MSG Red-Green-Blue(RGB) combinations

Estelle de Coning

South African Weather Service

Most slides taken from EUMETSAT training events, Jochen Kerkmann

South African Weather Service
ISO 9001 Certified Organisation

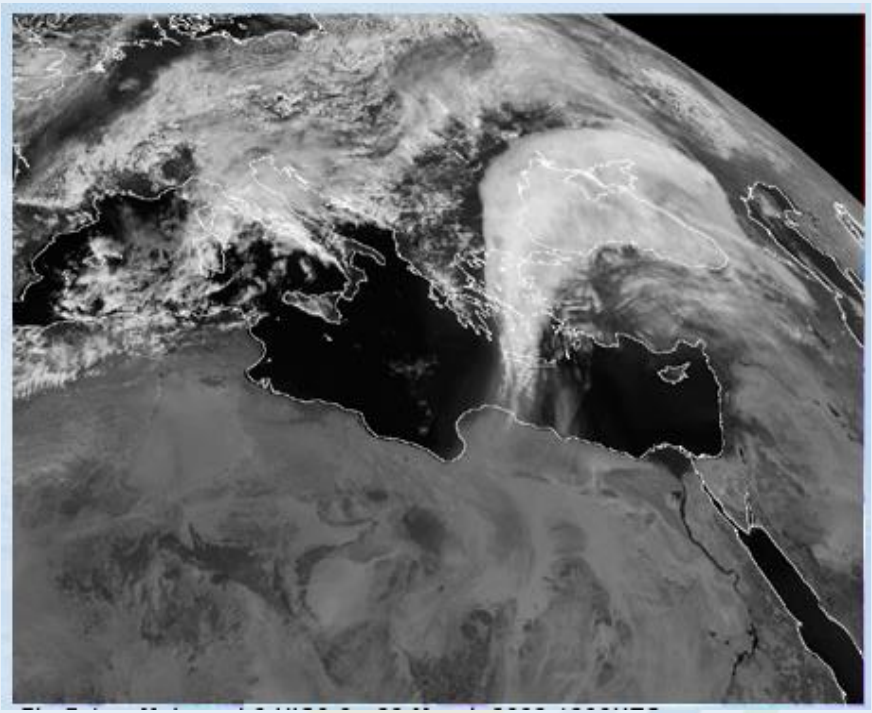
Content

- Why RGBs?
- Standard RGBs
- Examples of RGBs and their interpretation
  - Day Natural (3-2-1)
  - Day Microphysical (2-4r-9)
  - Convective Storms (5-6,4-9,3-1)
  - Airmass (5-6, 8-9,5i)
- Summary

South African Weather Service
ISO 9001 Certified Organisation

Why RGBs?

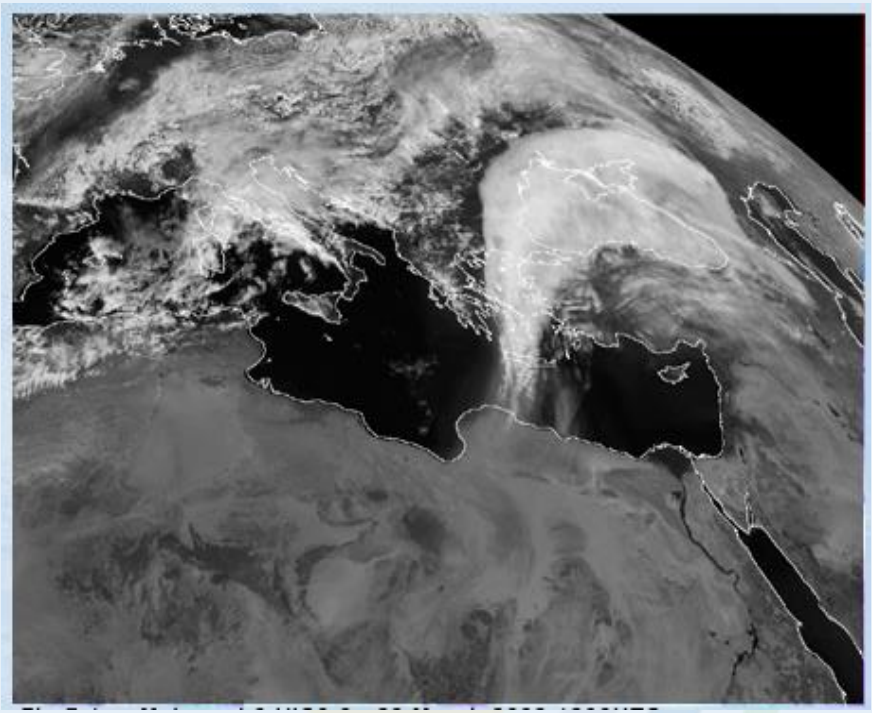
Visible (VIS0.6) image



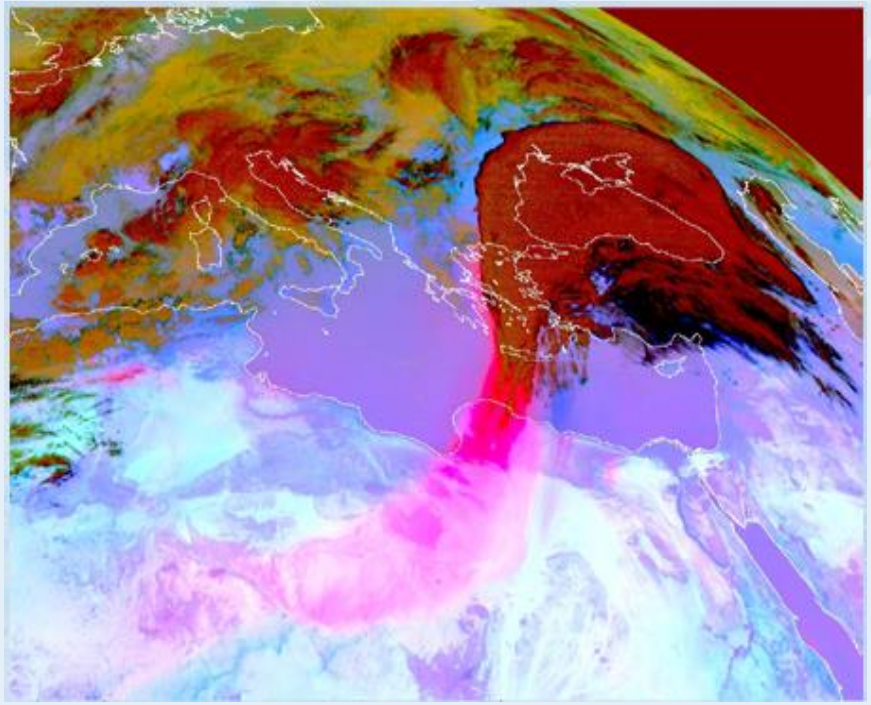
Exercise 1: where is the dust cloud ?

South African Weather Service
ISO 9001 Certified Organisation

Visible (VIS0.6) image



Dust RGB Product



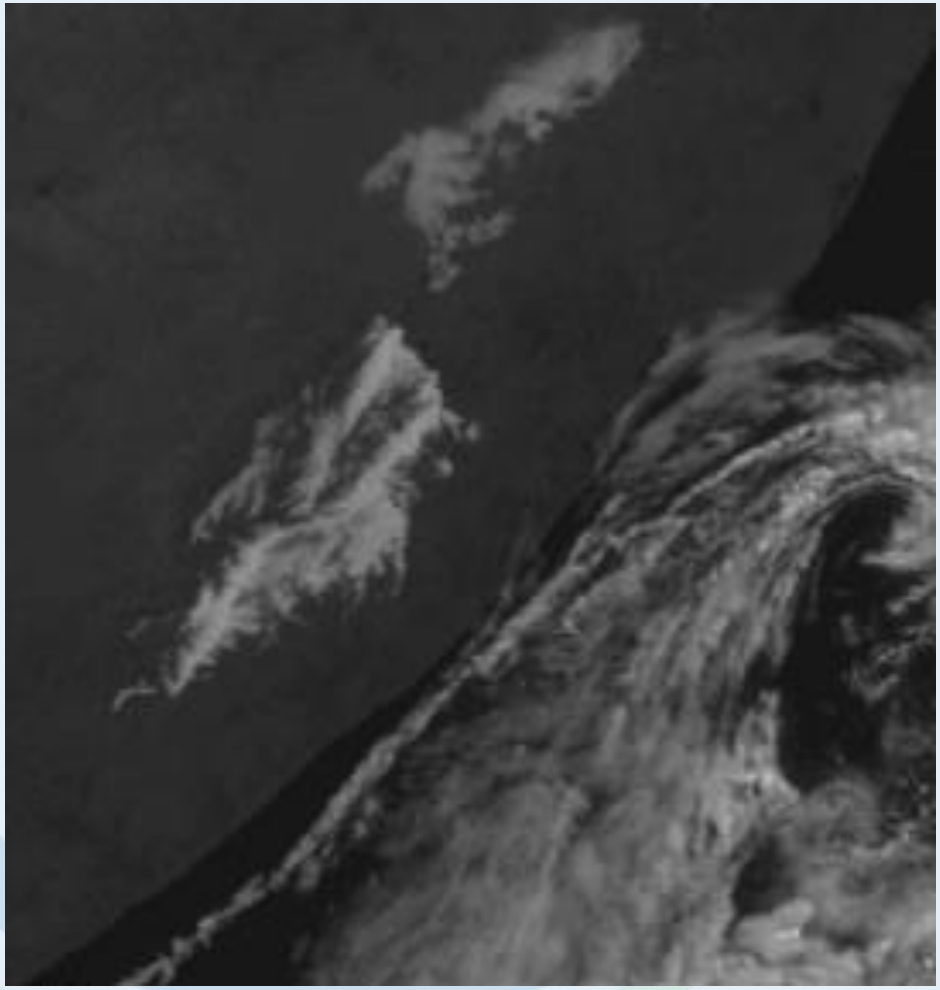
23 March 2008, 12 UTC

EUMETRAIN Module on RGB images:

