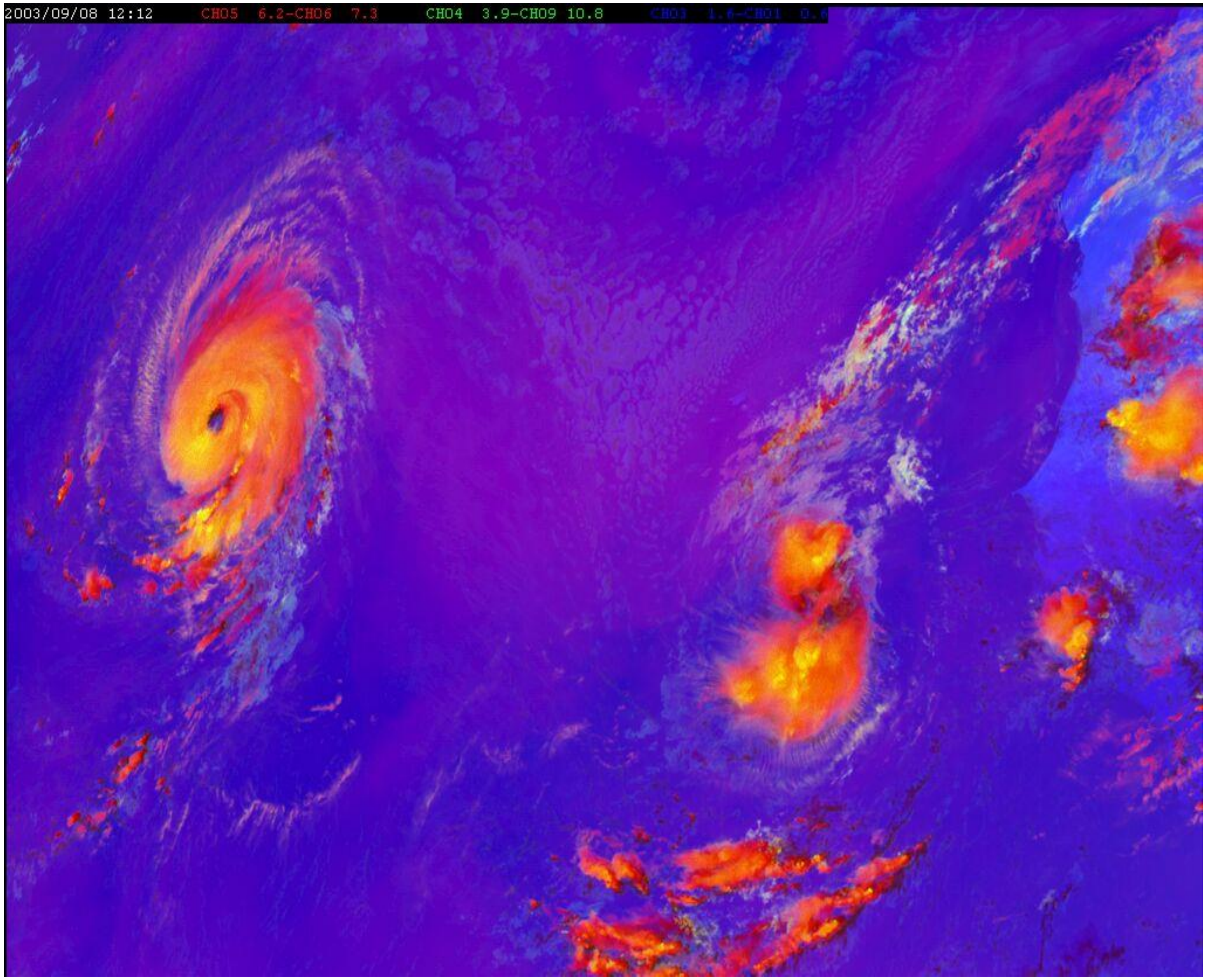


Ch.04 -Ch.09



Ch.03 -Ch.01

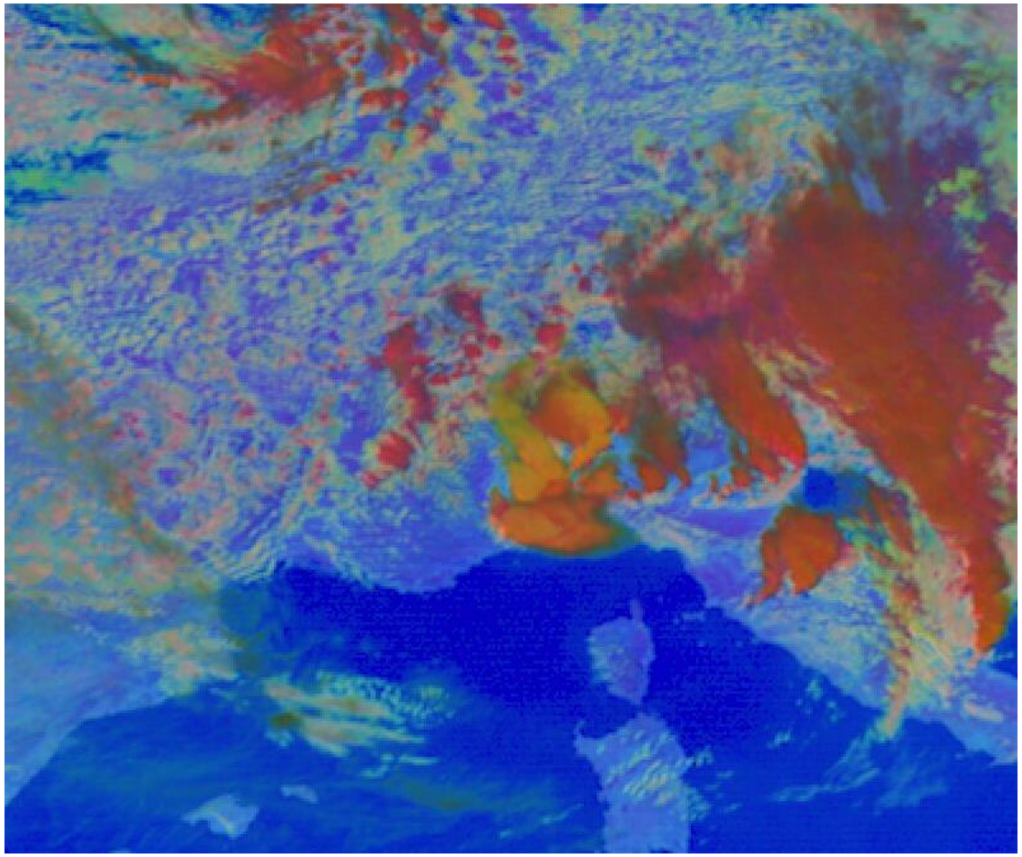


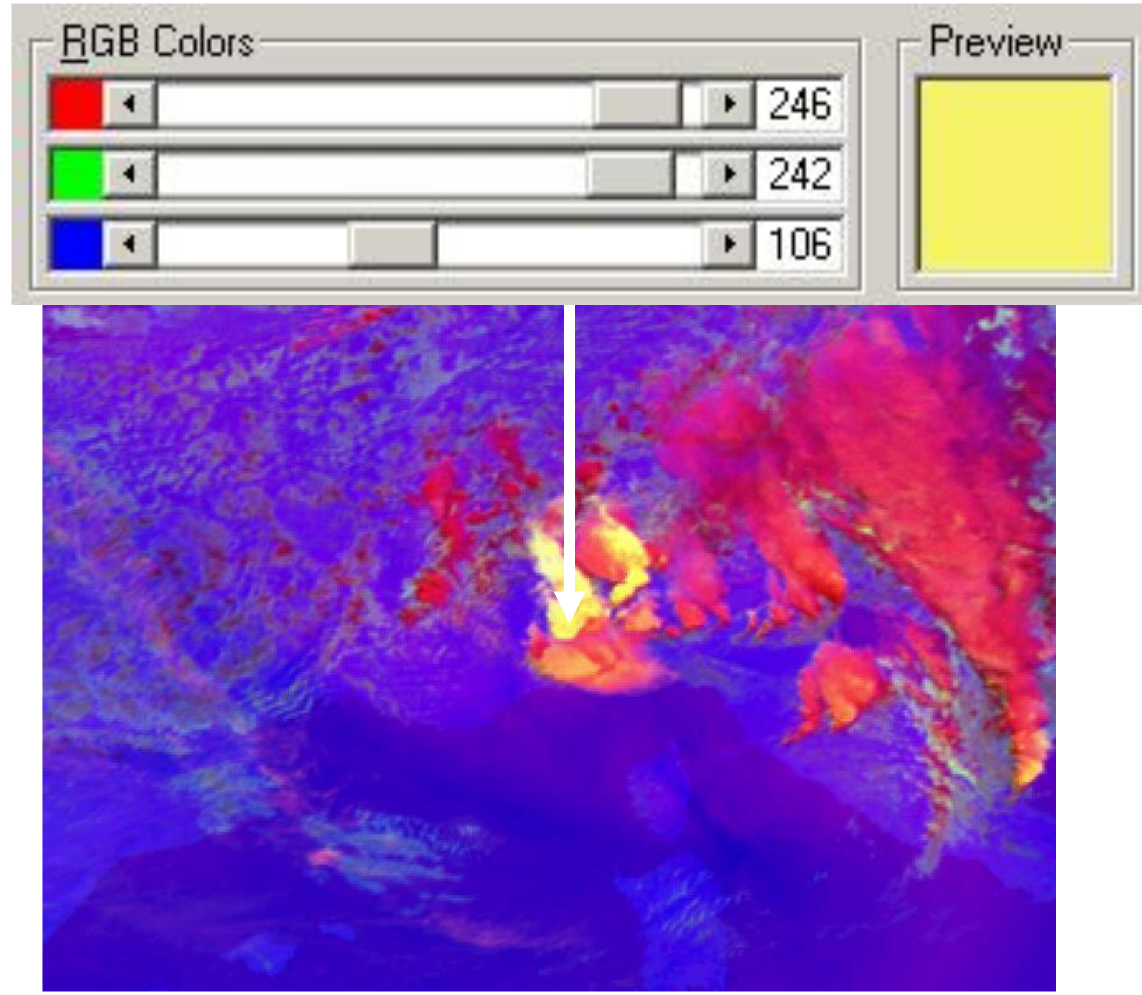


MSG-1, 8 September 2003, 12:00 UTC
RGB Composite 05-06, 04-09, 03-01

CLICK HERE

Example: Severe Convection



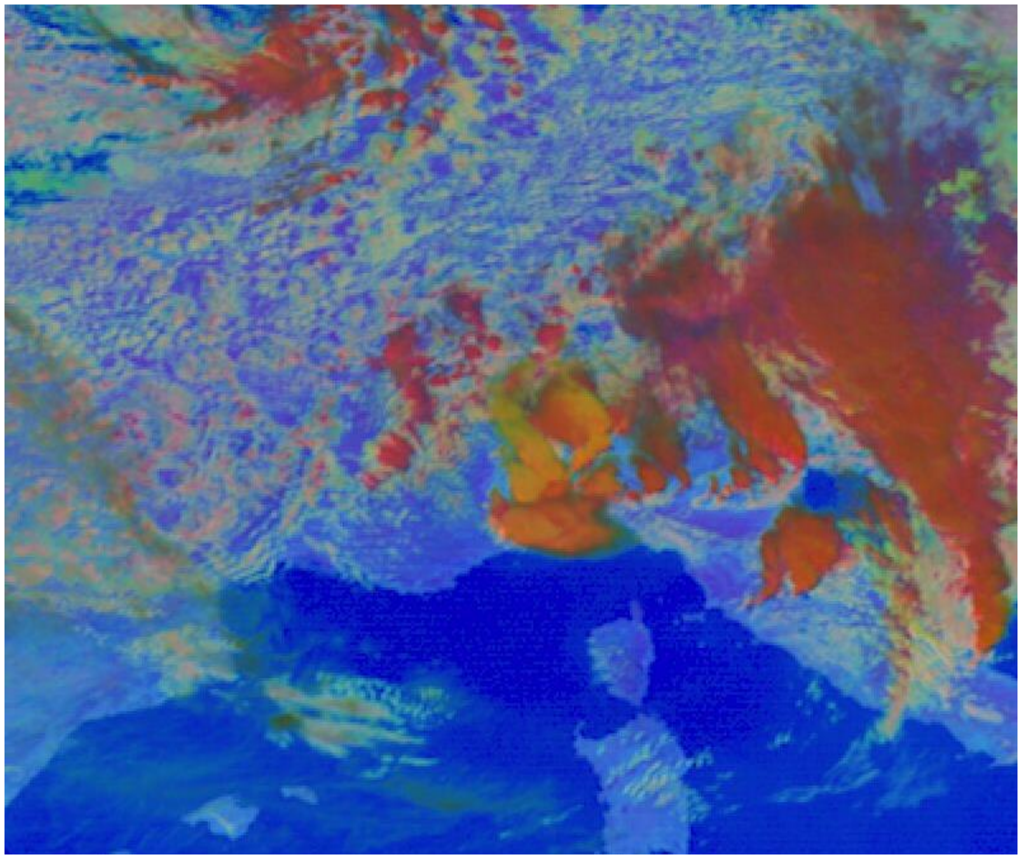


RGB 02,04r,09
(for comparison)

