GeoSphere Austria

EUMeTrain – MTG-I Event Week

24 June 2025 – 12:00 UTC

The new RGBs from FCI and their main areas of application

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Introduction:

- The FCI sensor has new channels, mainly in the short wave spectrum (0.44µm, 0.51µm, 0.91µm,1.38µm and 2.25µm)
- They can be used to create “new” RGBs, mainly for daytime use.

This presentation will not provide a complete description of each new RGBs, but instead focus on the most important information they provide.

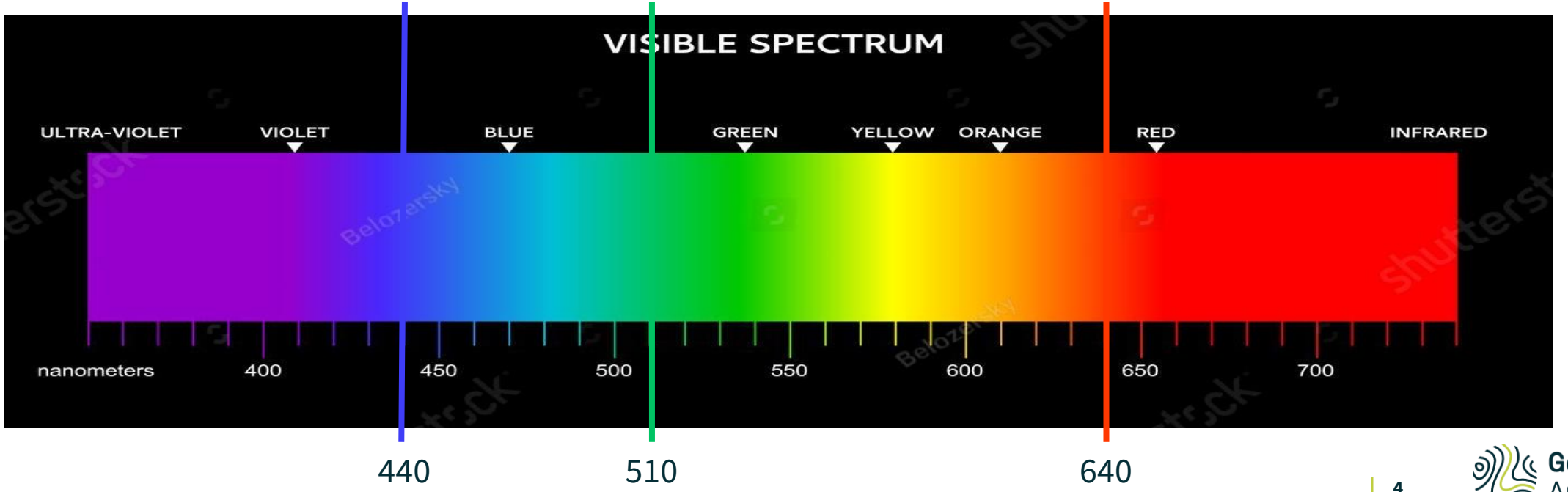
… and include a pro/con list reflecting their strong and weak sides.

Outline

1. The True Colour RGB
2. The Cloud Phase RGB
3. The Cloud Type RGB
4. The Fire Temperature RGB

The True Colour RGB

Colour	Channel [µm]	Physically relates to	Smaller contribution to the signal	Larger contribution to the signal
Red	VIS0.64	Cloud optical thickness, vegetation, aerosols	Thin clouds	Thick clouds
Green	VIS0.51	Cloud optical thickness, vegetation, aerosols	Thin clouds Dry vegetation	Thick clouds Green vegetation
Blue	VIS0.44	Cloud optical thickness, vegetation, aerosols	Thin clouds	Thick clouds



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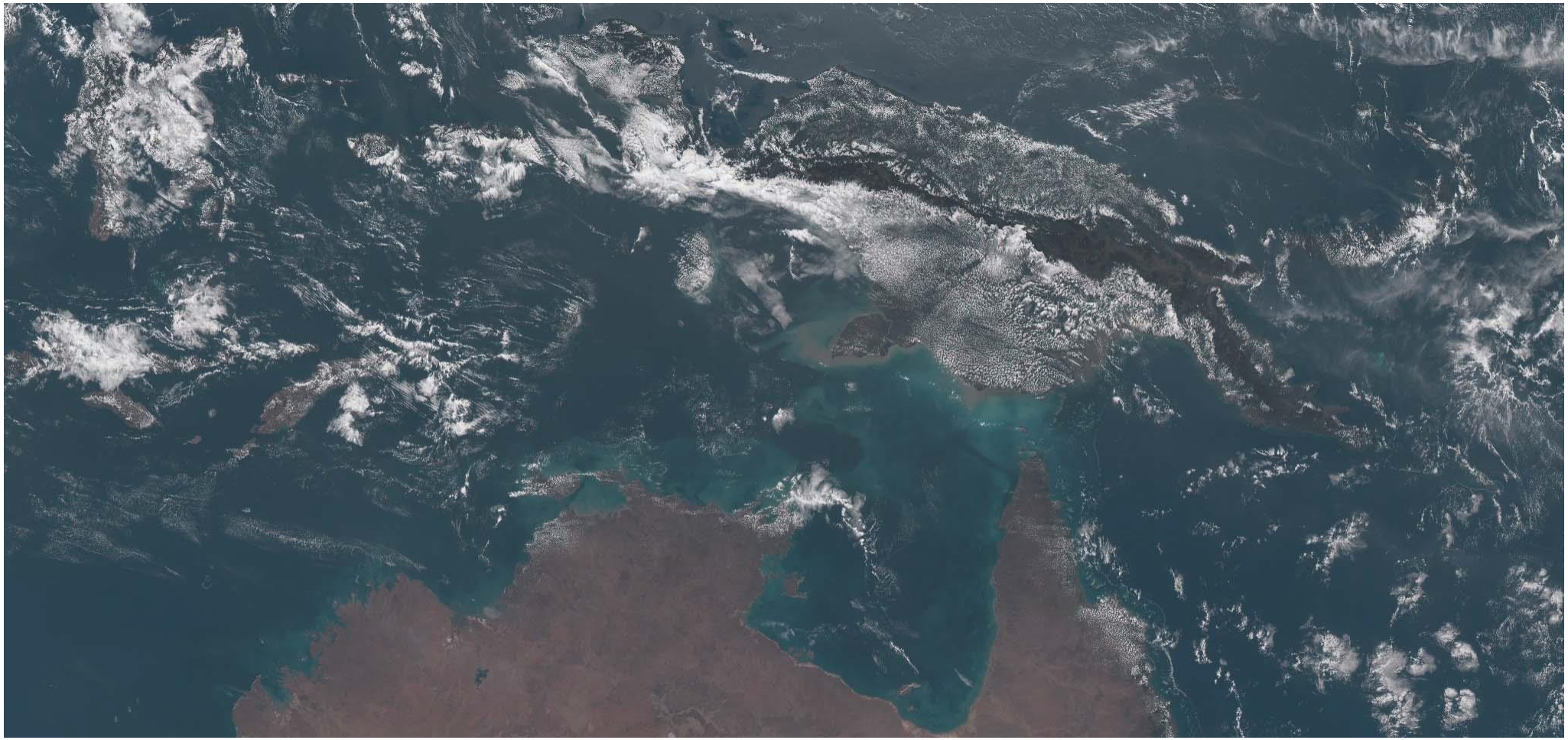
The True Colour RGB – the Rayleigh Correction

No Rayleigh correction



Credit: Jochen Kerkmann – EUMETSAT; Original: Seve Miller – CIRA

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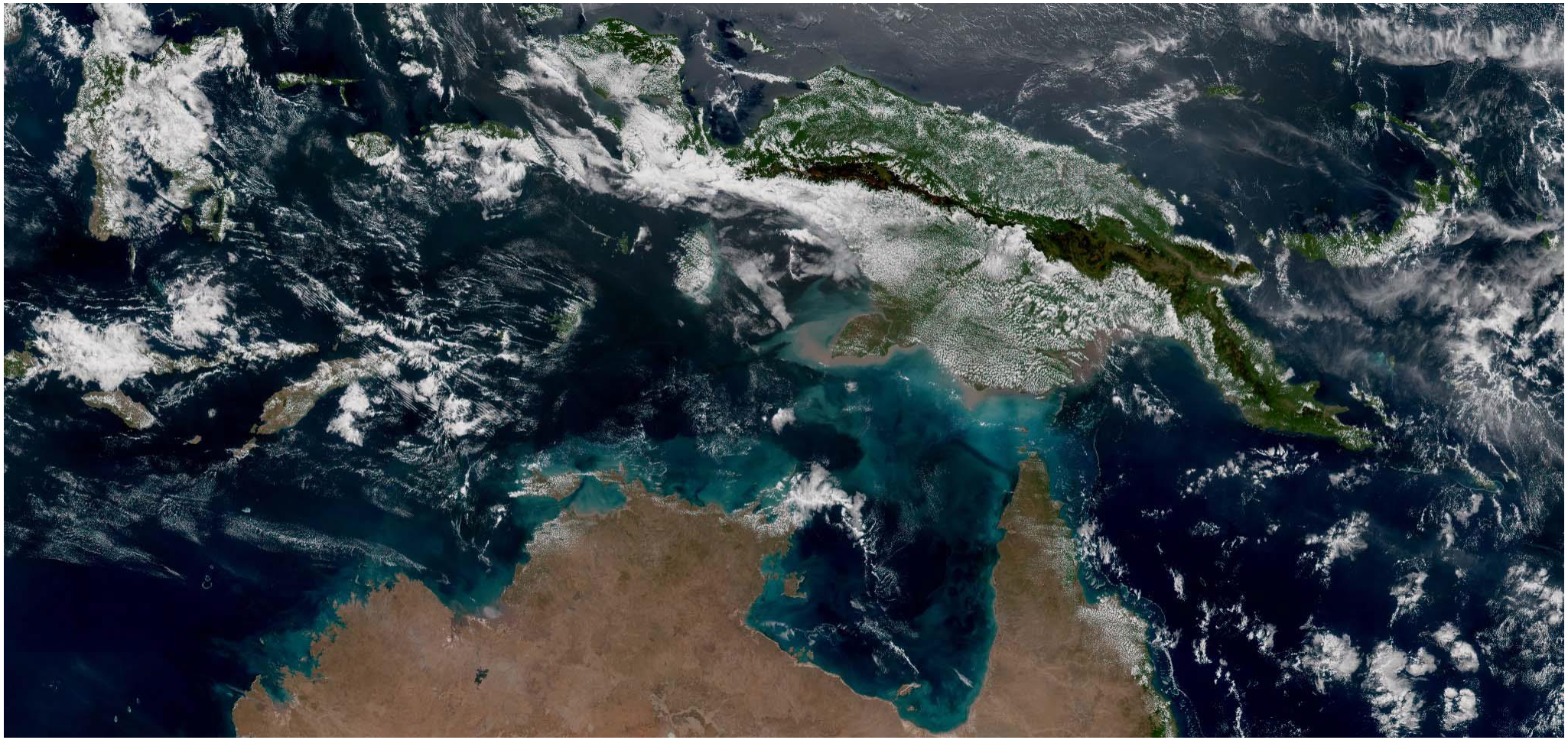
The True Colour RGB – the Rayleigh Correction

