A Snow RGB composite for Suomi NPP VIIRS

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Outline

I- CONTEXT

- CMS (who /what)
- Why a snow product with SUOMI-NPP ?
- Image versus Classification approach

II- RGB SNOW Composite Image

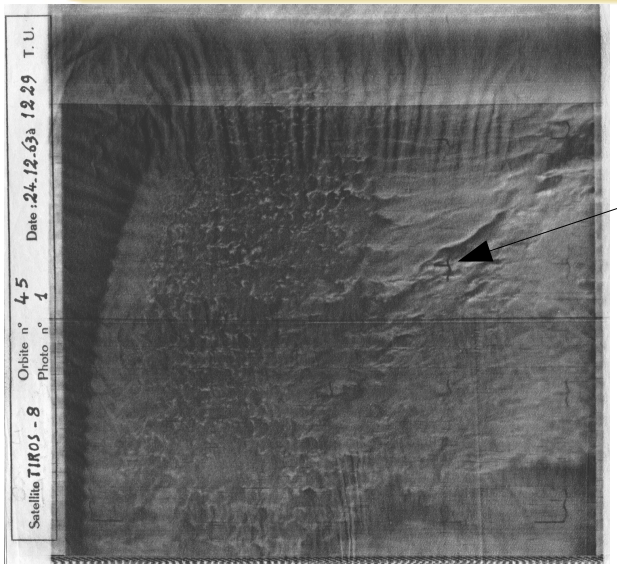
- Examples
- Algorithm description (how)

Conclusion

(I) Centre de Météorologie Spatiale

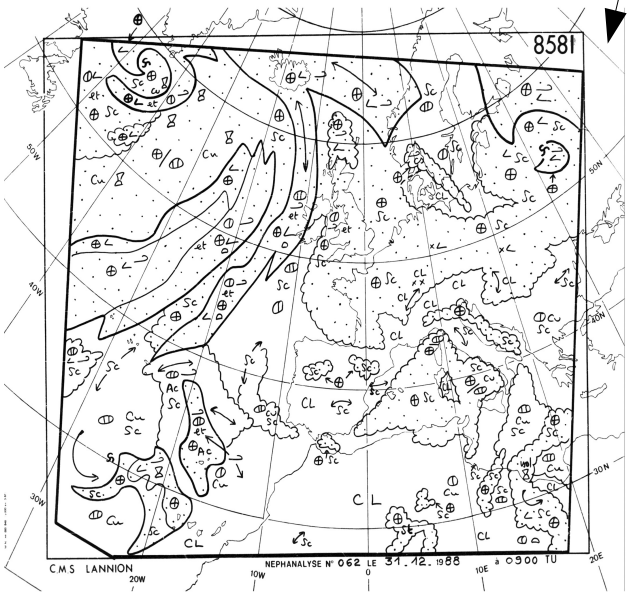
The CMS is in charge of acquisition and processing of the weather satellite data for the national weather service.