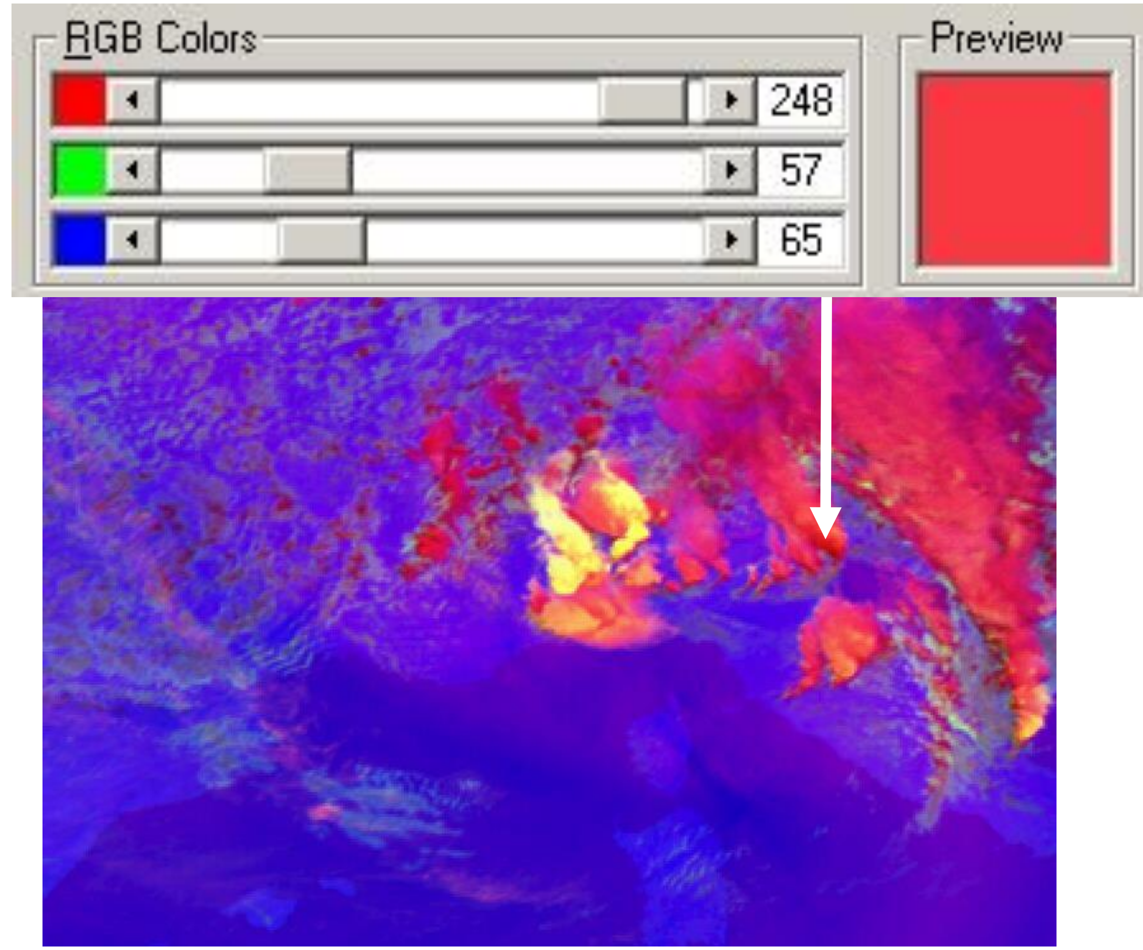
RGB 05-06,04-09,03-01
better identification of young, severe storms

MSG-1, 20 May 2003, 13:30 UTC

Example: Convection



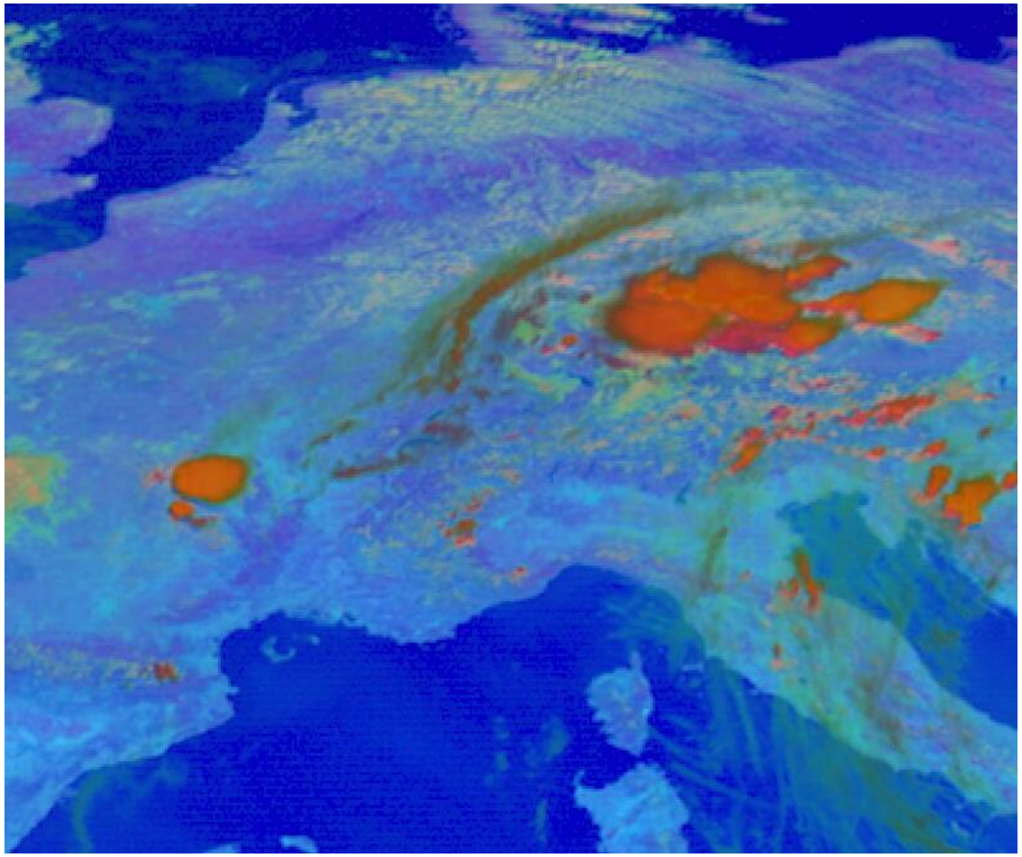
RGB 02,04r,09
(for comparison)



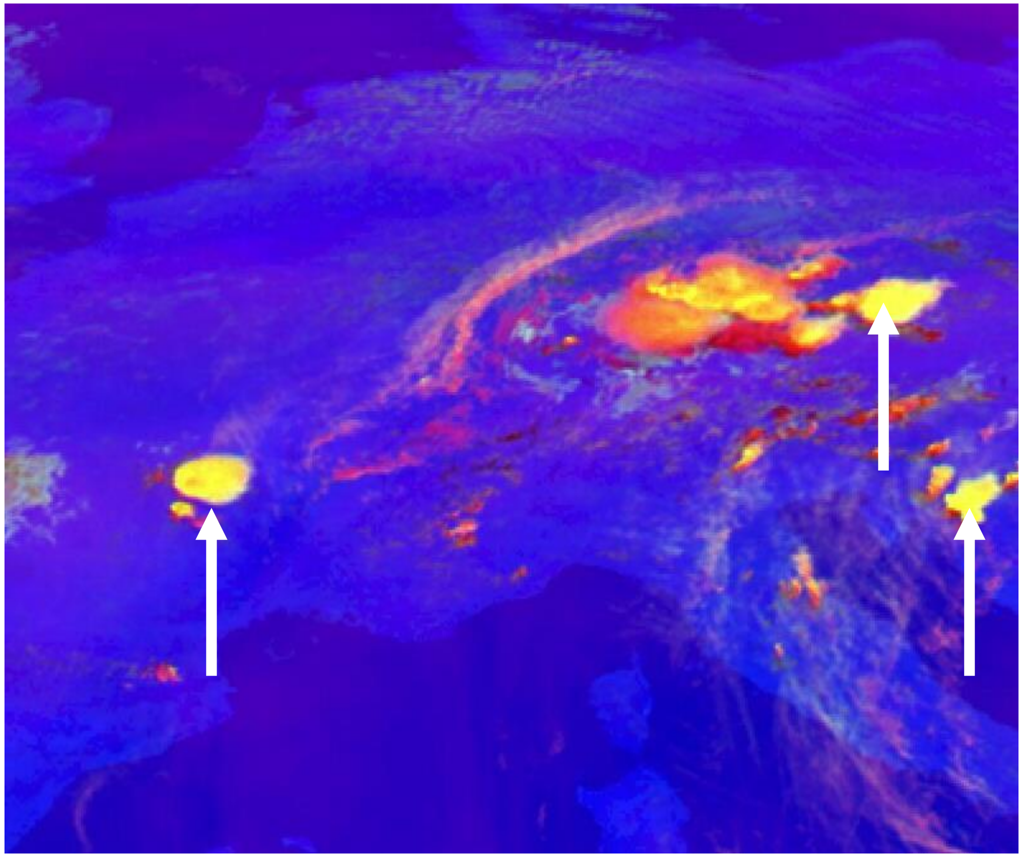
RGB 05-06,04-09,03-01
better identification of young, severe storms

MSG-1, 20 May 2003, 13:30 UTC

Example: Severe Convection



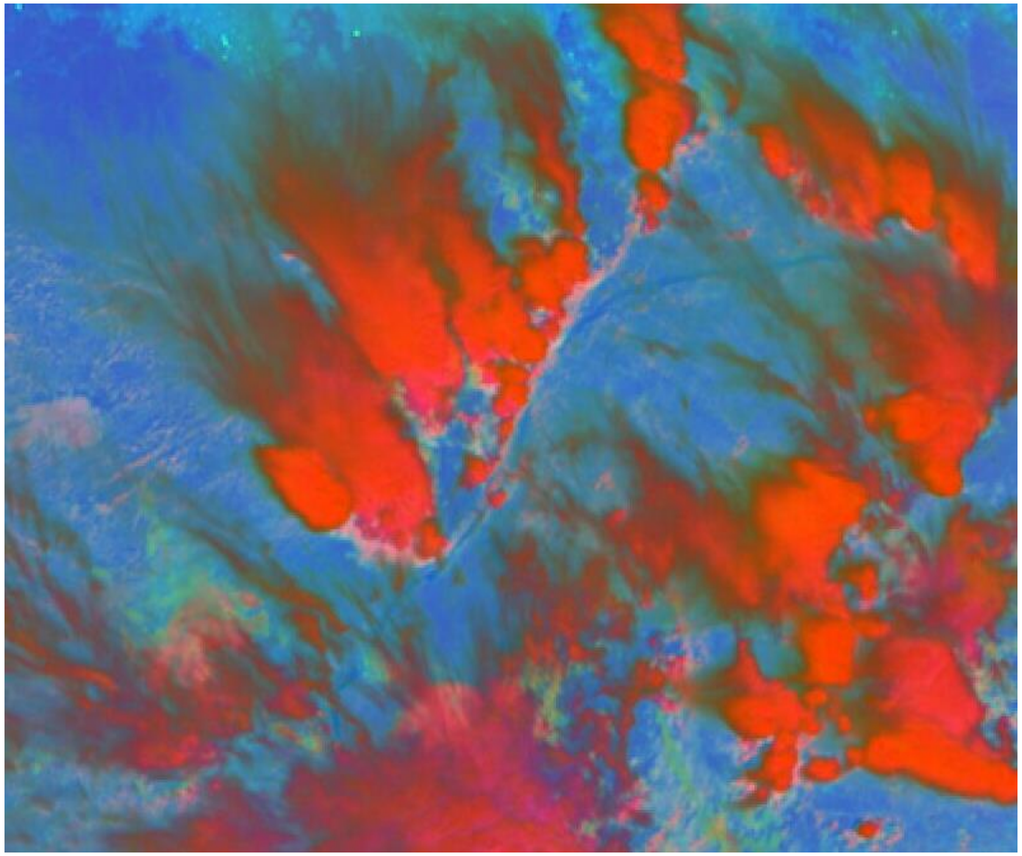
RGB 02,04r,09
(for comparison)