With Rayleigh correction



Credit: Jochen Kerkmann – EUMETSAT; Original: Seve Miller – CIRA

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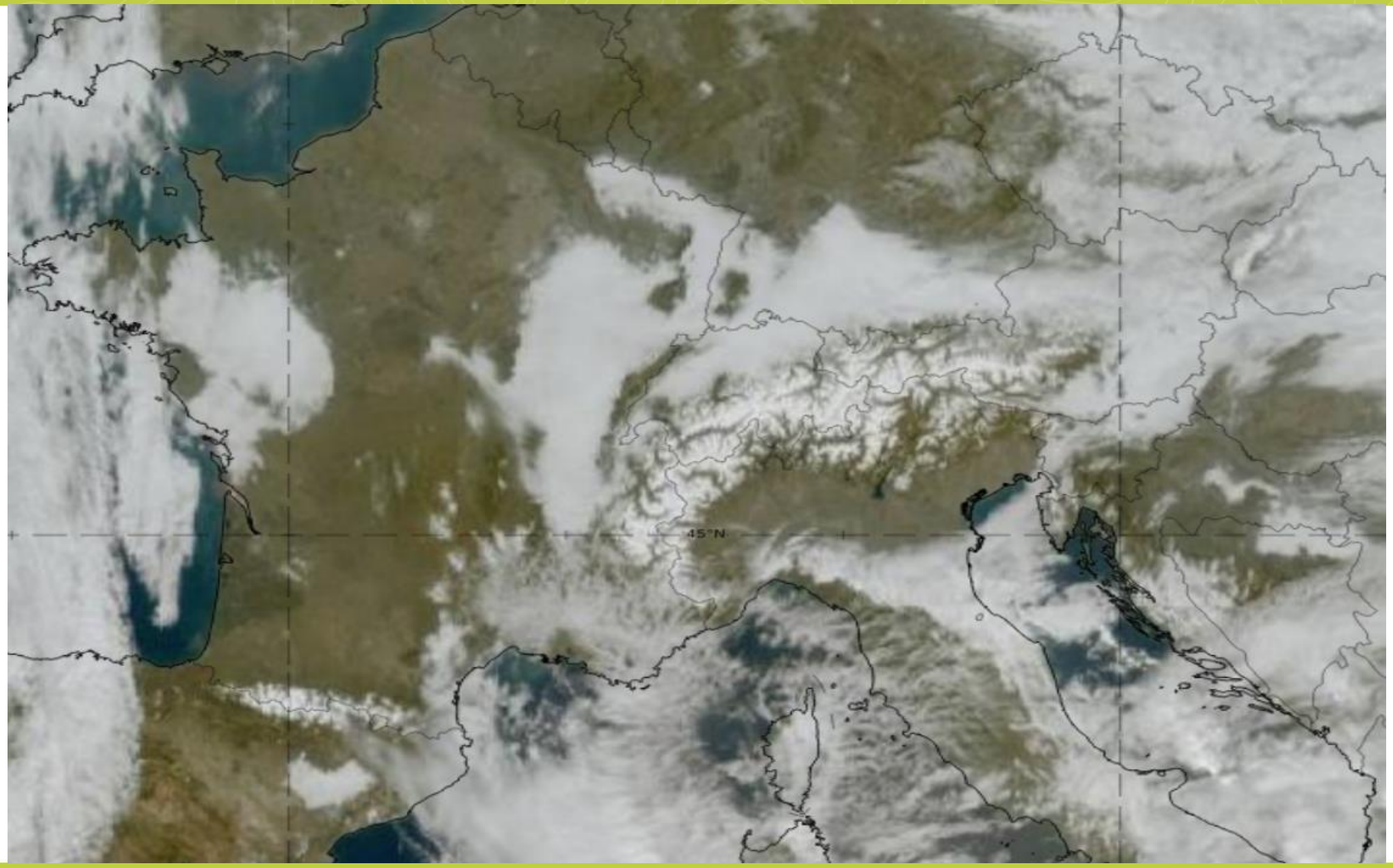
The True Colour RGB – Fog and low clouds



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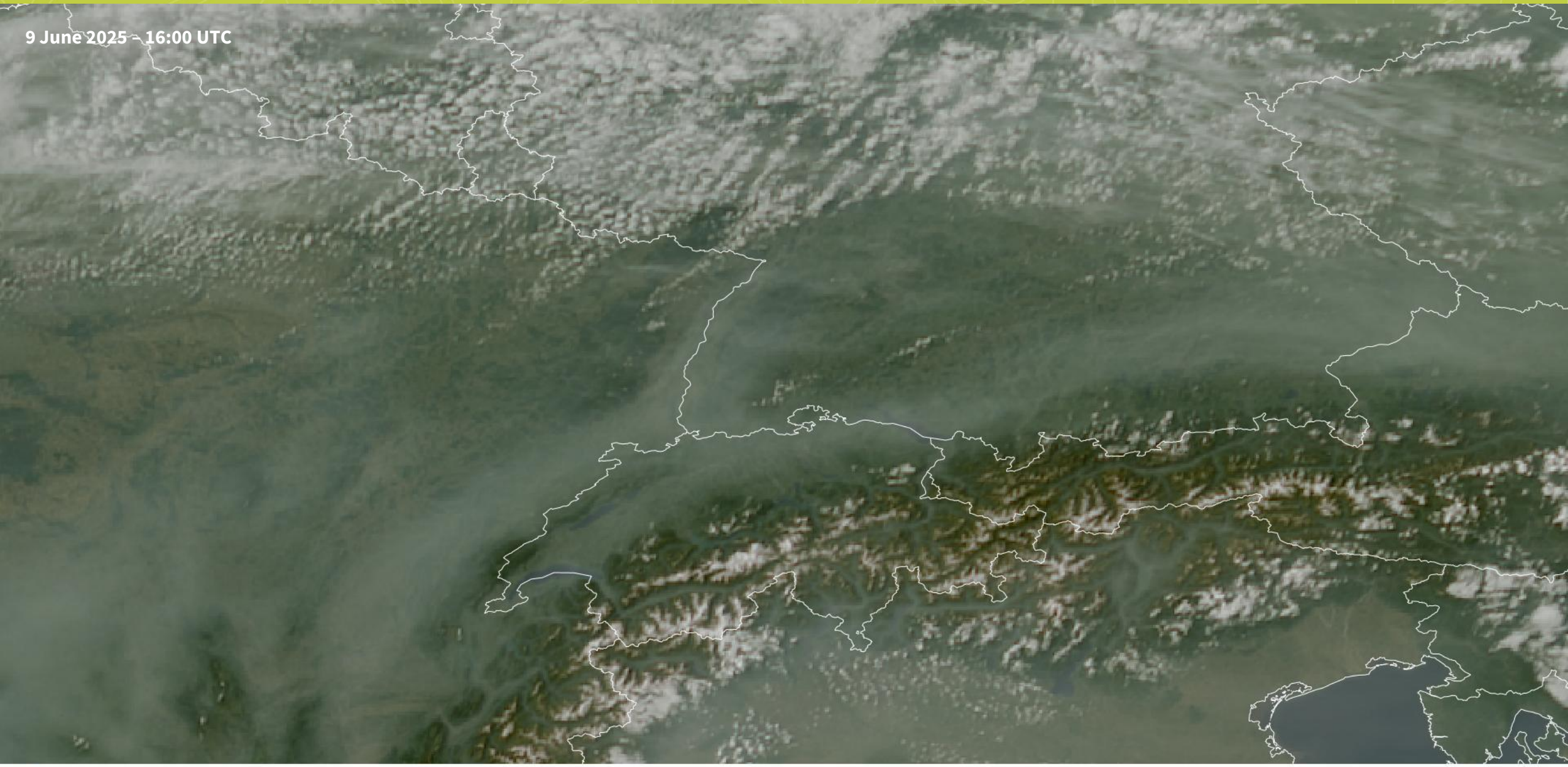
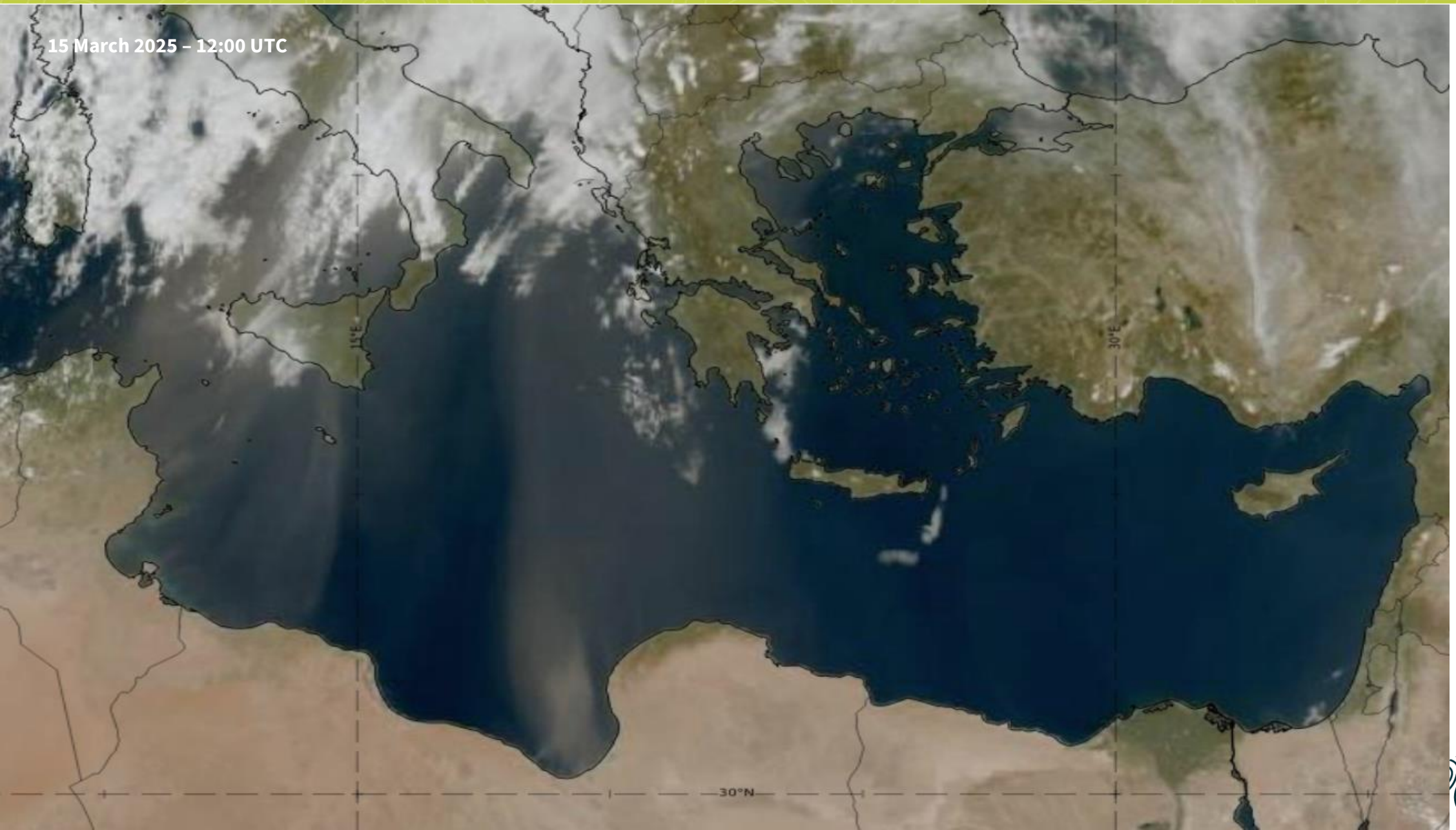
The True Colour RGB – Smoke