http://www.zamg.ac.at/eumetrain/Seiten/CAL_Topic.htm

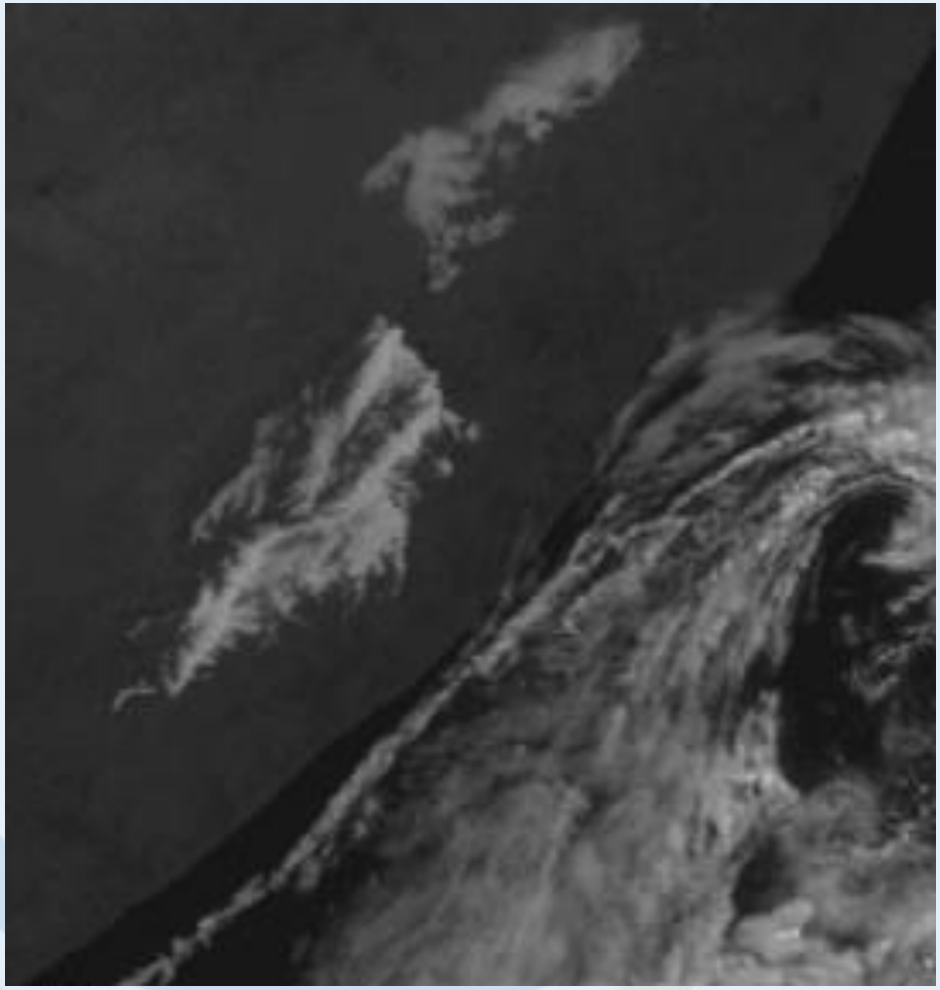
South African Weather Service
ISO 9001 Certified Organisation

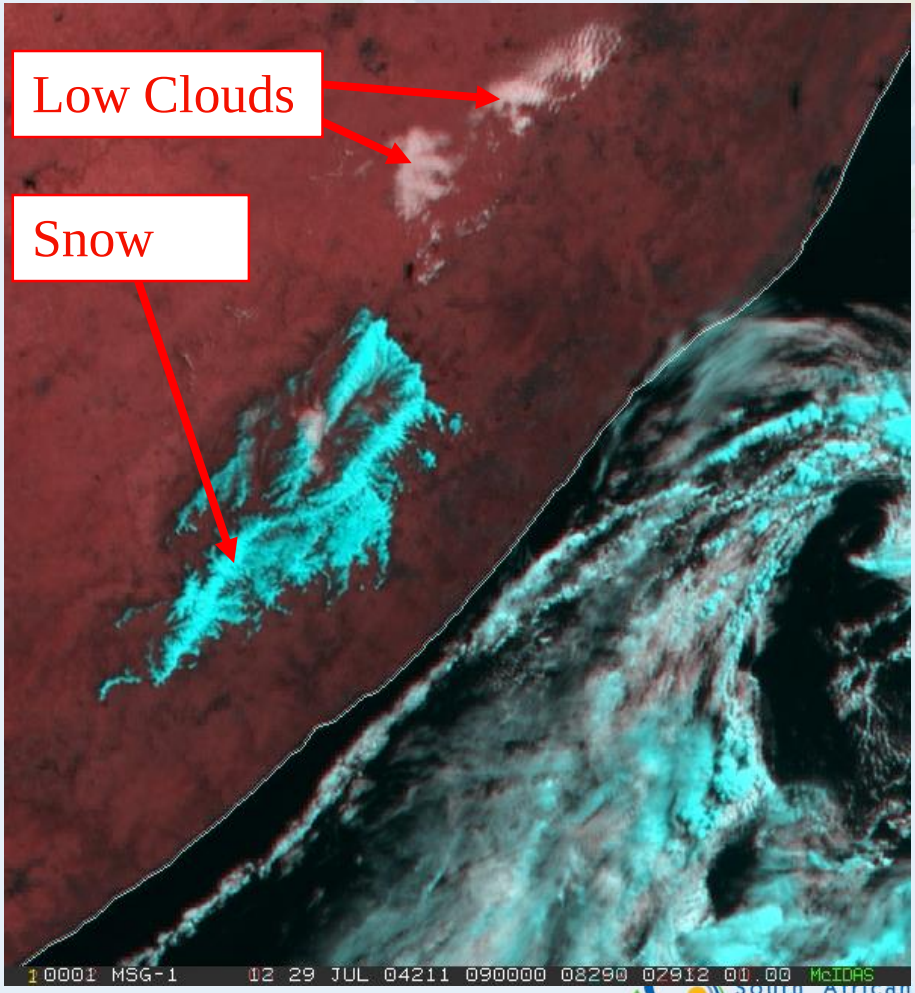
Where is snow and where low clouds ?



MFG VIS Channel

South African Weather Service
ISO 9001 Certified Organisation





MFG VIS Channel

MSG RGB HRV, NIR1.6

29 July 2004, 09 UTC

South African Weather Service
ISO 9001 Certified Organisation

RGB Image Composites – Pros & Cons

- **Drawbacks**:
  - Millions of colours compared to discrete classes used in quantitative image products → interpretation more difficult;
  - Cannot be handled by colour-blind.
- **Advantages**:
  - Millions of colours: high information content;
  - Easily implemented;
  - Preserves “natural look” of images by retaining original textures (in particular for clouds);
  - Preserves temporal continuity allowing for smooth animation of RGB image sequences.

South African Weather Service
ISO 9001 Certified Organisation

Standard RGBs

	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

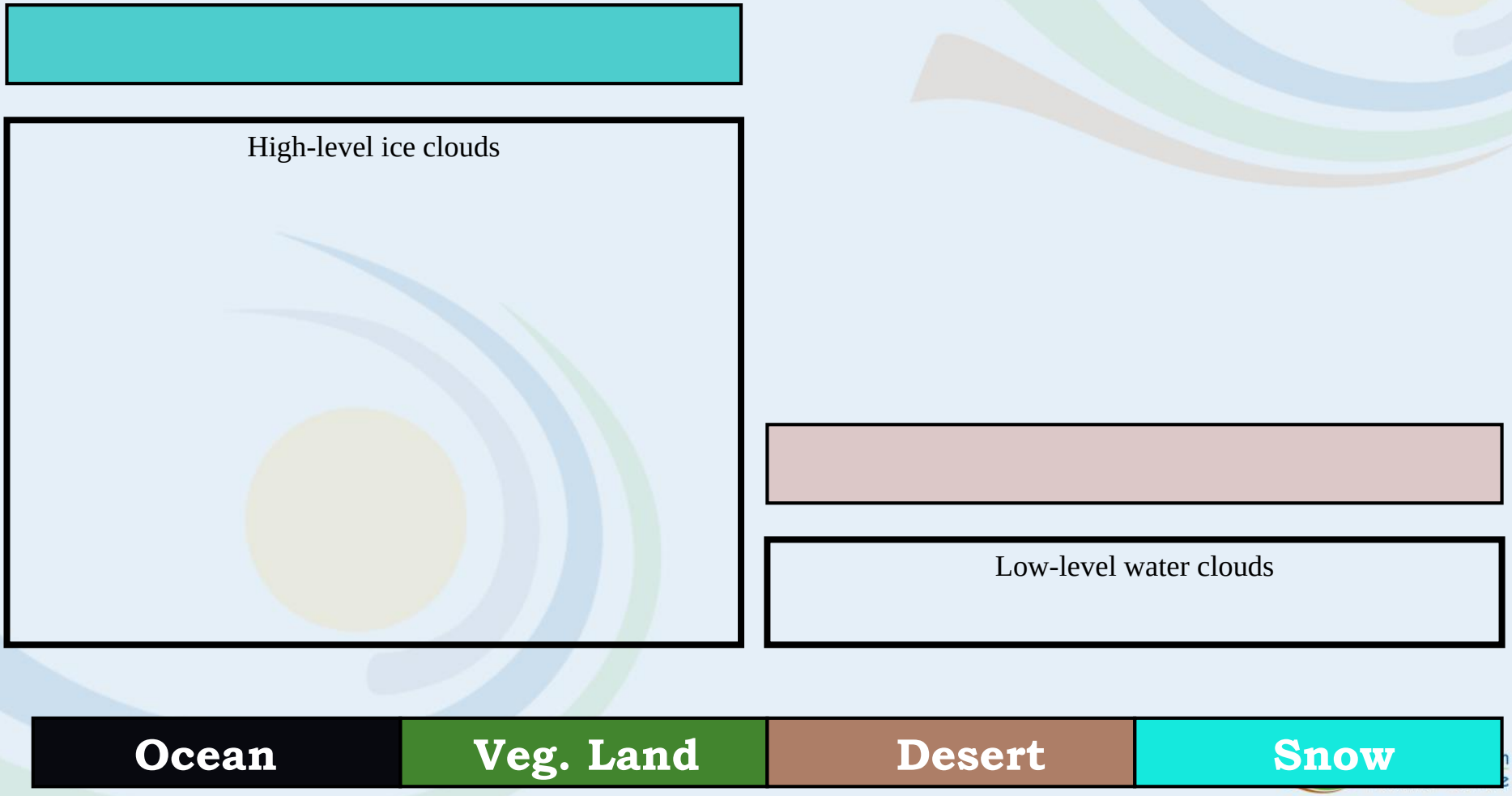
South African Weather Service
ISO 9001 Certified Organisation

RGB 03, 02, 01
("Day Natural Colours")

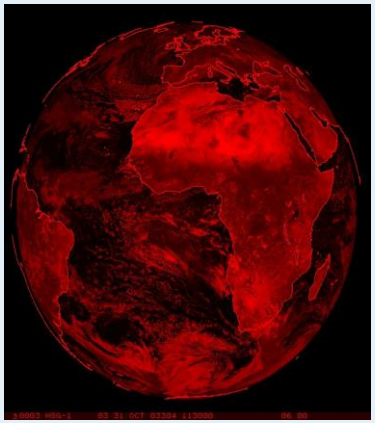
R = Channel 03 (NIR1.6)
G = Channel 02 (VIS0.8)
B = Channel 01 (VIS0.6)