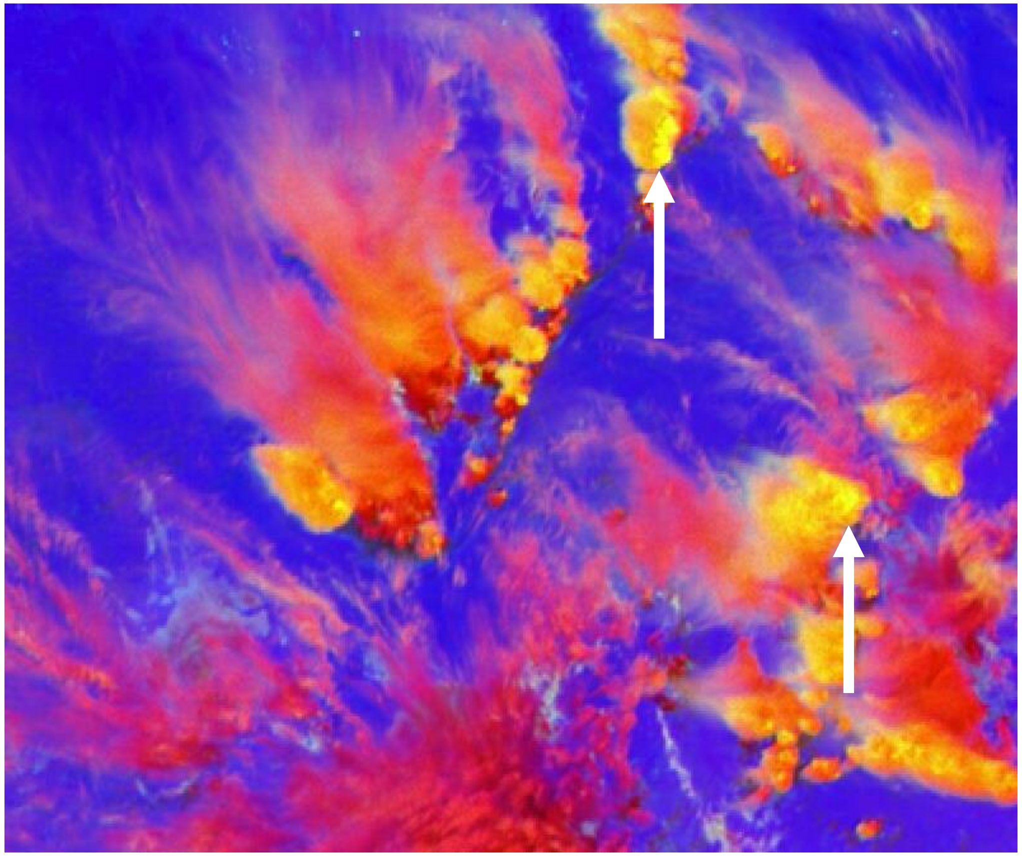


RGB 05-06,04-09,03-01
better identification of young, severe storms

MSG-1, 13 June 2003, 12:00 UTC

Example: Severe Convection



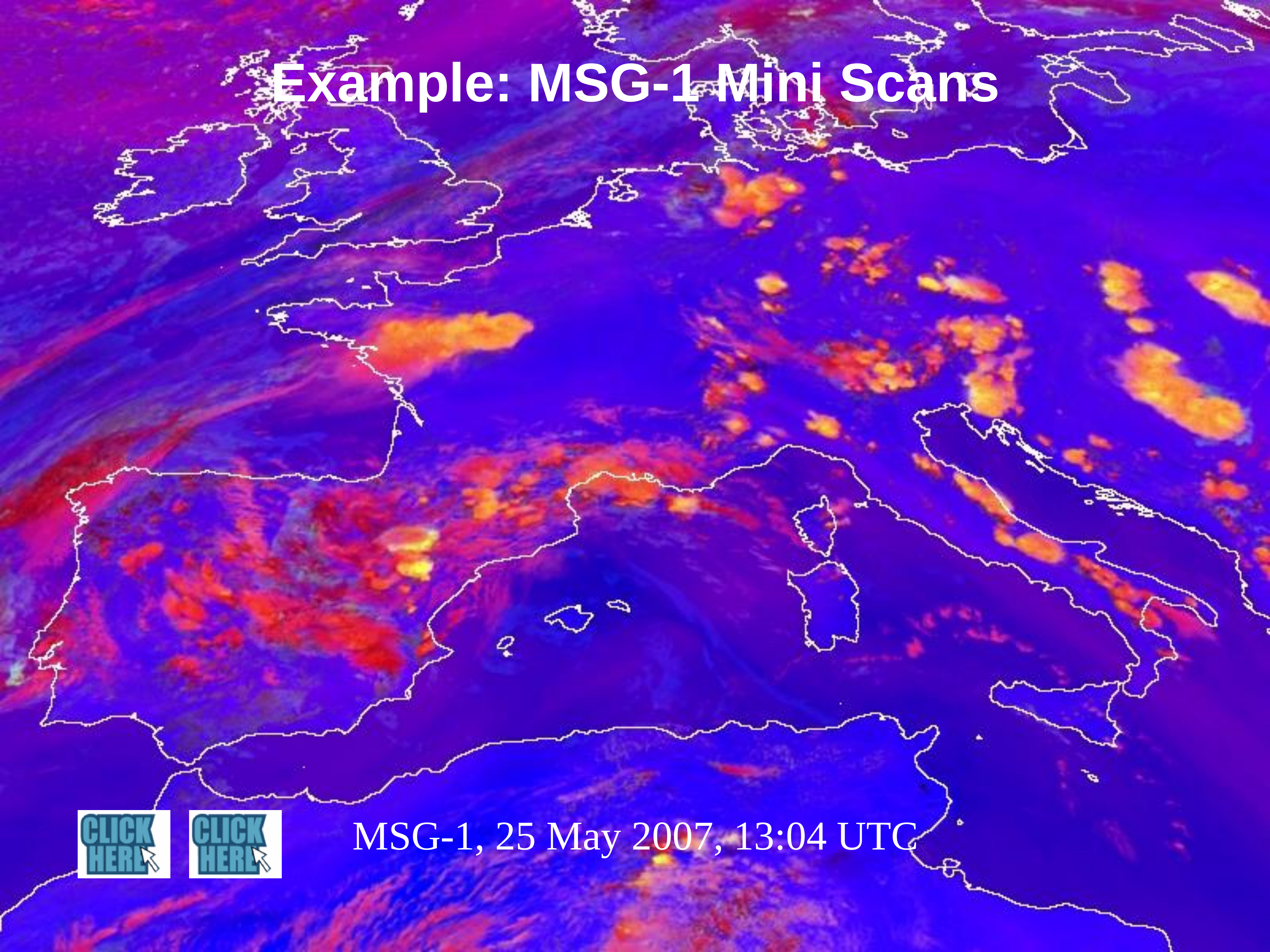


RGB 02,04r,09
(for comparison)

RGB 05-06,04-09,03-01
better identification of young, severe storms

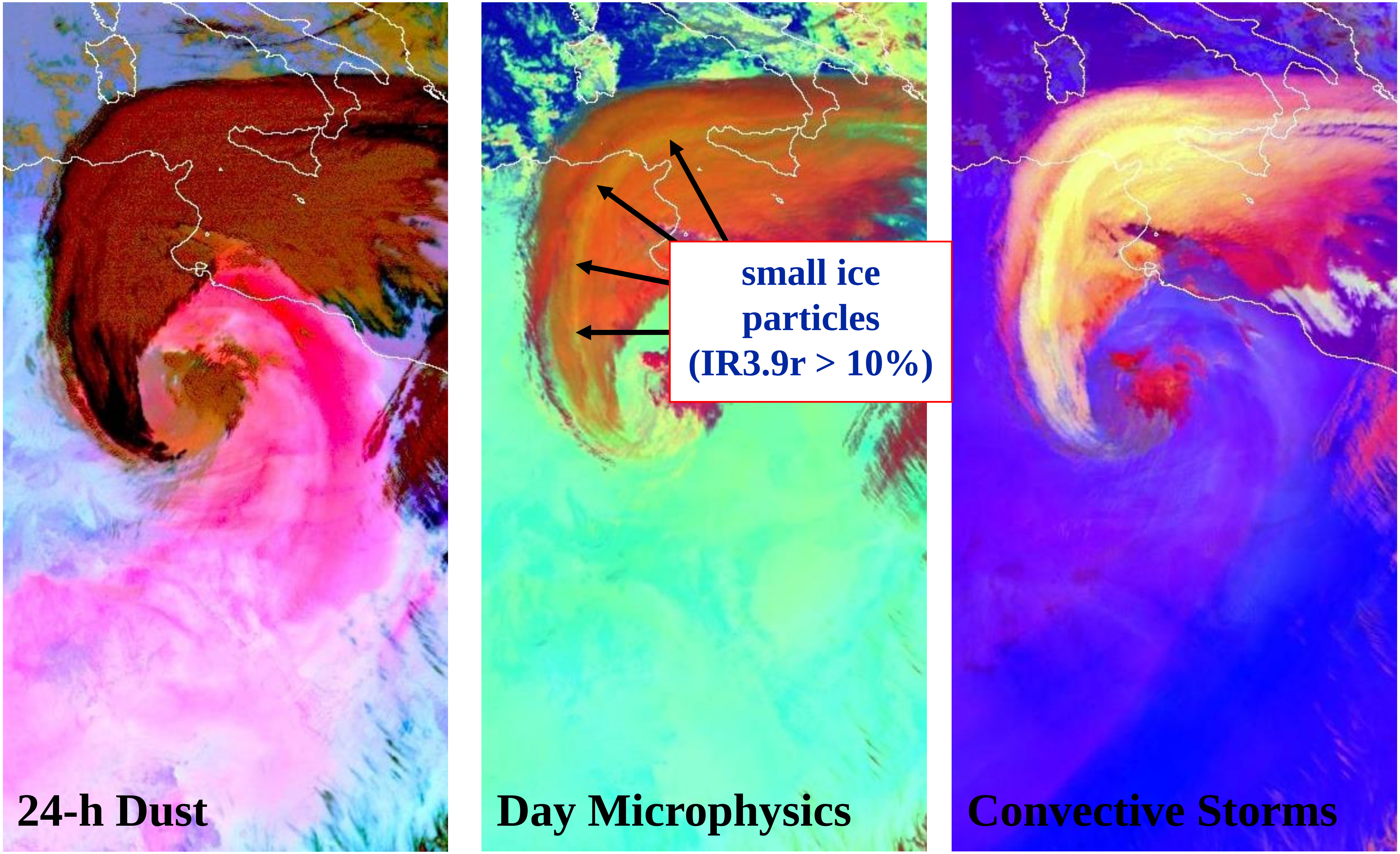
MSG-1, 3 February 2004, 11:30 UTC

Example: MSG-1 Mini Scans

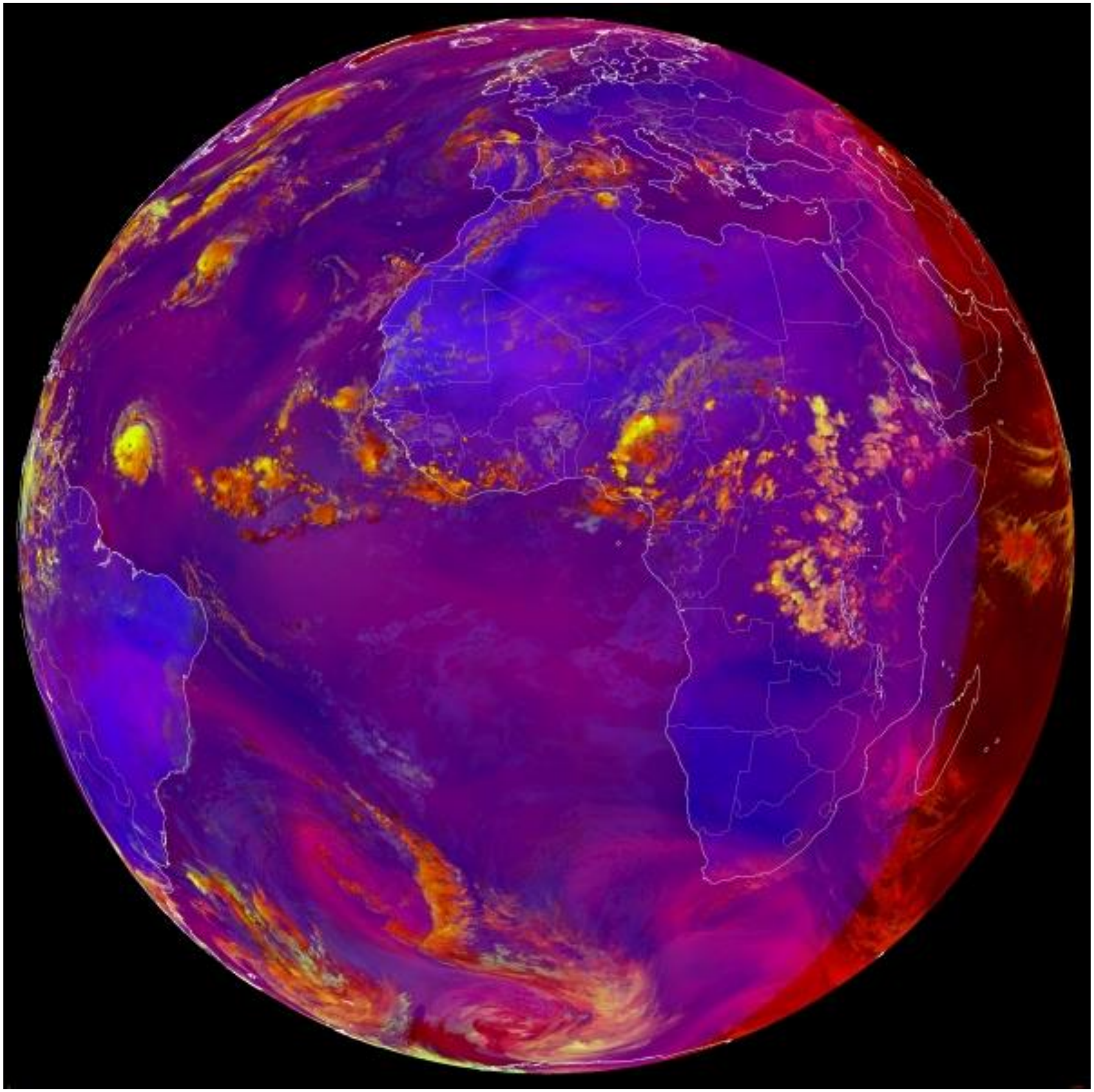


MSG-1, 25 May 2007, 13:04 UTC

... dust changes cloud microphysics!



