

Novel FCI solar WV absorption channels (NIR0.9, NIR1.3), and related RGBs

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EUMETSAT Training Team*

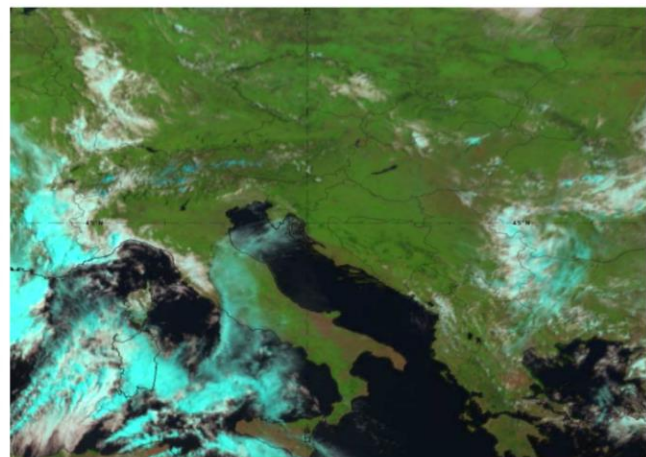
12 December 2022, EUMeTrain WV Event Week, Online





CLOUDS in the atmosphere

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2020/6/13 10:40

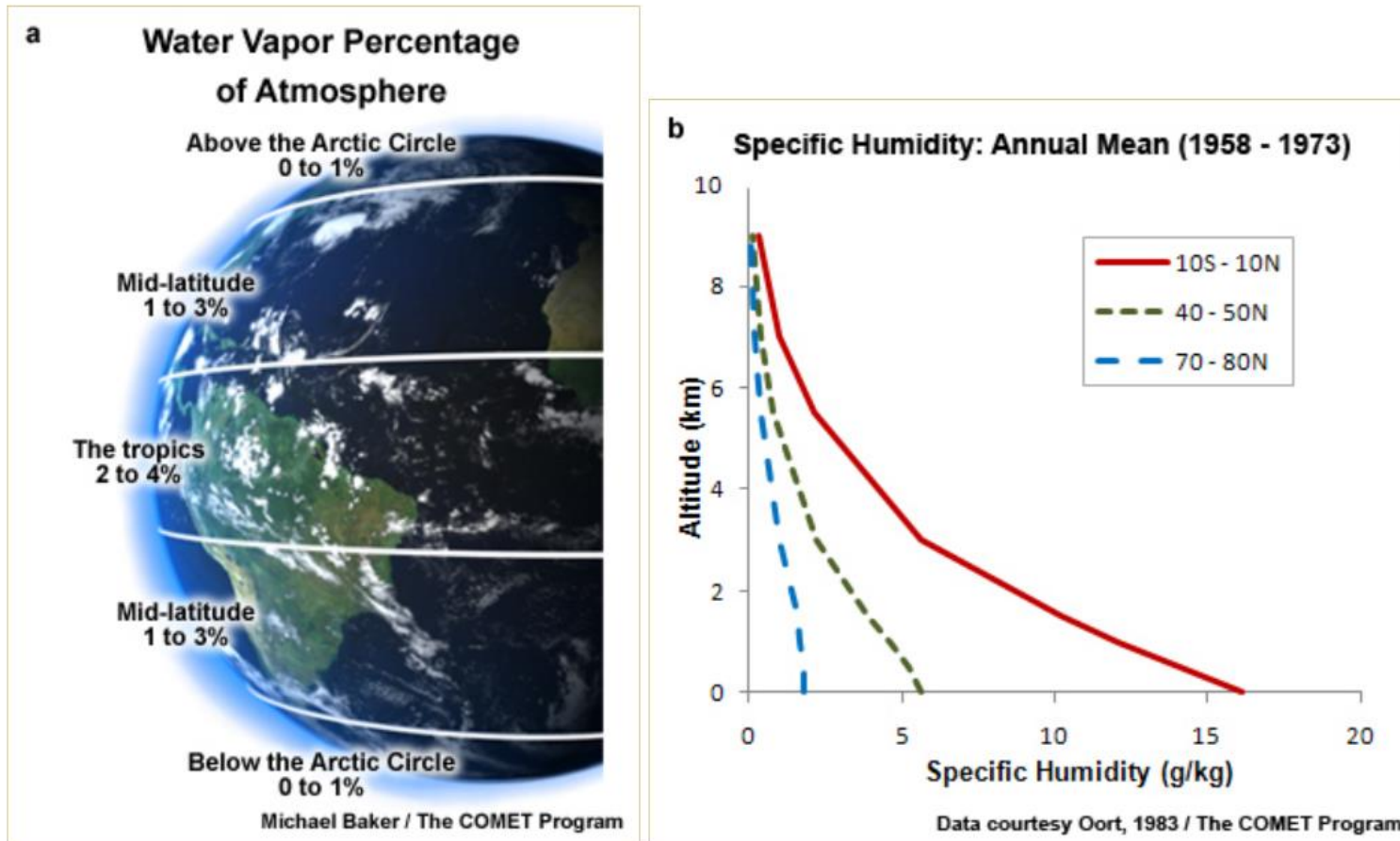


Fig. 1.19. (a) The distribution of surface water vapor percentage by latitude and (b) annual mean water vapor content (specific humidity) profile. Data in (b) from Oort (1983)²¹

Credit: [COMET Program](#)



New FCI imager

Novelties with FCI imager, on-board MTG.

WV absorption in solar region

Details of photon processes.

NIR0.9 and NIR1.3 imagery

Examples of utility of the two WV channels.



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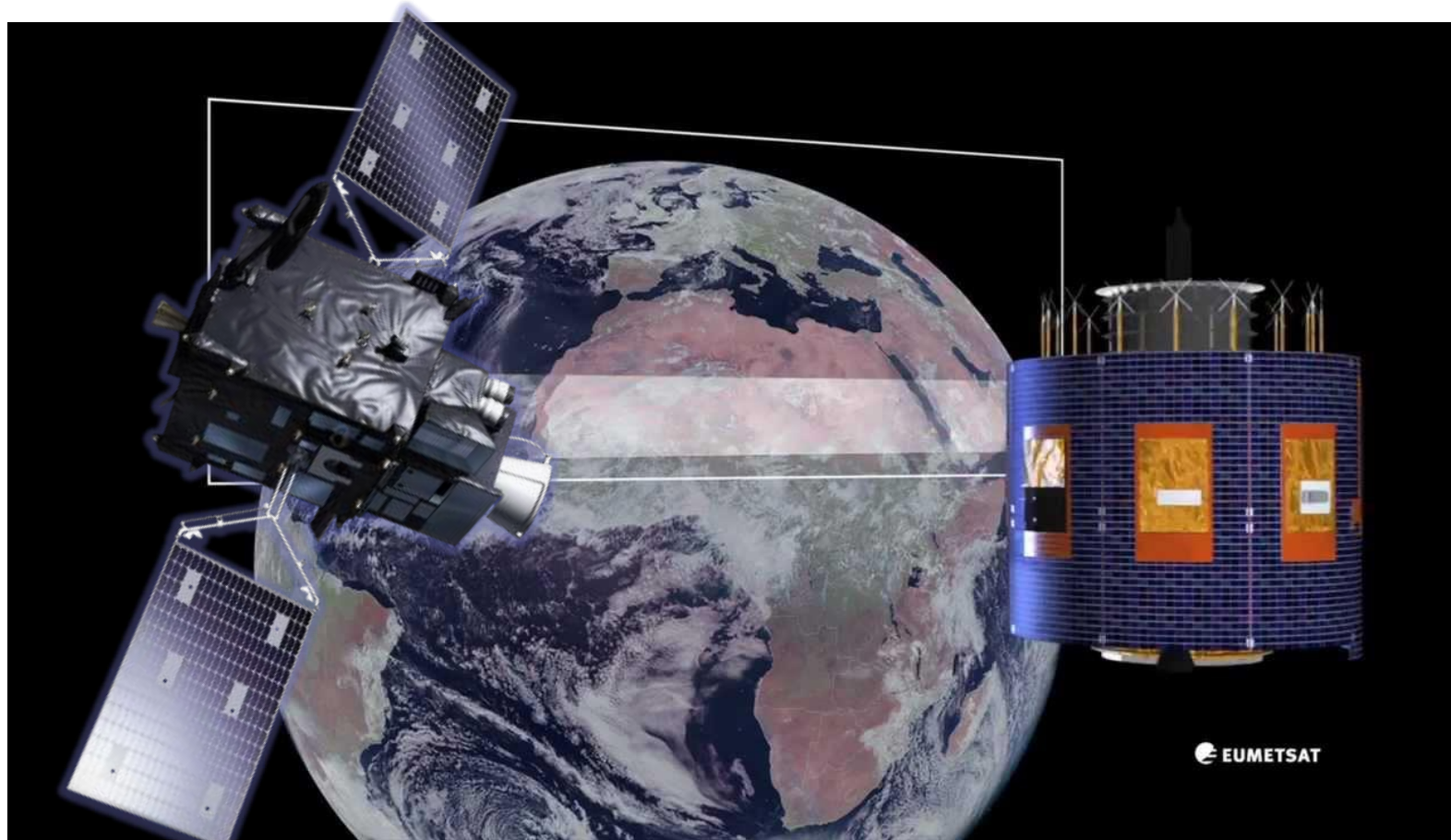
Examples of utility of the two WV channels.



- MTG mission

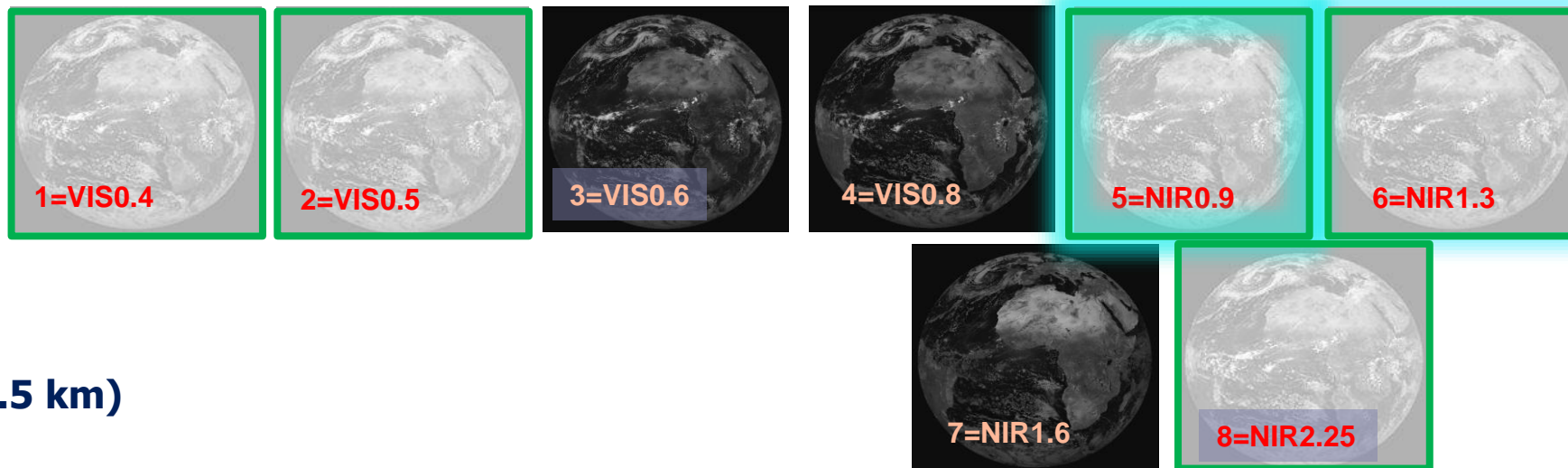


- What is new?



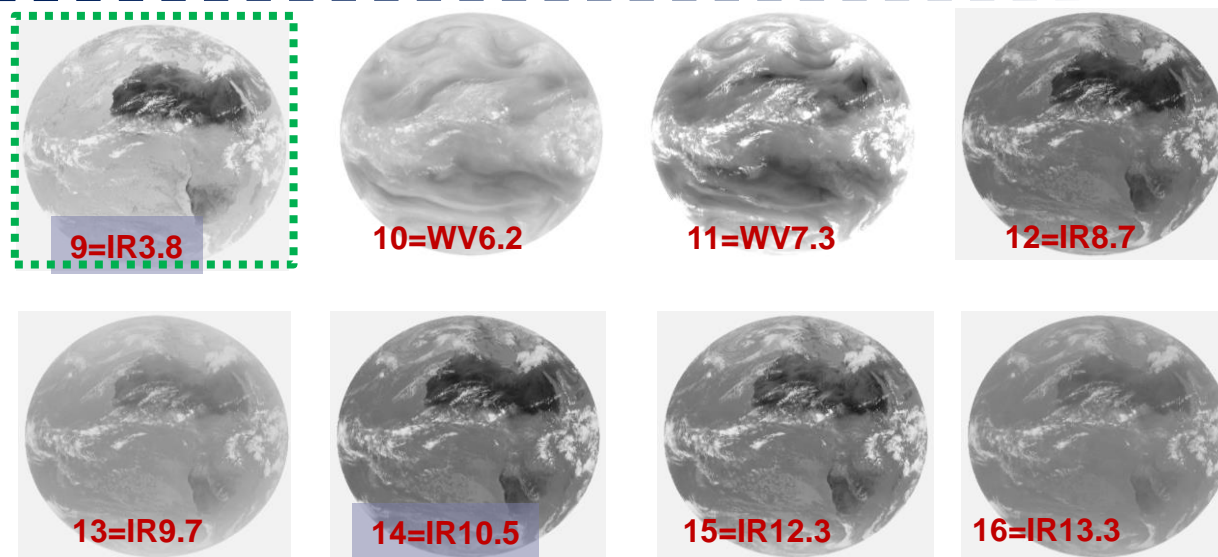


FCI vs SEVIRI



Solar
1.0 km (0.5 km)

Thermal
2.0 km (1.0 km)





New FCI imager

Novelties with FCI imager, on-board MTG.