(I) 50 Years of Satellite Images

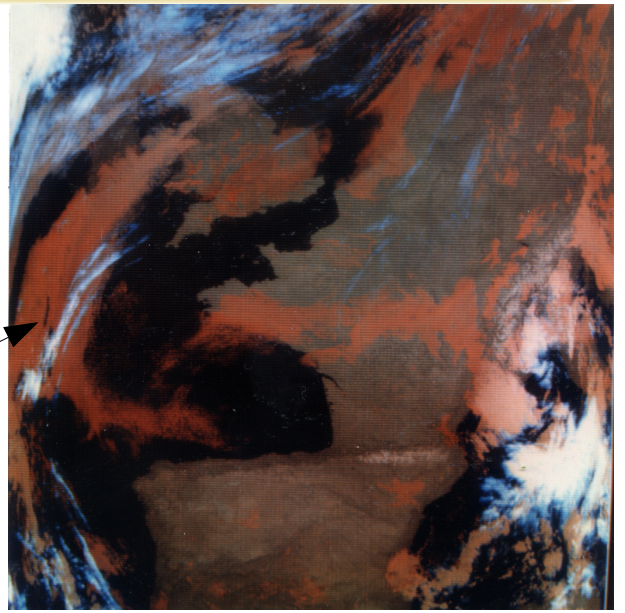


1963 : First Image

1963 – 1988 : Nephanalysis



1984 : First Coloured Composite Image



1986 : First Meteosat Coloured Composite

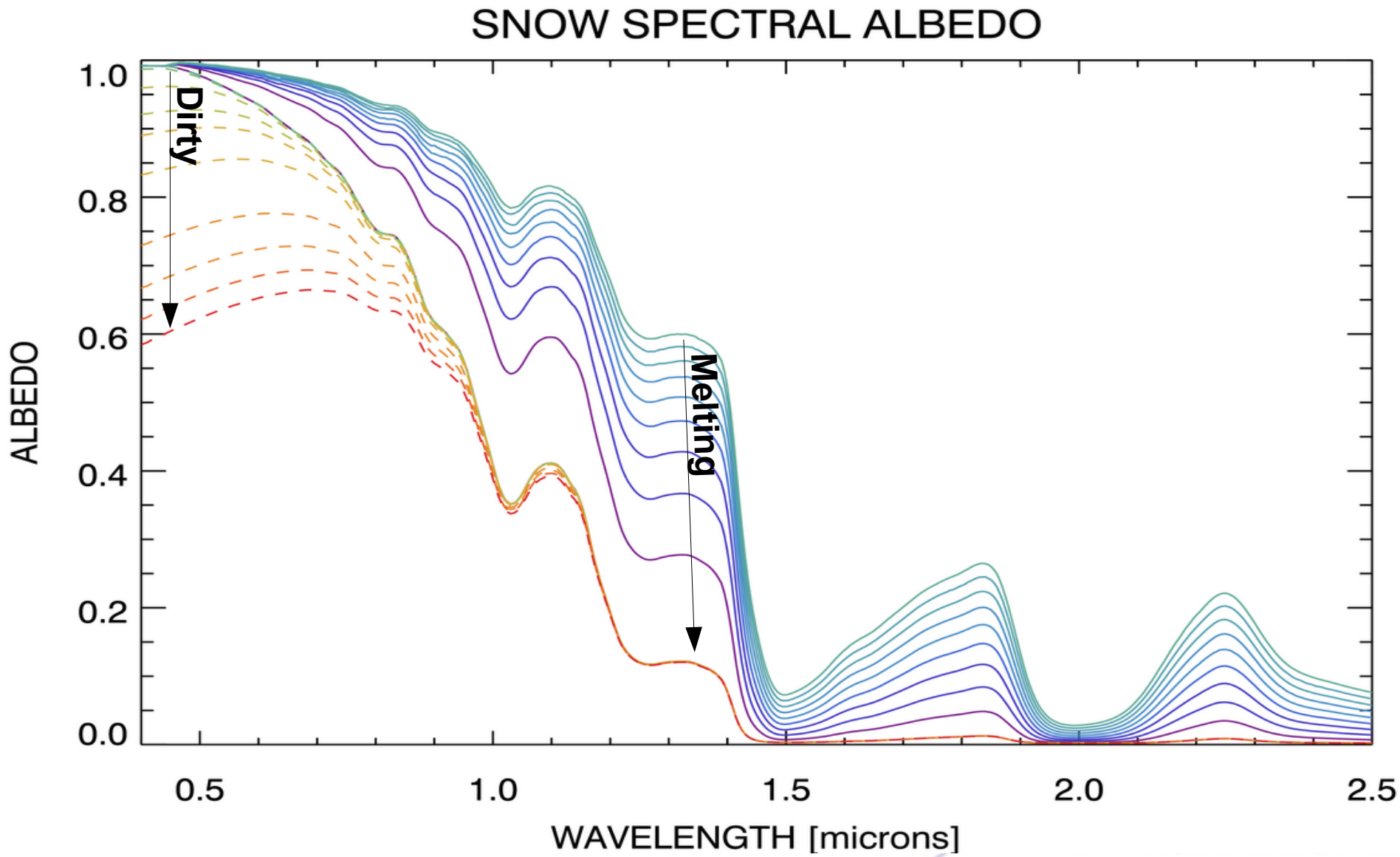
(...)