Met-8, 22 February 2007, 12:00 UTC



RGB Day
Convective Storms
Global View

MSG-1
5 September 2004
15:00 UTC

RGB Day Convective Storms: Interpretation of Colours

Deep precipitating cloud (precip. not necessarily reaching the ground) - high-level cloud - large ice particles	Deep precipitating cloud (Cb cloud with strong updrafts and severe weather)* - high-level cloud - small ice particles *or thick, high-level lee cloudiness with small ice particles	Thin Cirrus cloud (large ice particles)	Thin Cirrus cloud (small ice particles)

Ocean	Land

EUMETSAT

5. RGB 02, 03, 04r
("Day Snow-Fog")

devised by: D. Rosenfeld

R = Channel 02 (VIS0.8)
G = Channel 03 (NIR1.6)
B = Channel 04r (IR3.9r, solar component)

Applications:	Fog/Low Clouds, Snow
Area:	Mid-High Latitudes
Time:	Day-Time in Winter
Users:	Hungary, Israel

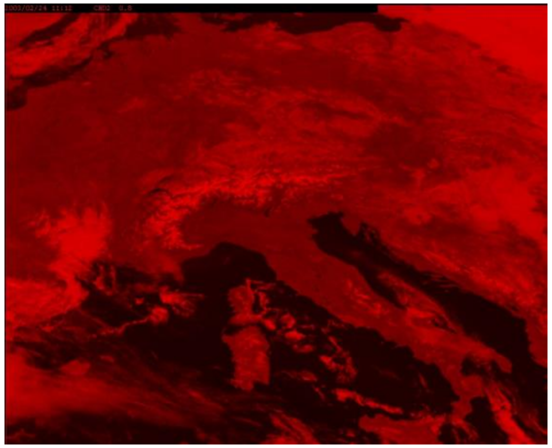
5. RGB 02, 03, 04r
("Day Snow-Fog")

devised by: D. Rosenfeld

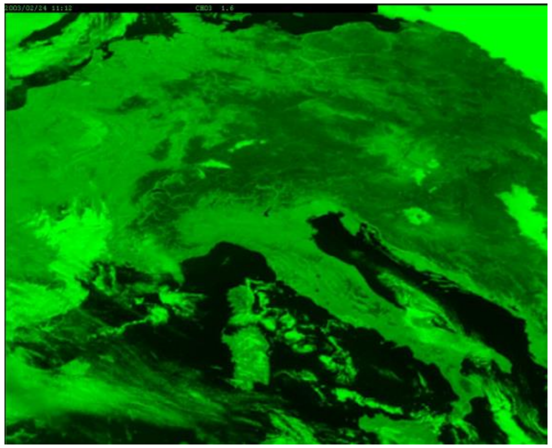
Recommended Range and Enhancement:

Beam	Channel	Range	Gamma
Red	02 (VIS0.8)	0 …+100 %	1.0
Green	03 (NIR1.6)	0 ... +70 %	1.7
Blue	04r (IR3.9r)	0 … +30 %	1.7

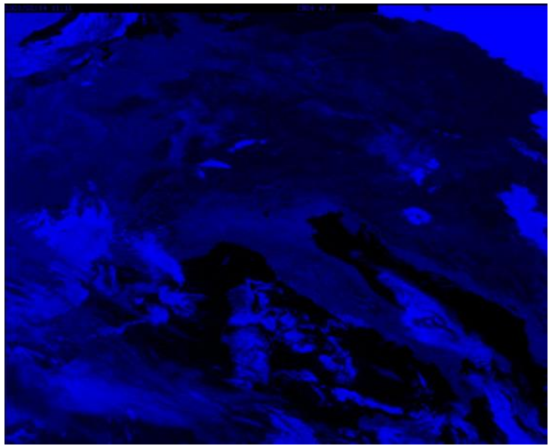
Ch.02
VIS0.8

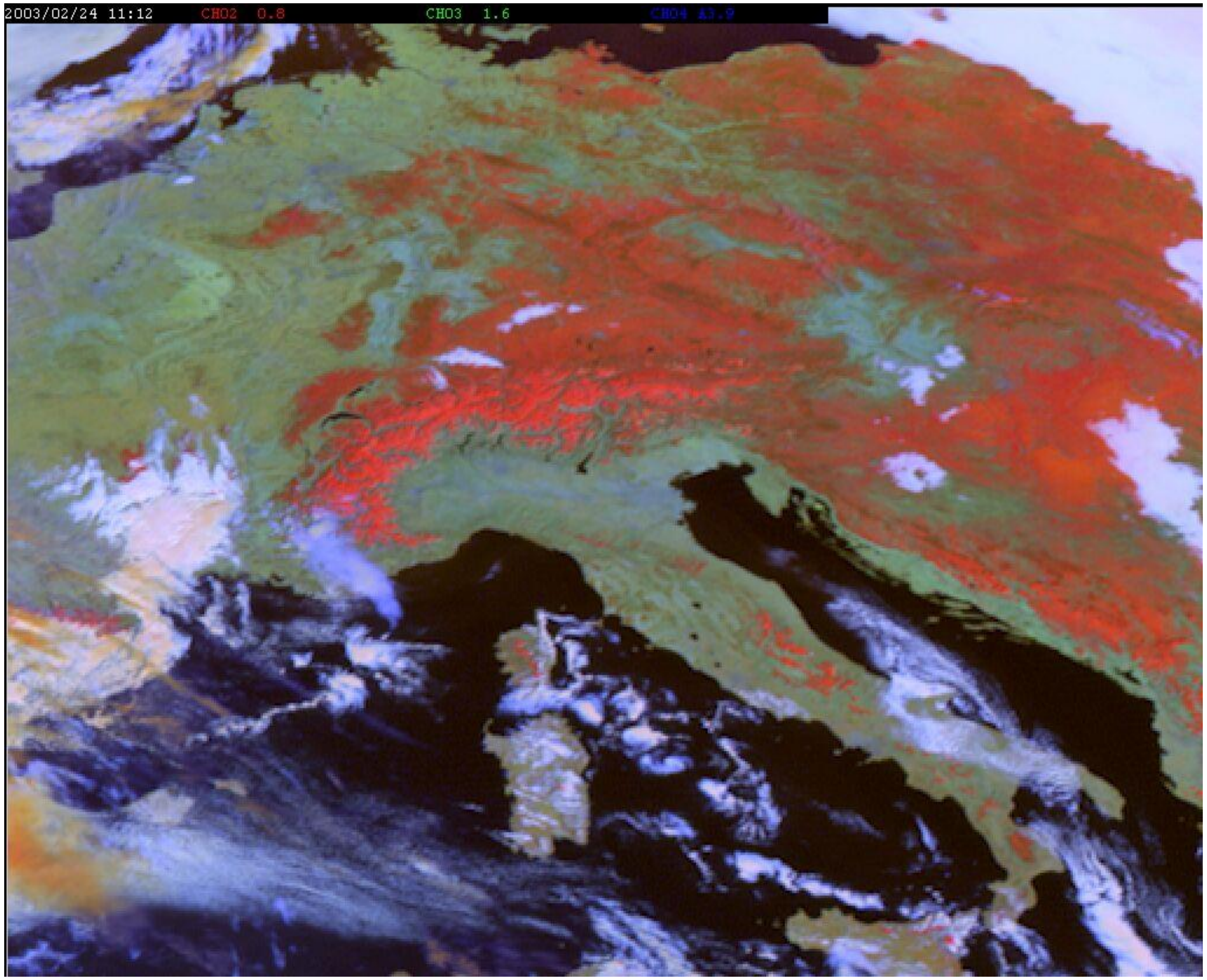


Ch.03
NIR1.6



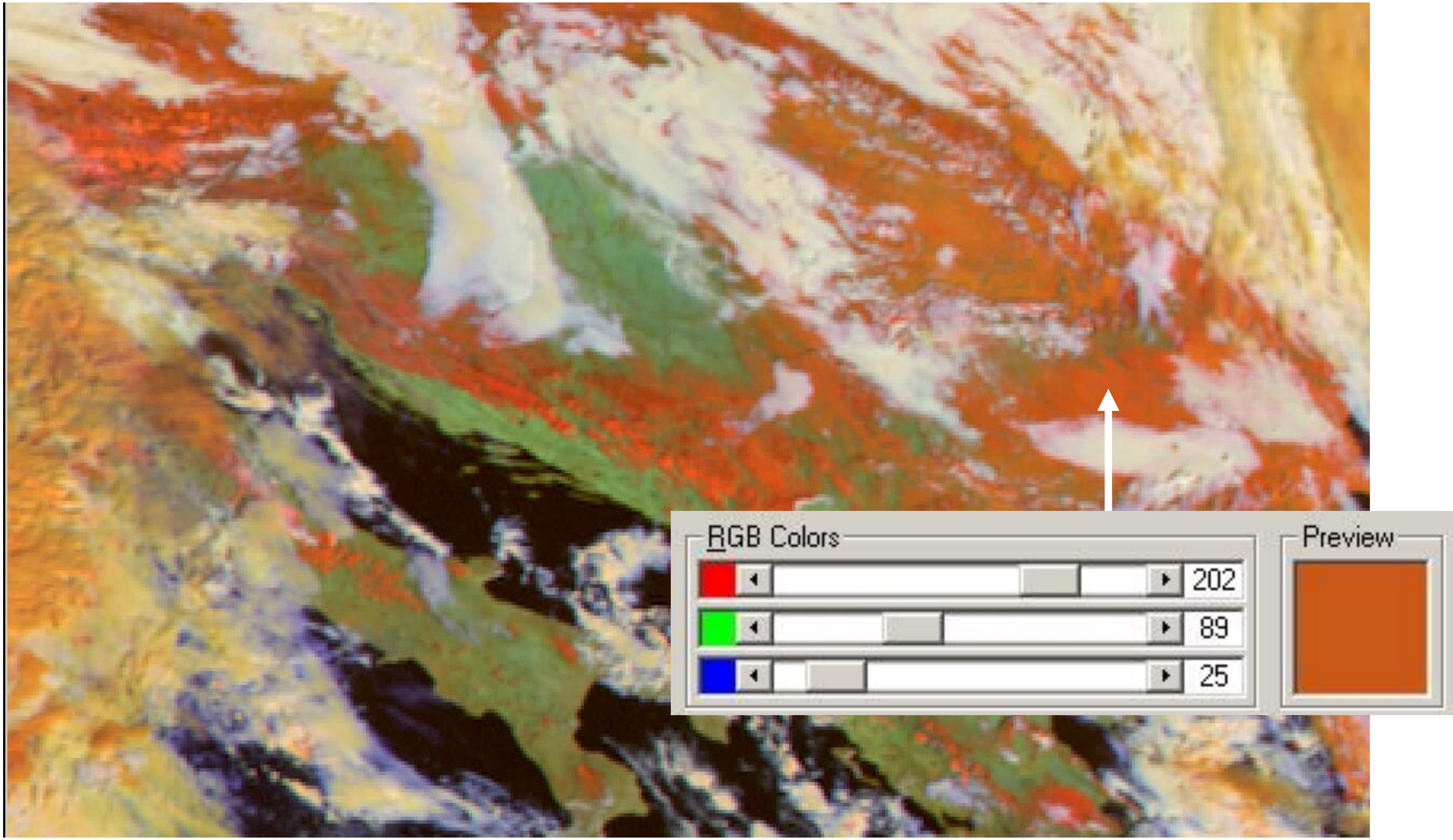
Ch.04r
IR3.9r





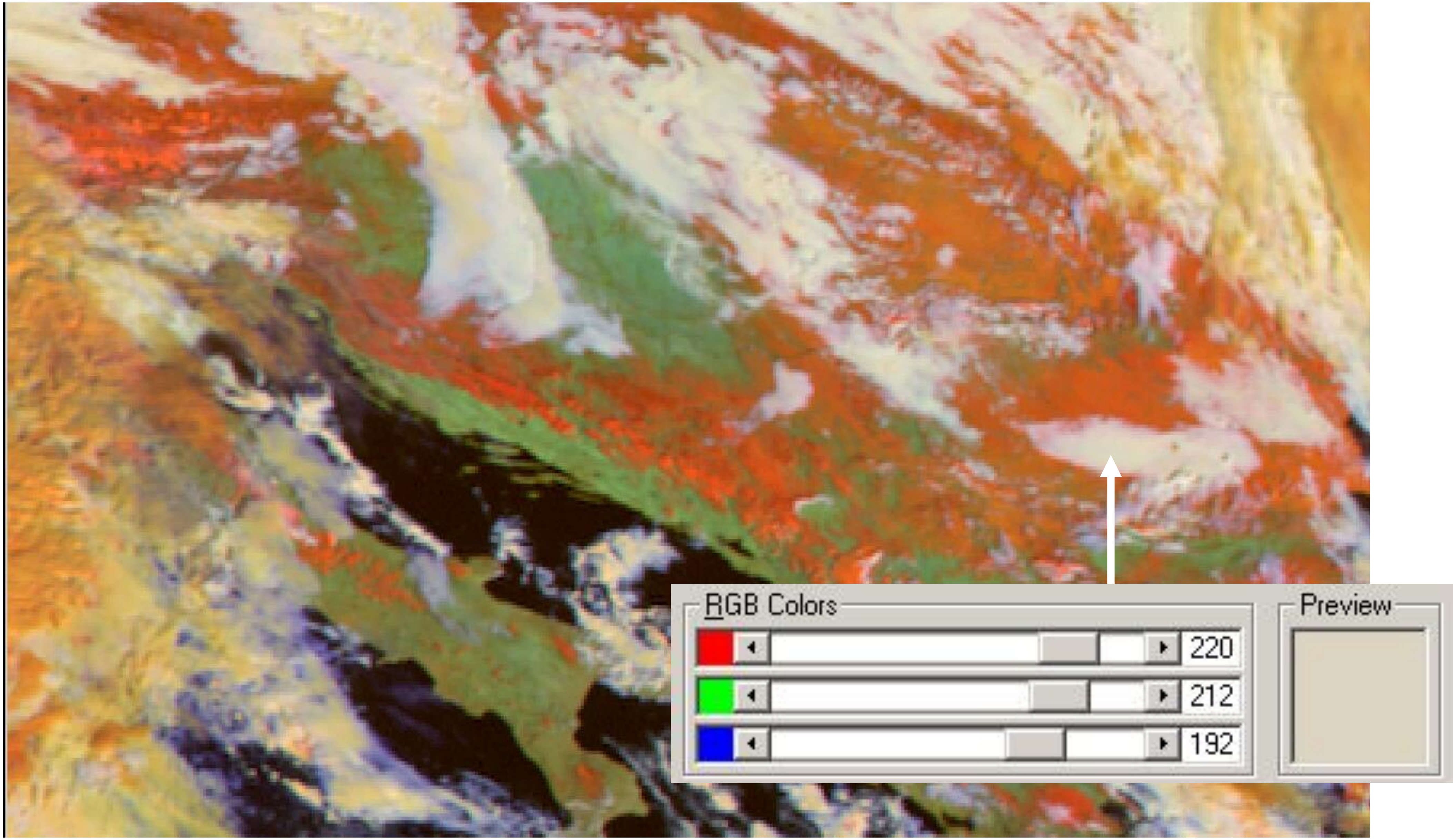
MSG-1, 24 February 2003, 11:00 UTC
RGB Composite 02, 03, 04r