The True Colour RGB – Dust



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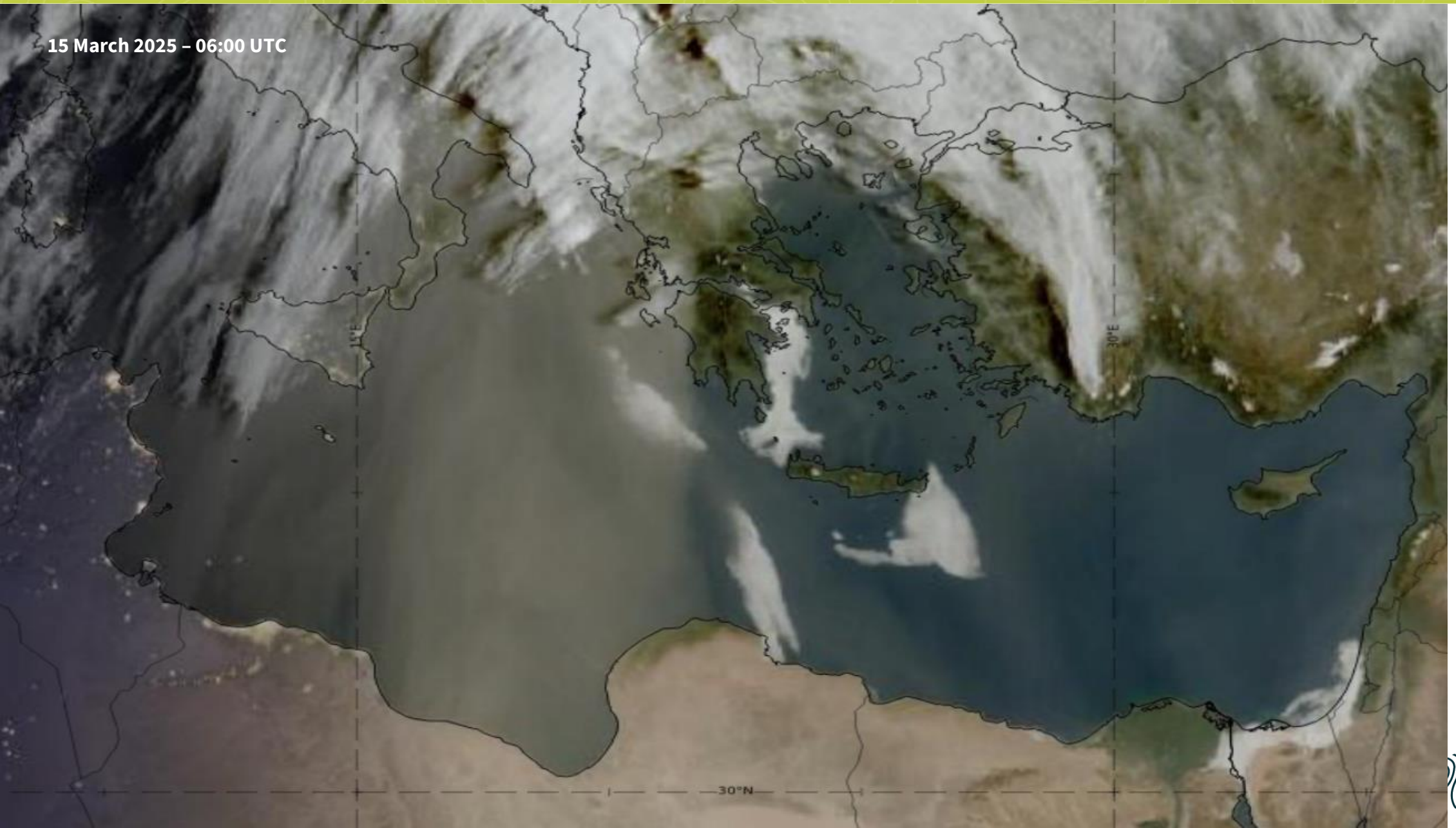
The True Colour RGB – Dust – Low Solar Angle



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The True Colour RGB

Pros

- **Easy to interpret**
- **Surface features, vegetation**
- **Sensitivity to aerosols (smoke)**
- **Optical thickness of clouds**
- Sea sediments and algae bloom

Cons

- **Daytime only**
- **No cloud height information**
- **Dust harder to detect over land (deserts)**

The Cloud Phase RGB

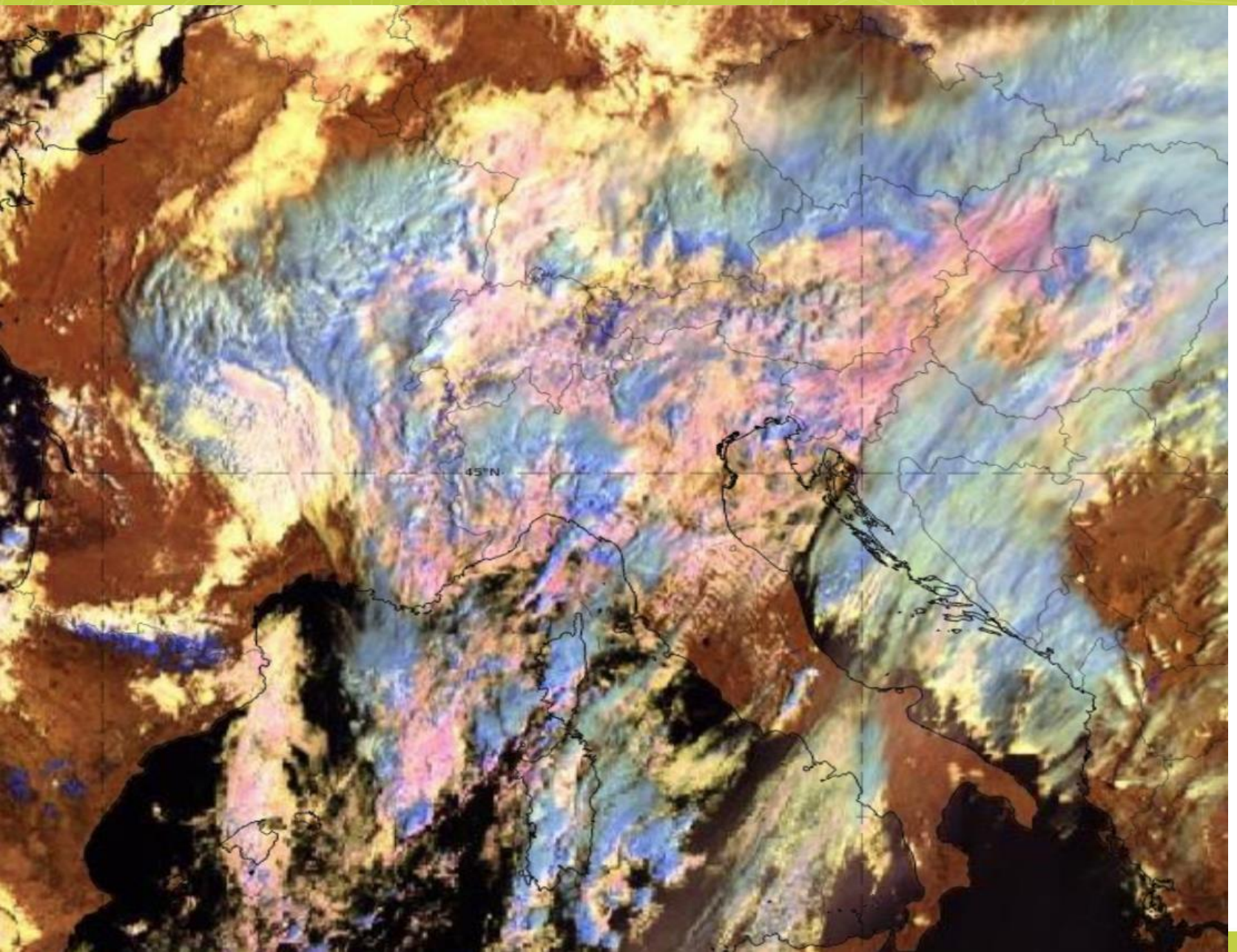
Colour	Channel [µm]	Physically relates to	Smaller contribution to the signal	Larger contribution to the signal
Red	NIR1.6	Cloud Phase (and cloud top particle size)	Thick ice clouds	Thick water clouds
Green	NIR2.25	Cloud top particle size (and phase)	Thick clouds with large particles	Thick clouds with small particles
Blue	VIS0.64	Cloud optical thickness	Thin clouds	Thick clouds