2014 : S-NPP VIIRS SNOW RGB

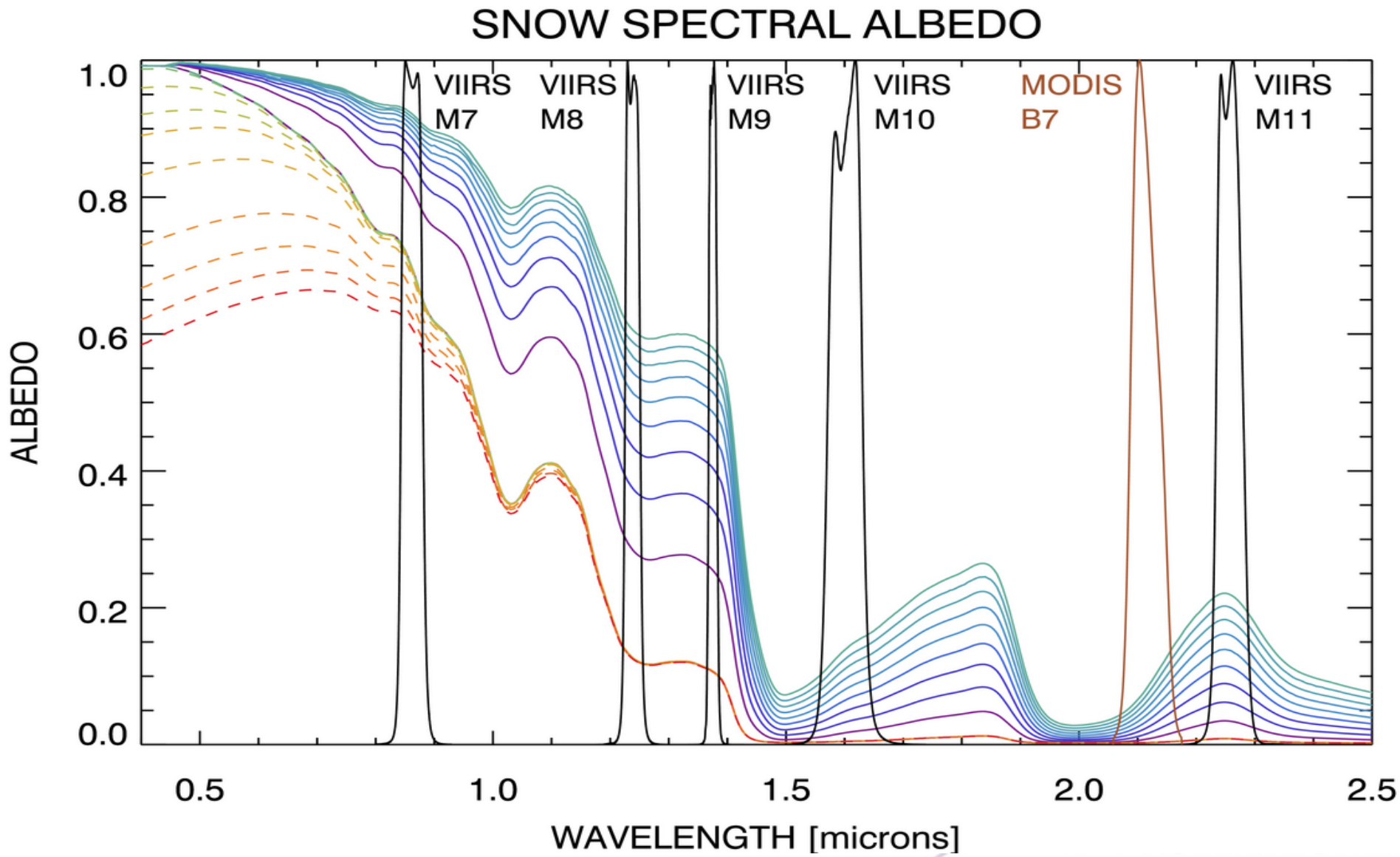
(I) S-NPP VIIRS bands and bandwiths

VIIRS Band	Central Wavelength (µm)	Bandwidth (µm)	Wavelength Range (µm)	Band Explanation	Spatial Resolution (m) @ nadir
M1	0.412	0.02	0.402 - 0.422	Visible	750 m
M2	0.445	0.018	0.436 - 0.454		
M3 (blue)	0.488	0.02	0.478 - 0.488		
M4 (green)	0.555	0.02	0.545 - 0.565		
M5 (red)	0.672	0.02	0.662 - 0.682		
M6	0.746	0.015	0.739 - 0.754	Near IR	
● M7	0.865	0.039	0.846 - 0.885		
● M8	1.240	0.020	1.23 - 1.25	Shortwave IR	
● M9	1.378	0.015	1.371 - 1.386		
● M10	1.61	0.06	1.58 - 1.64		
● M11	2.25	0.05	2.23 - 2.28		
M12	3.7	0.18	3.61 - 3.79	Medium-wave IR	
M13	4.05	0.155	3.97 - 4.13		
M14	8.55	0.3	8.4 - 8.7	Longwave IR	
M15	10.763	1.0	10.26 - 11.26		
M16	12.013	0.95	11.54 - 12.49		
DNB	0.7	0.4	0.5 - 0.9	Visible	750 m across full scan
I1 (red)	0.64	0.08	0.6 - 0.68	Visible	375 m
I2	0.865	0.039	0.85 - 0.88	Near IR	
I3	1.61	0.06	1.58 - 1.64	Shortwave IR	
I4	3.74	0.38	3.55 - 3.93	Medium-wave IR	
I5	11.45	1.9	10.5 - 12.4	Longwave IR	

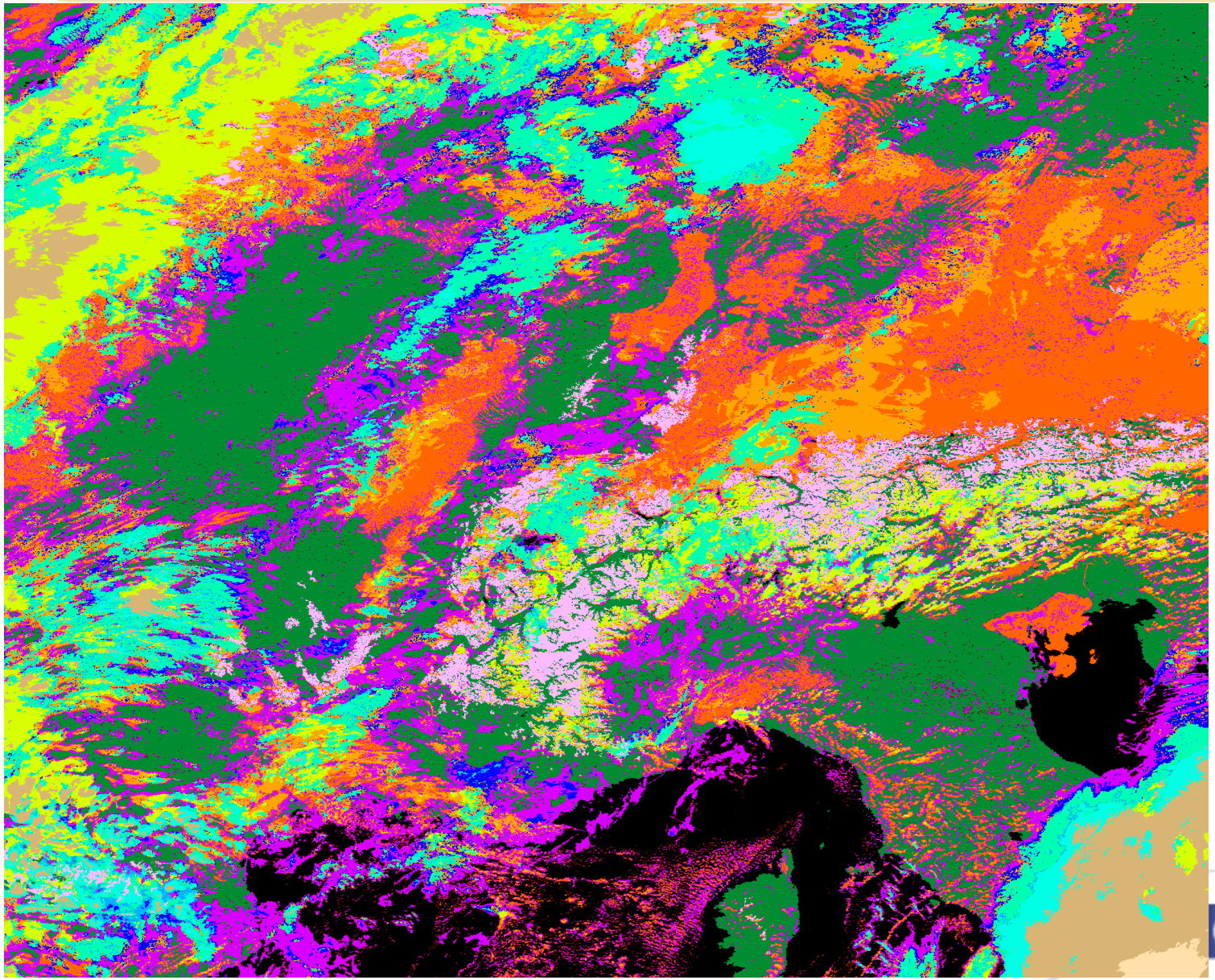
(I) Why snow with SUOMI-NPP ?



(I) Why snow with SUOMI-NPP ?