Example: Snow

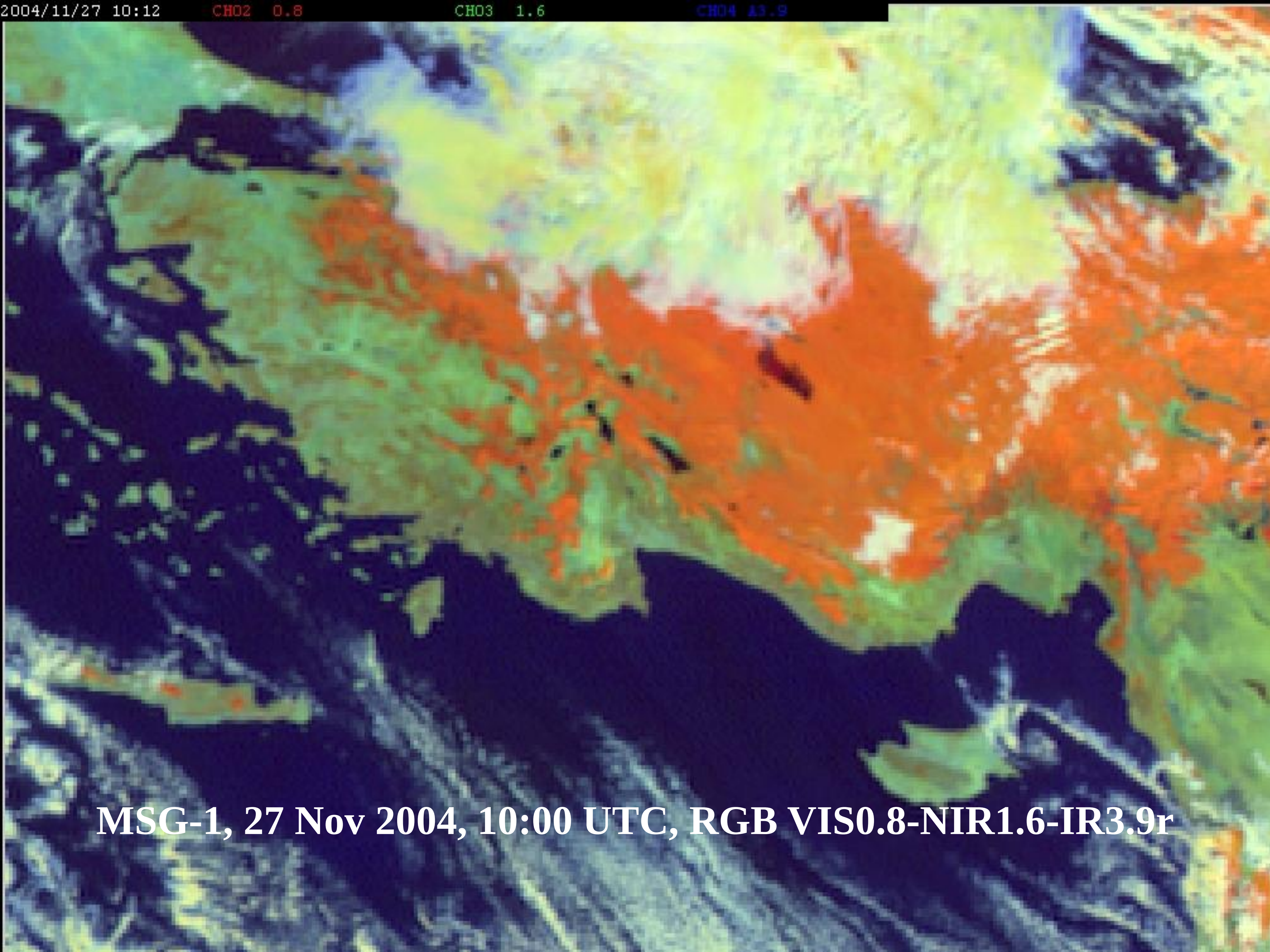


MSG-1, 26 January 2004, 10:00 UTC

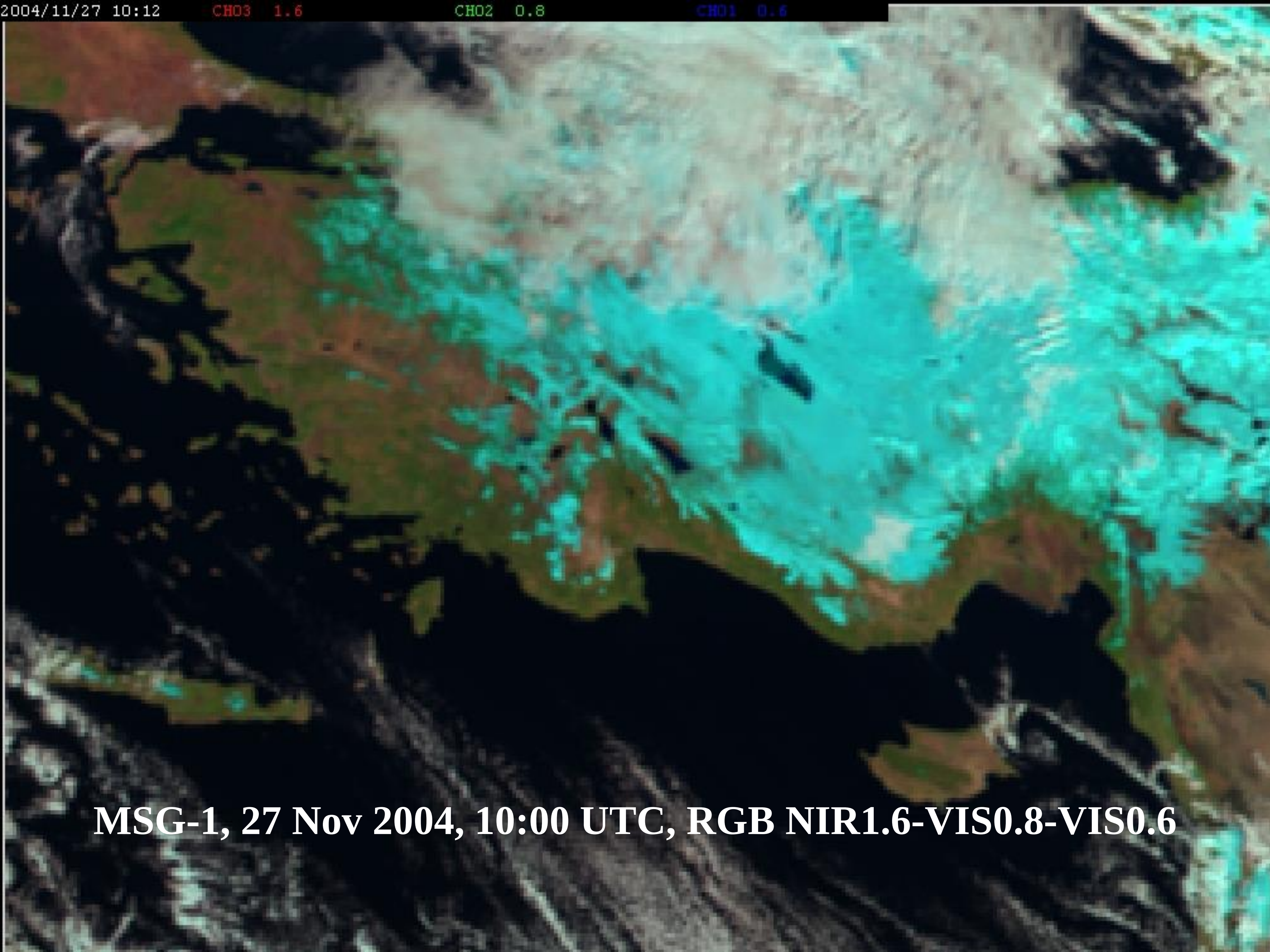
Example: Low Clouds



MSG-1, 26 January 2004, 10:00 UTC



MSG-1, 27 Nov 2004, 10:00 UTC, RGB VIS0.8-NIR1.6-IR3.9r



MSG-1, 27 Nov 2004, 10:00 UTC, RGB NIR1.6-VIS0.8-VIS0.6

RGB Day Snow-Fog: Interpretation of Colours for Thick Ice and Water Clouds

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

- bright, thick
- large ice particles

Deep precipitating cloud*

- bright, thick
- small ice particles

*or thick, high-level lee cloudiness with small ice particles

Thick water cloud with large droplets

Thick water cloud with small droplets

Ocean	Veg. Land	Desert	Snow

6. RGB 03, 02, 01
(“Day Natural Colours")

devised by: D. Rosenfeld

R = Channel 03 (NIR1.6)
G = Channel 02 (VIS0.8)
B = Channel 01 (VIS0.6)

Applications:	Vegetation, Dust, Smoke, Haze, Fog, Snow
Area:	Full MSG Viewing Area
Time:	Day-Time
Users:	All European & African NMSs

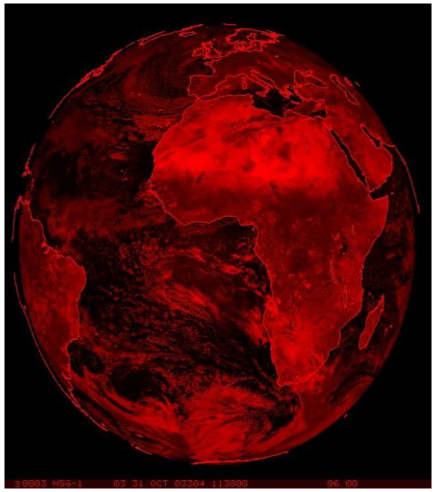
6. RGB 03, 02, 01 ("Natural Colours")

devised by: D. Rosenfeld

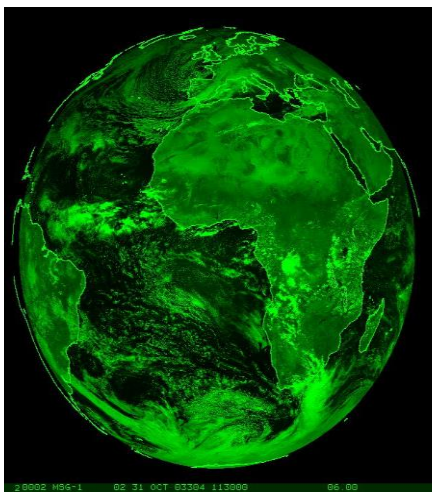
Recommended Range and Enhancement:

Beam	Channel	Range	Gamma
Red	03 (NIR1.6)	0 …+100 %	1.0
Green	02 (VIS0.8)	0 ... +100 %	1.0
Blue	01 (VIS0.6)	0 ... +100 %	1.0