Applications:	Vegetation, Dust, Smoke, Fog, Snow
Area:	Full MSG Viewing Area
Time:	Day-Time

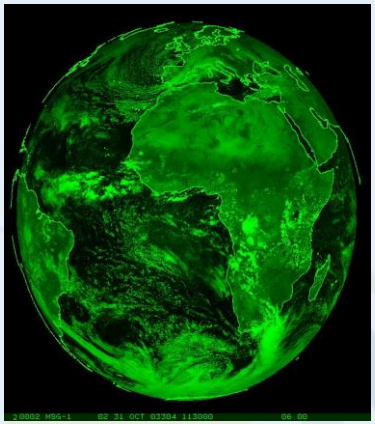
RGB 03, 02, 01: Interpretation of Colours



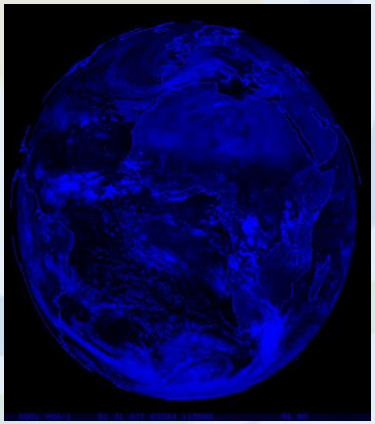
Ch.03
NIR1.6

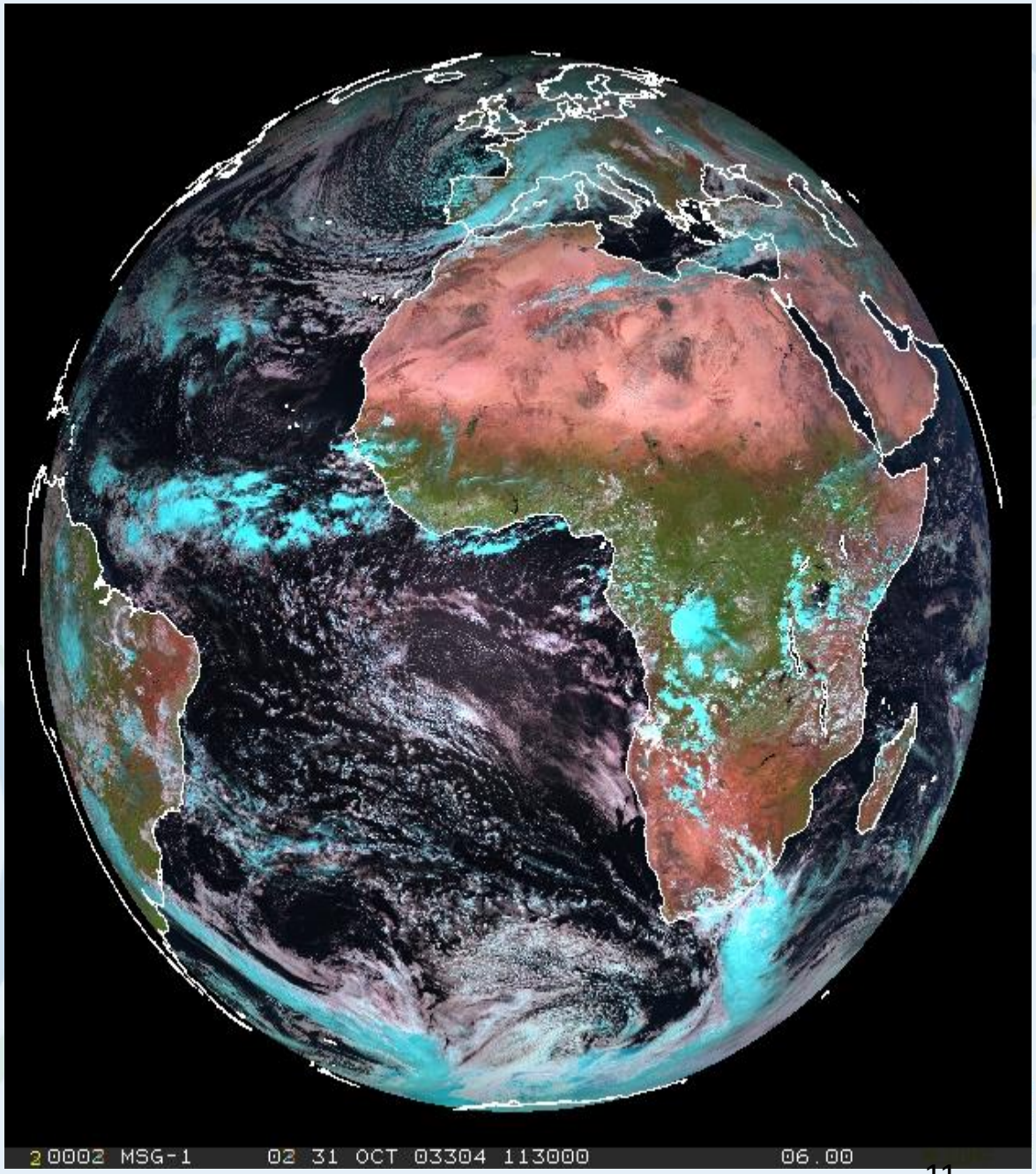


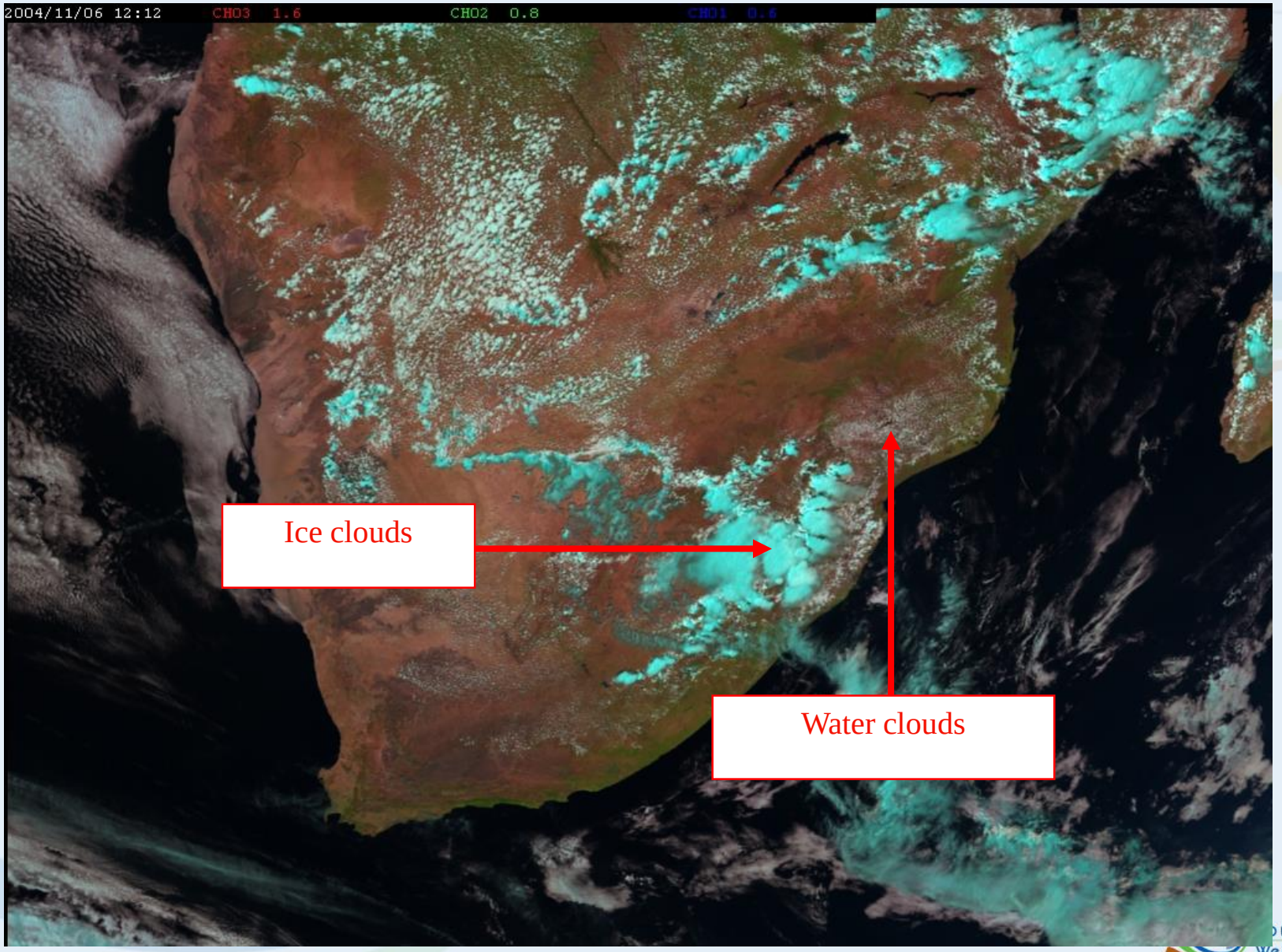
Ch.02
VIS0.8



Ch.01
VIS0.6

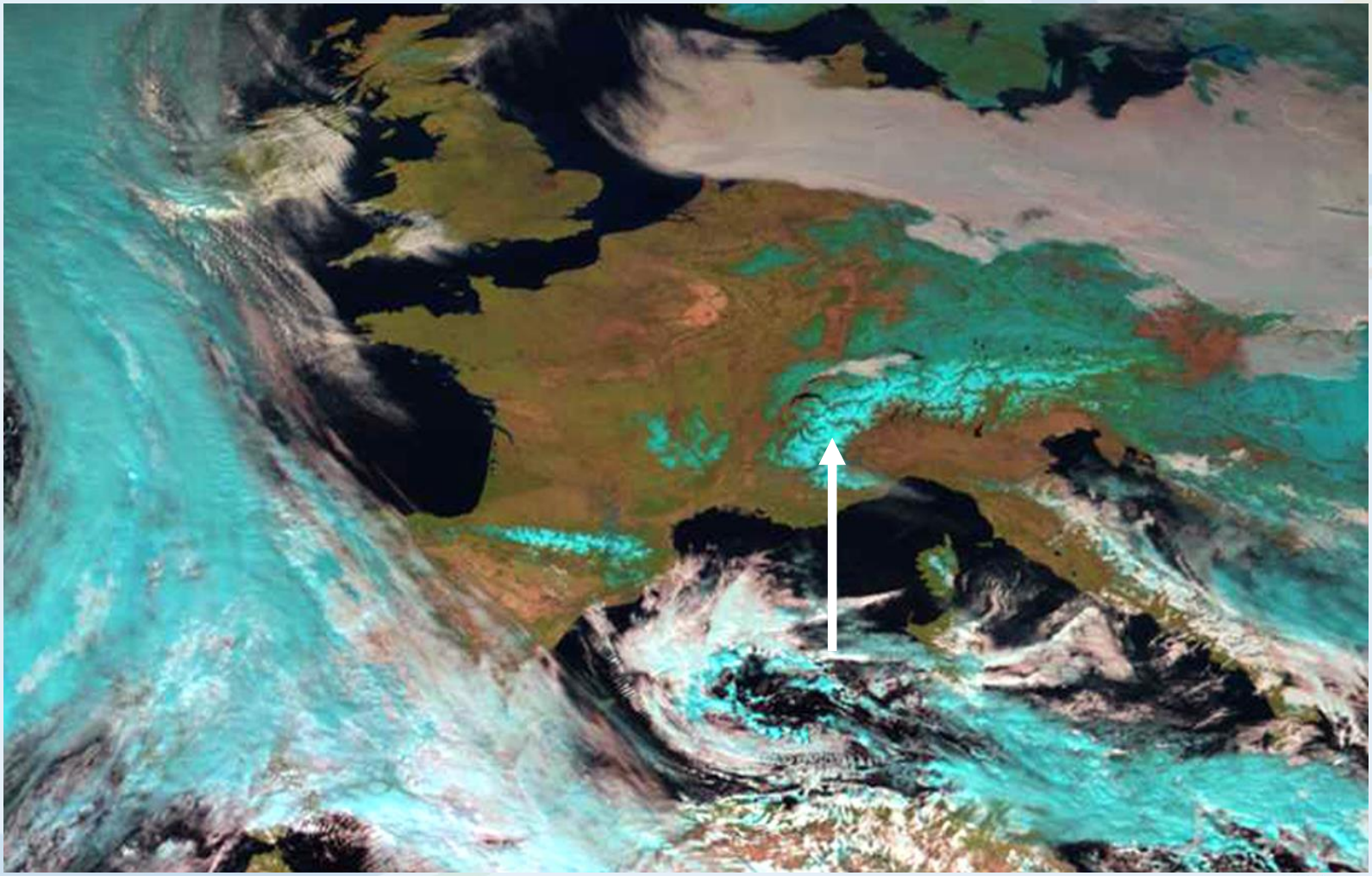






6 November 2004, 12:00 UTC, RGB NIR1.6, VIS0.8 VIS0.6

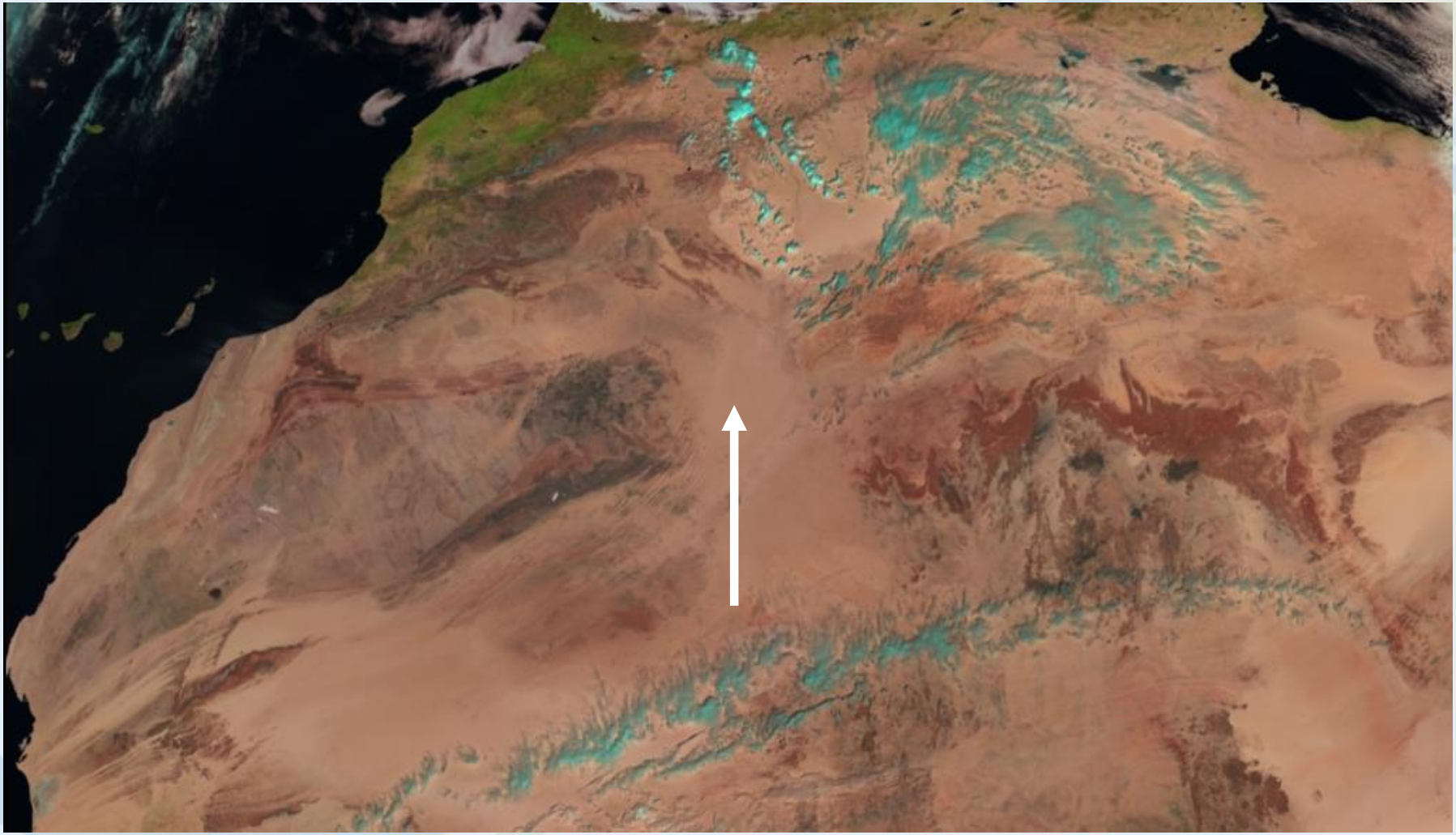
RGB 03, 02, 01 Example: Snow