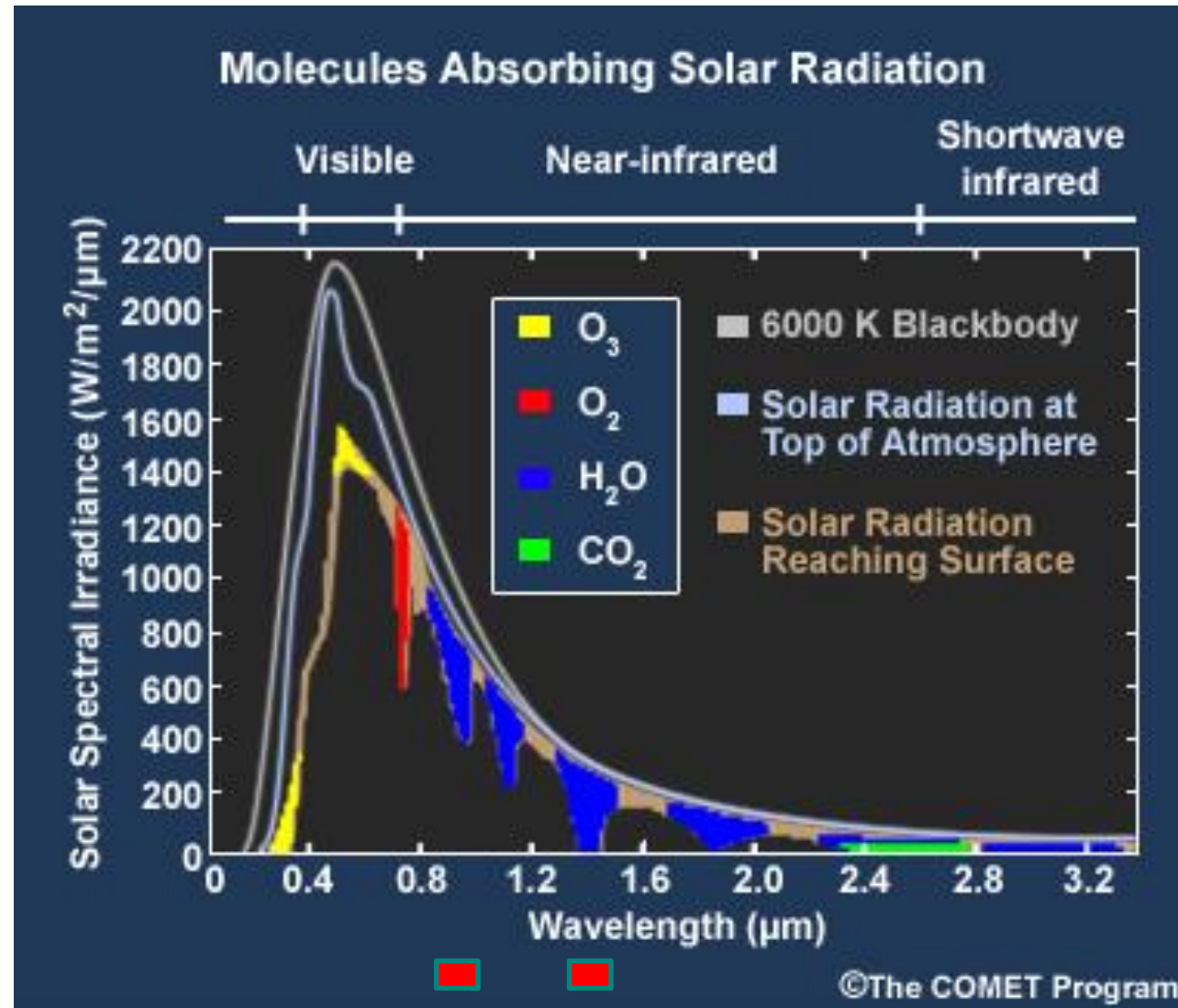
WV absorption in solar region

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Examples of utility of the two WV channels.

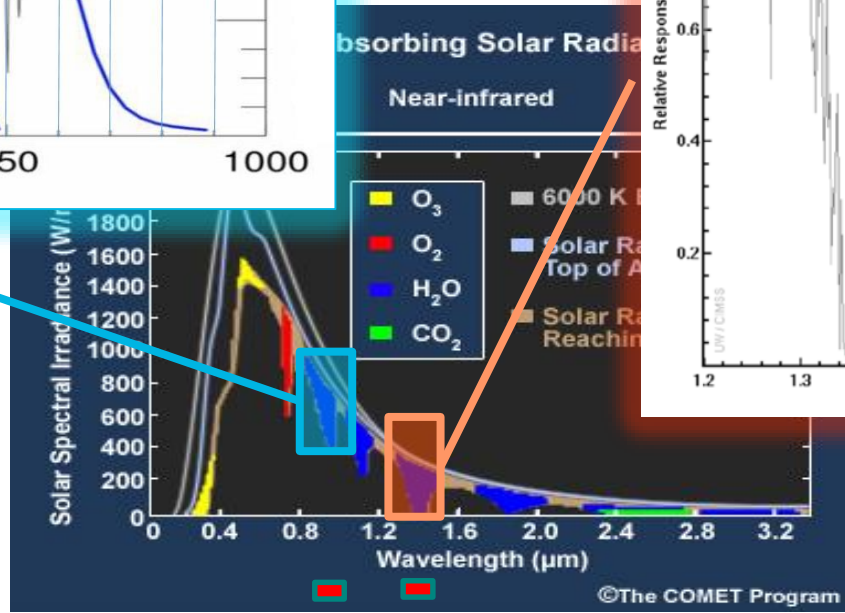
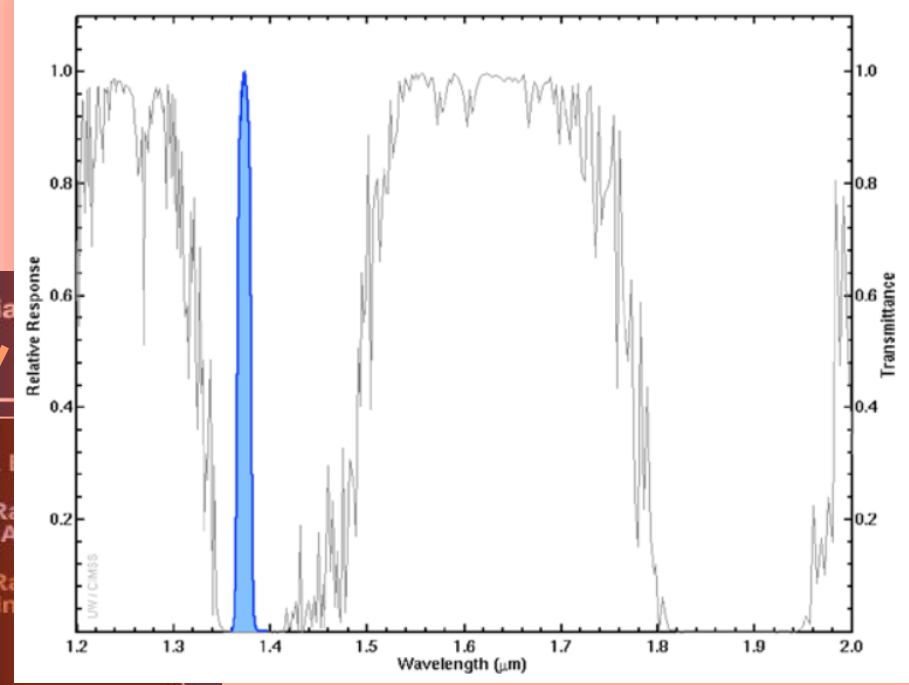
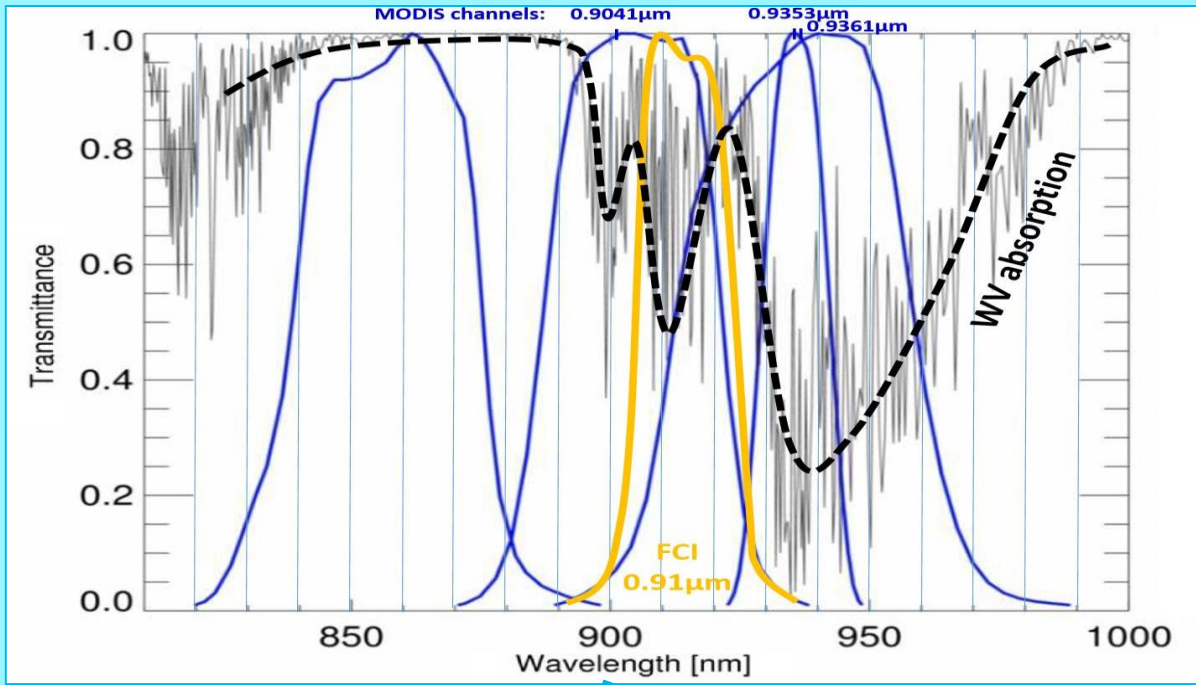
WV absorption (solar region)



910 nm

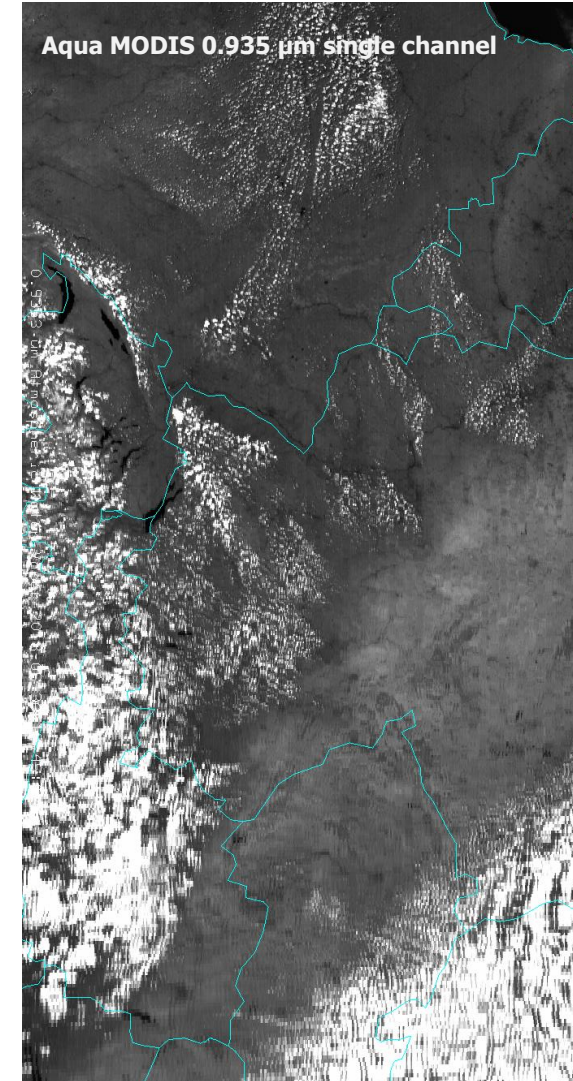
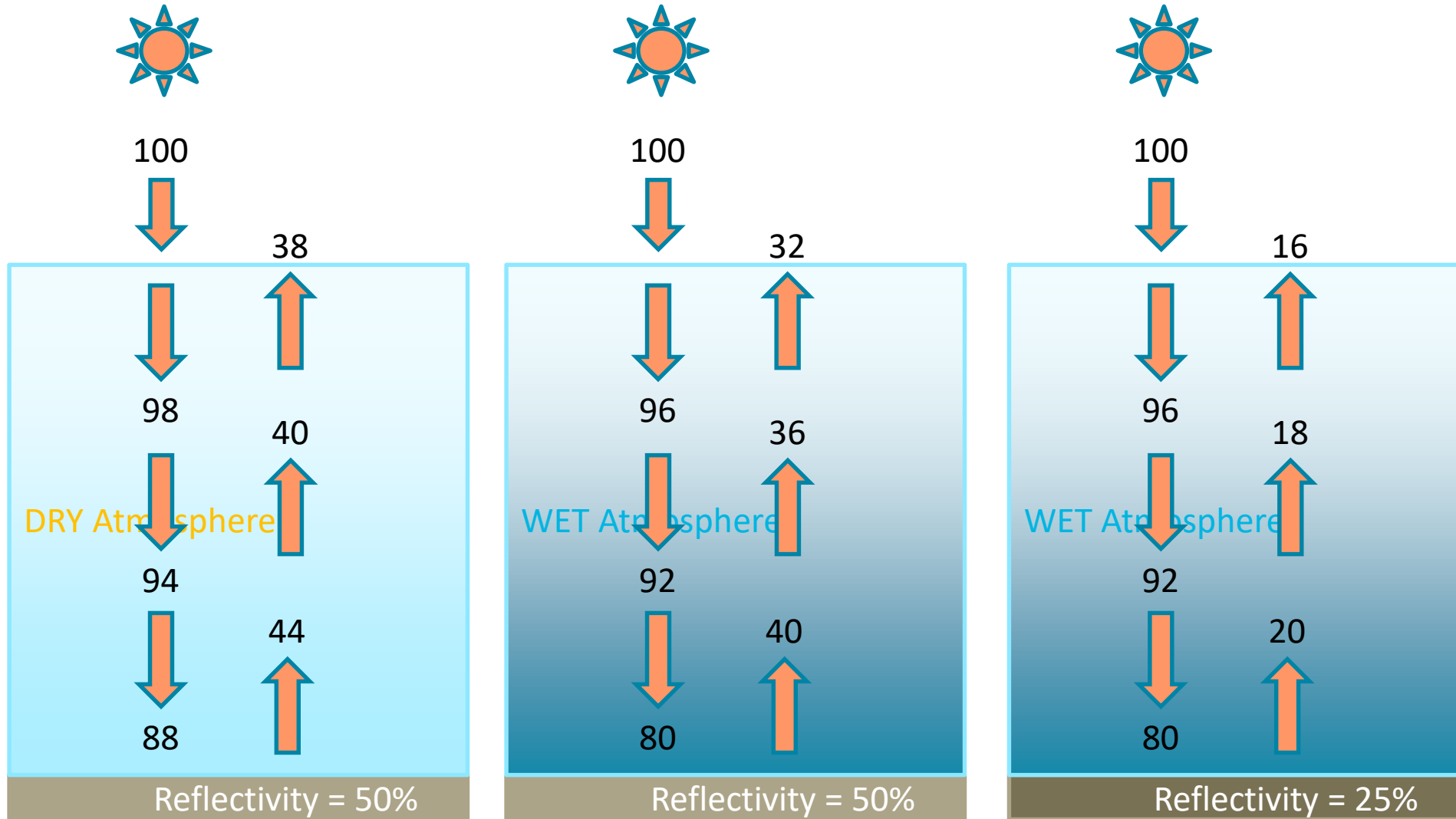
1375 nm