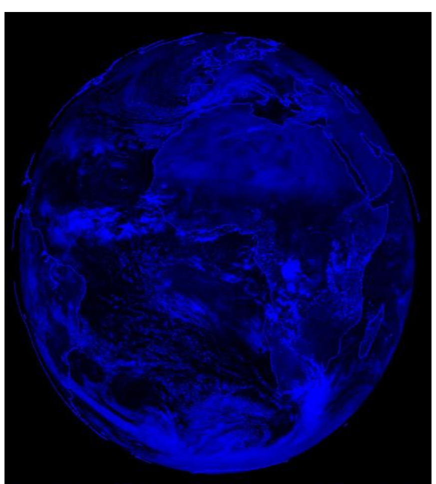
Ch.03
NIR1.6

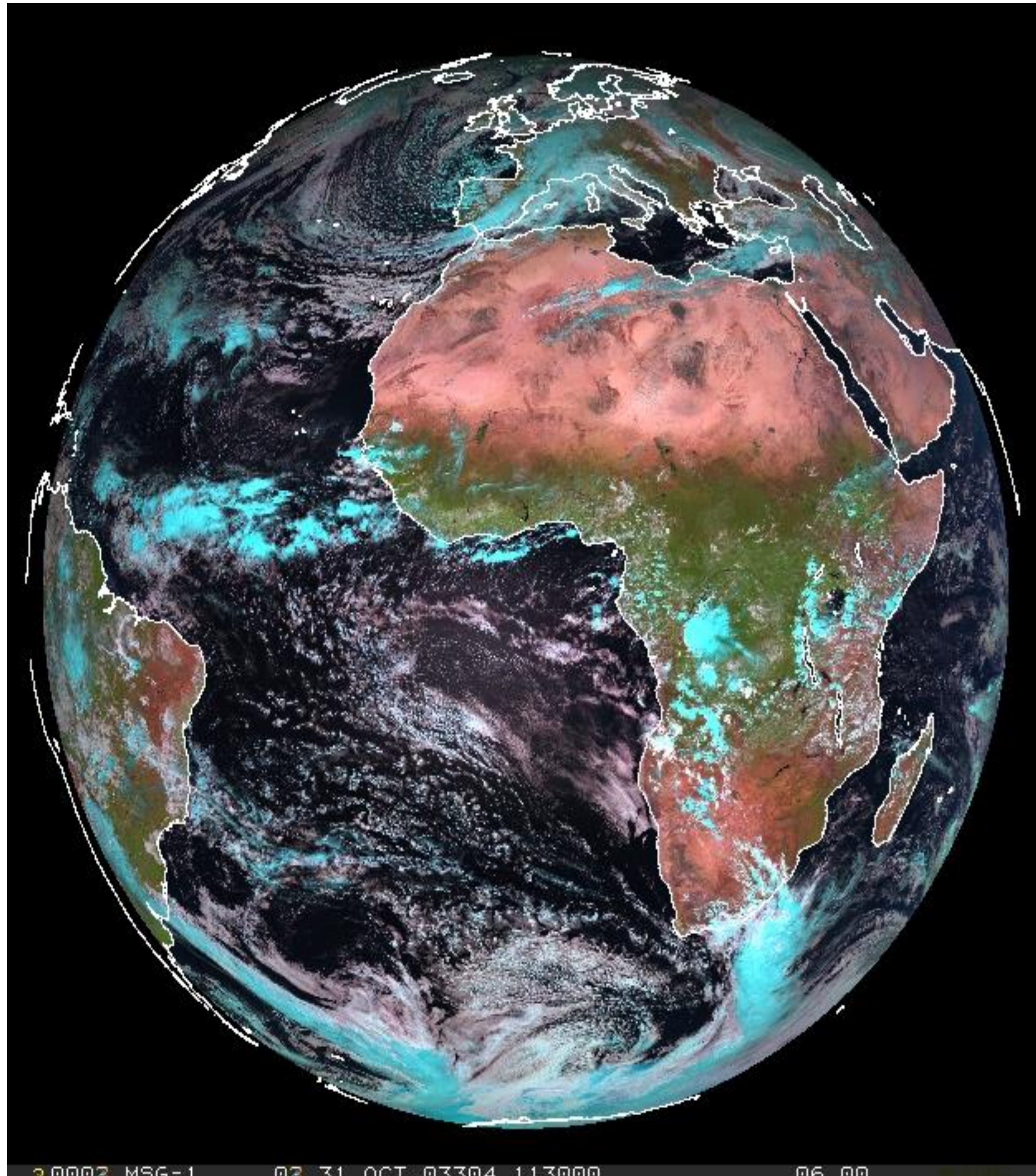


Ch.02
VIS0.8

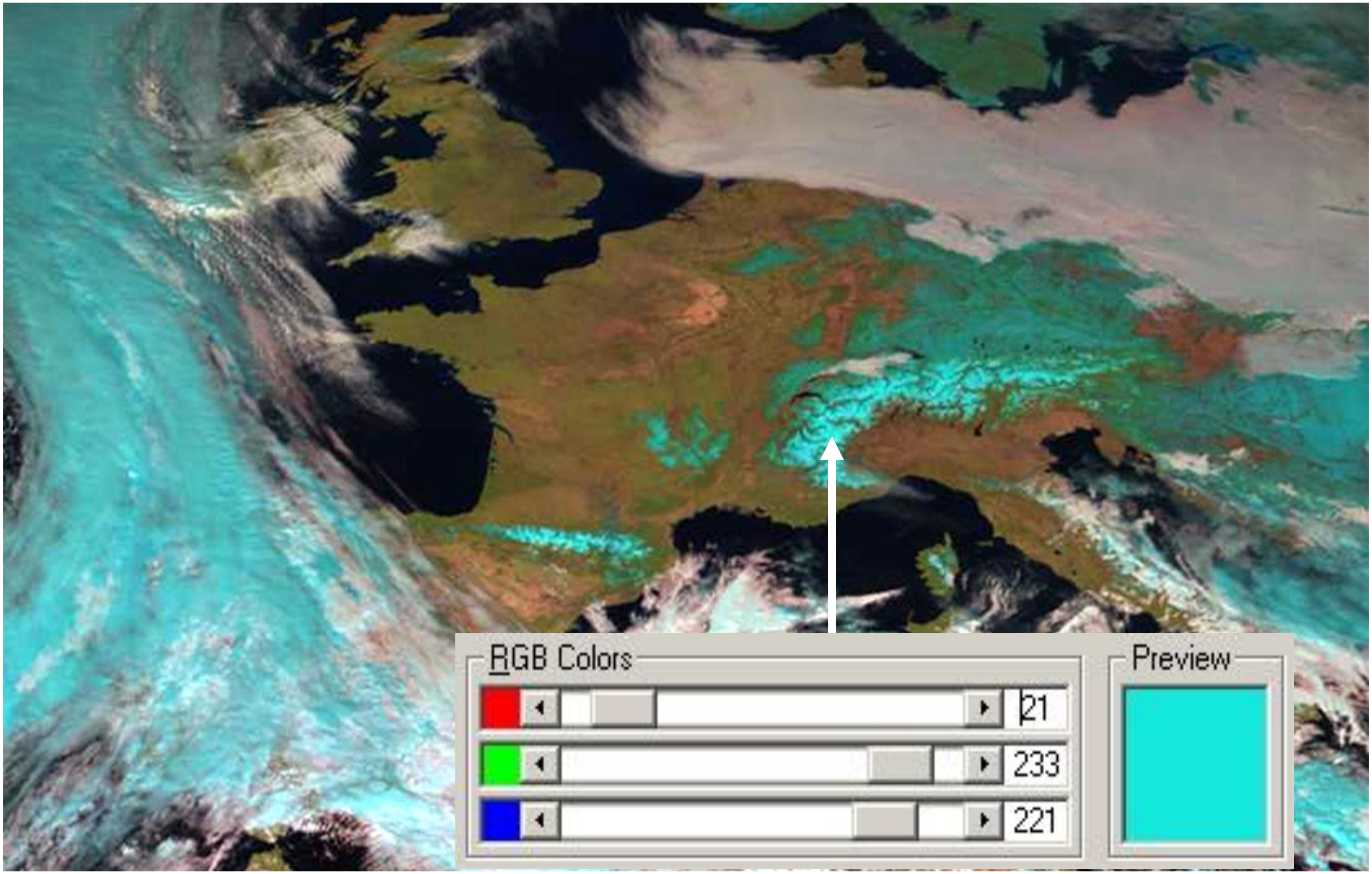


Ch.01
VIS0.6



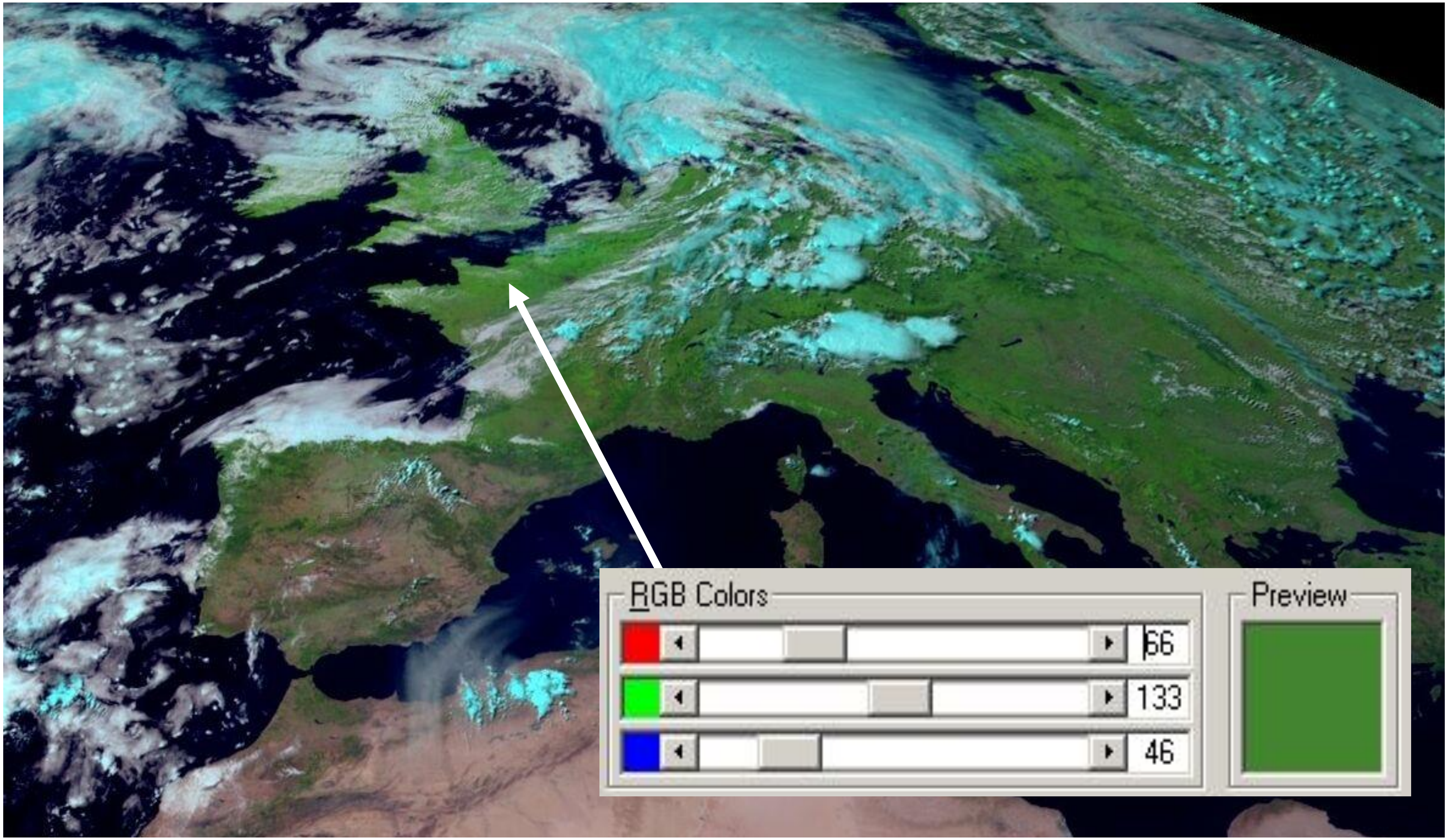


Example: Snow



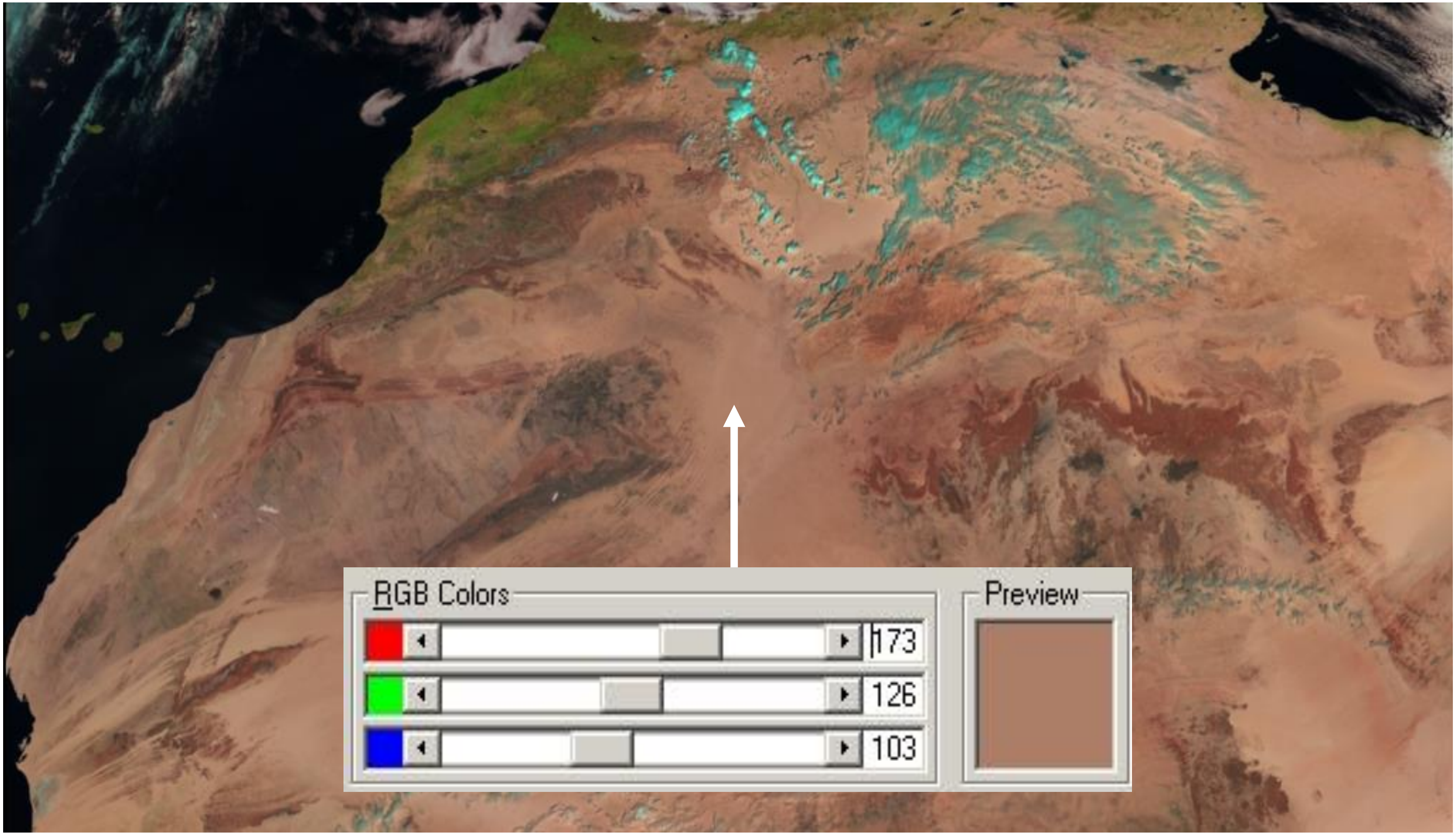
MSG-1, 18 February 2003, 13:00 UTC

Example: Vegetation



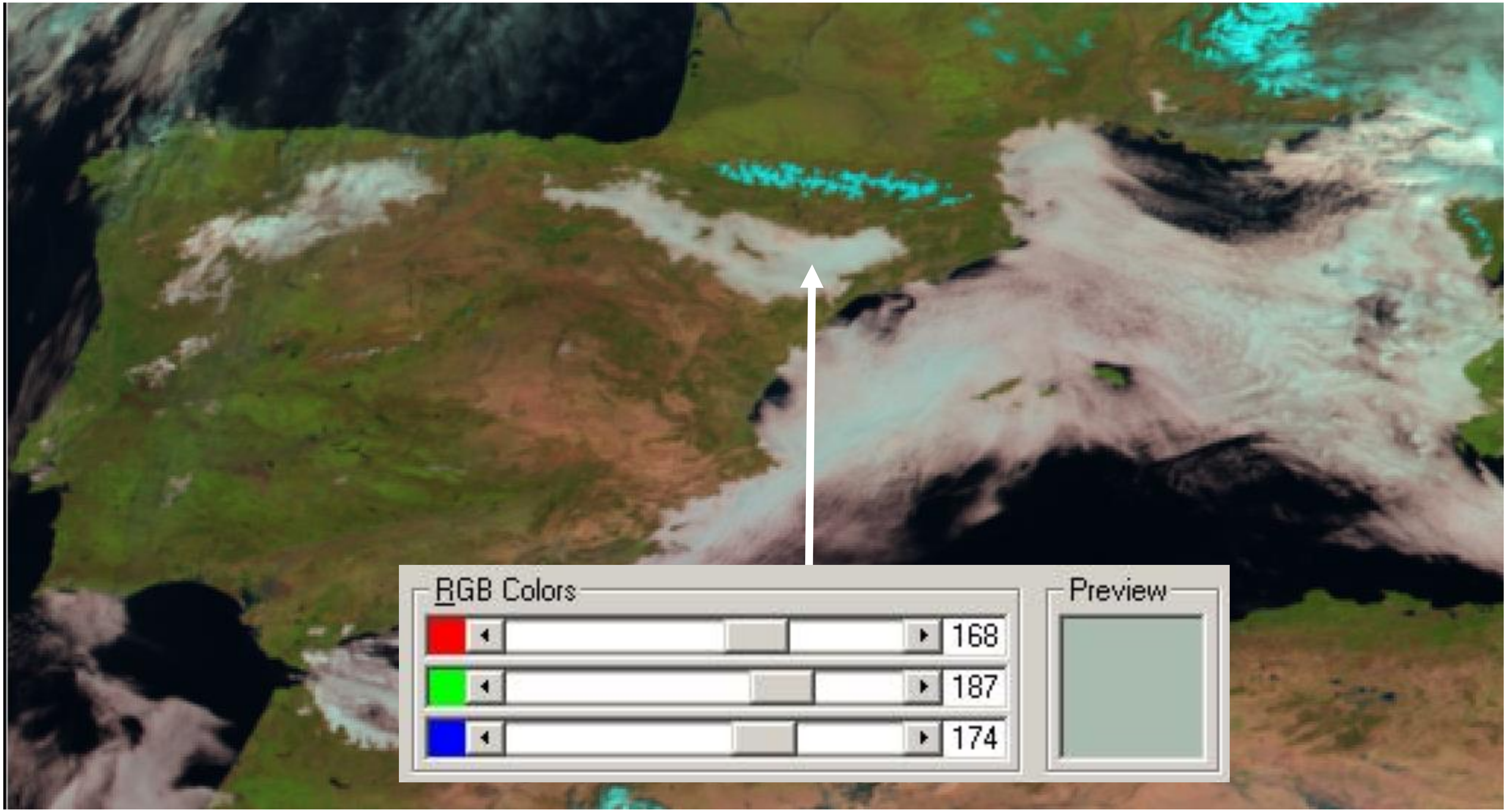
MSG-1, 23 June 2003, 15:00 UTC

Example: Desert