(I) Classification vs Image : maia



- Unprocessed
- Cloudfree land
- Cloudfree sea
- Snow cover
- Sea ice
- Very low clouds
- Low clouds
- Medium level clouds
- High clouds
- Very high clouds
- Very thin cirrus
- Thin cirrus
- Thick cirrus
- Cirrus above low/medium
- Fractional clouds
- Unclassified

MAIA
18 January 2015 12:33

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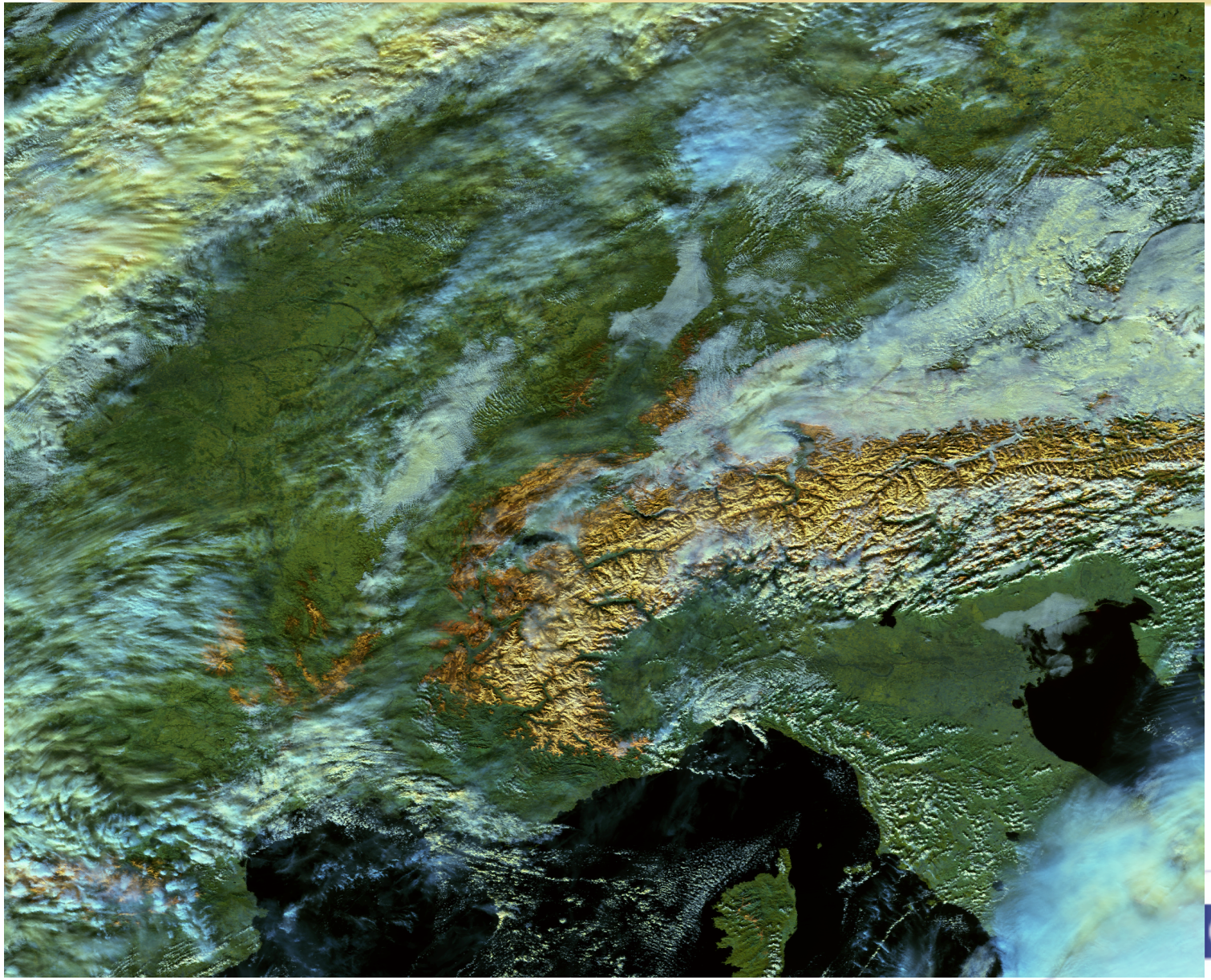
(I-II) Classification vs Image