WV absorption (solar region)

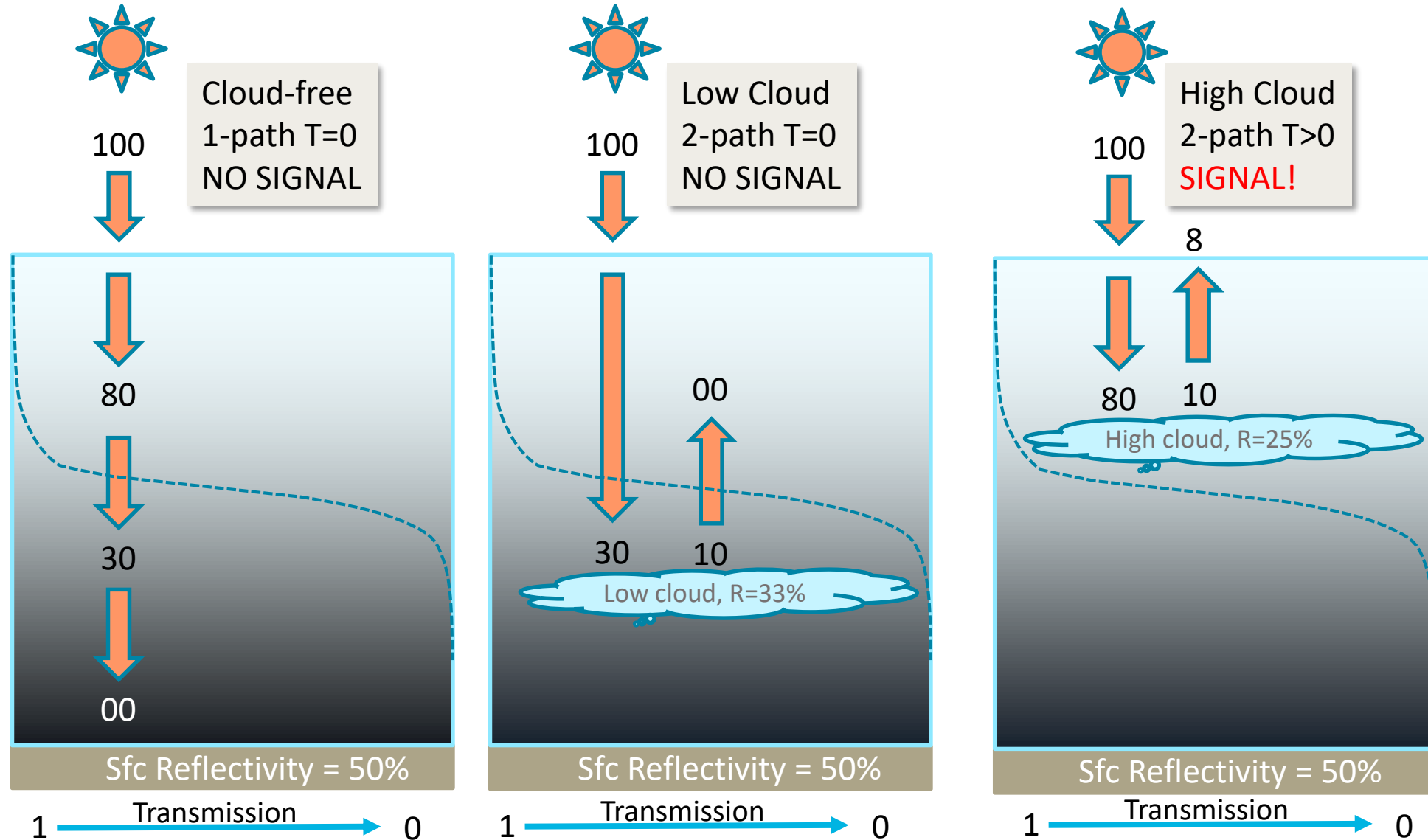


910 nm 1375 nm

WV Absorption: what does it mean in NIRS.9 region?

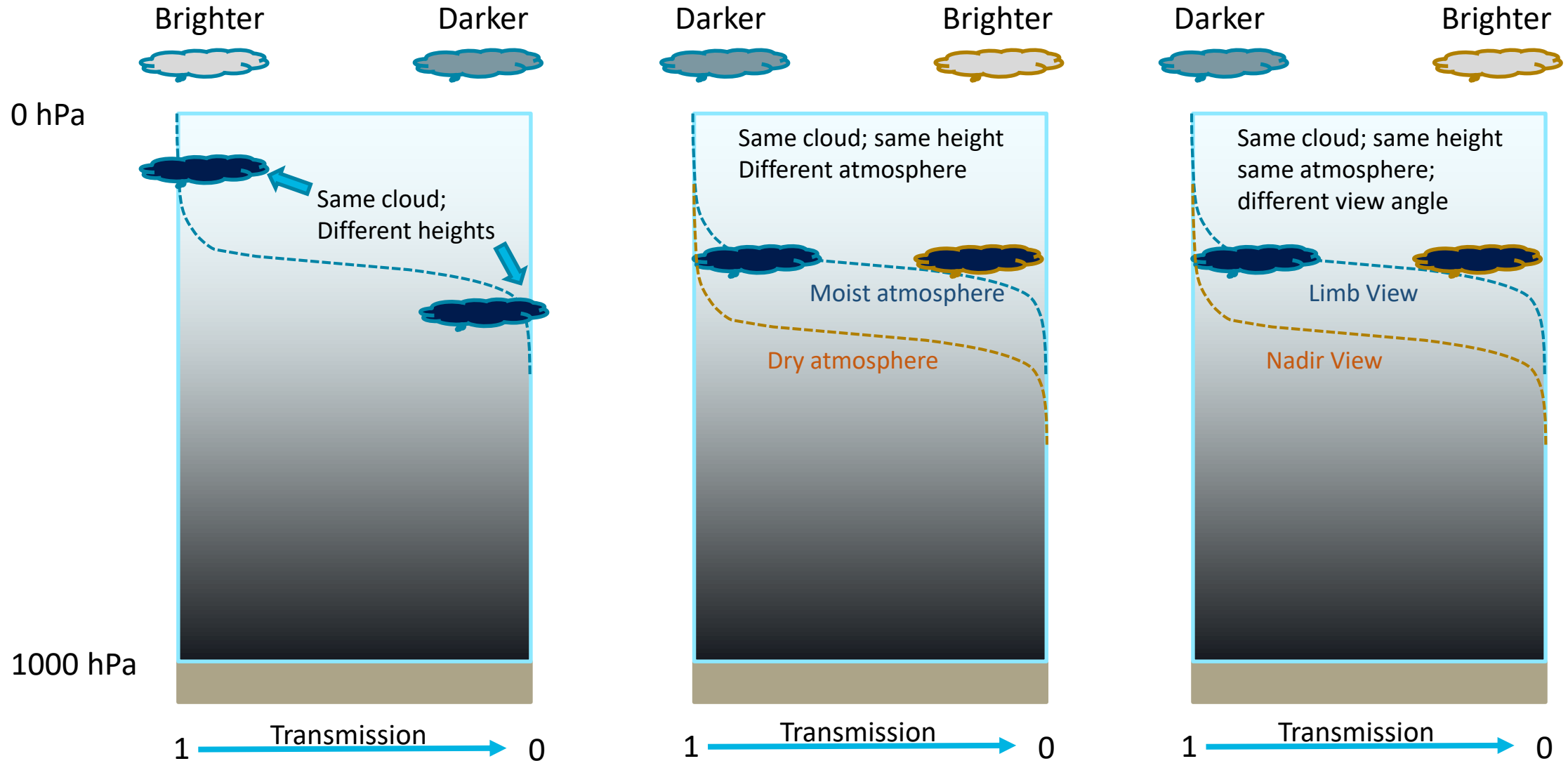


WV Absorption: what does it mean in NIR1.3 region?

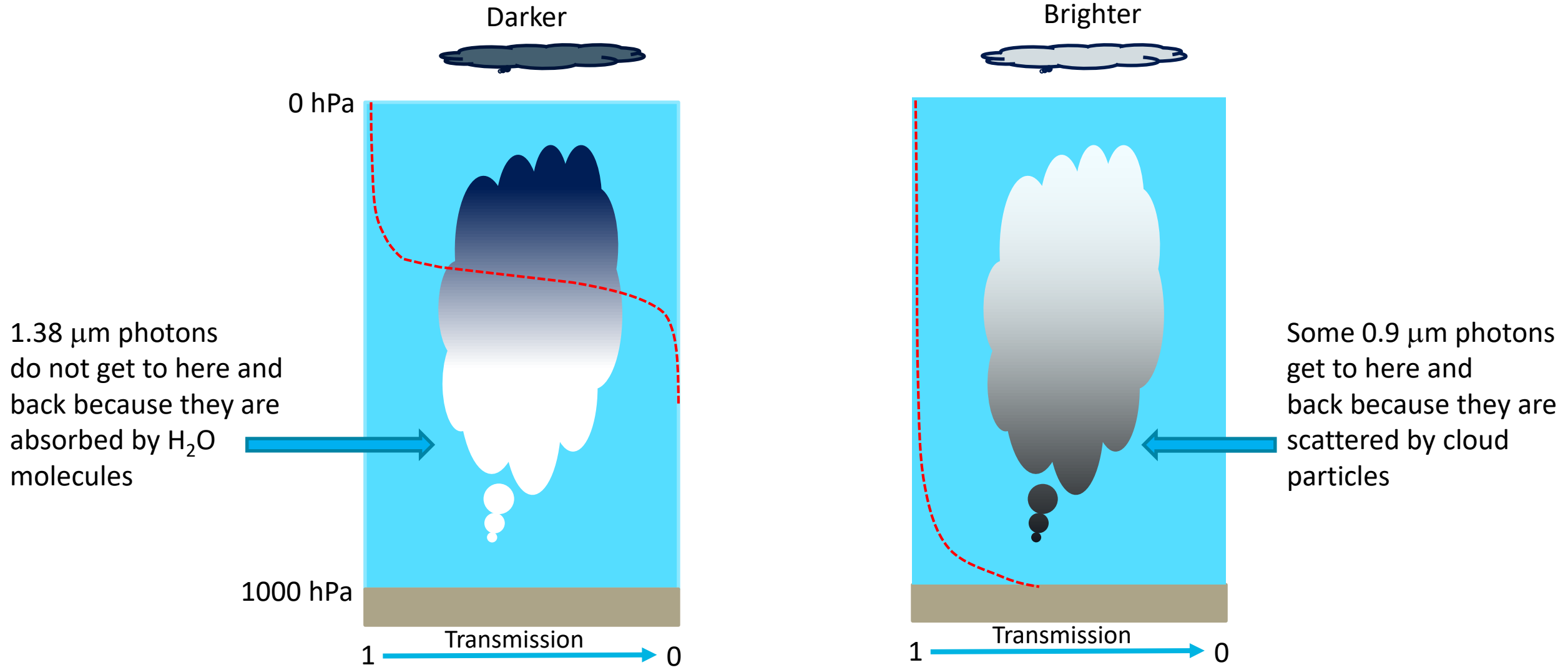


1.38 μm : If we see a cloud, what can we say about it?

... maybe not so much(?), except that it must be high



1.38 μm compared to 0.9 μm





New FCI imager

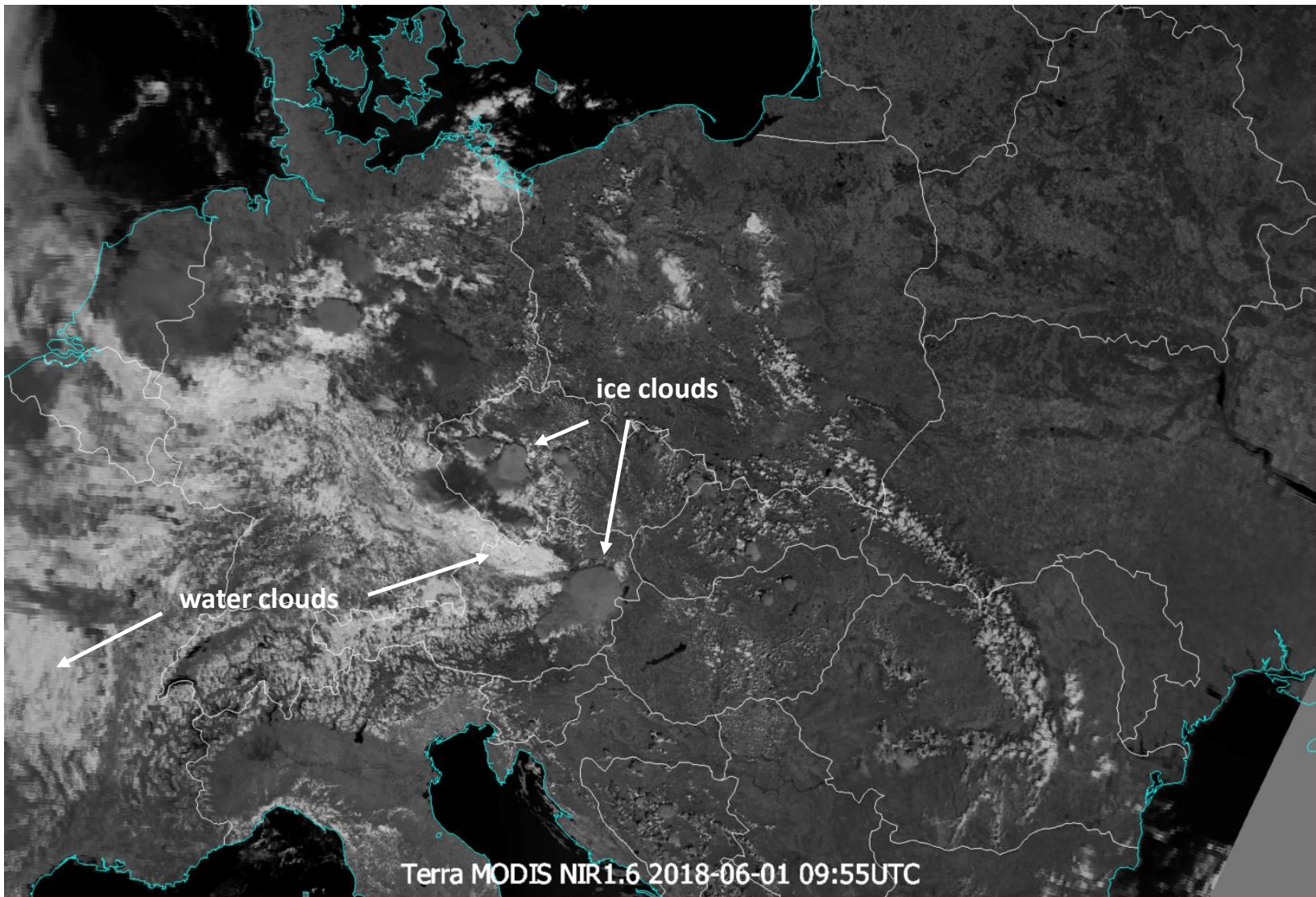
Novelties with FCI imager, on-board MTG.