NIR2.25 is sensitive to the cloud phase.
This enhances (together with NIR1.6) the capability to discriminate between ice and water

<u>Applications</u>:

- **Convection → CI, cloud top icing**
- **Cloud particle size**

The Cloud Phase RGB



Water clouds

- Very large drops
- Large drops
- Smaller drops
- Even smaller drops

warm

Ice clouds

- Large particles
- Small particles
- Snow

cold

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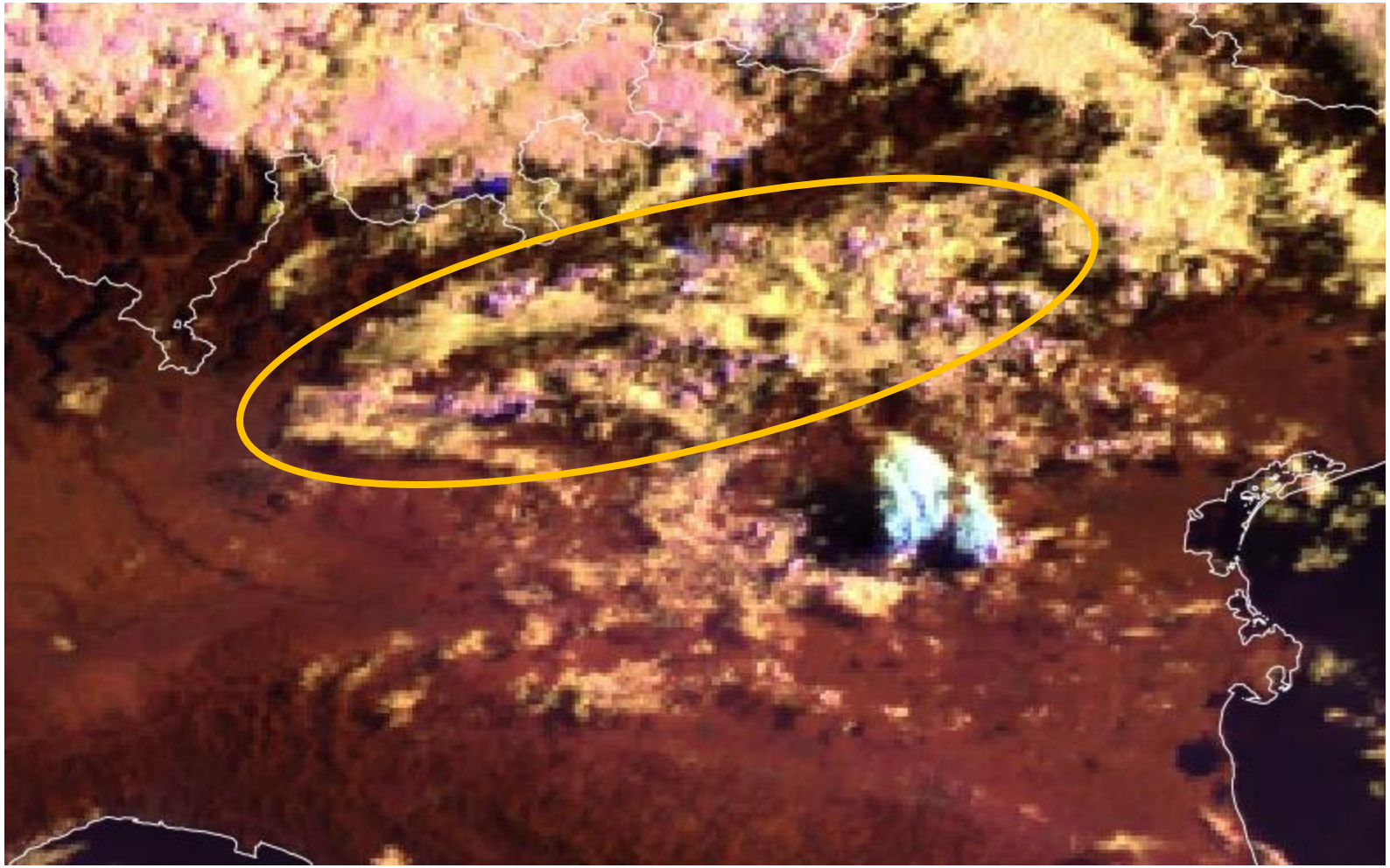
The Cloud Phase RGB – Convective Initiation



16 June 2025 – 06:00 UTC

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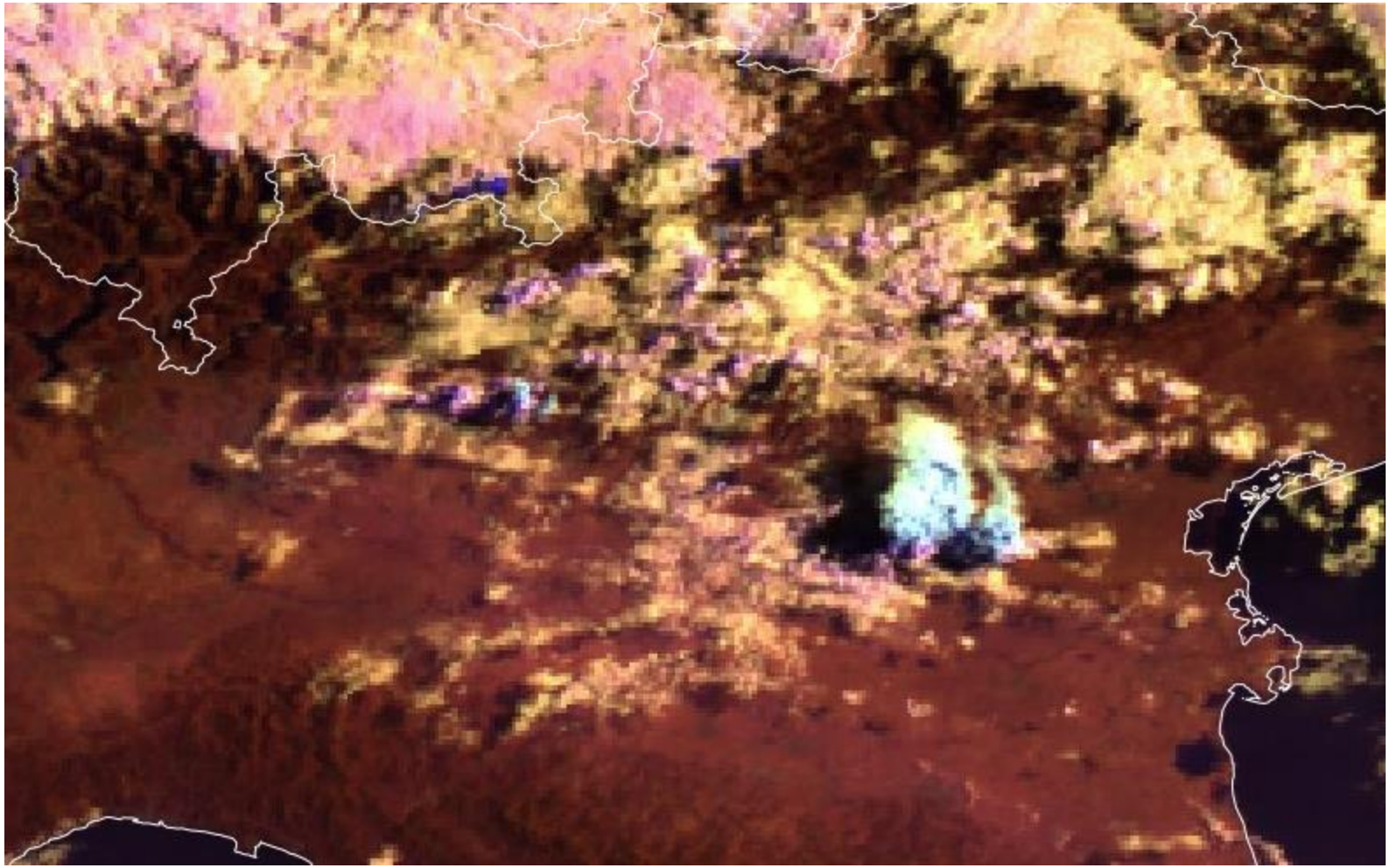
The Cloud Phase RGB – Convective Initiation