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

South African Weather Service
ISO 9001 Certified Organisation

RGB 03, 02, 01 Example: Desert



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

South African Weather Service
ISO 9001 Certified Organisation

RGB 02, 04r, 09
("Day Microphysical")

R = Channel 02 (VIS0.8)

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

B = Channel 09 (IR10.8)

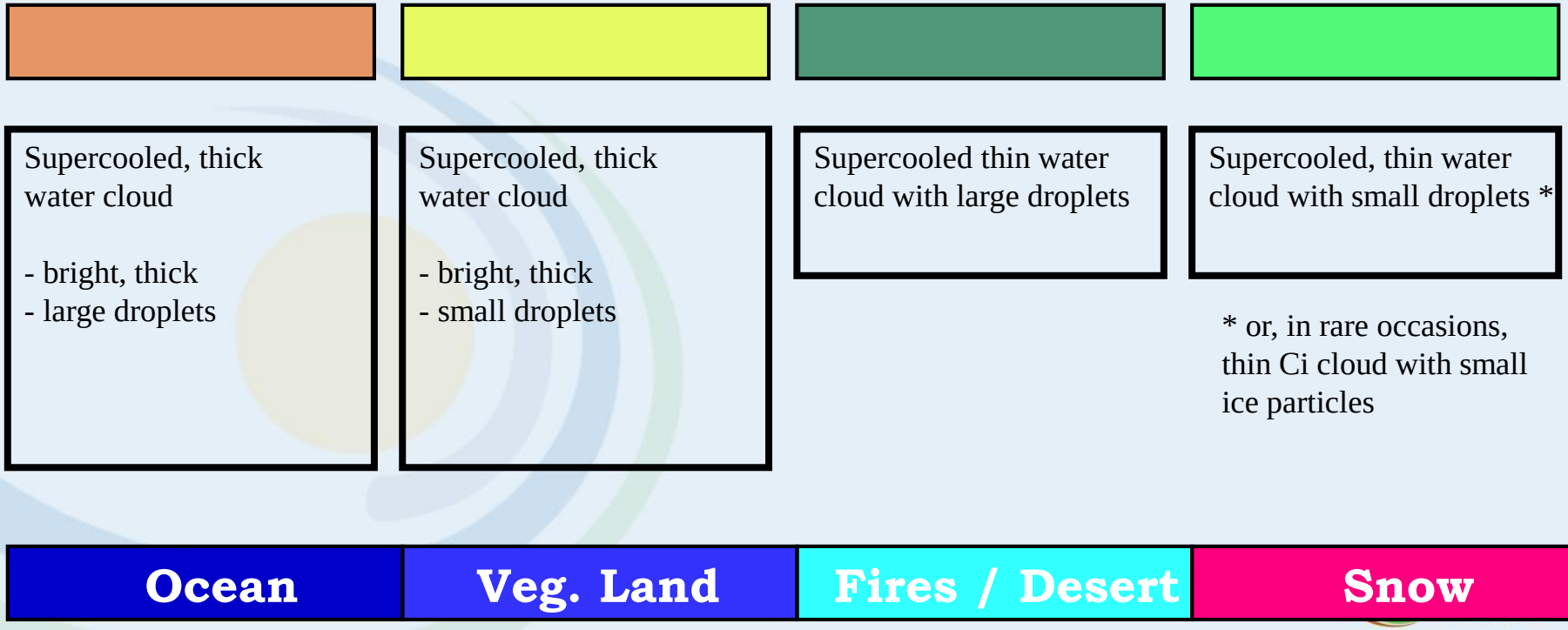
Applications:	Cloud Analysis, Convection, Fog, Snow, Fires
Area:	Full MSG Viewing Area
Time:	Day-Time