SNOW product
18 January 2015 12:33

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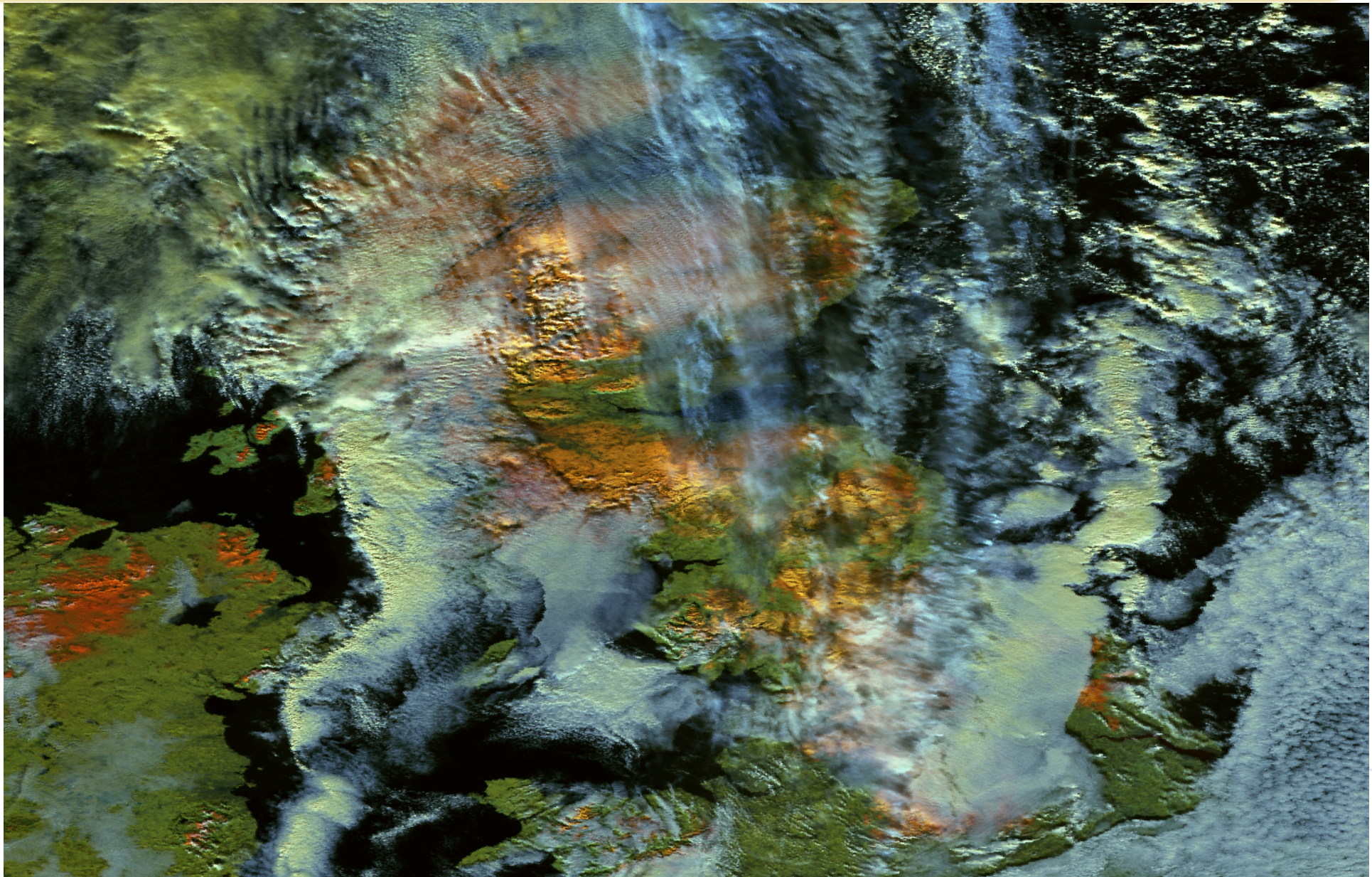