16 June 2025 – 06:10 UTC

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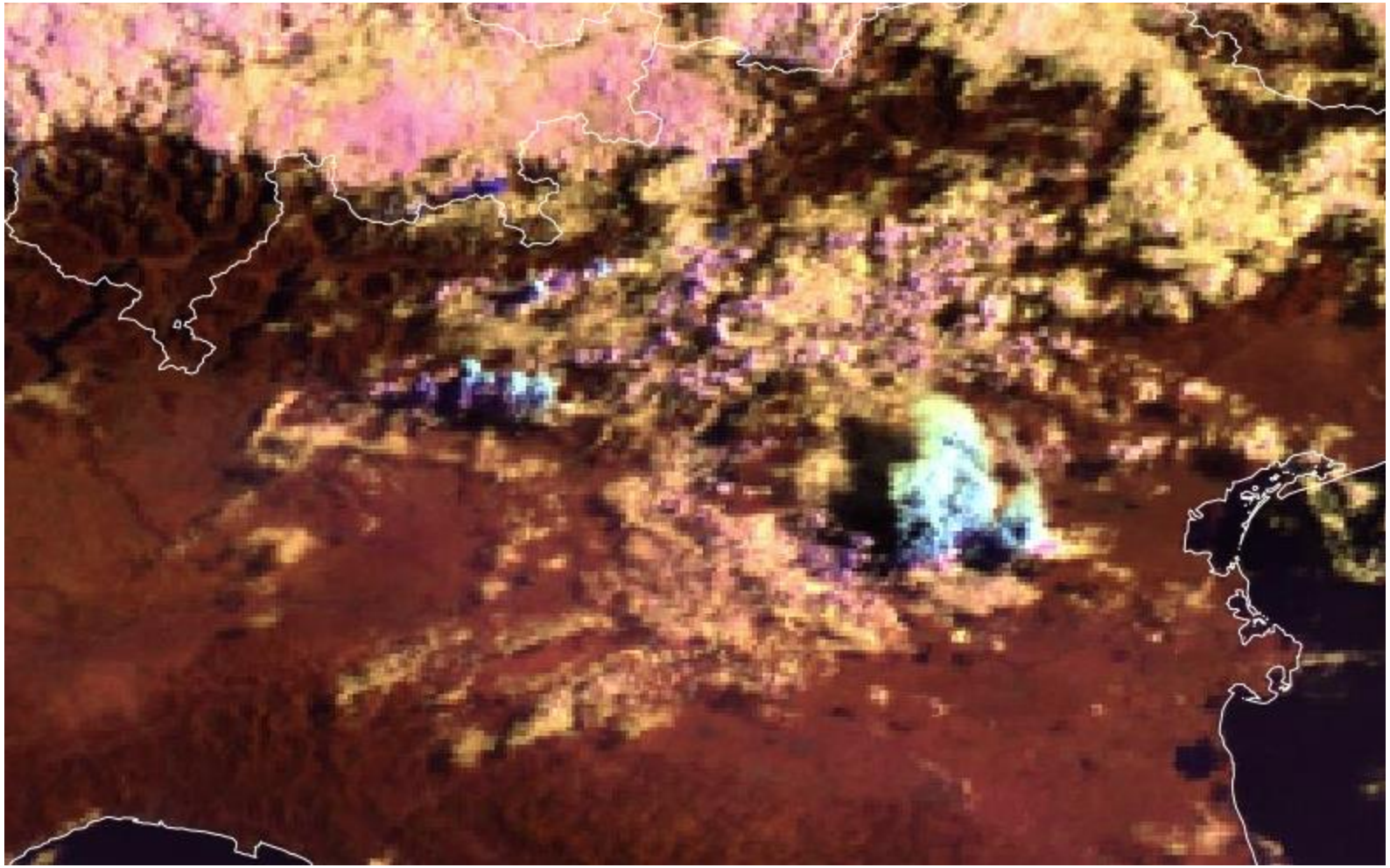
The Cloud Phase RGB – Convective Initiation



16 June 2025 – 06:20 UTC

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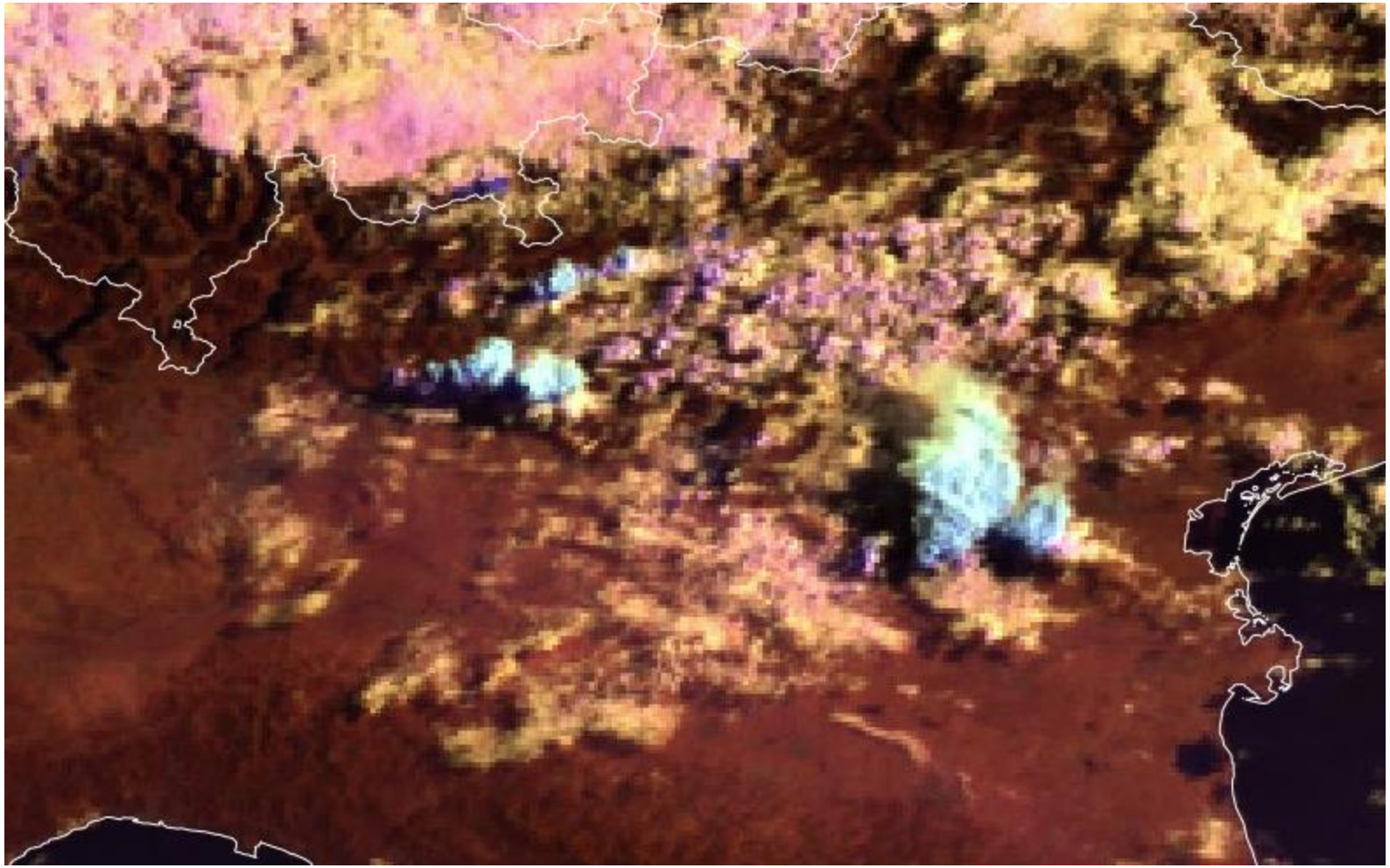
The Cloud Phase RGB – Convective Initiation



16 June 2025 – 06:30 UTC

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The Cloud Phase RGB

Pros

- **Cloud phase information**
- **Particle size information**
- Useful for convective initiation

Cons

- **Daytime only**
- **No temperature information**
- Snow and ice clouds with similar colours (shades of blue)

The Cloud Type RGB

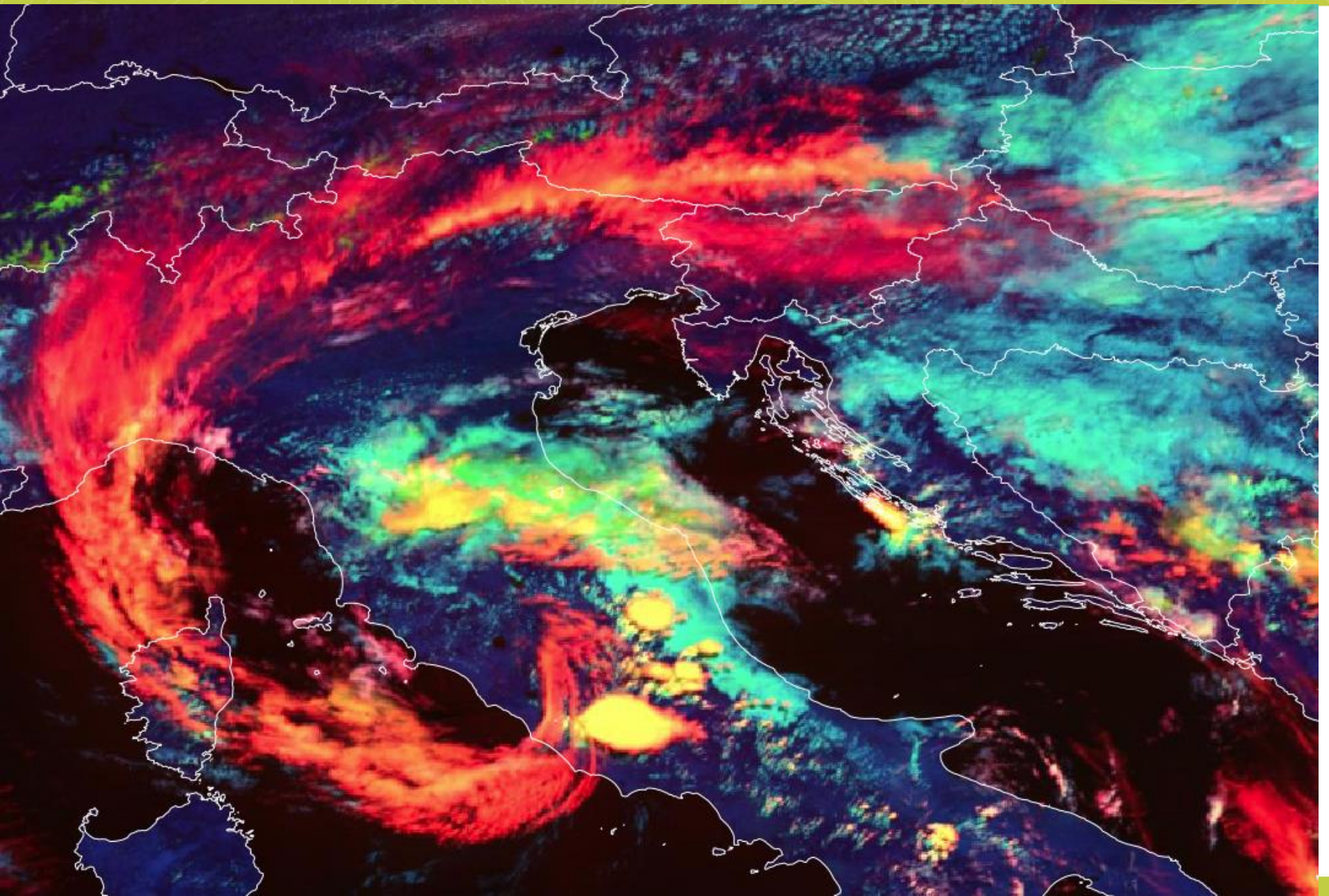
Colour	Channel [µm]	Physically relates to	Small contribution to the signal of	Large contribution to the signal of
Red	NIR 1.38	Cloud height and optical depth	Low-level clouds	High clouds
Green	VIS 0.64	Cloud optical thickness	Thin clouds	Thick clouds Snow covered land Sea ice
Blue	NIR 1.61	Cloud phase	Thick ice clouds Snow covered land	Thick water clouds

NIR1.38 is sensitive high-level water vapour (absorption band).