WV absorption in solar region

Details of photon processes.

NIR0.9 and NIR1.3 imagery

Examples of utility of the two WV channels.



World Political Boundaries
World Coastlines

Imagery

RGB 1.6 / 0.9 / 1.3
Level 1B data (All Bands)

DUST (cloud microphysics tuned for dust)
Level 1B data (All Bands)

RGB 0.9 / 0.9 / 1.3
Level 1B data (All Bands)

G_NCOL (generic natural colour)
Level 1B data (All Bands)

1.3820 um Cirrus Cloud Water Vapor
Level 1B data (All Bands)

8.5288 um Cirrus Cloud Water Vapor
Level 1B data (All Bands)

12.0325 um Surface/Cloud Temperature
Level 1B data (All Bands)

11.0186 um Surface/Cloud Temperature
Level 1B data (All Bands)

0.6465 um Land/Cloud Boundaries
Level 1B data (All Bands)

0.8567 um Land/Cloud Boundaries
Level 1B data (All Bands)

1.6291 um Land/Cloud Properties
Level 1B data (All Bands)

0.9041 um Atmospheric Water Vapor
Level 1B data (All Bands)

0.9361 um Atmospheric Water Vapor
Level 1B data (All Bands)

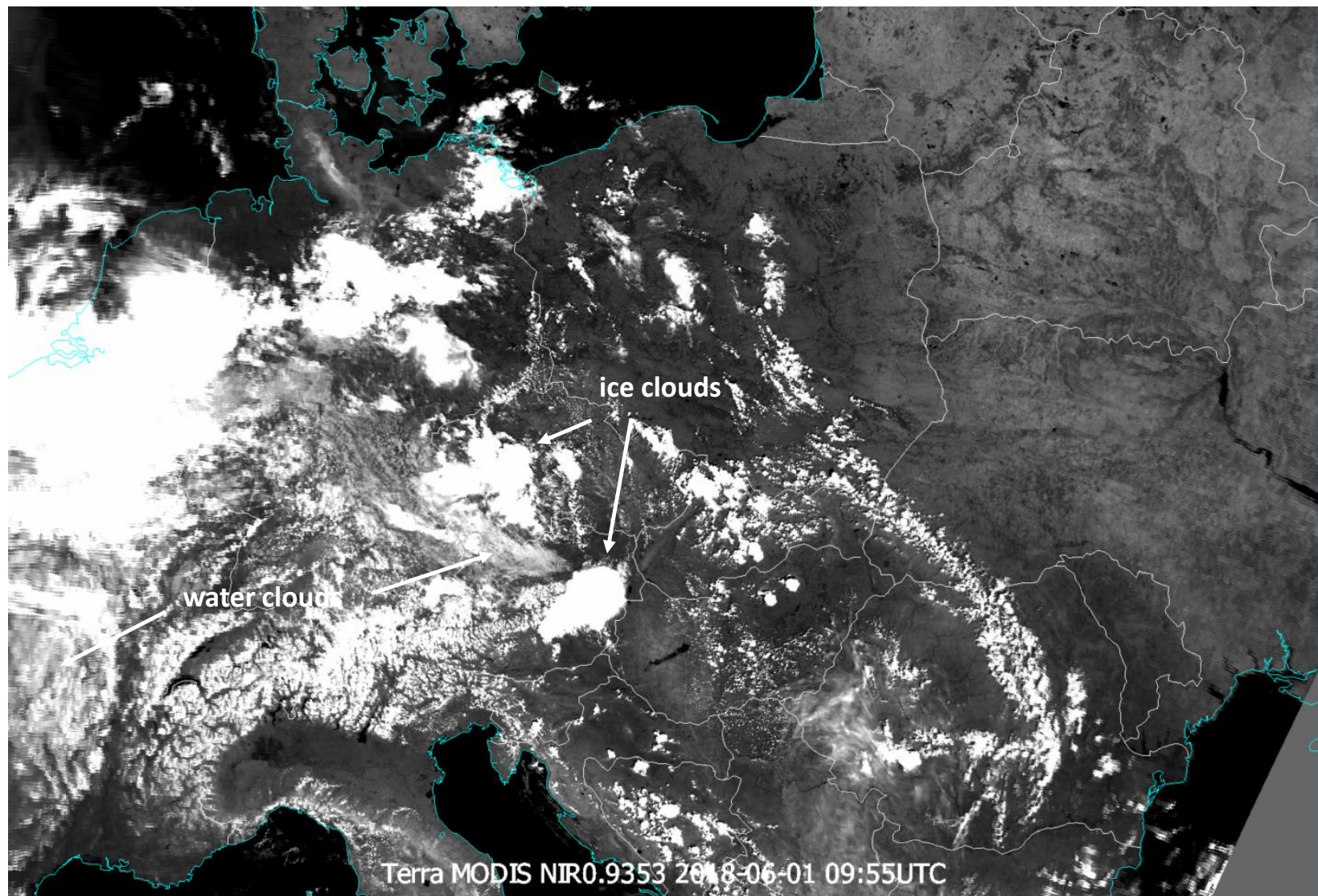
0.9353 um Atmospheric Water Vapor
Level 1B data (All Bands)

- NIR1.6 solar channel

VIIRS Cloud Phase 20170622, Germany



NIR0.9 imagery examples



World Political Boundaries
World Coastlines

Imagery

RGB 1.6 / 0.9 / 1.3
Level 1B data (All Bands)

DUST (cloud microphysics tuned for dust)
Level 1B data (All Bands)

0 241.8

RGB 0.9 / 0.9 / 1.3
Level 1B data (All Bands)

G_NCOL (generic natural colour)
Level 1B data (All Bands)

1.3820 um Cirrus Cloud Water Vapor
Level 1B data (All Bands)

0 2

6.5288 um Cirrus Cloud Water Vapor
Level 1B data (All Bands)

180 320

12.0325 um Surface:Cloud Temperature
Level 1B data (All Bands)

180 320

11.0186 um Surface:Cloud Temperature
Level 1B data (All Bands)

190 320

0.6465 um Land/Cloud Boundaries
Level 1B data (All Bands)

0 350

0.8567 um Land/Cloud Boundaries
Level 1B data (All Bands)

0 350

1.6291 um Land/Cloud Properties
Level 1B data (All Bands)

0 60

0.9041 um Atmospheric Water Vapor
Level 1B data (All Bands)

5 200

0.9361 um Atmospheric Water Vapor
Level 1B data (All Bands)

5 70

0.9353 um Atmospheric Water Vapor
Level 1B data (All Bands)

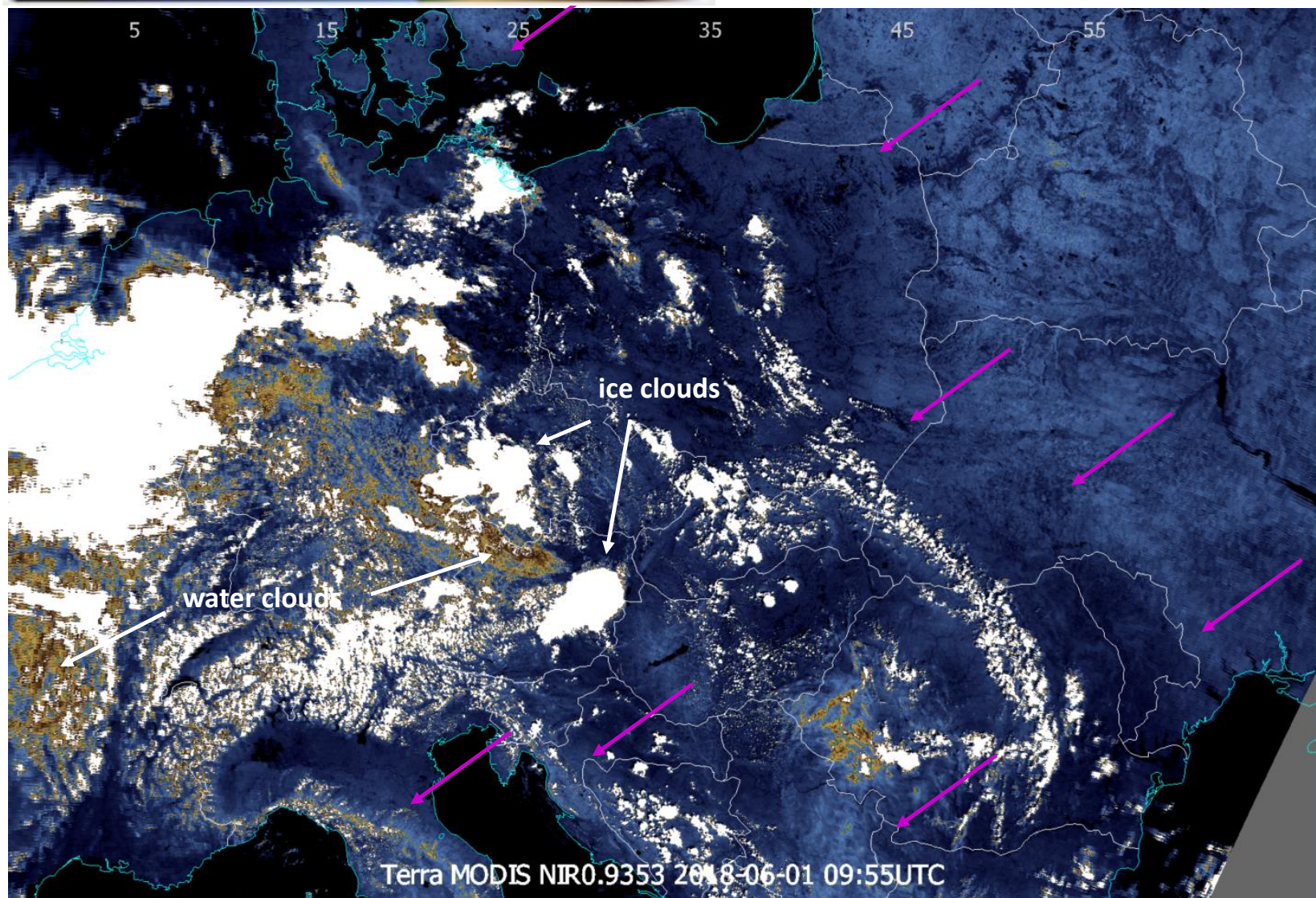
5 60

- NIR0.9 solar channel

VIIRS Cloud Phase 20170622, Germany



NIR0.9 imagery examples



World Political Boundaries
World Coastlines

Imagery

RGB 1.6 / 0.9 / 1.3
Level 1B data (All Bands)

DUST (cloud microphysics tuned for dust)
Level 1B data (All Bands)

RGB 0.9 / 0.9 / 1.3
Level 1B data (All Bands)

G_NCOL (generic natural colour)
Level 1B data (All Bands)

1.3820 um Cirrus Cloud Water Vapor
Level 1B data (All Bands)

0.5288 um Cirrus Cloud Water Vapor
Level 1B data (All Bands)

12.0325 um Surface/Cloud Temperature
Level 1B data (All Bands)

11.0186 um Surface/Cloud Temperature
Level 1B data (All Bands)

0.6465 um Land/Cloud Boundaries
Level 1B data (All Bands)

0.8567 um Land/Cloud Boundaries
Level 1B data (All Bands)

1.6291 um Land/Cloud Properties
Level 1B data (All Bands)

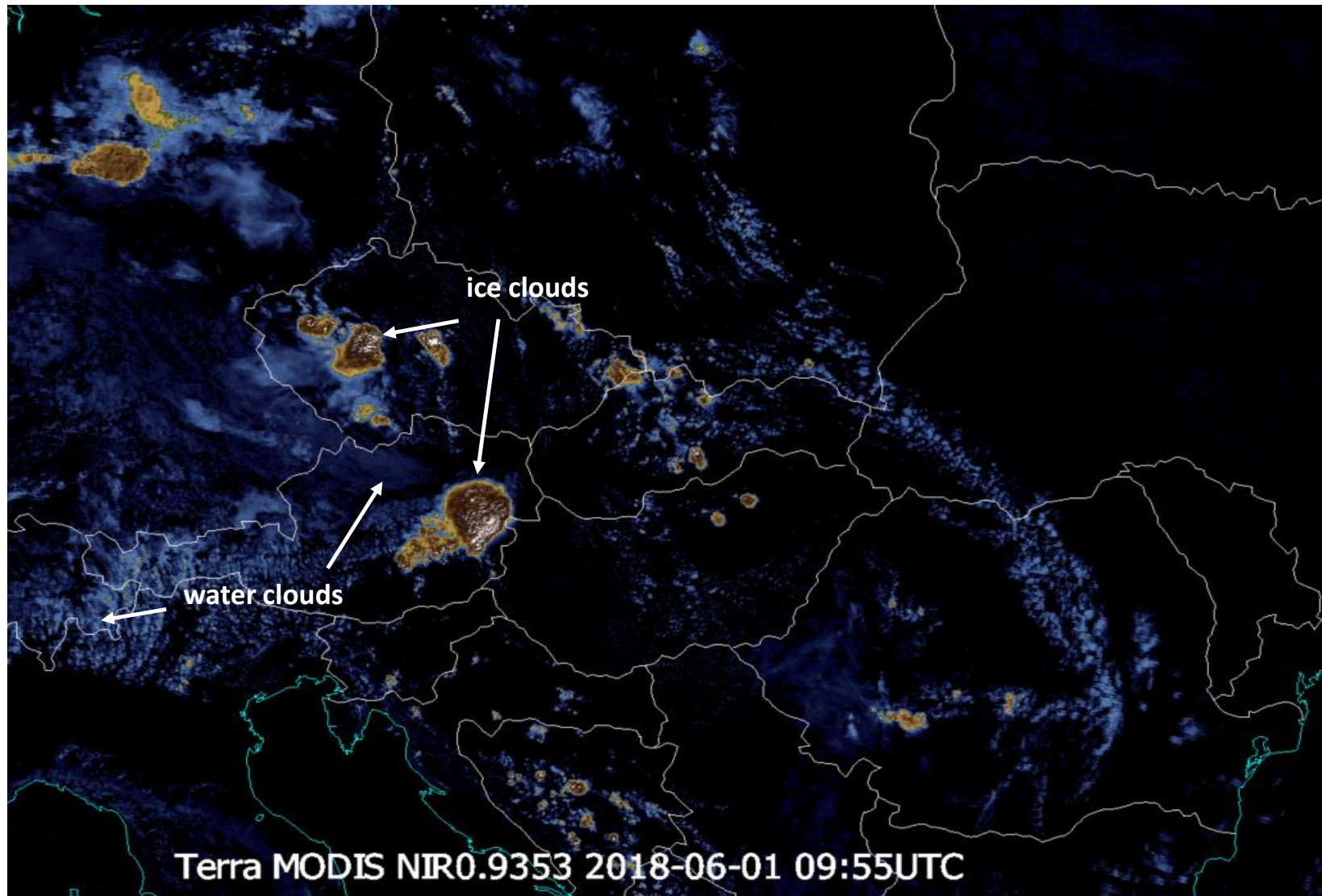
0.9041 um Atmospheric Water Vapor
Level 1B data (All Bands)