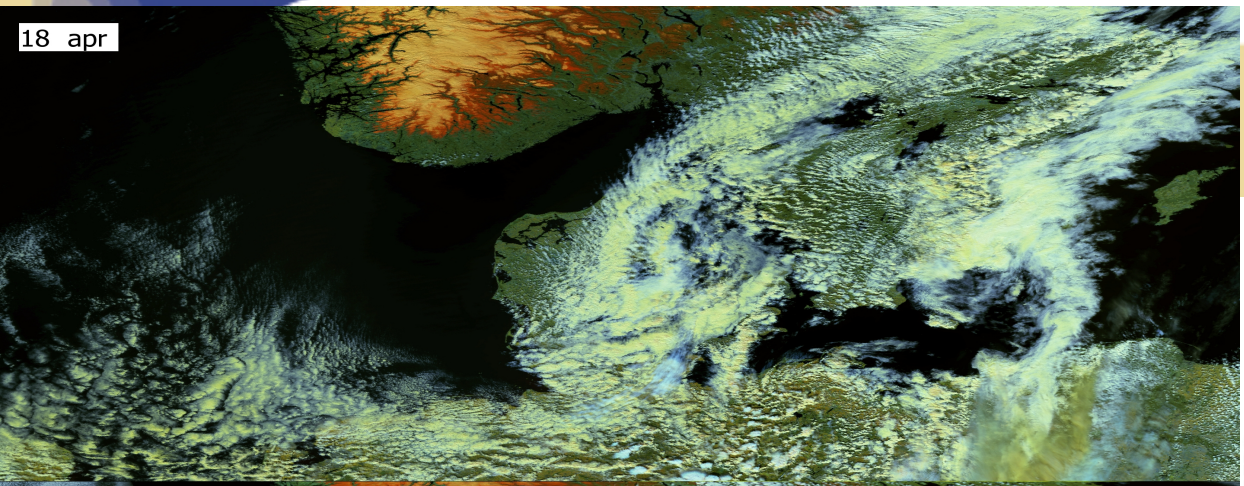
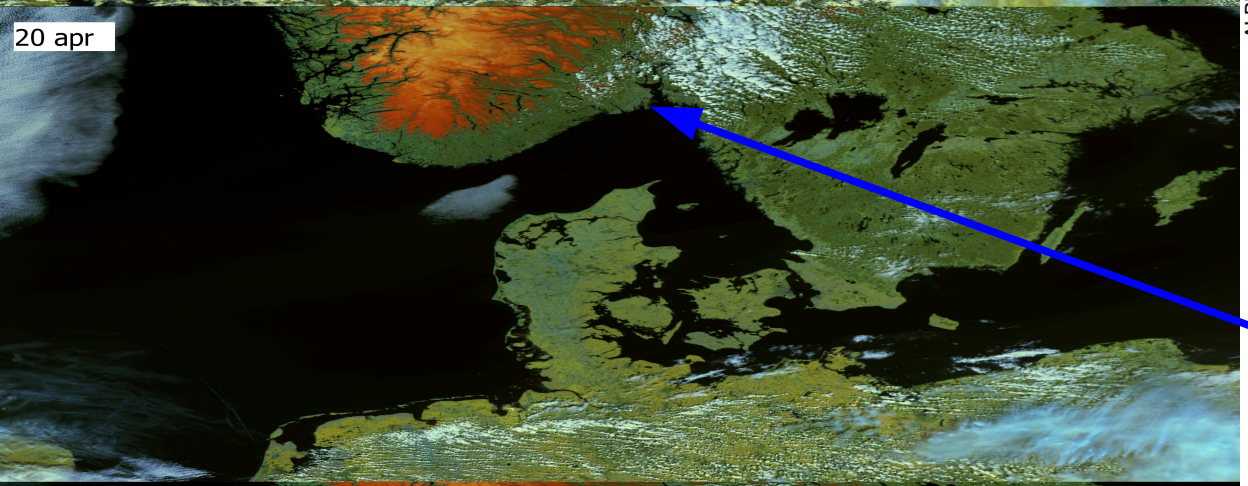
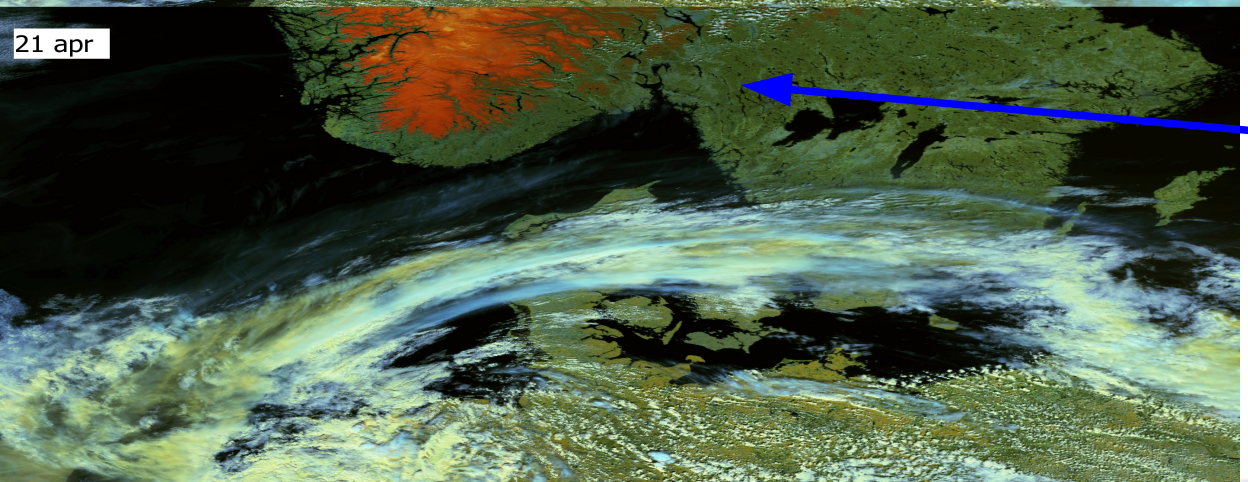
(4) Snow under Cirrus Clouds