Applications:

- **Cirrus cloud detection**
- **Discrimination of snow and ice on the ground**
- **Super-cooled water clouds**

The Cloud Type RGB



- Optical thin ice clouds
- Optical thick ice clouds
- Low to mid-level water clouds
- Low to mid-level mixed phase clouds
- Mid-level thin water clouds
- Super-cooled water clouds

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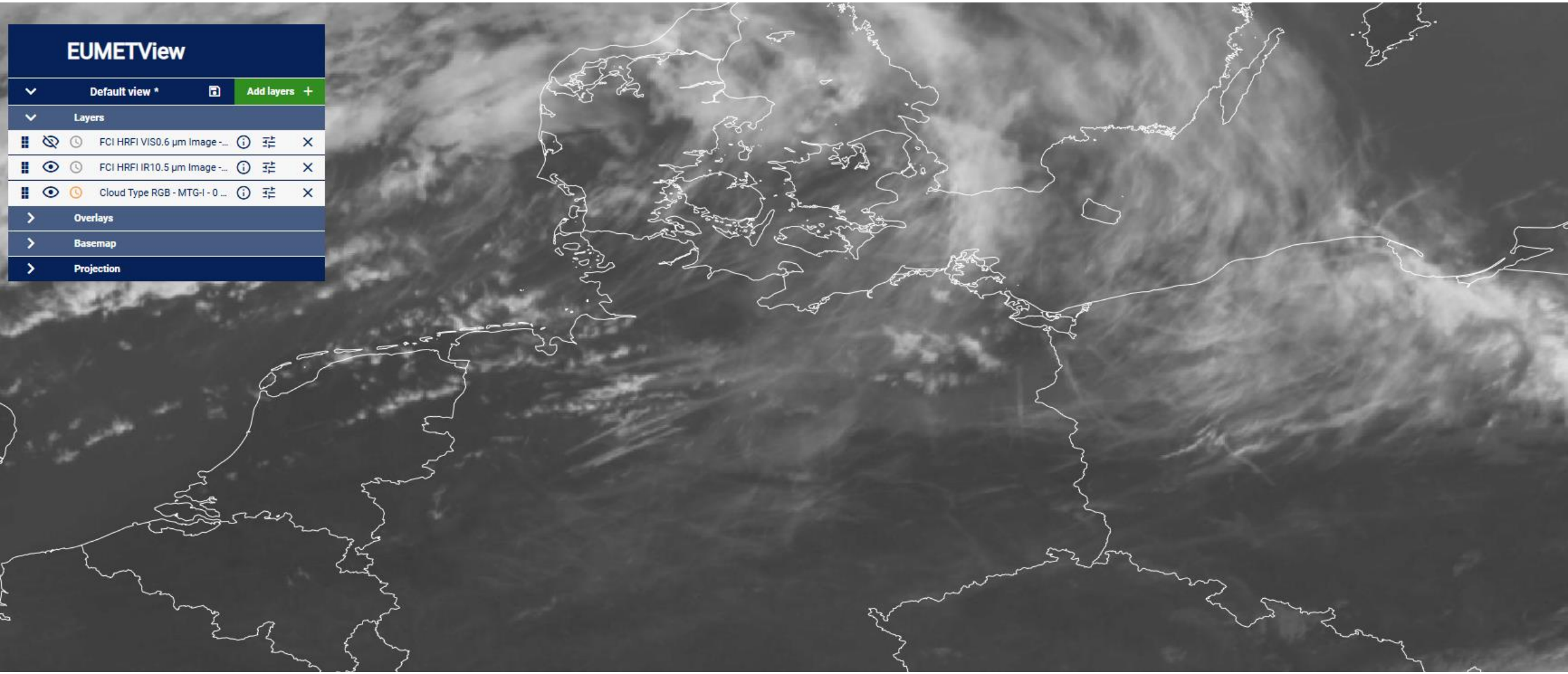
The Cloud Type RGB: Cirrus Cloud Detection



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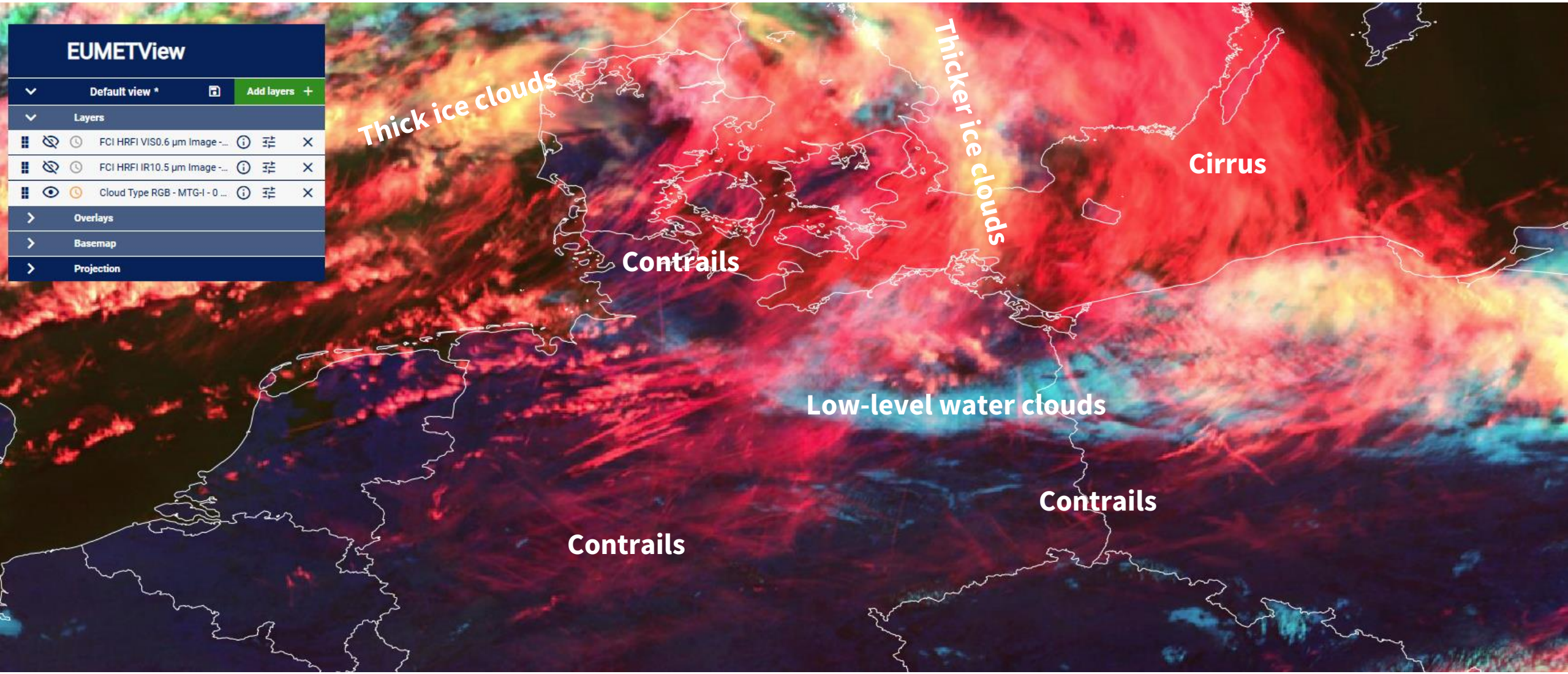
The Cloud Type RGB: Cirrus Cloud Detection