0.9361 um Atmospheric Water Vapor
Level 1B data (All Bands)

0.9353 um Atmospheric Water Vapor
Level 1B data (All Bands)

- NIR0.9 solar channel
- Colour coded single channel

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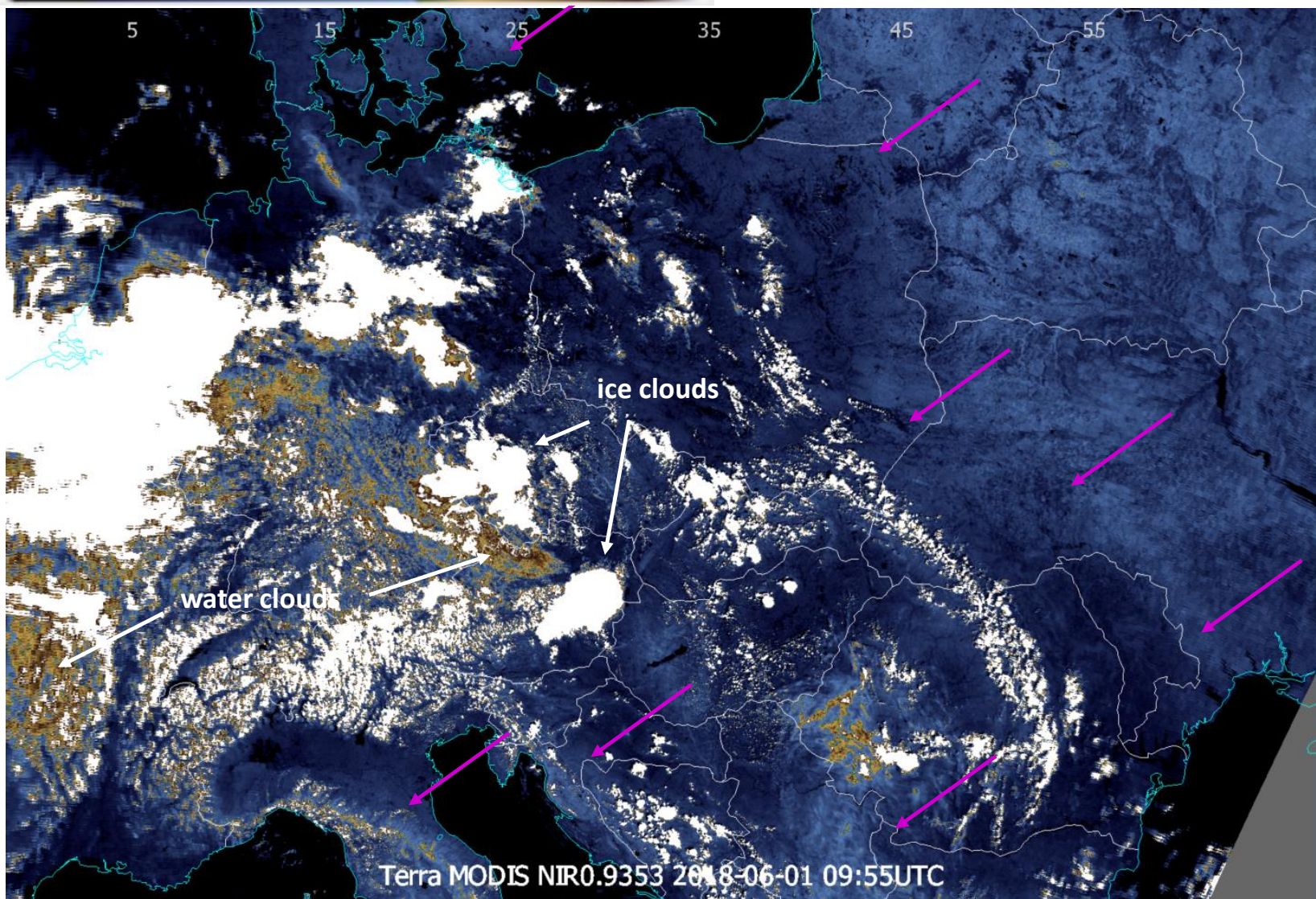


VIIRS Cloud Phase 20170622, Germany

- NIR0.9 solar channel
- Colour coded single channel



NIR0.9 imagery examples



World Political Boundaries
World Coastlines

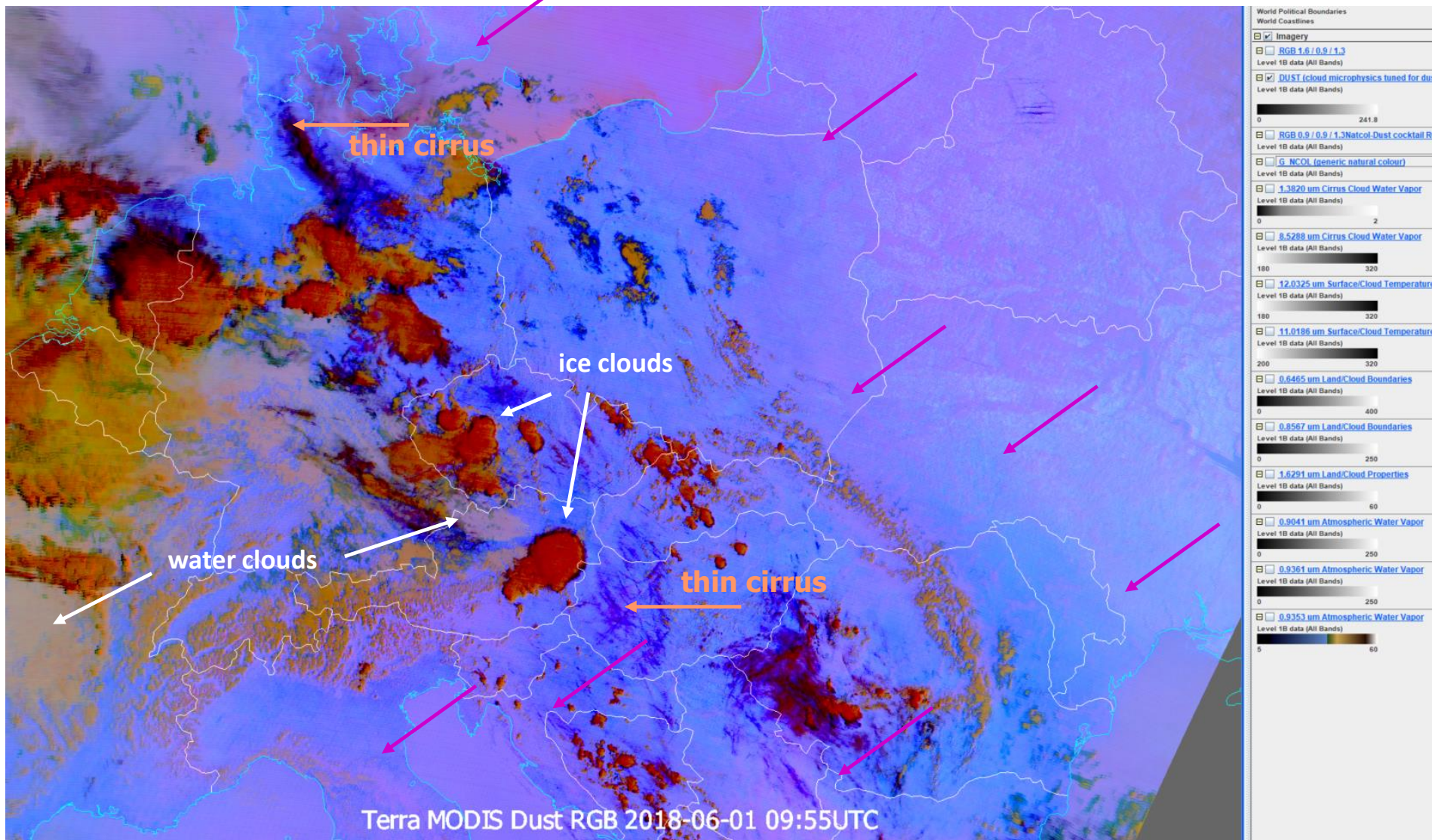
- Imagery
 - RGB 1.6 / 0.9 / 1.3
Level 1B data (All Bands)
 - DUST (cloud microphysics tuned for dust)
Level 1B data (All Bands)
 - RGB 0.9 / 0.9 / 1.3
Level 1B data (All Bands)
 - G_NCOL (generic natural colour)
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 - 0.9353 um Atmospheric Water Vapor
Level 1B data (All Bands)

- NIR0.9 solar channel
- Colour coded single channel

VIIRS Cloud Phase 20170622, Germany



NIR0.9 imagery examples



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World Coastlines

Imagery

RGB 1.6 / 0.9 / 1.3
Level 1B data (All Bands)

DUST (cloud microphysics tuned for dust)
Level 1B data (All Bands)

0 241.9

RGB 0.9 / 0.9 / 1.3 Natcol Dust cocktail RGB
Level 1B data (All Bands)

G_NCOL (generic natural colour)
Level 1B data (All Bands)

1.3820 um Cirrus Cloud Water Vapor
Level 1B data (All Bands)

0 2

0.5288 um Cirrus Cloud Water Vapor
Level 1B data (All Bands)

180 320

12.0325 um Surface:Cloud Temperature
Level 1B data (All Bands)

180 320

11.0186 um Surface:Cloud Temperature
Level 1B data (All Bands)

200 320

0.6465 um Land:Cloud Boundaries
Level 1B data (All Bands)

0 400

0.8567 um Land:Cloud Boundaries
Level 1B data (All Bands)

0 250

1.6291 um Land:Cloud Properties
Level 1B data (All Bands)

0 60

0.9041 um Atmospheric Water Vapor
Level 1B data (All Bands)

0 250

0.9361 um Atmospheric Water Vapor
Level 1B data (All Bands)

0 250

0.9353 um Atmospheric Water Vapor
Level 1B data (All Bands)

5 60

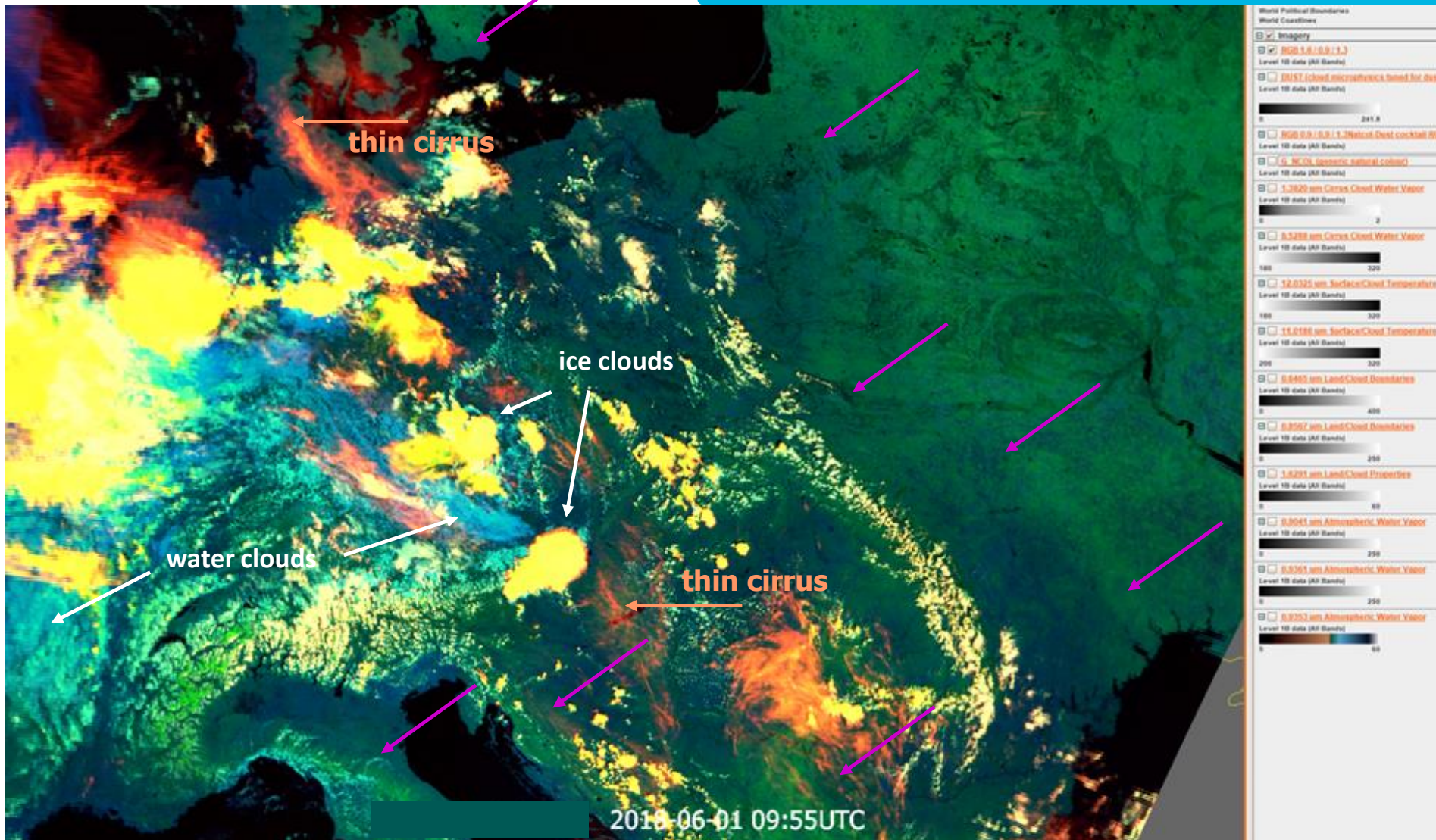
- Dust RGB for comparison
 - Red component BTD12-10 (low level moisture)