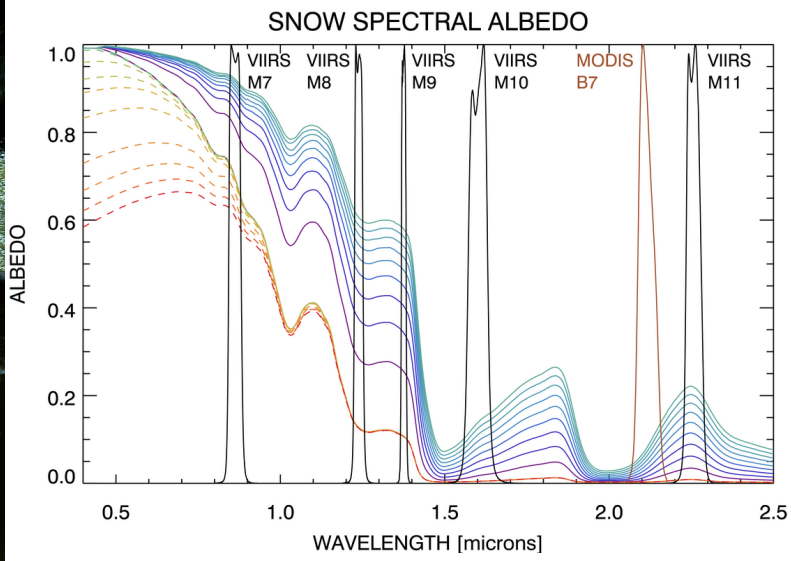


(II) Melting Snow









2 days

3 days

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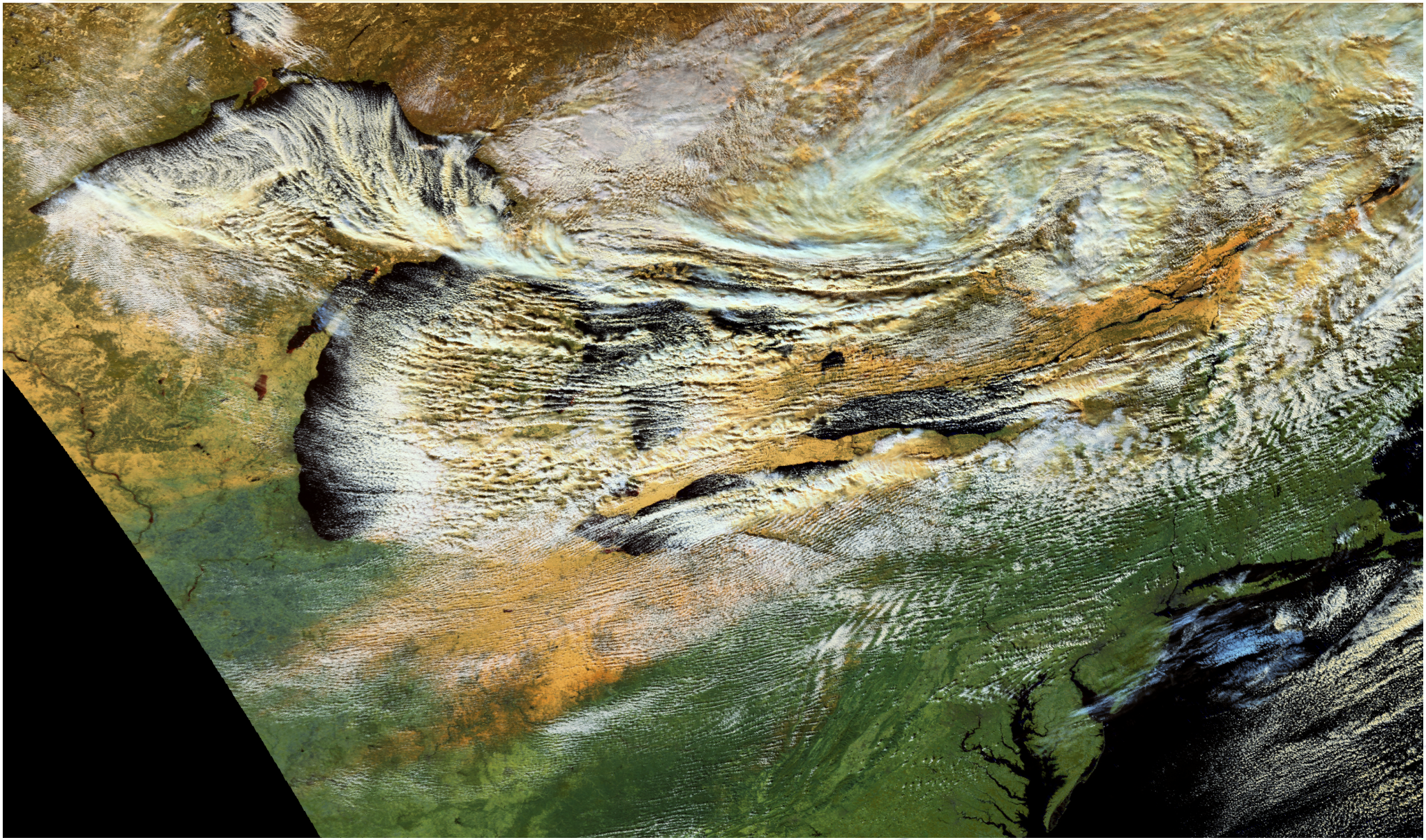
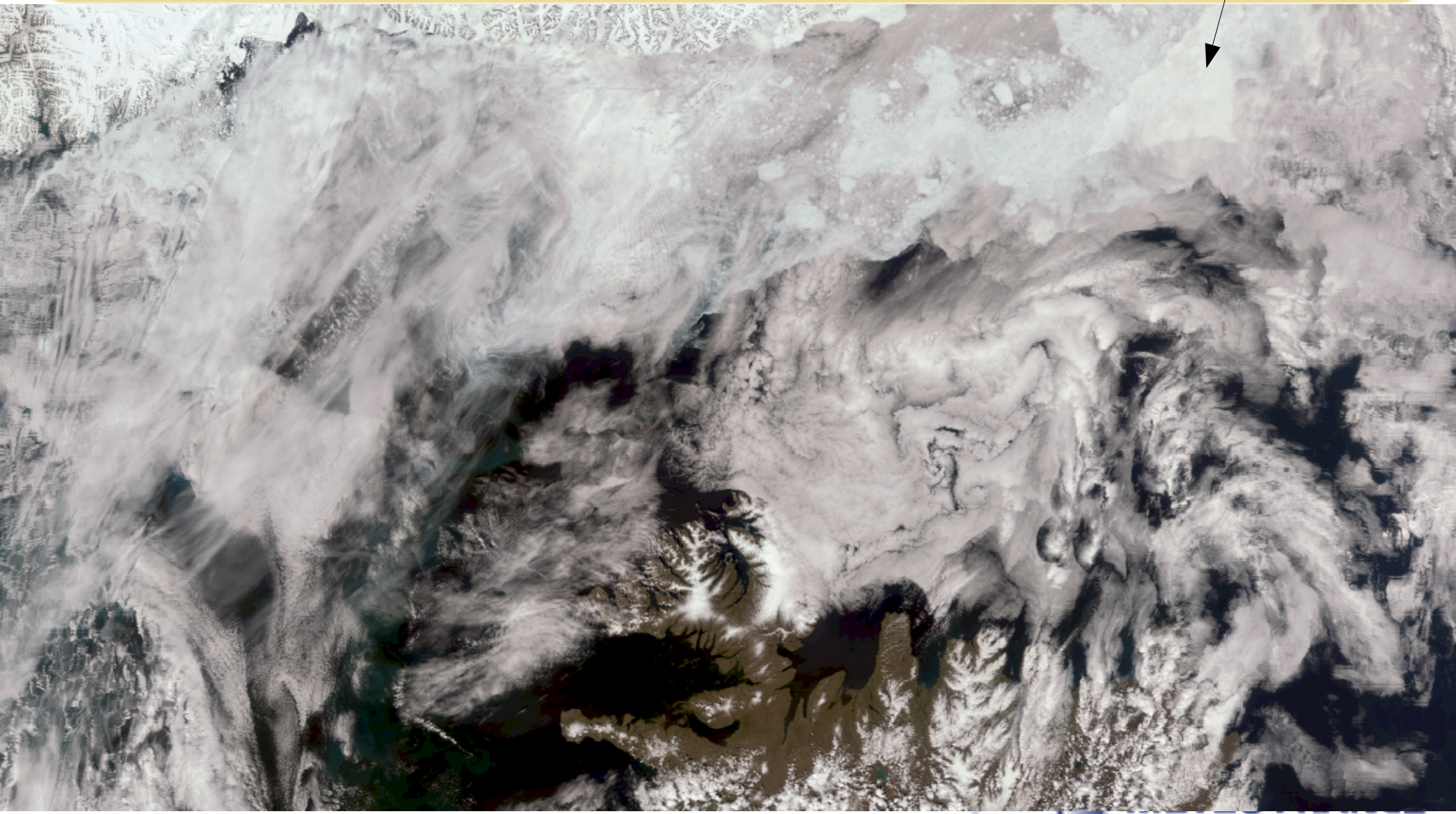
(II) 20 November 2014