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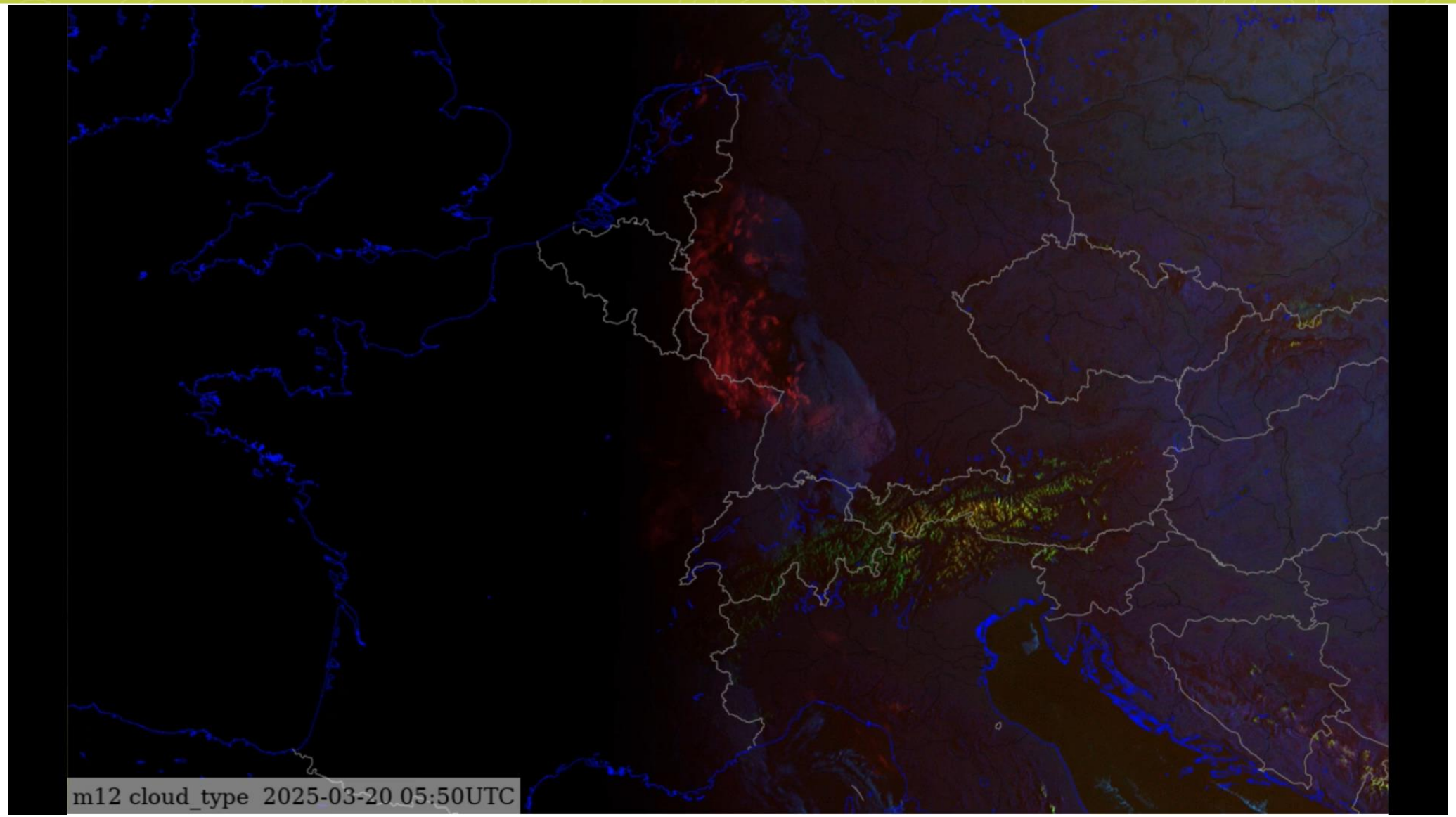
The Cloud Type RGB: Discrimination of Snow and Ice on the Ground



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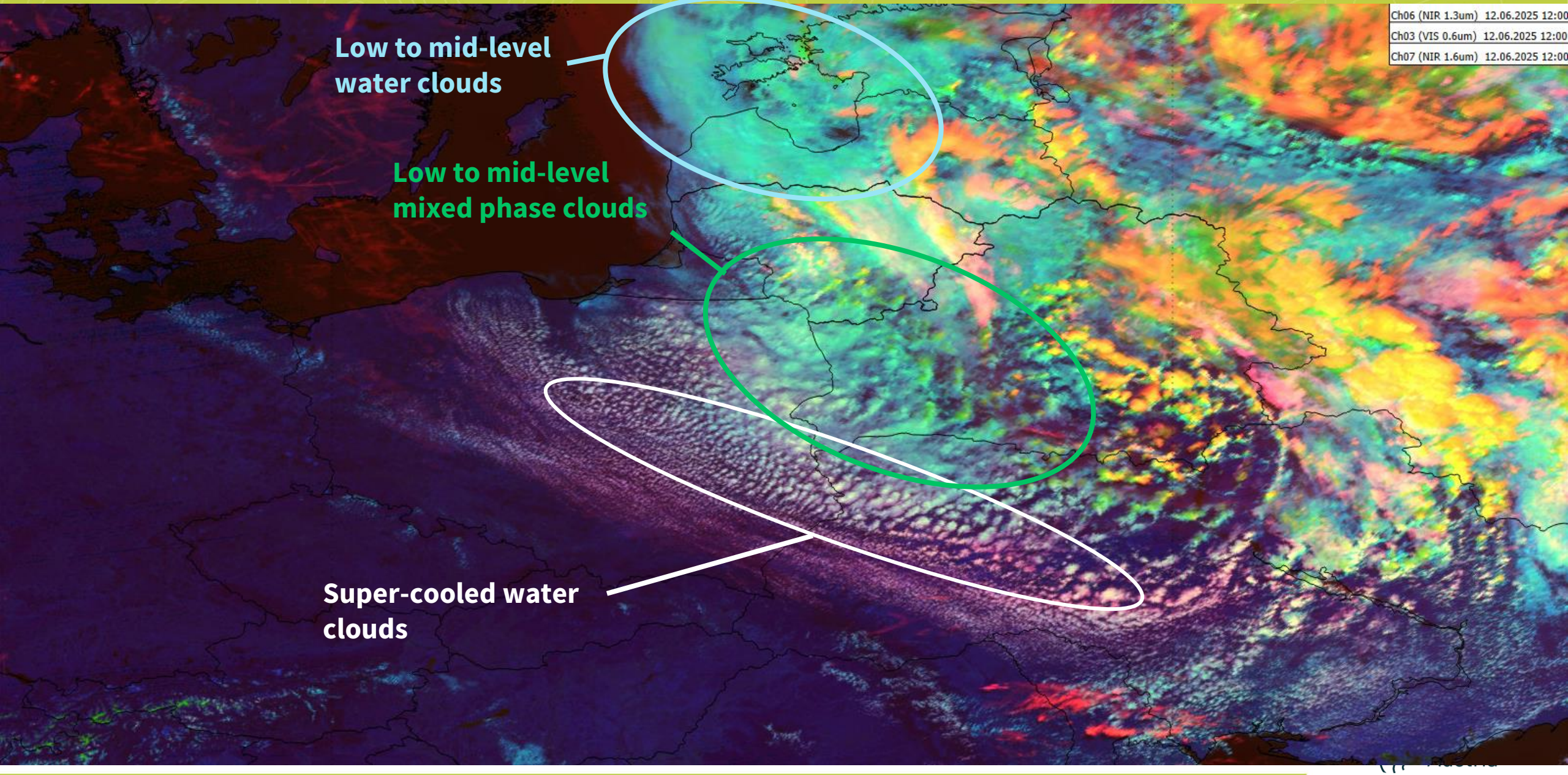
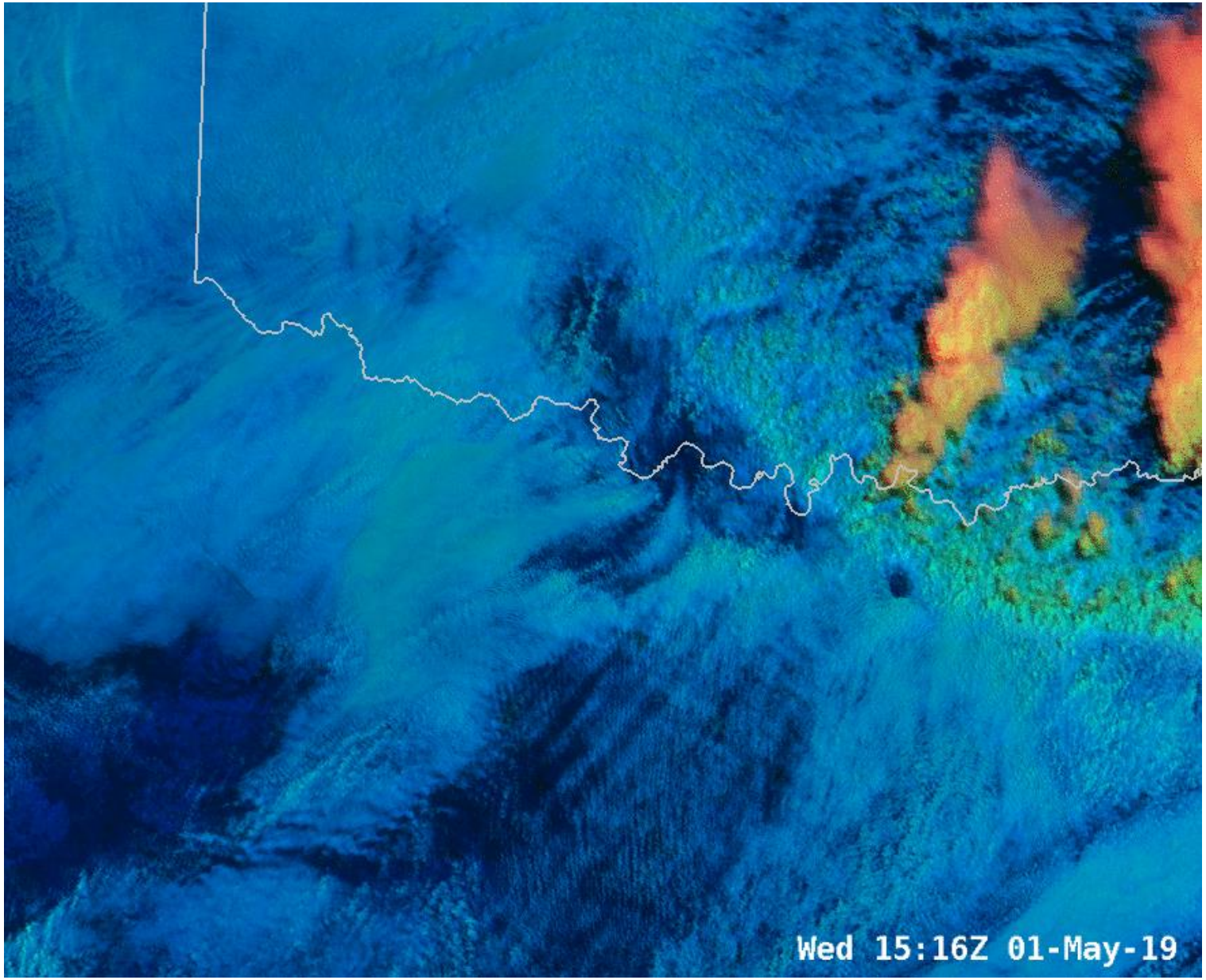
The Cloud Type RGB: Super-Cooled Water Clouds