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NIR0.9 imagery examples

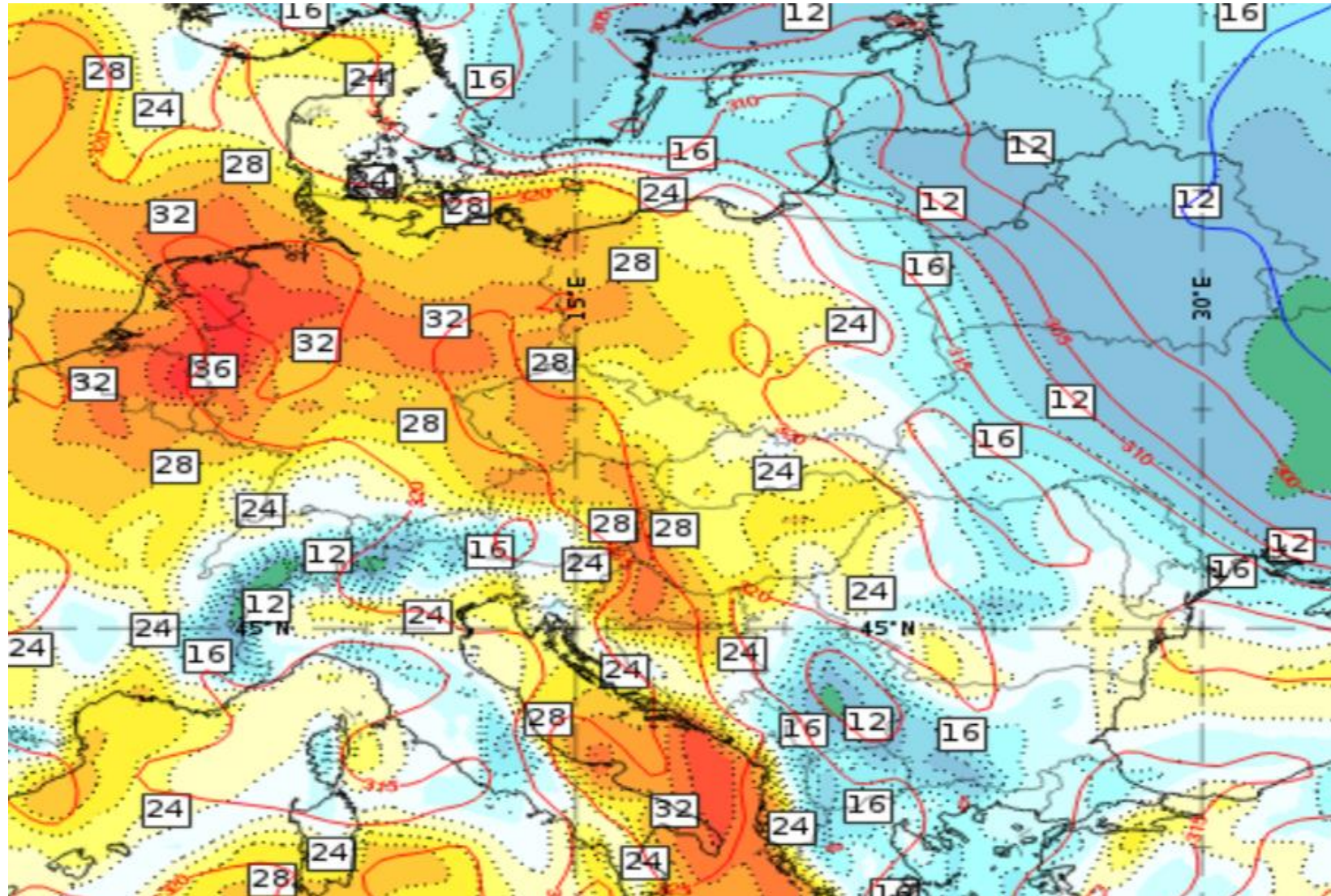
RGB: NIR1.38 (0-3%) - NIR0.9353 (lower end) - NIR1.64



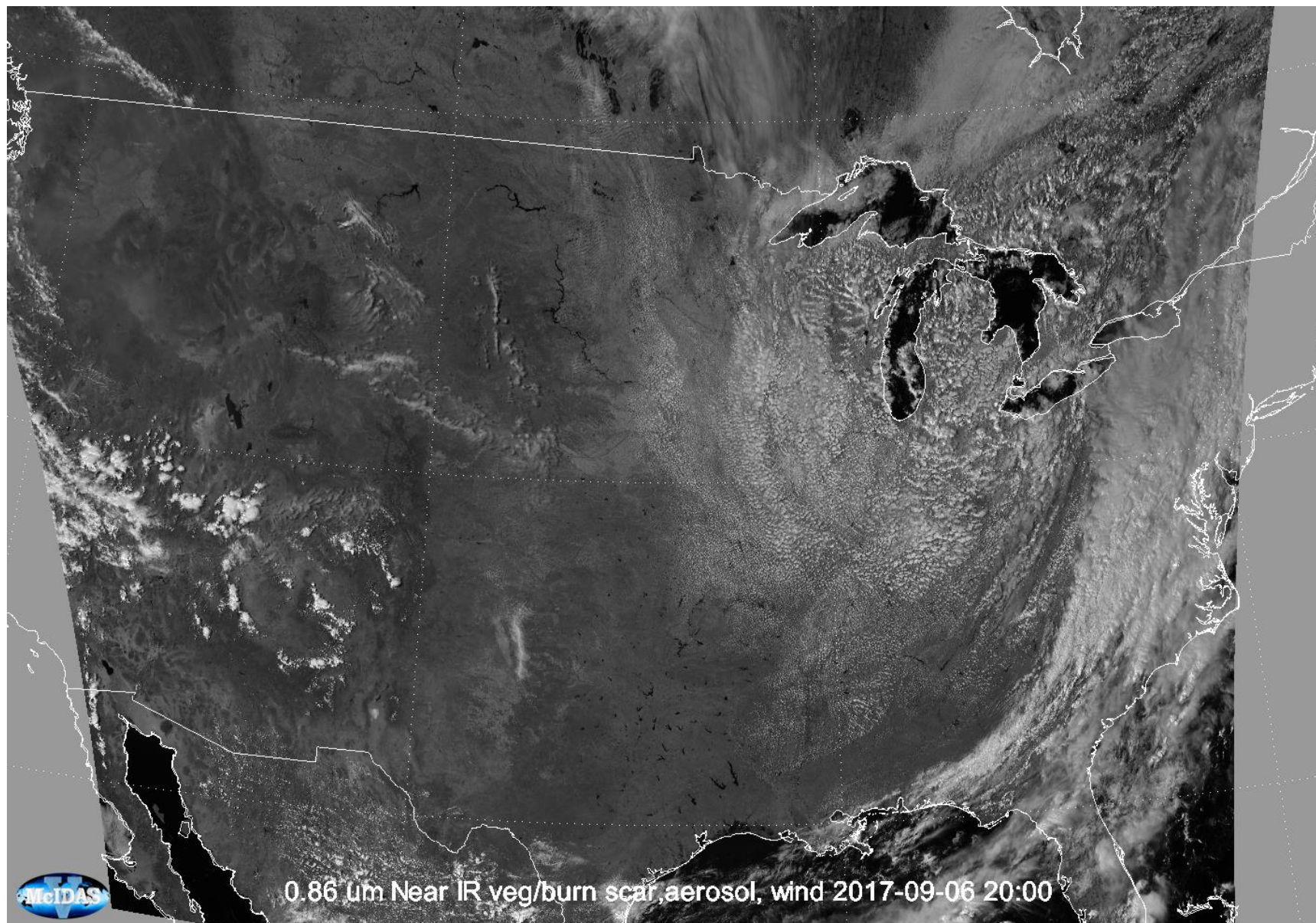
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• 'LL moisture' RGB

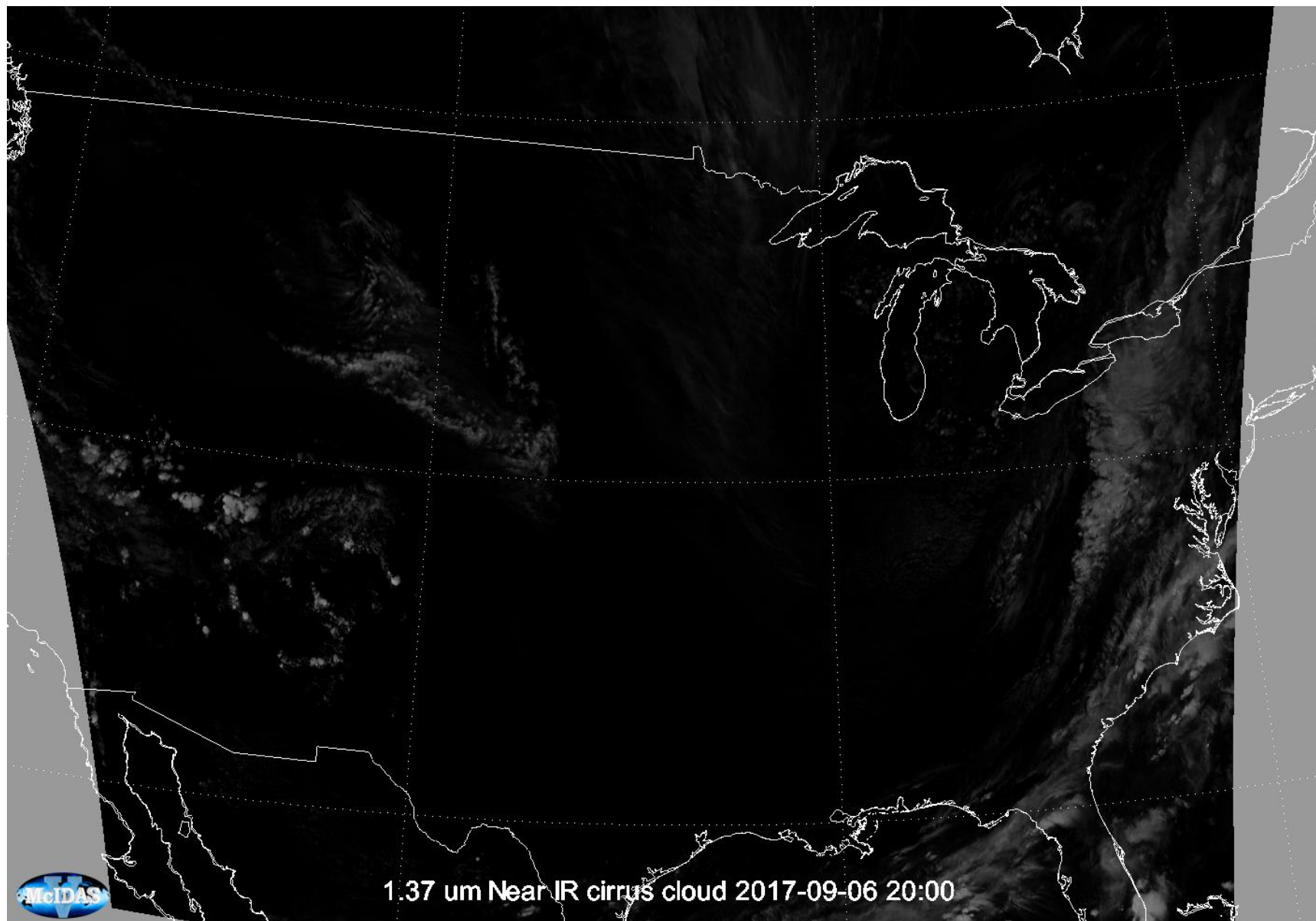
- Similarity with Cloud Type RGB



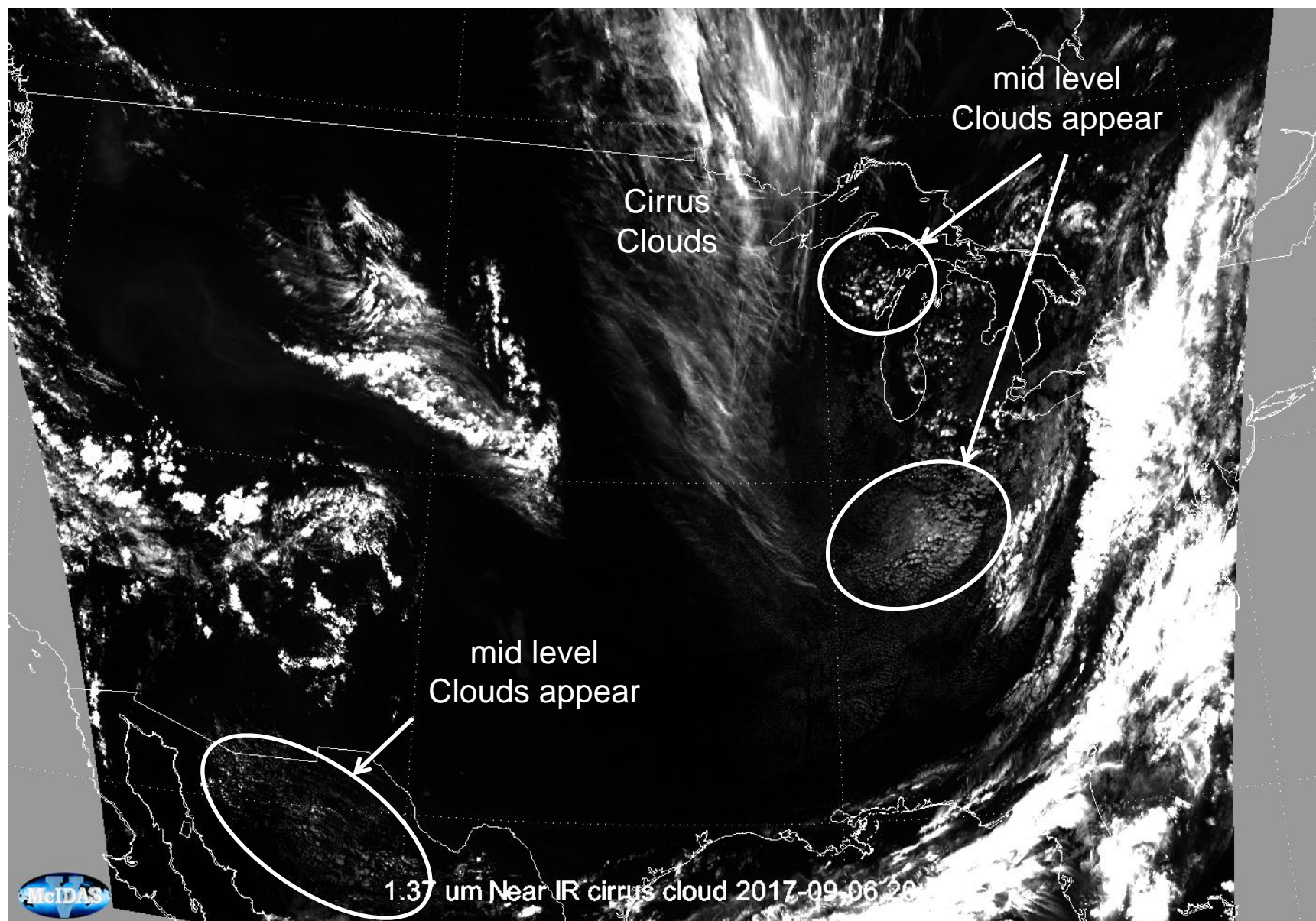
- NWP comparison
 - Total Column Water + ThetaE at 850hPa