South African Weather Service
ISO 9001 Certified Organisation

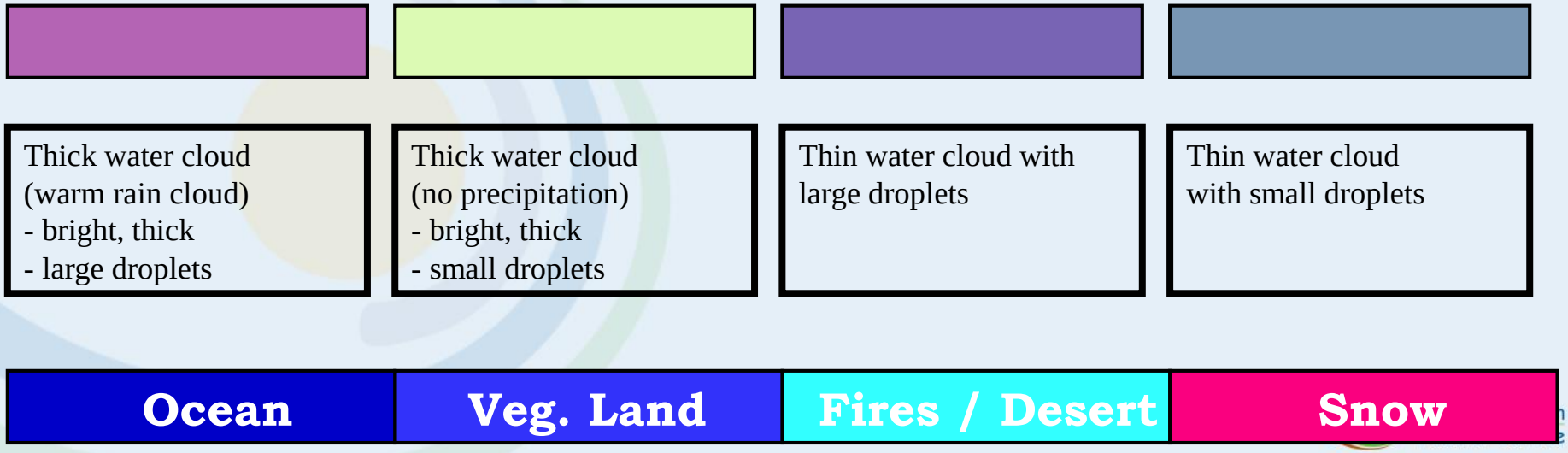
RGB 02, 04r, 09: Interpretation of Colours for High-level Clouds

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)

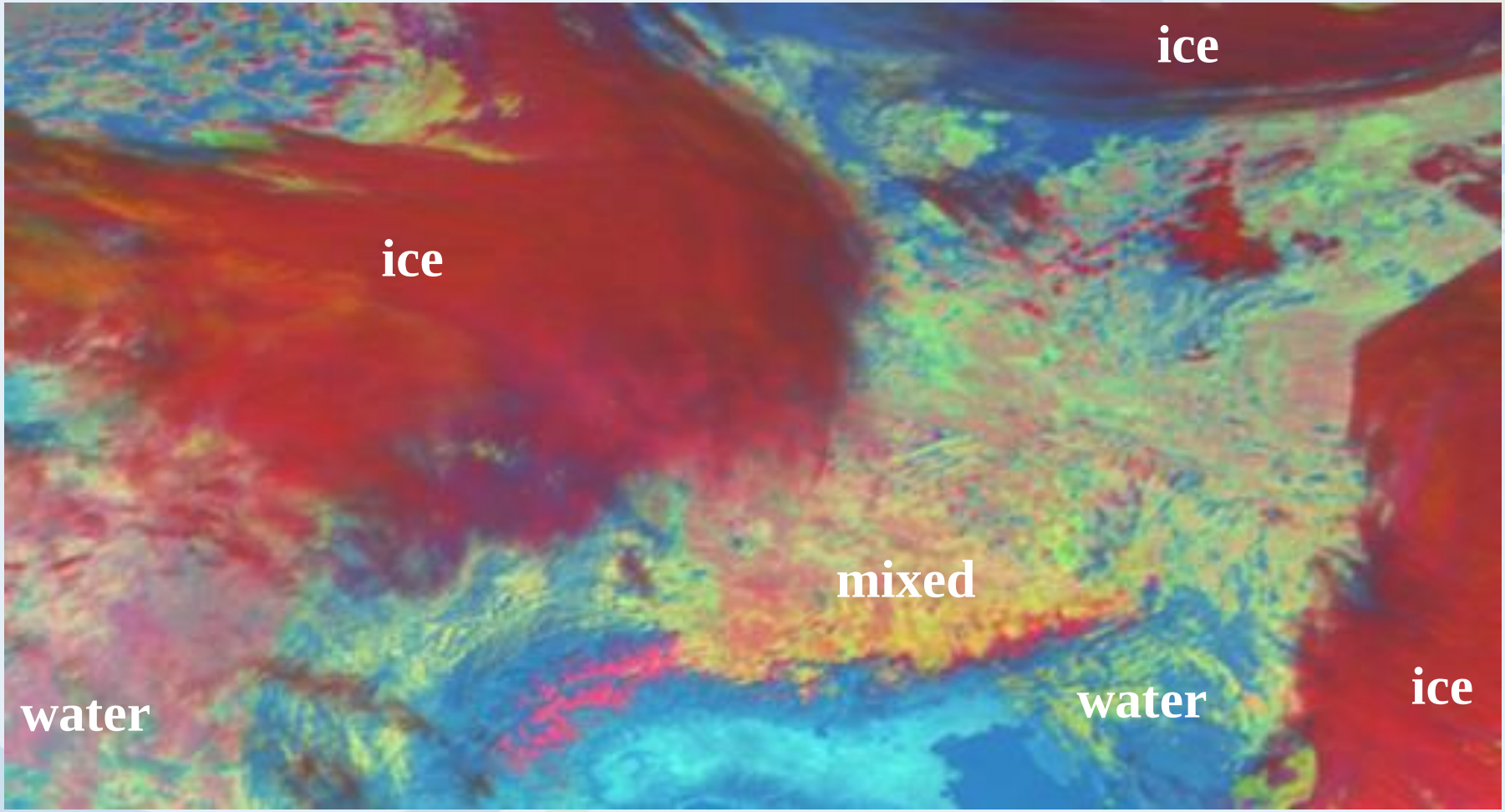
RGB 02, 04r, 09: Interpretation of Colours for Mid-level Clouds