The Cloud Type RGB: Convection



- Low to mid-level water clouds
- Low to mid-level mixed phase clouds
- Optical thick ice clouds

Credit: Bill Line; Satellite Liaison Blog – GOES-R & JPSS: The Future of Weather Satellites; 2. Mai 2019

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The Cloud Type RGB

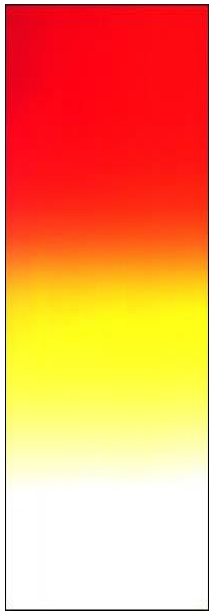
Pros

- **Thin Cirrus detection**
- **Discrimination of snow from ice clouds**
- **Detection of super-cooled water clouds**
- **Strong contrast between cloud types**

Cons

- **Daytime only**
- **Poor particle size information**
- **Thin Cirrus over thick ice clouds cannot be detected**
- Colours depend on air moisture

The Fire Temperature RGB

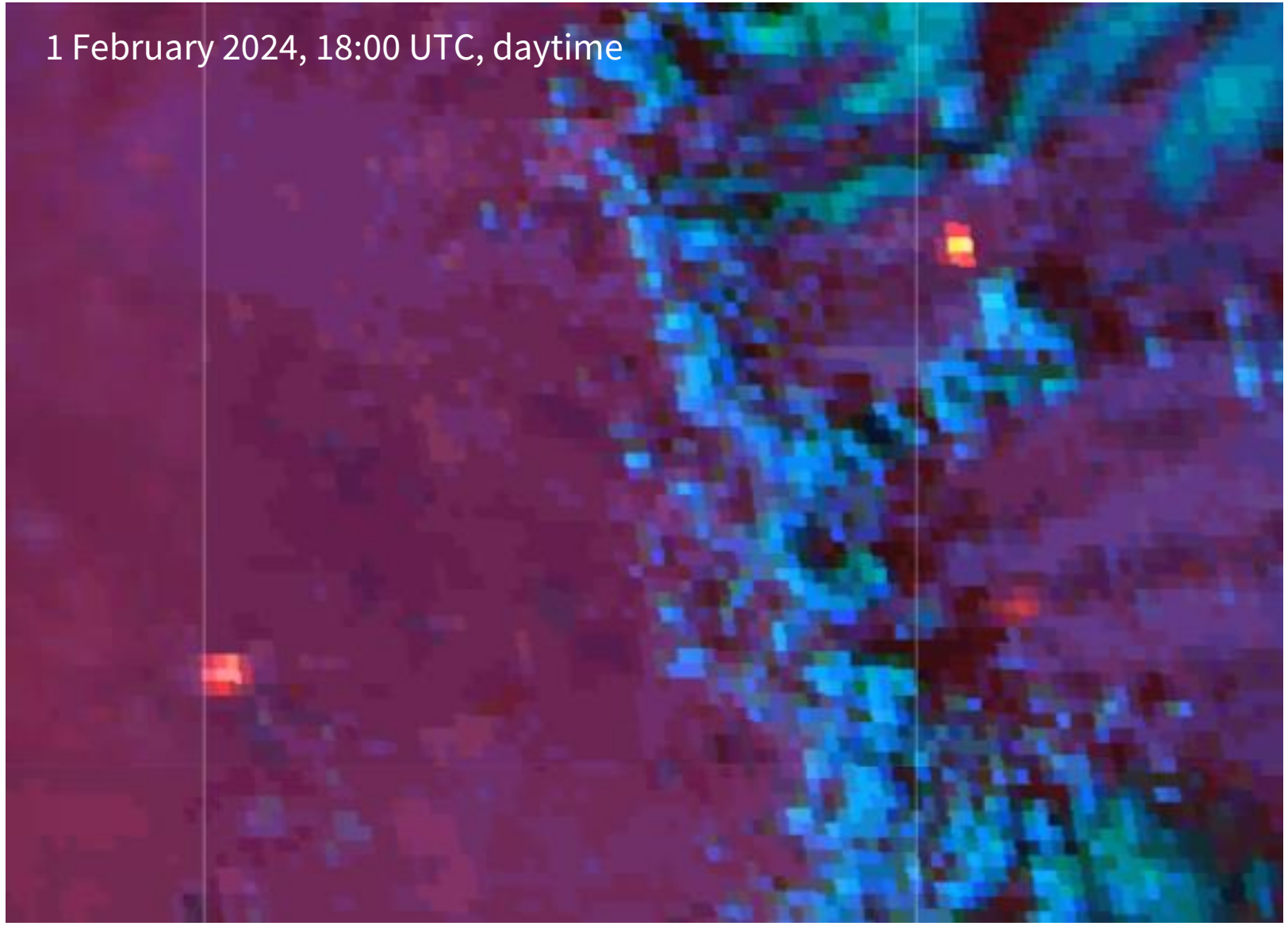


Colour	Channel [µm]	Physically relates to	Smaller contribution to the signal	Larger contribution to the signal
Red	IR3.7	**(Fire) temperature** *Cloud top microphysics*	**Cold land surfaces** *water, snow/ice, cold clouds*	**Low fire temperature, hot spots** *Warm land surfaces*
Green	NIR2.25	**Fire temperature** *Land type, cloud top particle size*	*Green vegetation, water, snow/ ice, large cloud particles*	**Medium fire temperature,** *Dry grass, bare ground, small cloud particles*
Blue	NIR1.6	**Fire temperature** *Land type, cloud top phase*	*Green vegetation, water, snow/ice, ice clouds*	**High fire temperature** *Dry vegetation, bare ground, water clouds*

Although this RGB contains only visible channels, it can be used day and night.

Also used by the Cloud Phase RGB

The Fire Temperature RGB



- Low fire temperature
- Medium fire temperature
- High fire temperature
- Extremely high fire temperature
- Burnt surface (daytime)

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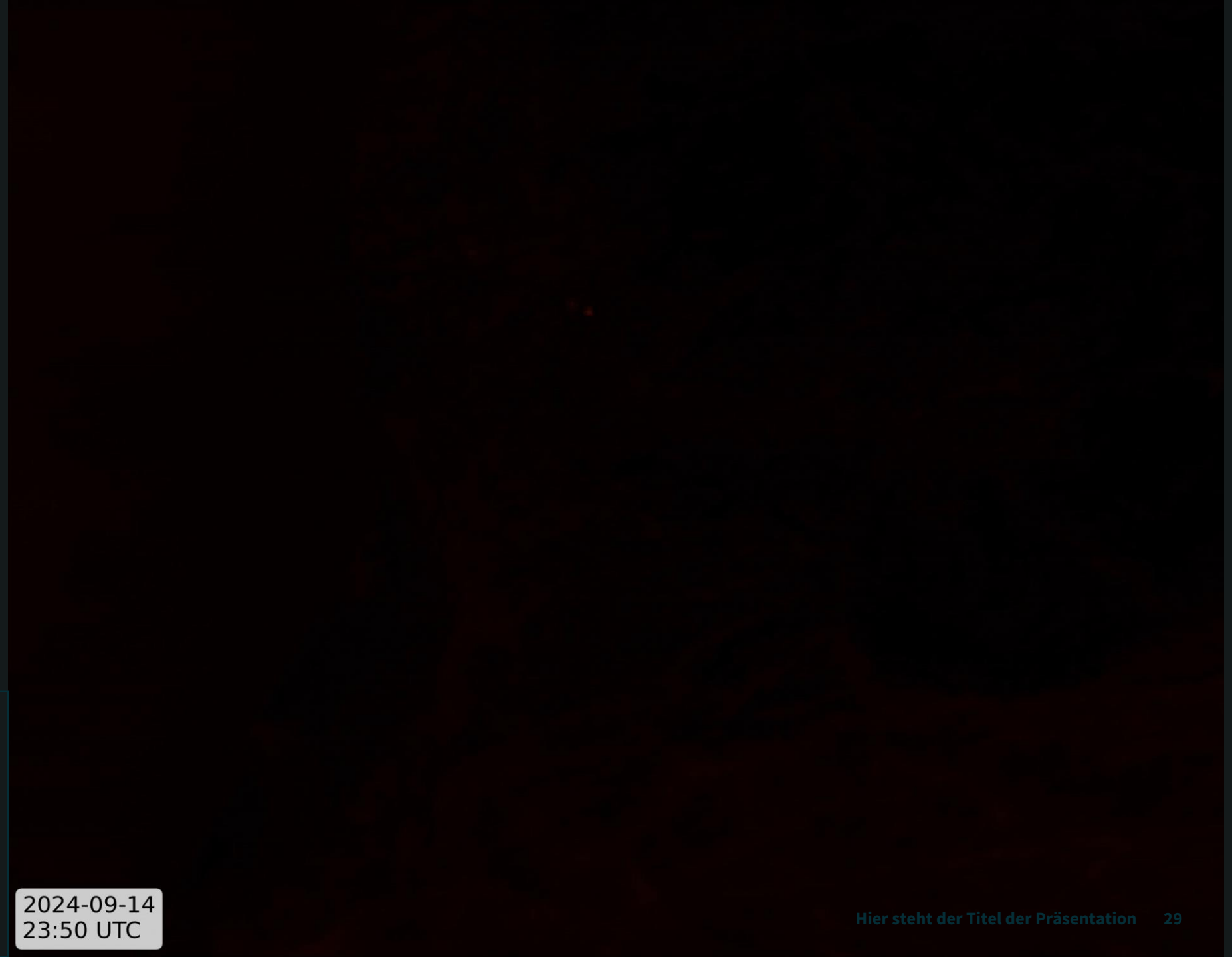

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The Fire Temperature RGB

Pros

- **Available 24 hours**
- **Information on fire intensity**
- Daytime information on ice and water clouds

Cons

- **Smoke from fires is not visible**
- **Fires can be hidden by clouds**

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https://eumetrain.org/user-manual