- Solar channel 0.86 μm
 - Both high and low clouds detected
 - No height information



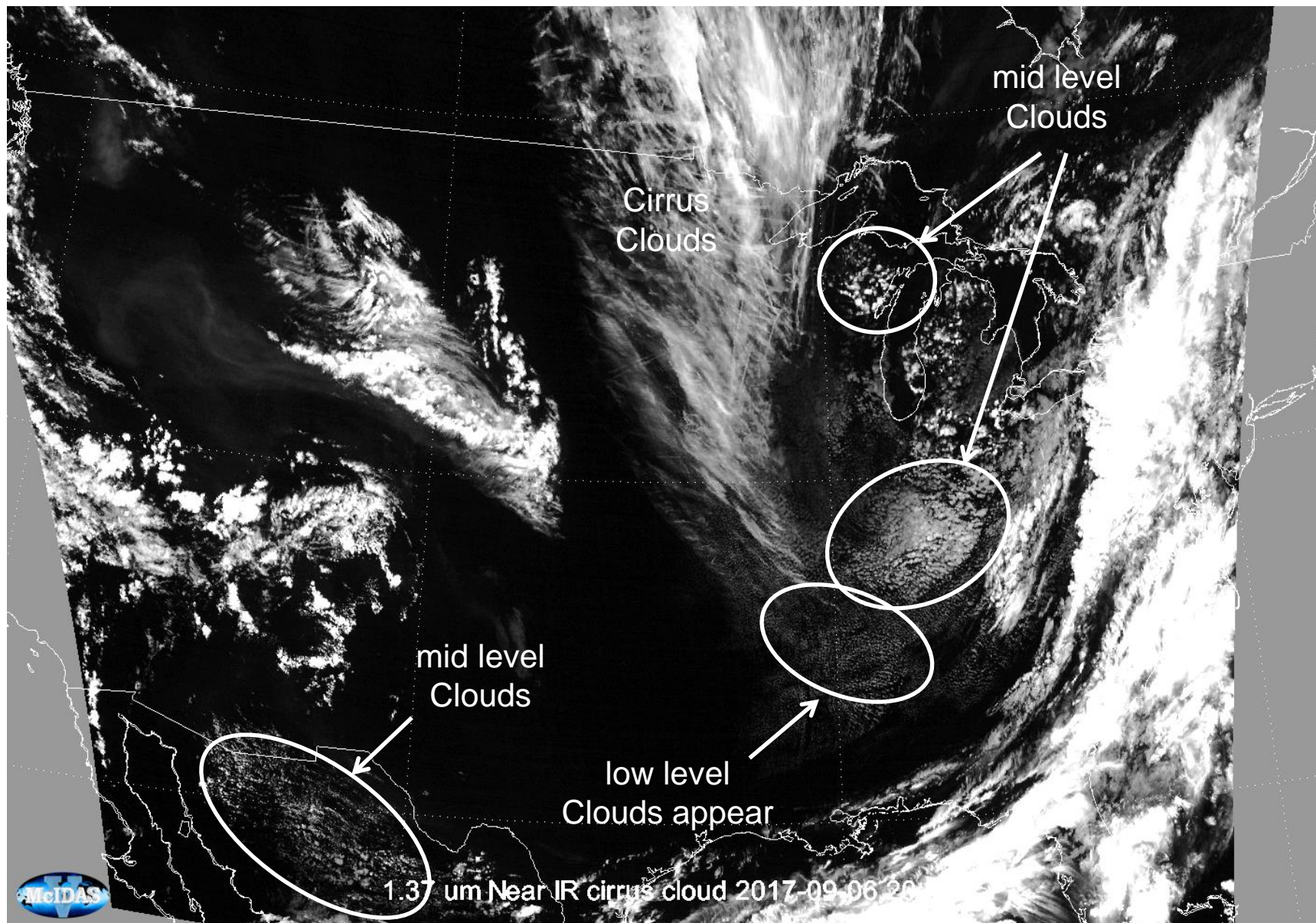
- **NIR1.3 channel**
 - Range: 0-70 %
 - Clouds (higher level) hardly seen



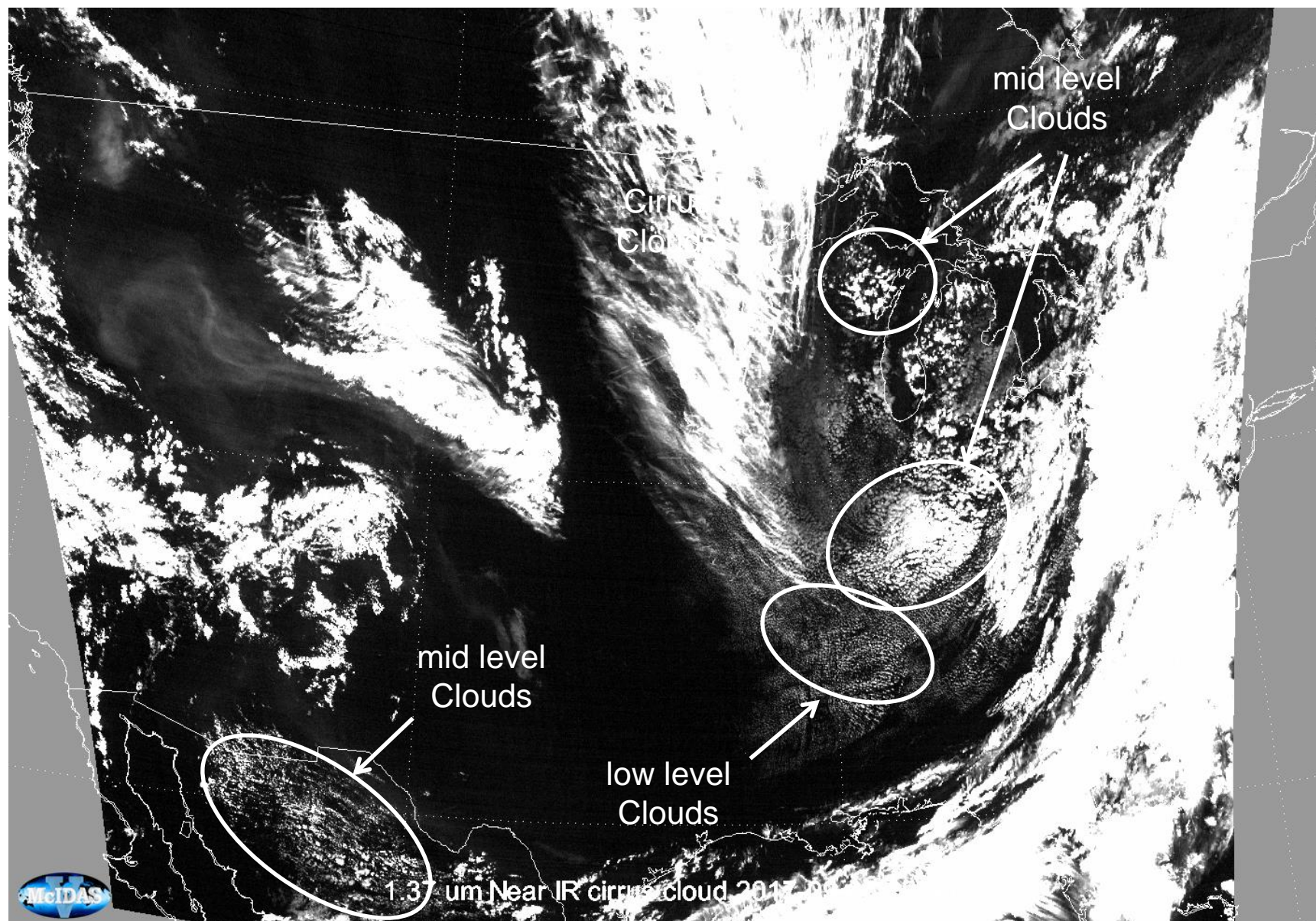
- **NIR1.3** channel
 - Range: 0-10 %
 - Clouds (higher level) well seen
 - Mid-level clouds start to appear



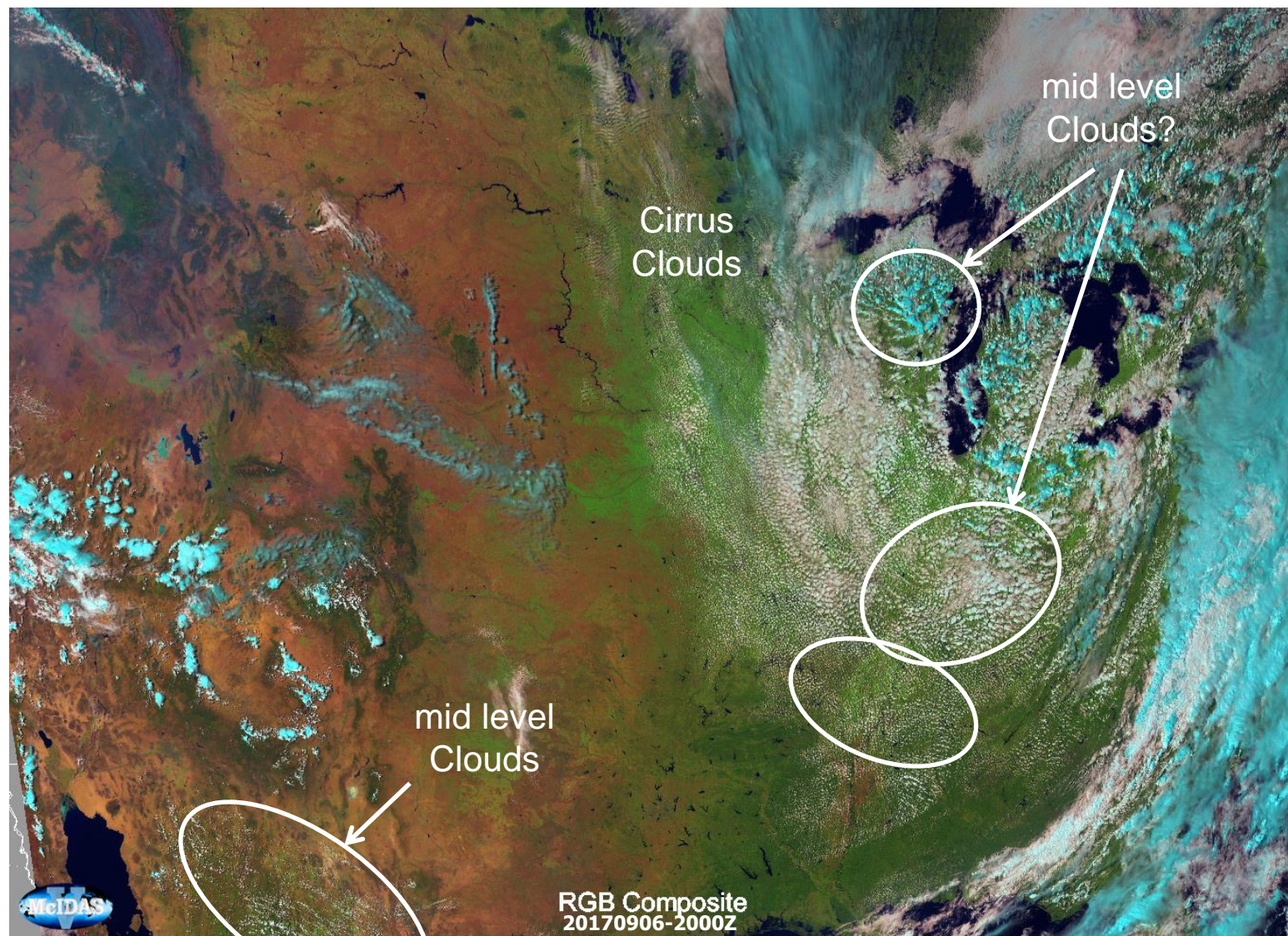
NIR1.3 imagery examples



- **NIR1.3 channel**
 - **Range: 0-10 %**
 - **Gamma: 2.5**
 - **Clouds (higher level) well seen**
 - **Mid-level clouds well detected**
 - **Low-level clouds start to appear**