RGB 02, 04r, 09: Interpretation of Colours for Low-level Clouds



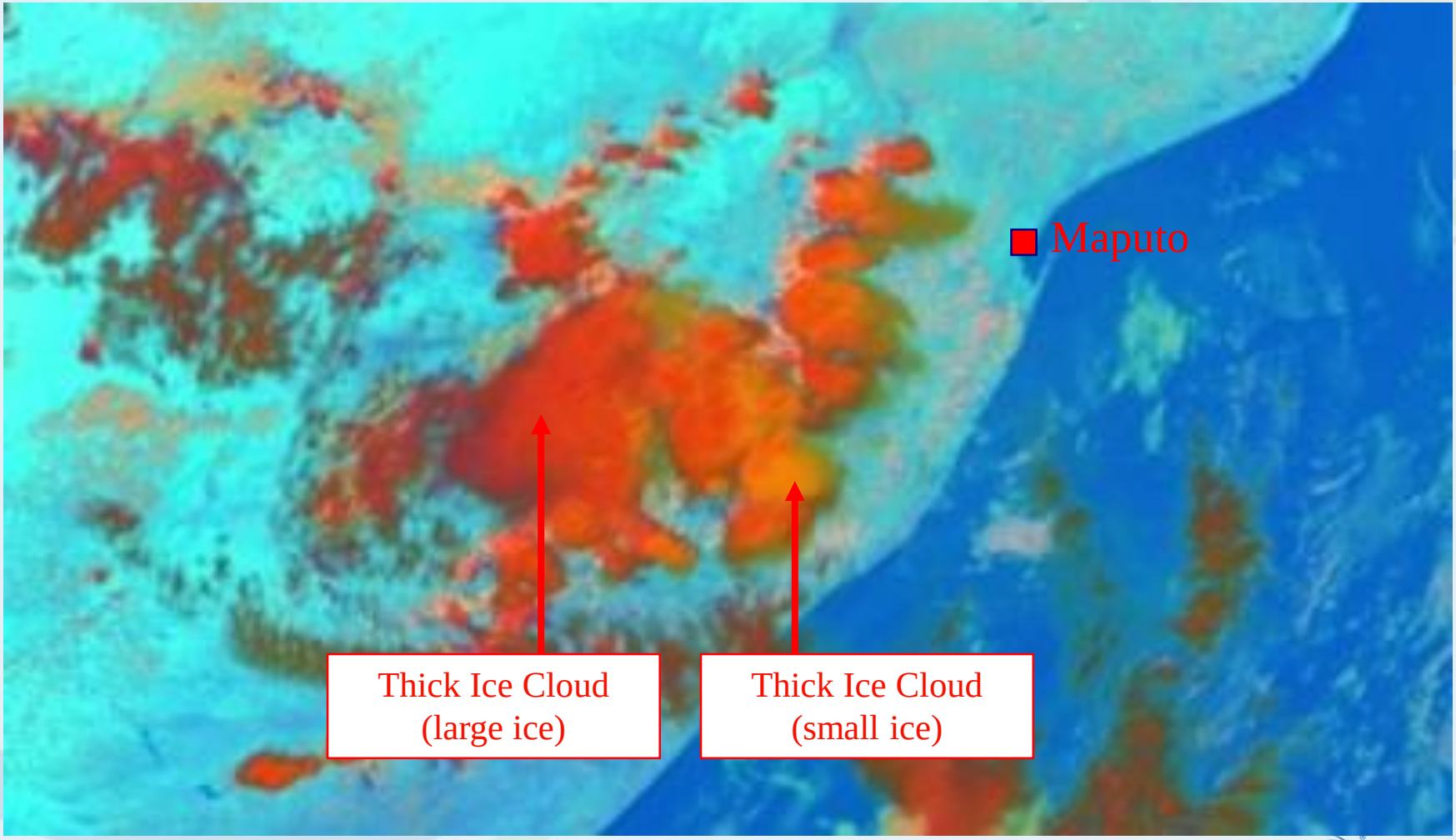
Example: Cloud Phase



8 October 2003, 12:00 UTC, RGB VIS0.6, IR3.9r, IR10.8

South African Weather Service
ISO 9001 Certified Organisation

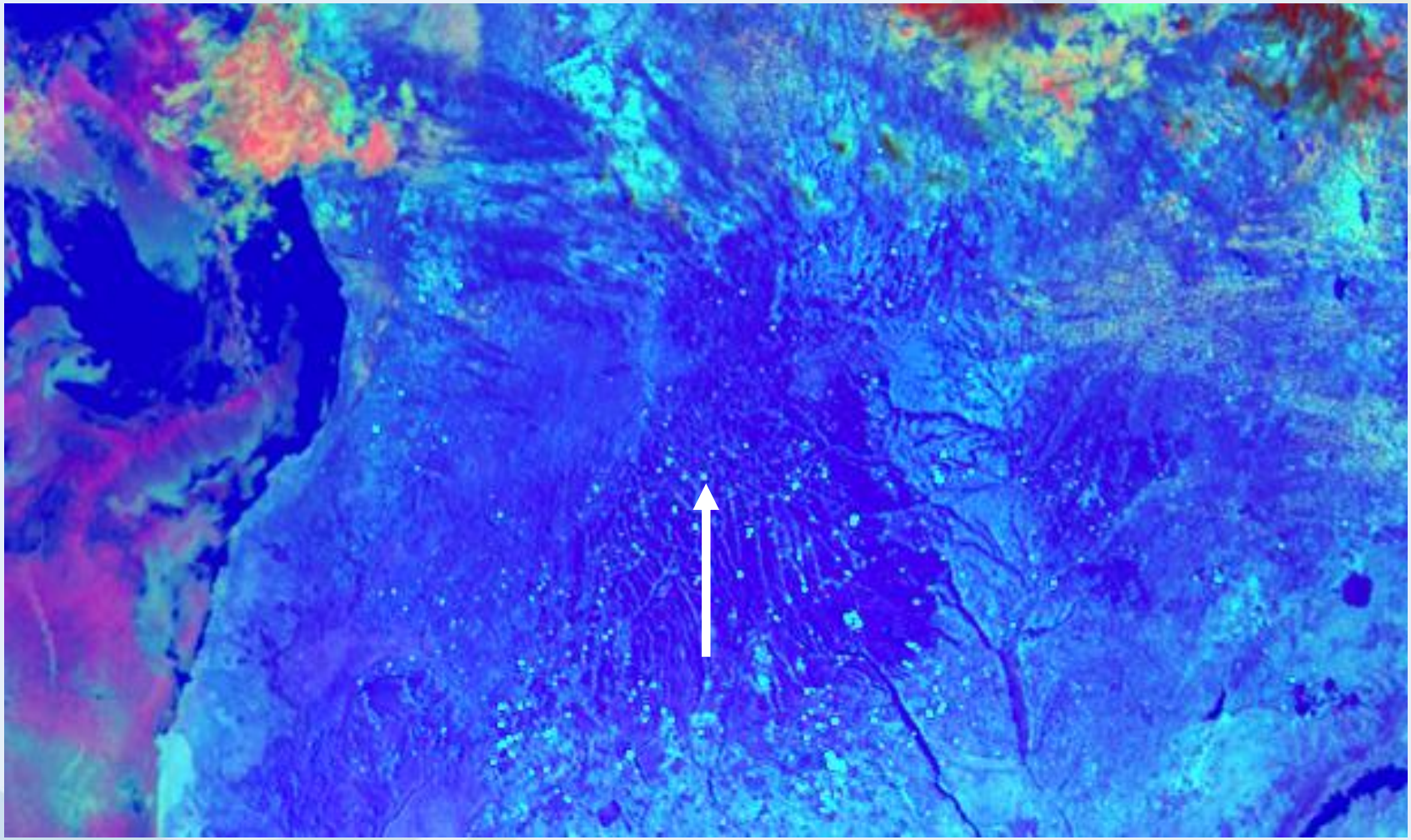
Example: Cloud Particle Size



MSG-1, 6 November 2004, 12:00 UTC, RGB VIS0.8, IR3.9r, IR10.8

South African Weather Service
ISO 9001 Certified Organisation

RGB 02, 04r, 09 Example: Fires



MSG-1, 7 September 2003, 11:45 UTC ("winter" enhancement)

South African Weather Service
ISO 9001 Certified Organisation

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

R = Difference WV6.2 - WV7.3

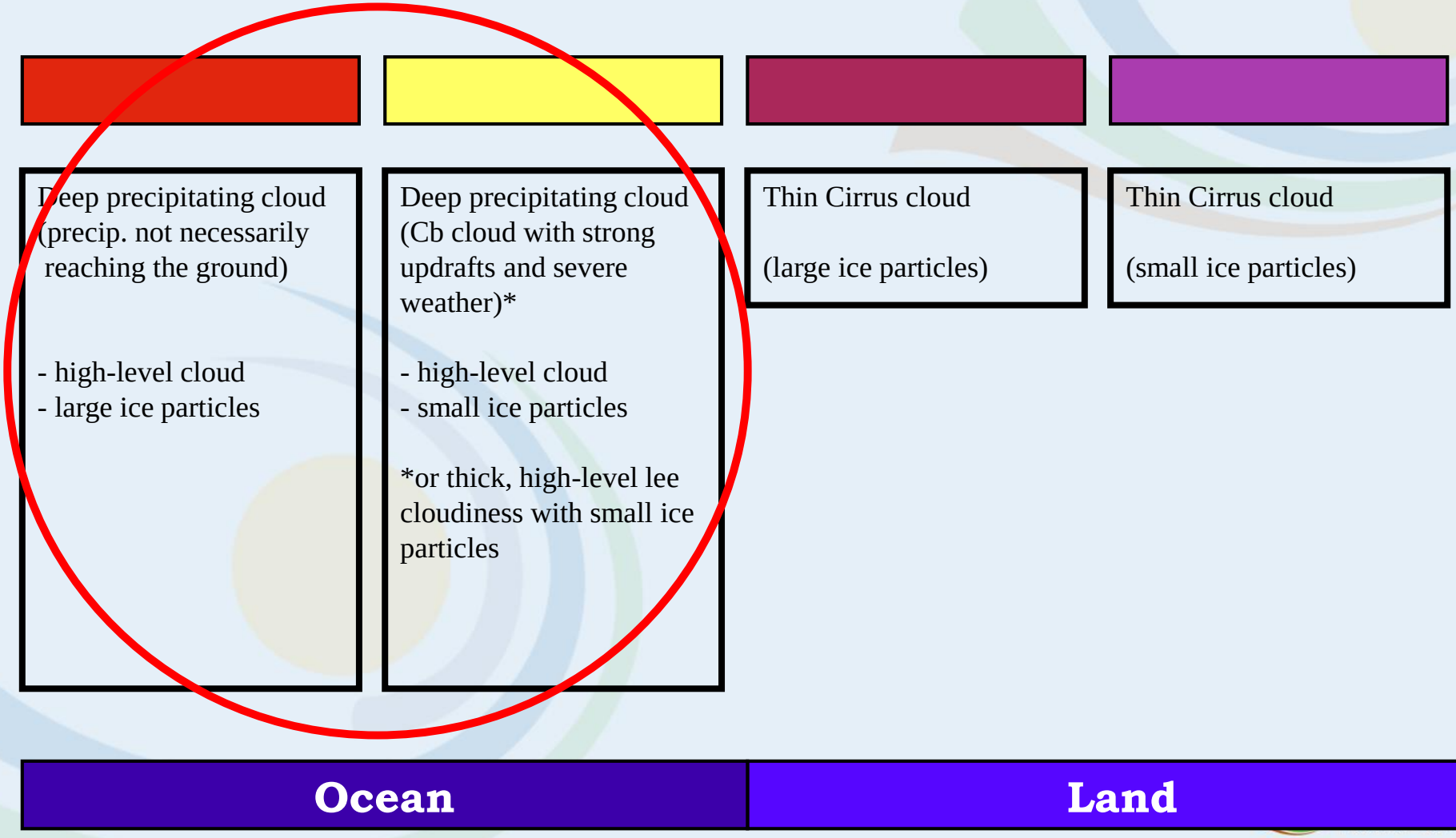
G = Difference IR3.9 - IR10.8

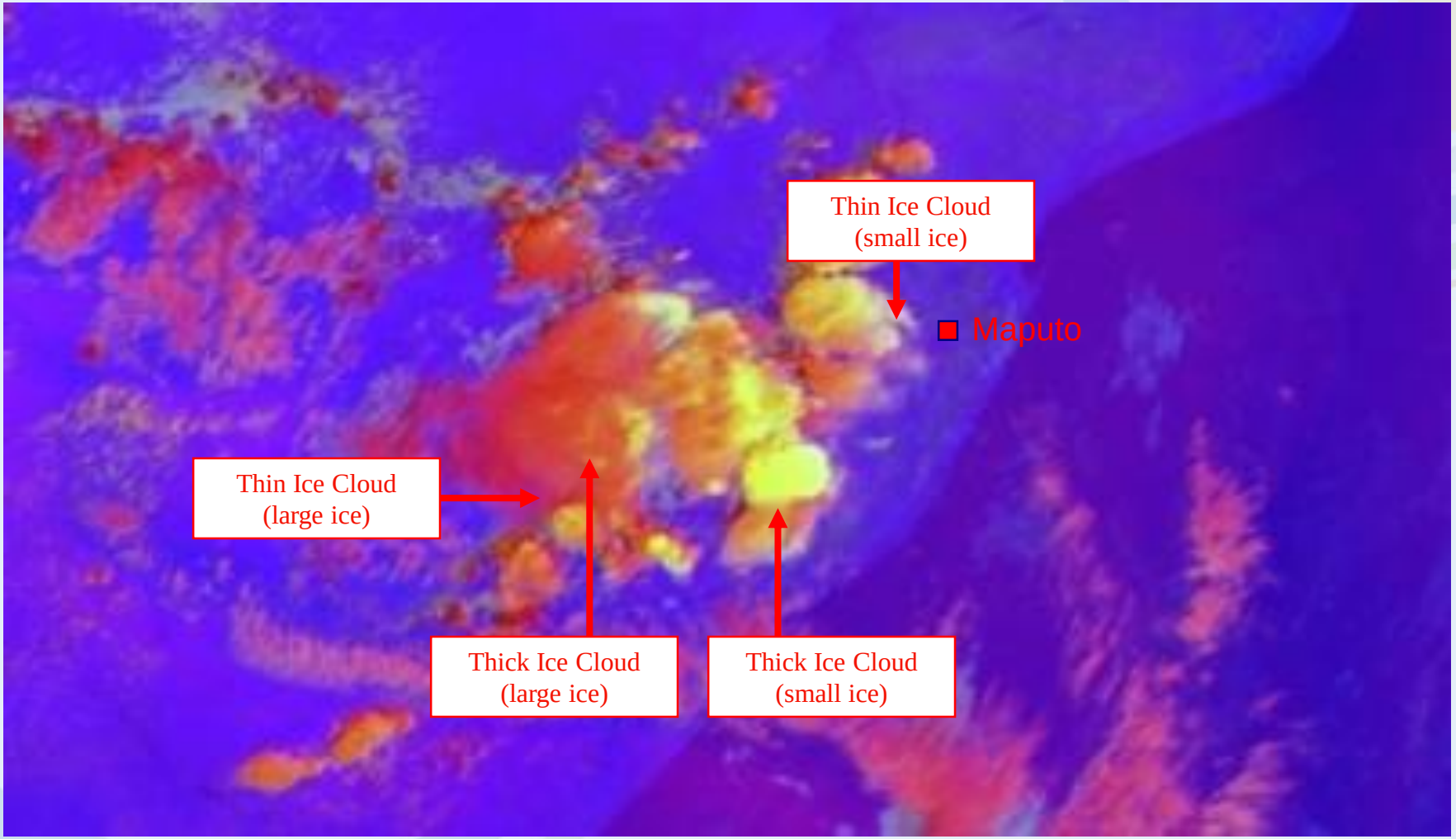
B = Difference NIR1.6 - VIS0.6

Applications:	Severe Convective Storms
Area:	Full MSG Viewing Area
Time:	Day-Time