MSG-1, 3 February 2004, 11:30 UTC

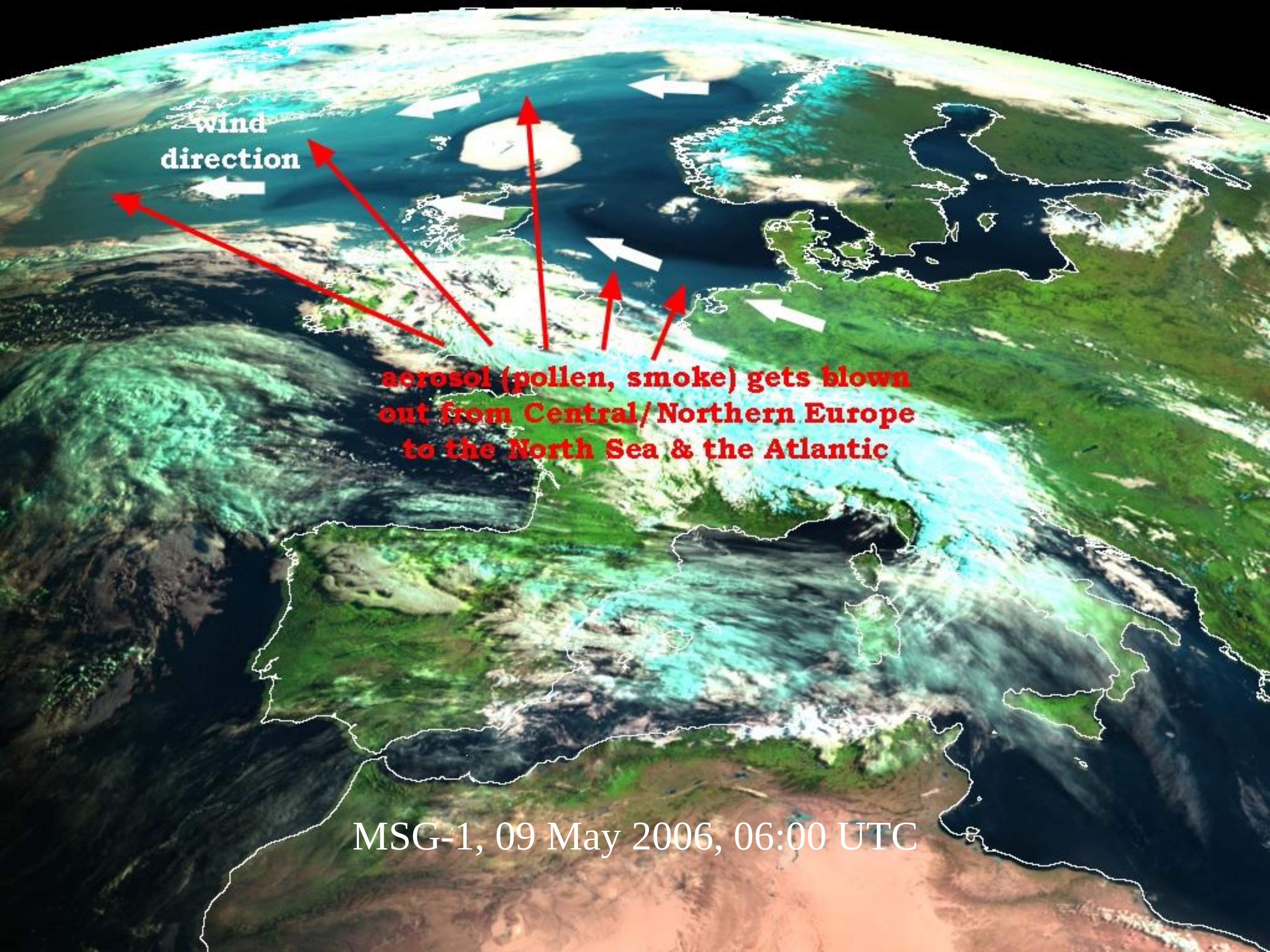
Example: Low-level Water Clouds (St, Sc)



MSG-1, 03 February 2004, 11:30 UTC

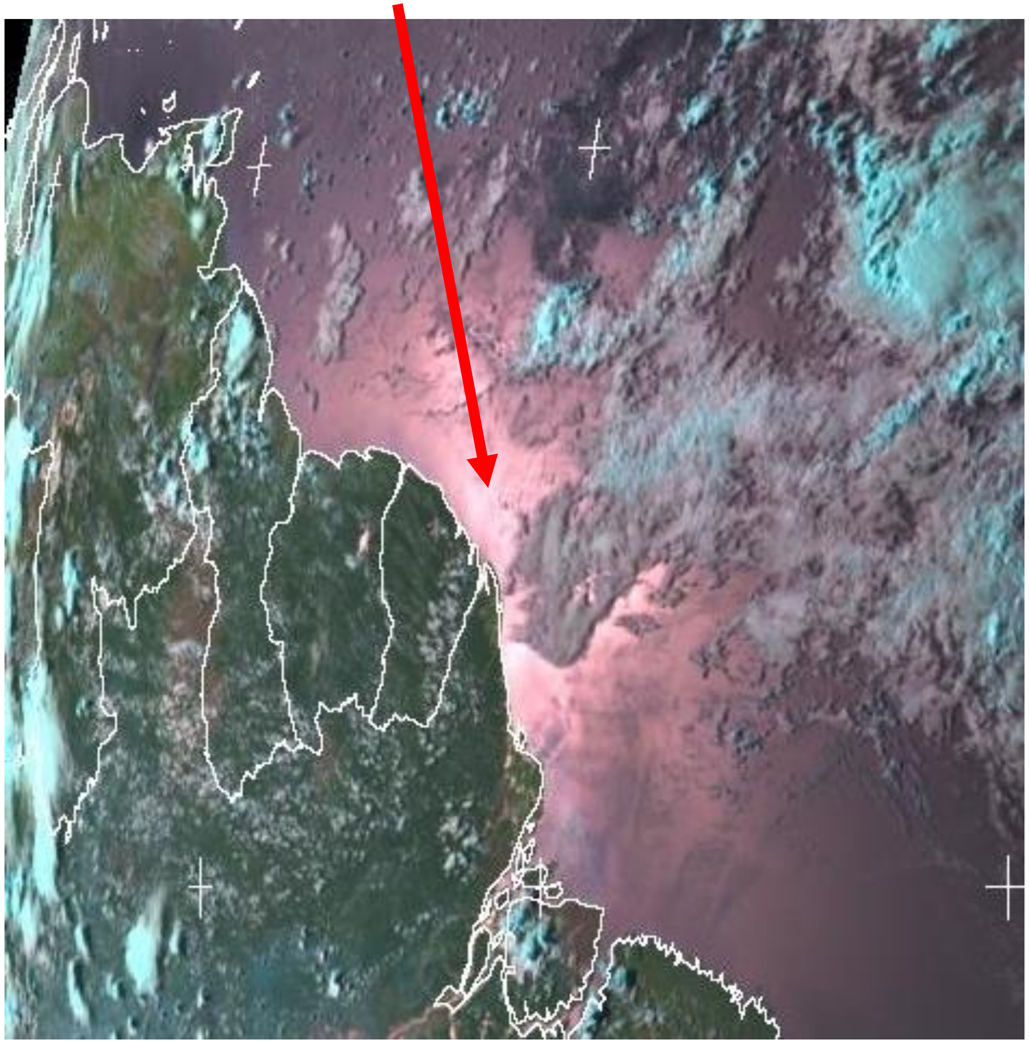
Example: Dust Cloud

MSG-1, 03 March 2004, 16:00 UTC


wind
direction
aerosol (pollen, smoke) gets blown
out from Central/Northern Europe
to the North Sea & the Atlantic
MSG-1, 09 May 2006, 06:00 UTC

Unusual colours because of:

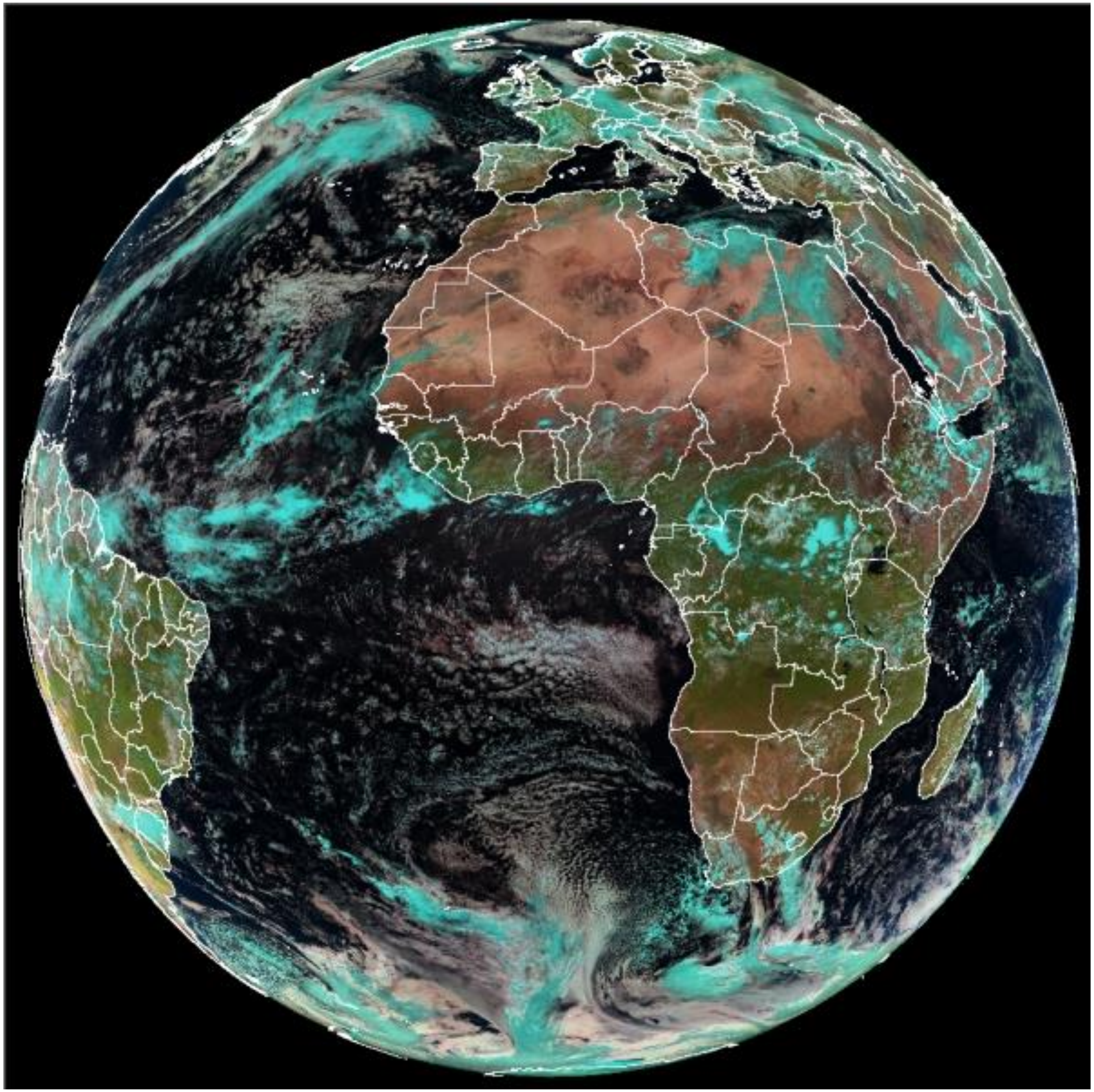
sun glint



13 September 2005, 19:00 UTC

dry salt lake

25 June 2007, 08:00 UTC



RGB
Natural Colours
Global View

MSG-1
19 April 2005
12:00 UTC

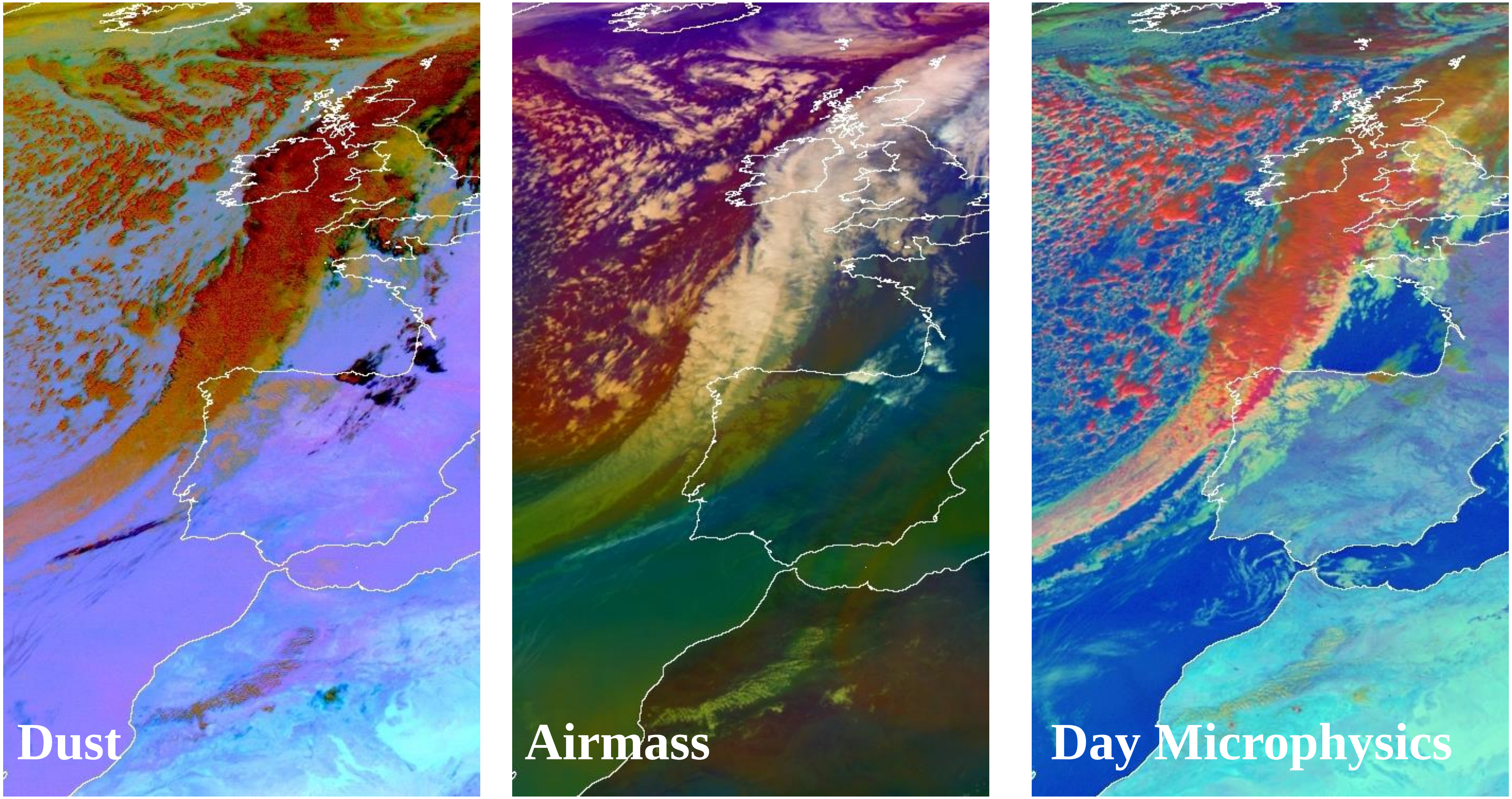
RGB Natural Colours: Interpretation of Colours

High-level ice clouds

Low-level water clouds

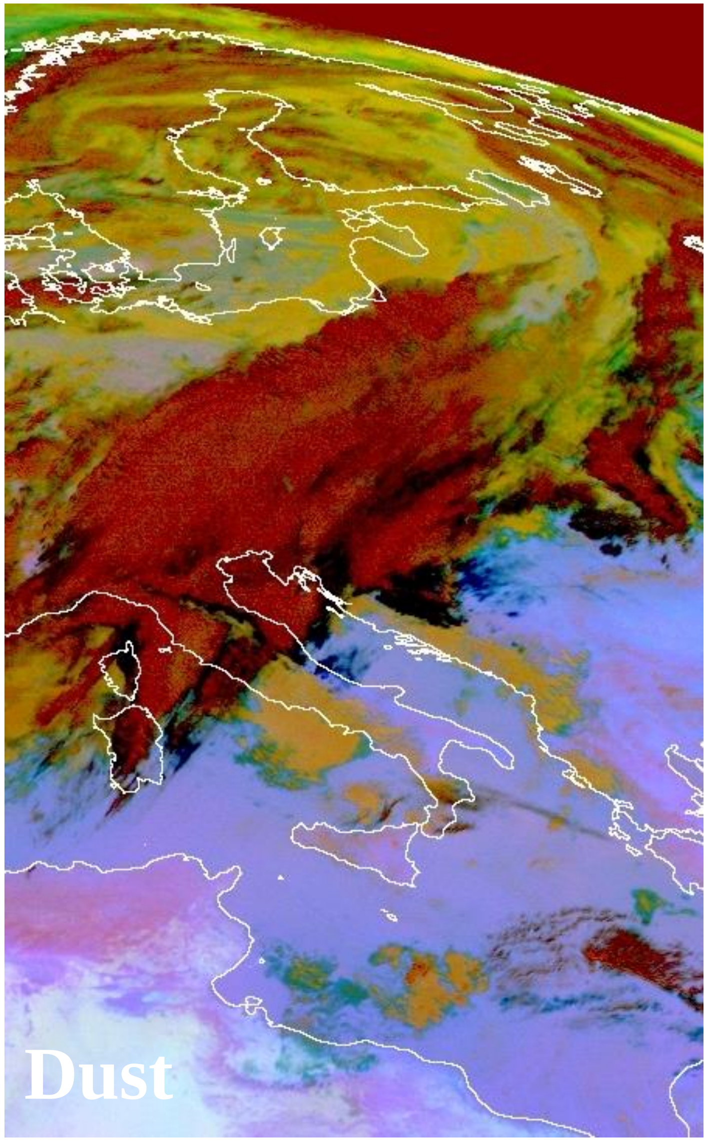
Ocean	Veg. Land	Desert	Snow

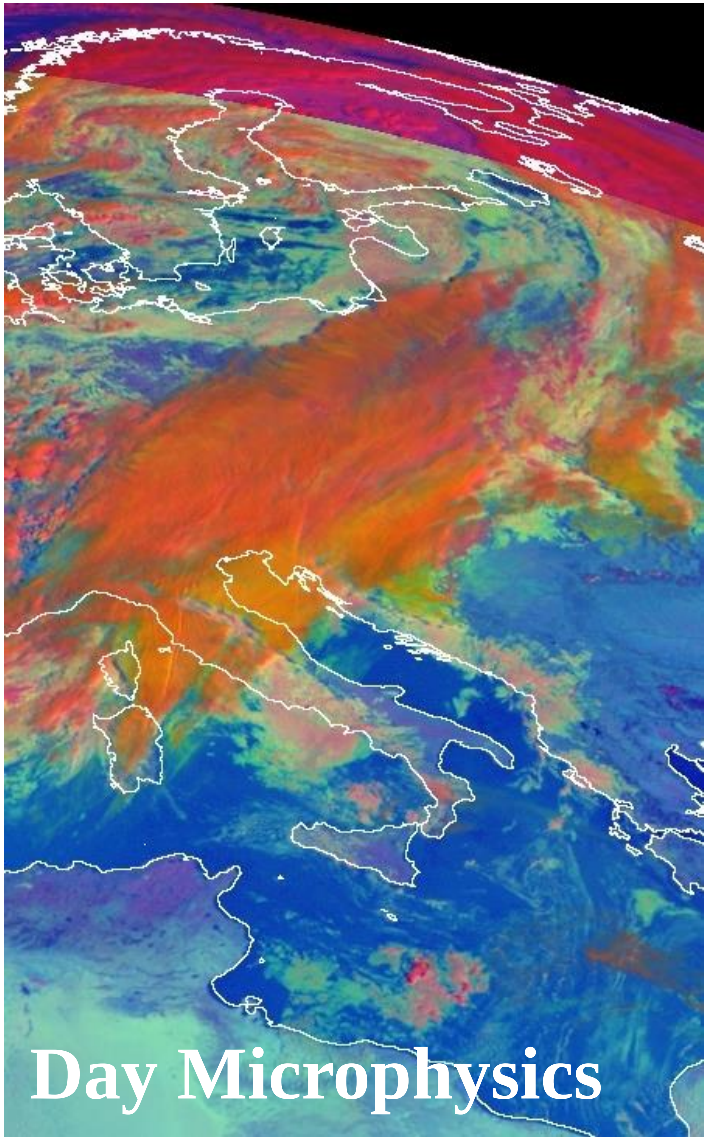
Summary: RGBs for Operational Forecasting

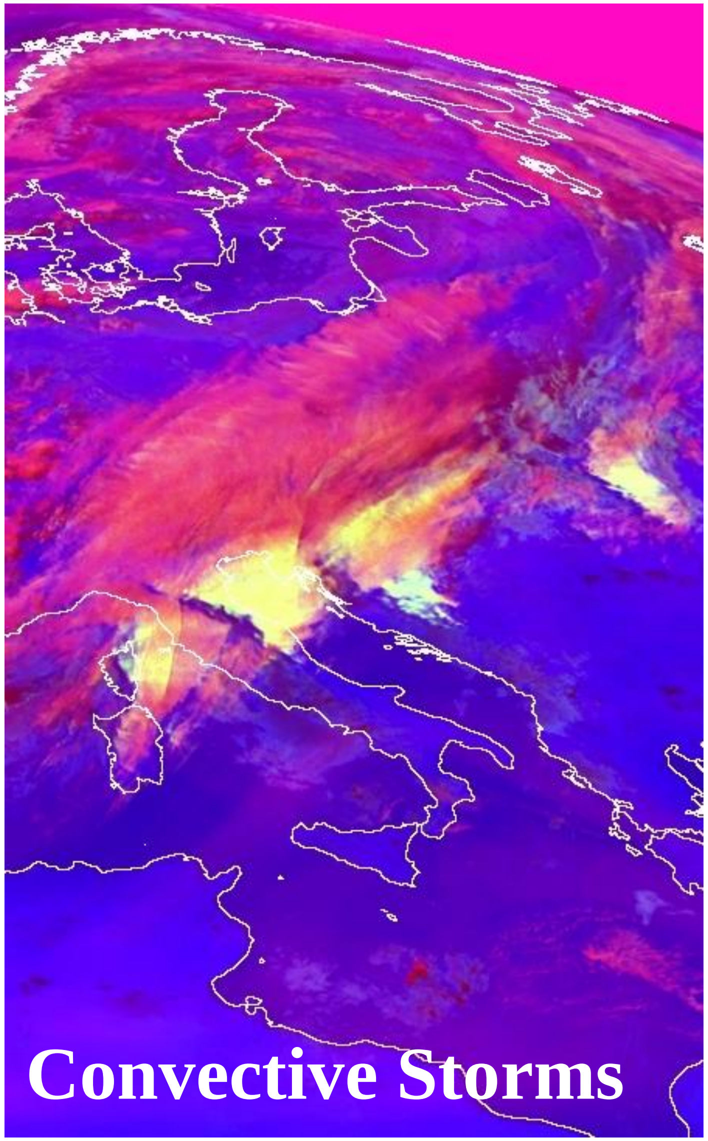


08 November 2005, 12:00 UTC

Summary: RGBs for Operational Forecasting







19 March 2007, 08:00 UTC