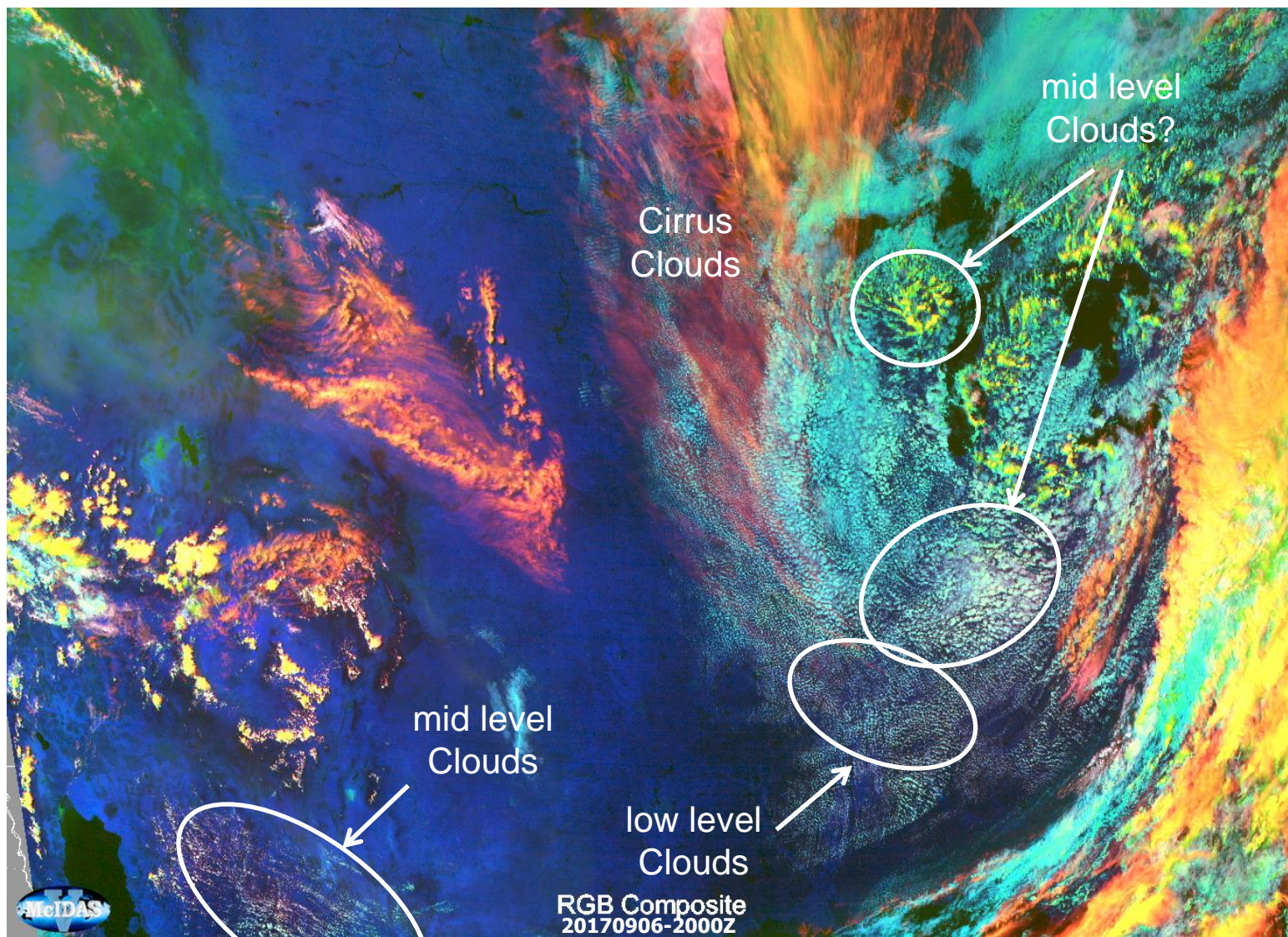
- **NIR1.3 channel**
 - Range: 0-2(!) %
 - Gamma: 1
 - Clouds (higher level) well seen
 - Mid-level clouds well detected
 - Low-level clouds detected



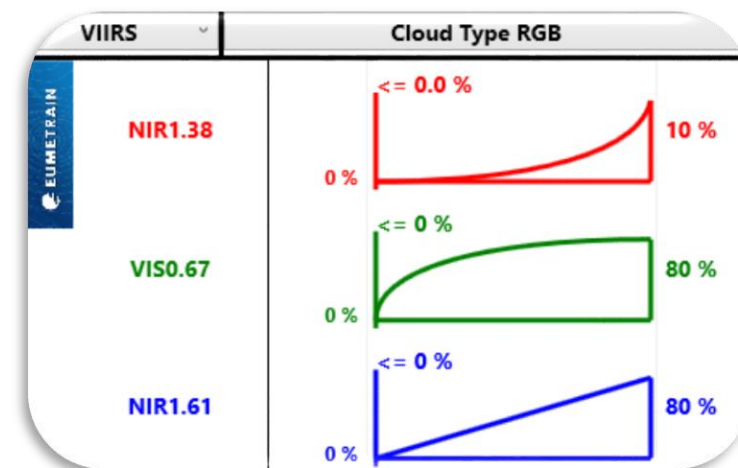
- Natural Colour RGB



NIR1.3 imagery examples

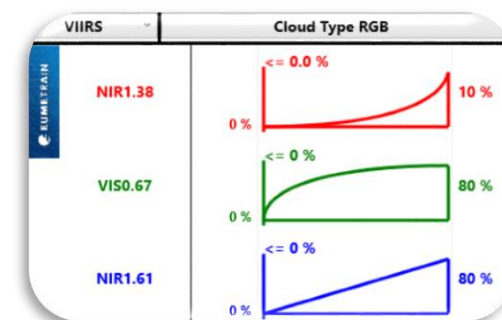
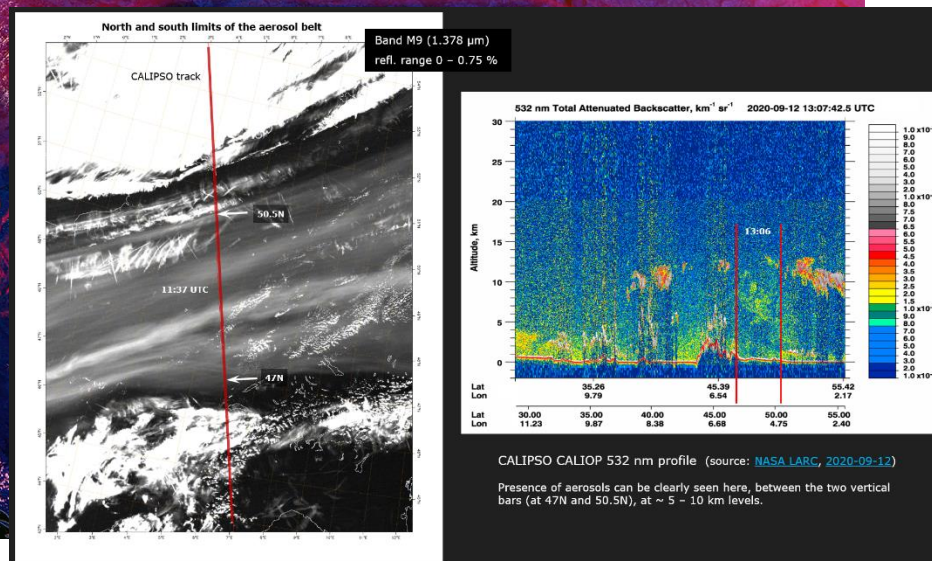
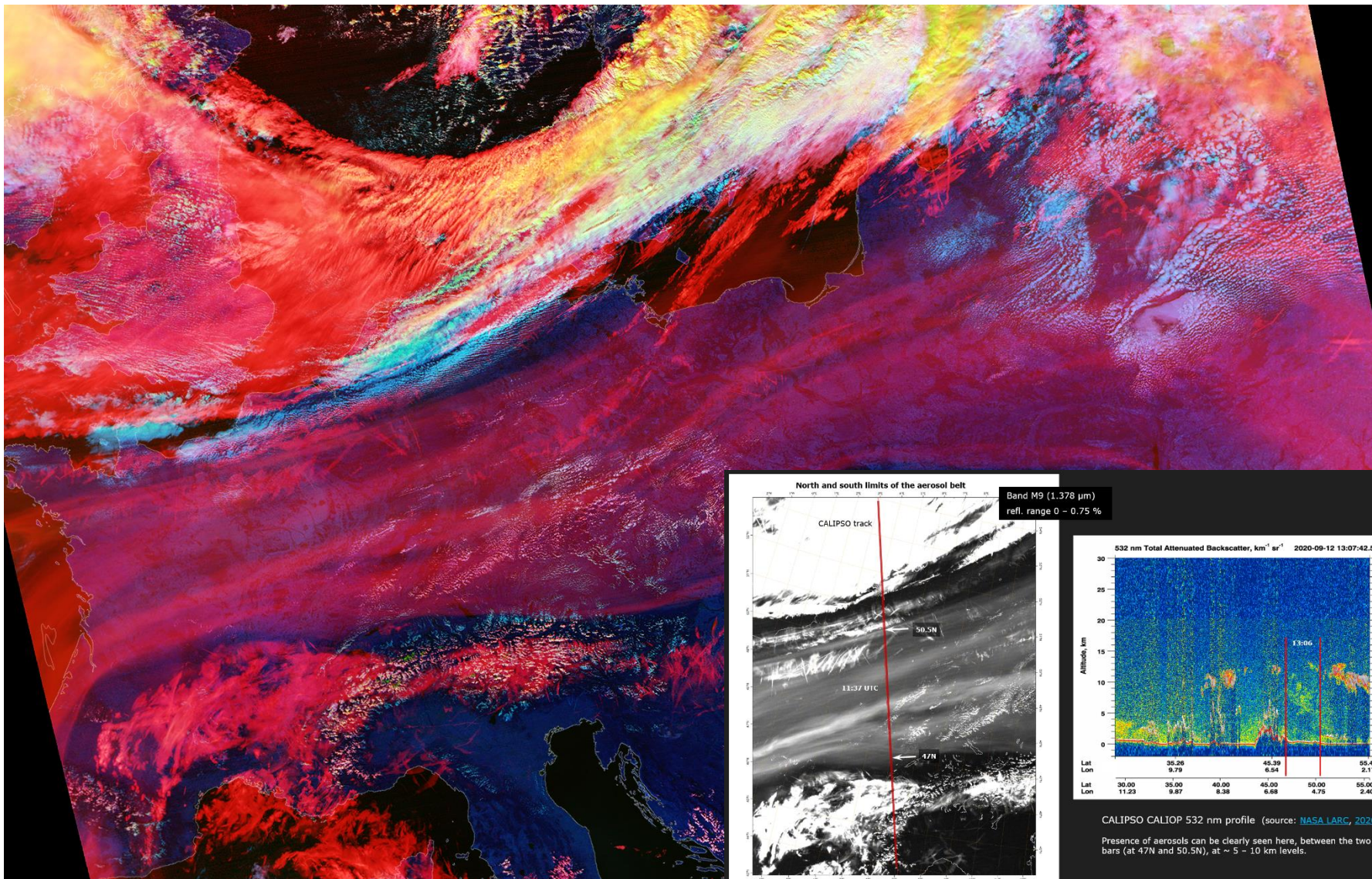


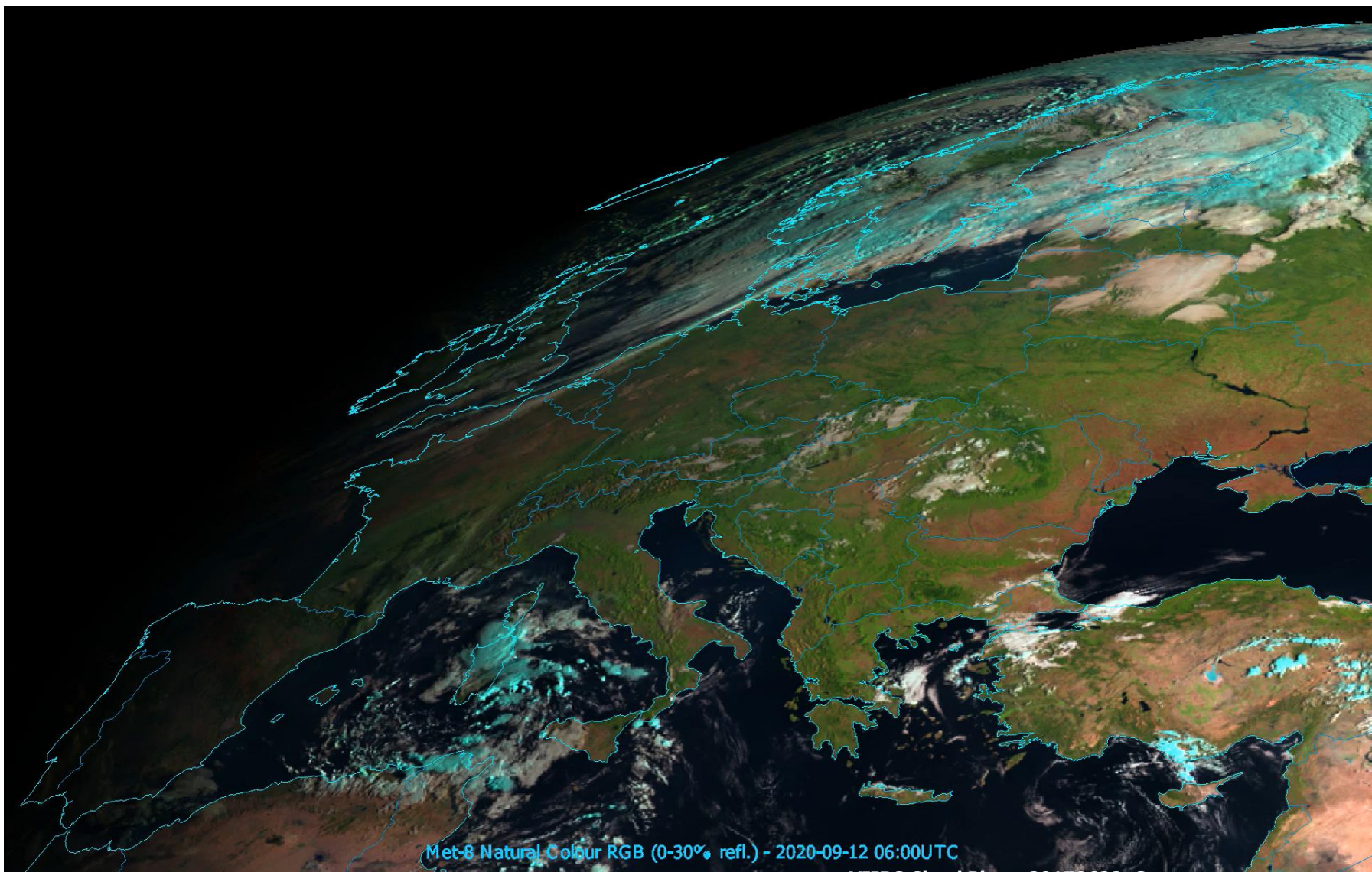
- **Cloud Type RGB**
 - Utilising NIR1.3 channel



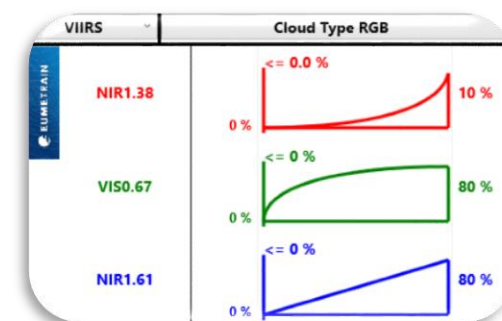


- Aerosols
 - High thin smoke





- Aerosols
 - High thin smoke
 - Hard to detect with SEVIRI





Thank you!

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