South African Weather Service
ISO 9001 Certified Organisation

RGB 05-06, 04-09, 03-01: Interpretation of Colours

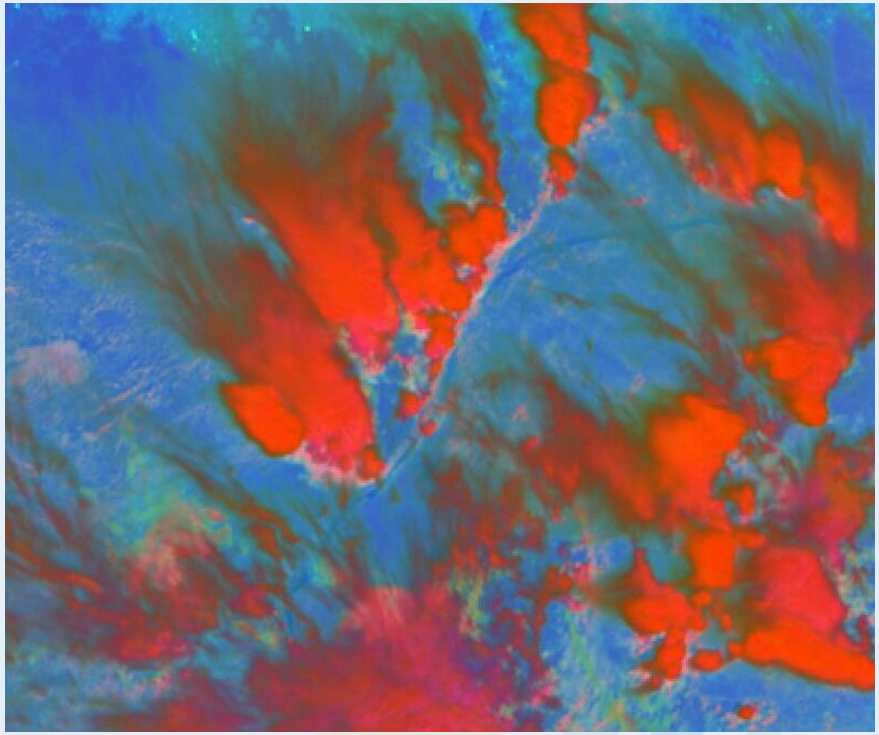




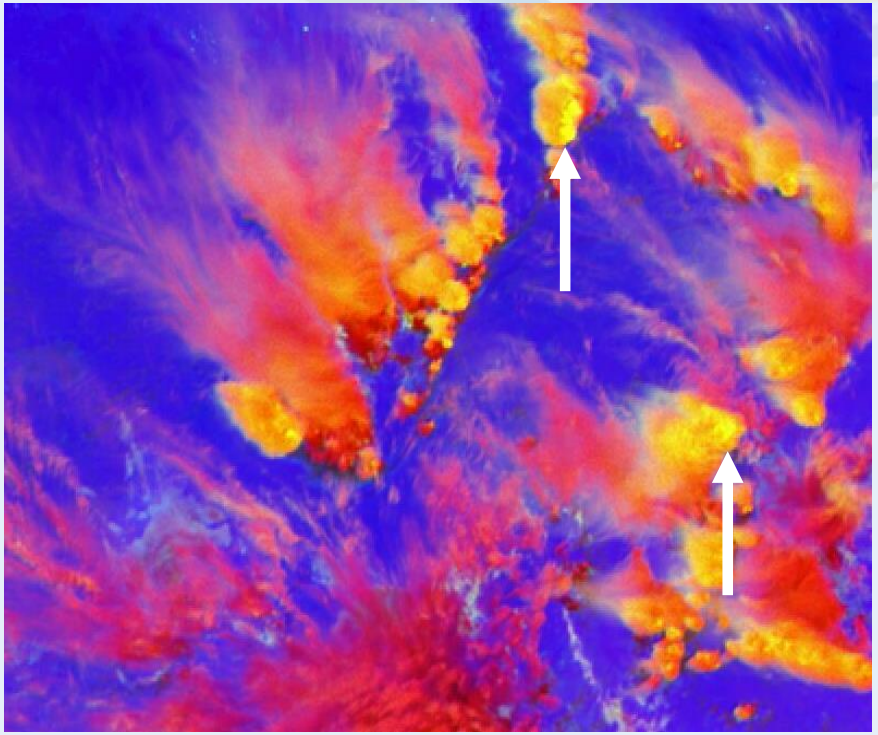
MSG-1, 6 November 2004, 12:00 UTC, RGB 05-06, 04-09, 03-01

South African Weather Service
ISO 9001 Certified Organisation

RGB 05-06, 04-09, 03-01 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

South African Weather Service
ISO 9001 Certified Organisation

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

R = Difference WV6.2 - WV7.3

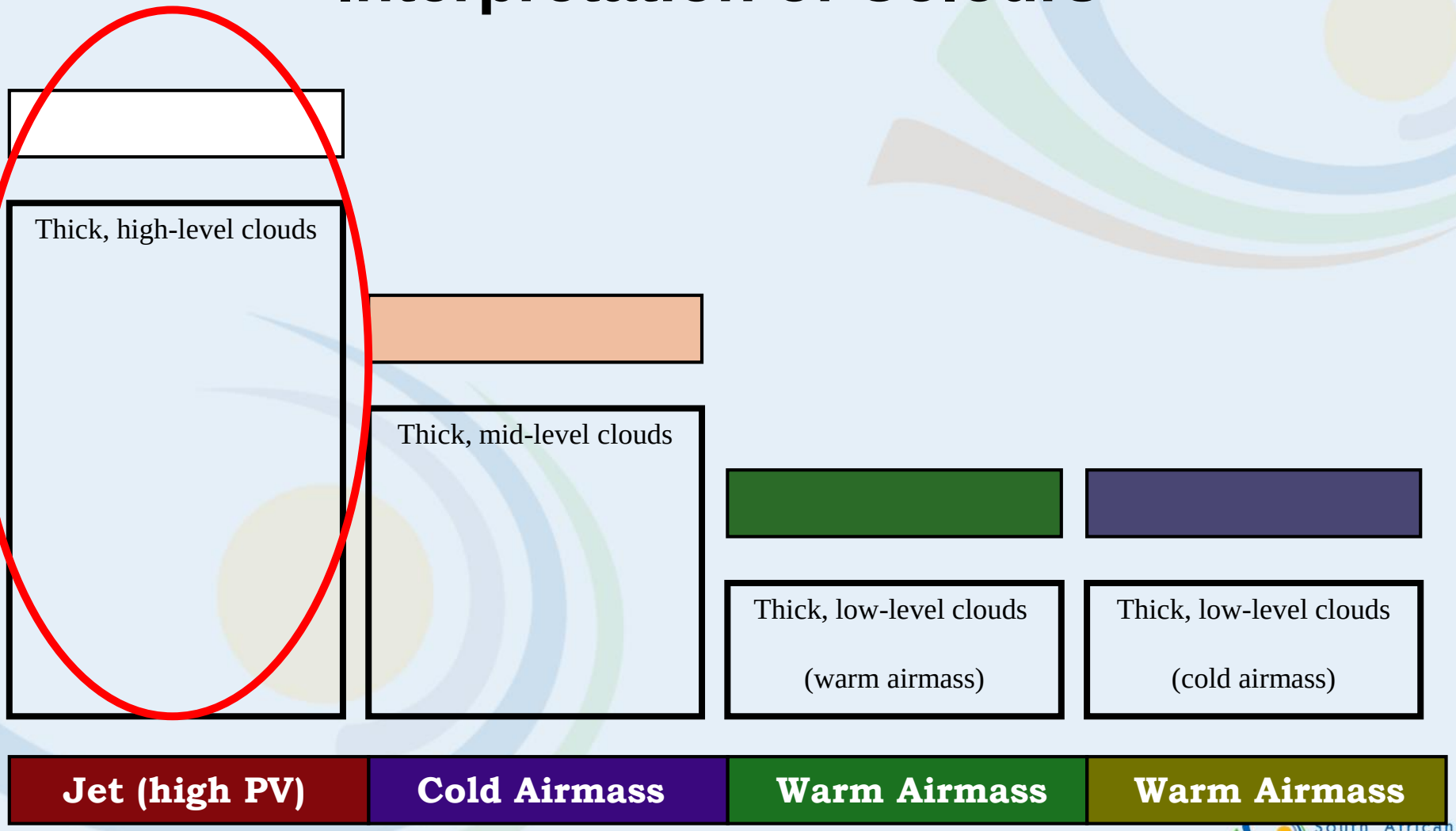
G = Difference IR9.7 - IR10.8

B = Channel WV6.2i

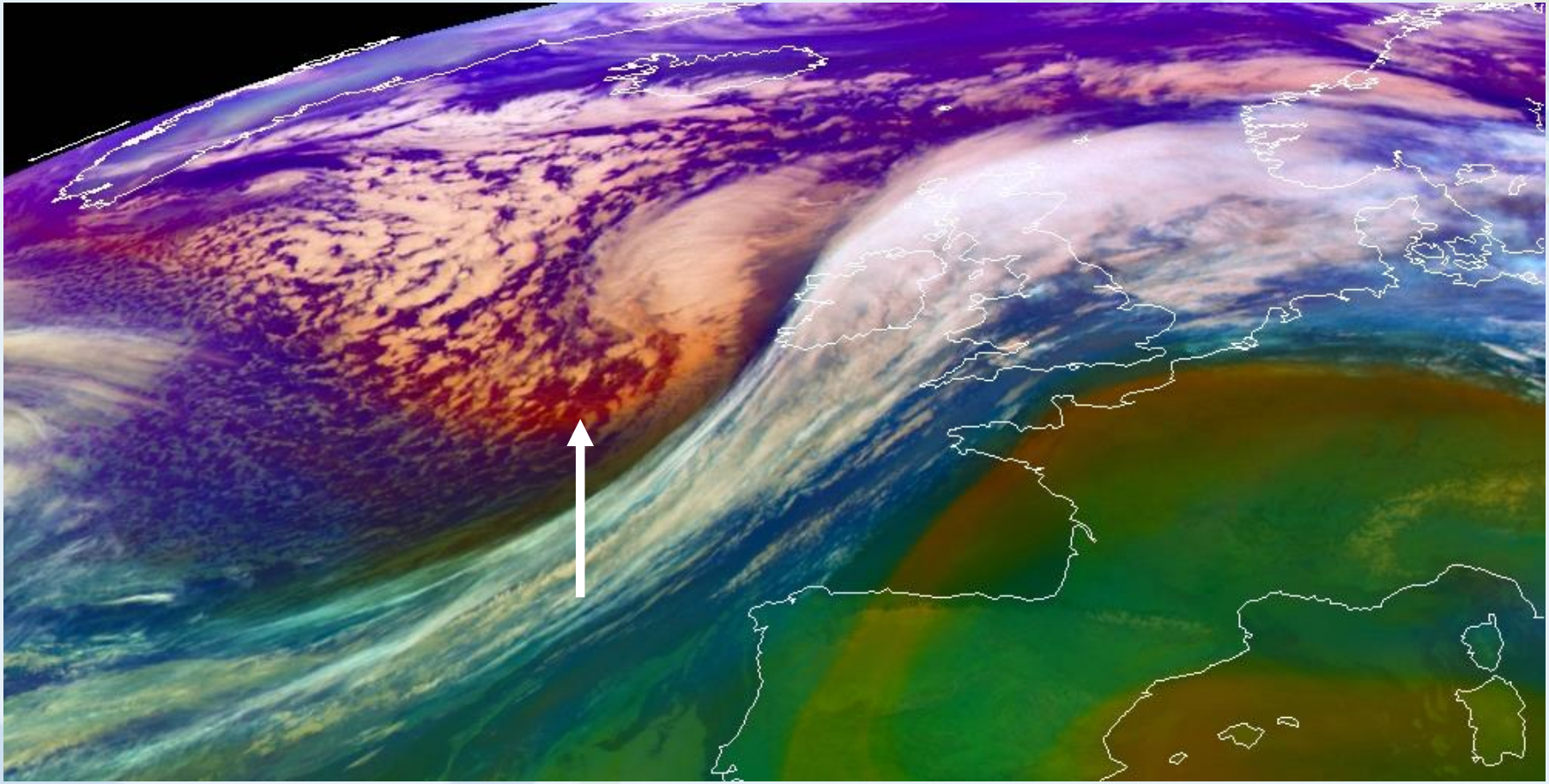
Applications:	Rapid Cyclogenesis, Jet Stream Analysis, PV Analysis
Area:	Full MSG Viewing Area
Time:	Day and Night

South African Weather Service
ISO 9001 Certified Organisation

RGB 05-06, 08-09, 05i: Interpretation of Colours



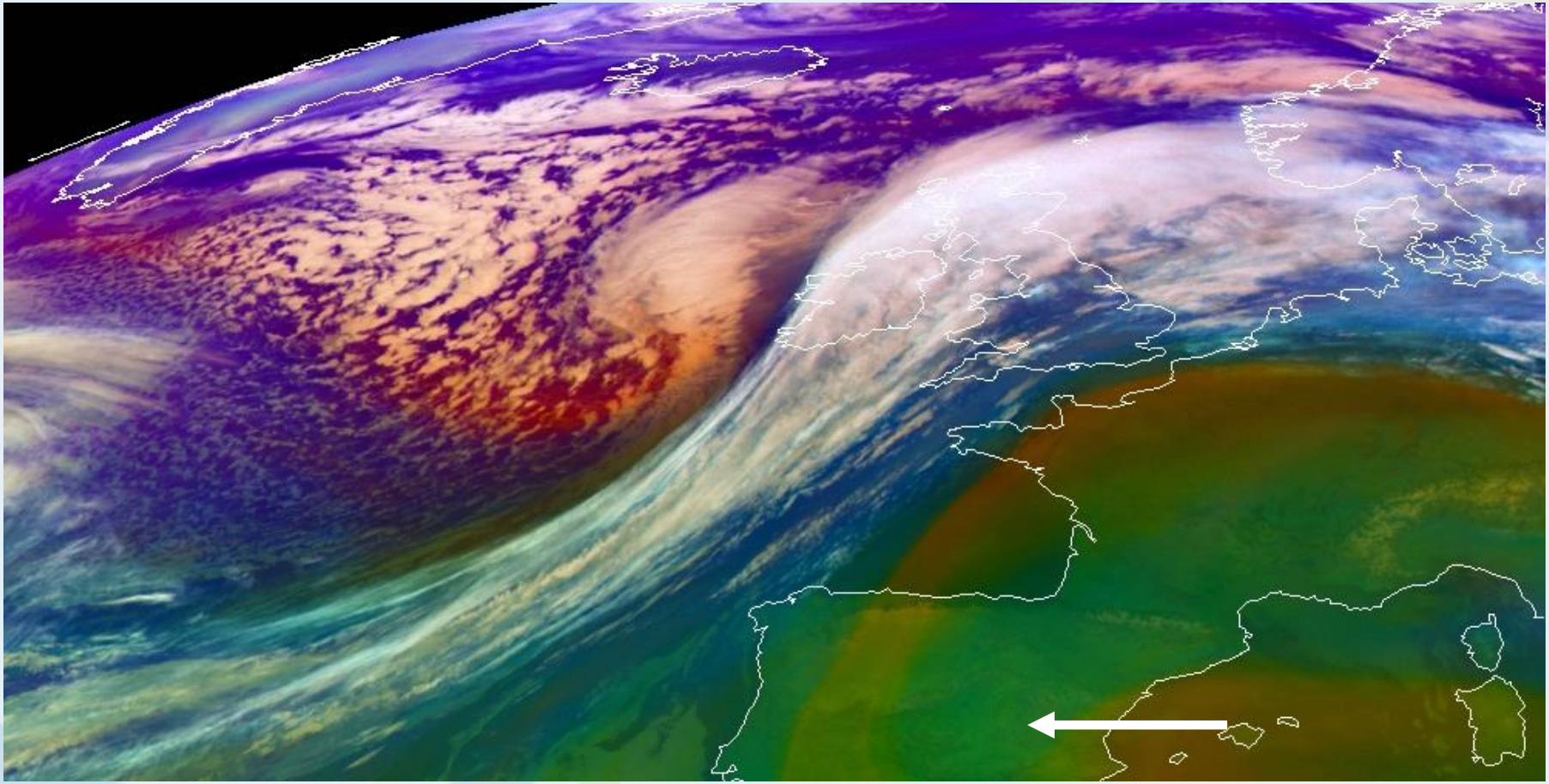
RGB 05-06, 08-09, 05i Example: Advection Jet



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

South African Weather Service
ISO 9001 Certified Organisation

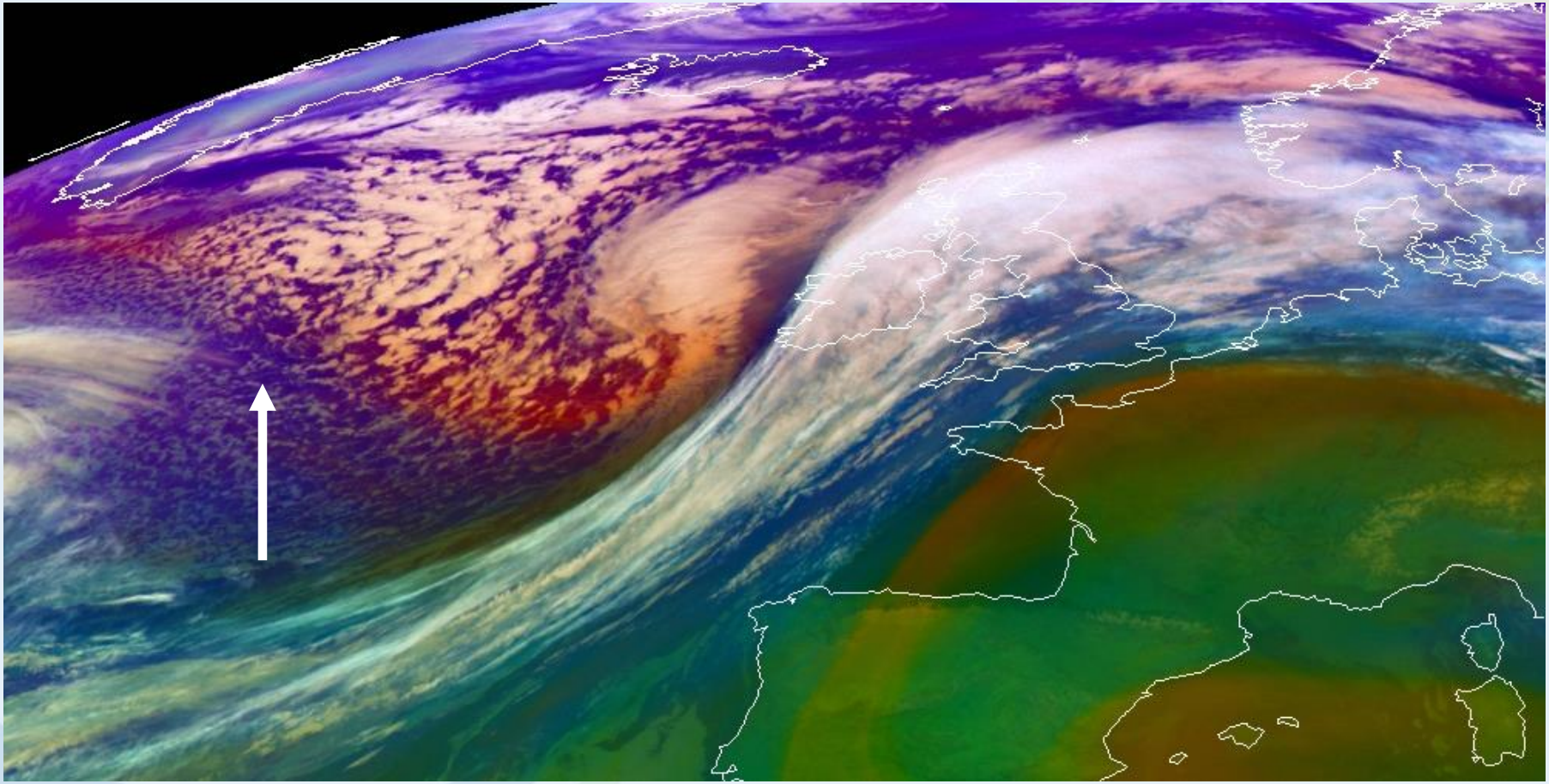
RGB 05-06, 08-09, 05i Example: Warm Airmass



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

South African Weather Service
ISO 9001 Certified Organisation

RGB 05-06, 08-09, 05i Example: Cold Airmass



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

South African Weather Service
ISO 9001 Certified Organisation

Standard RGBs

	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

South African Weather Service
ISO 9001 Certified Organisation

Summary

- Different RGB products exist for different purposes
- Using the standard RGBs provided, gives us common ground from comparisons
- Nowcasting of Convection is done best with the Convection RGB and HRV
- The Airmass RGB gives more information about synoptic scale systems

South African Weather Service
ISO 9001 Certified Organisation

EUMETSAT case study website

- http://www.eumetsat.int/website/home/Images/ImageLibrary/index.html