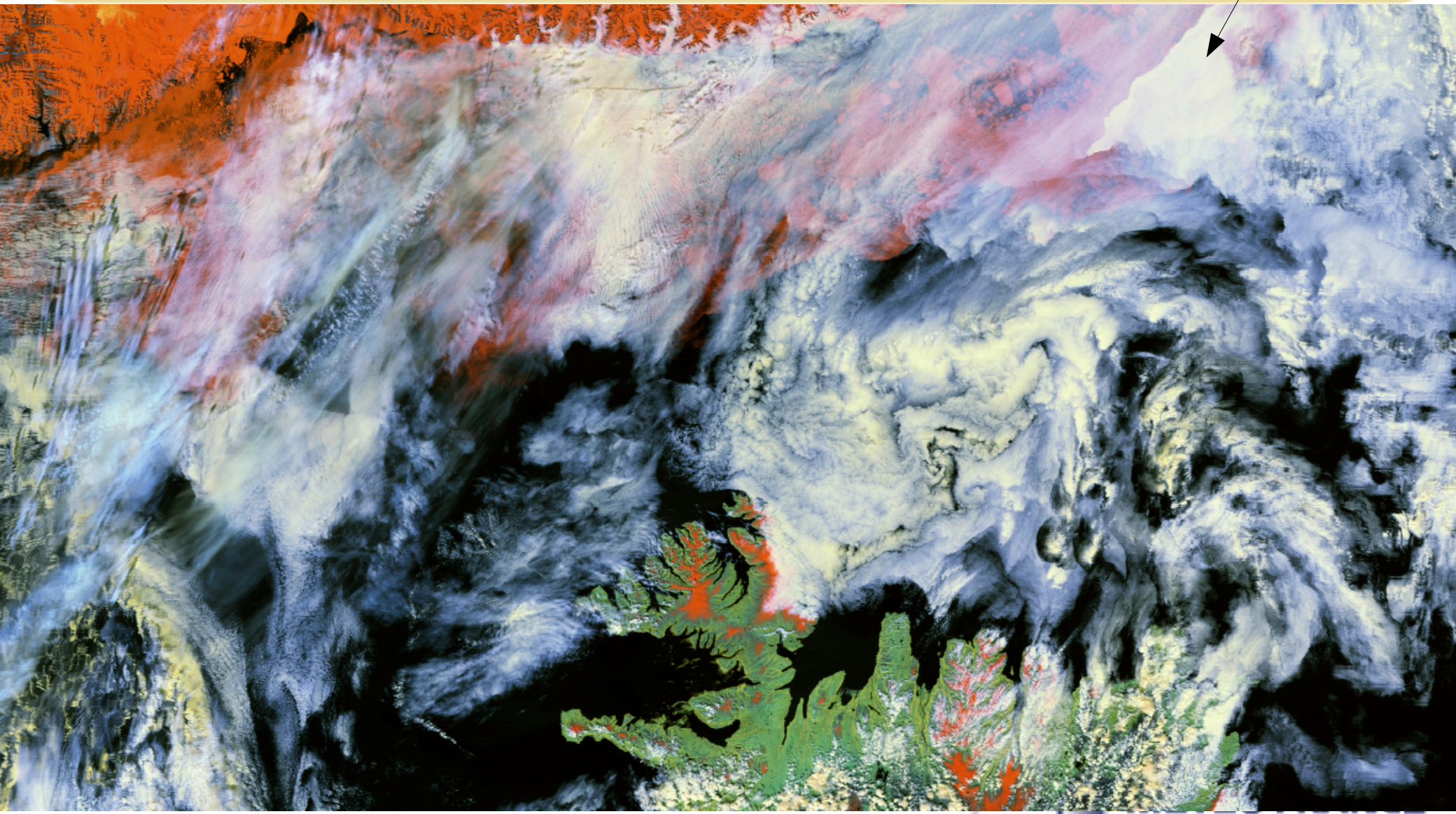


(II) Polar Region (True Colors)



20/06/2012 13:22 UTC

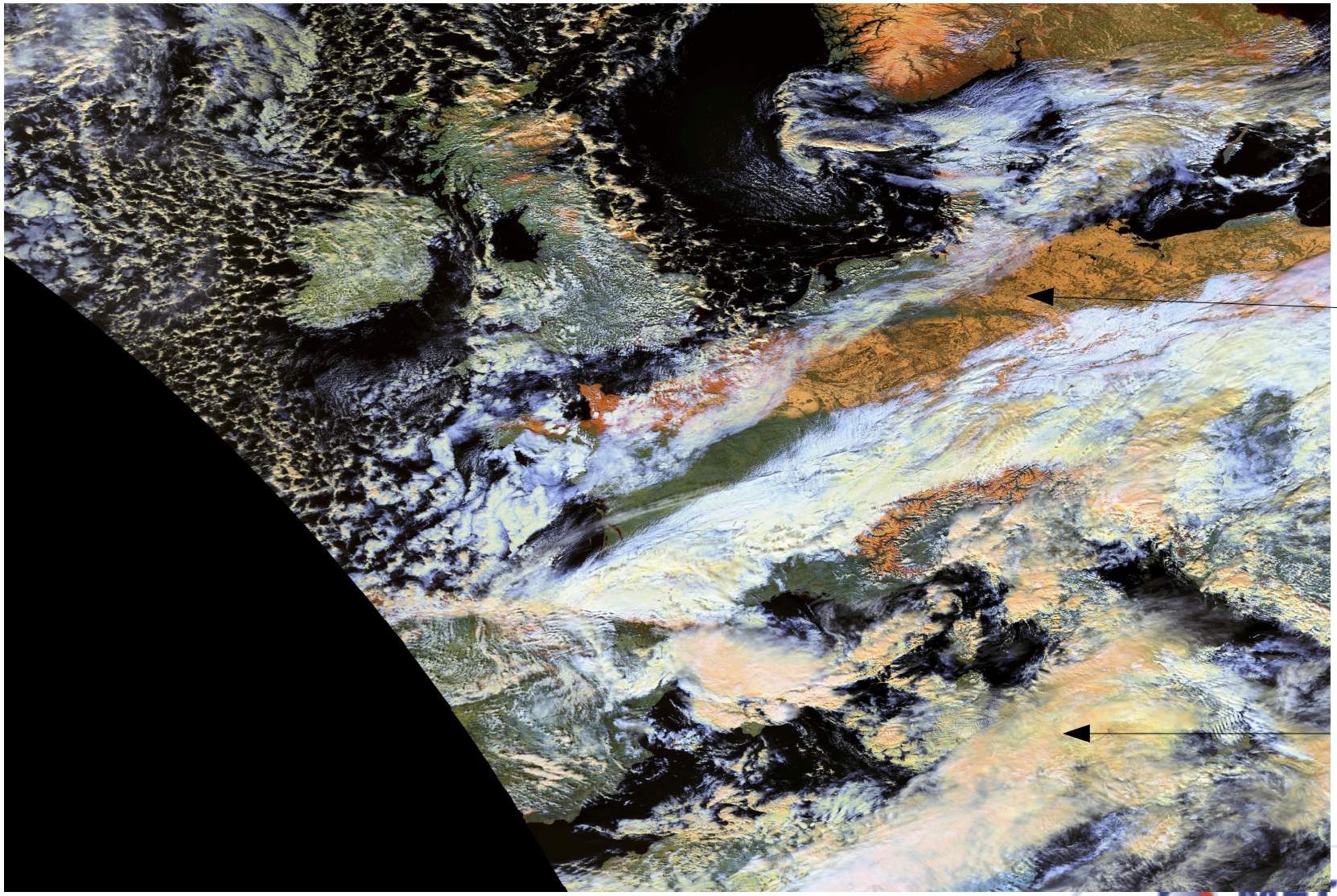
(II) Polar Region (SNOW RGB)



20/06/2012 13:22 UTC

(II) Algorithm 1

RGB= (M7, M8, M11)



(II) Algorithm 2

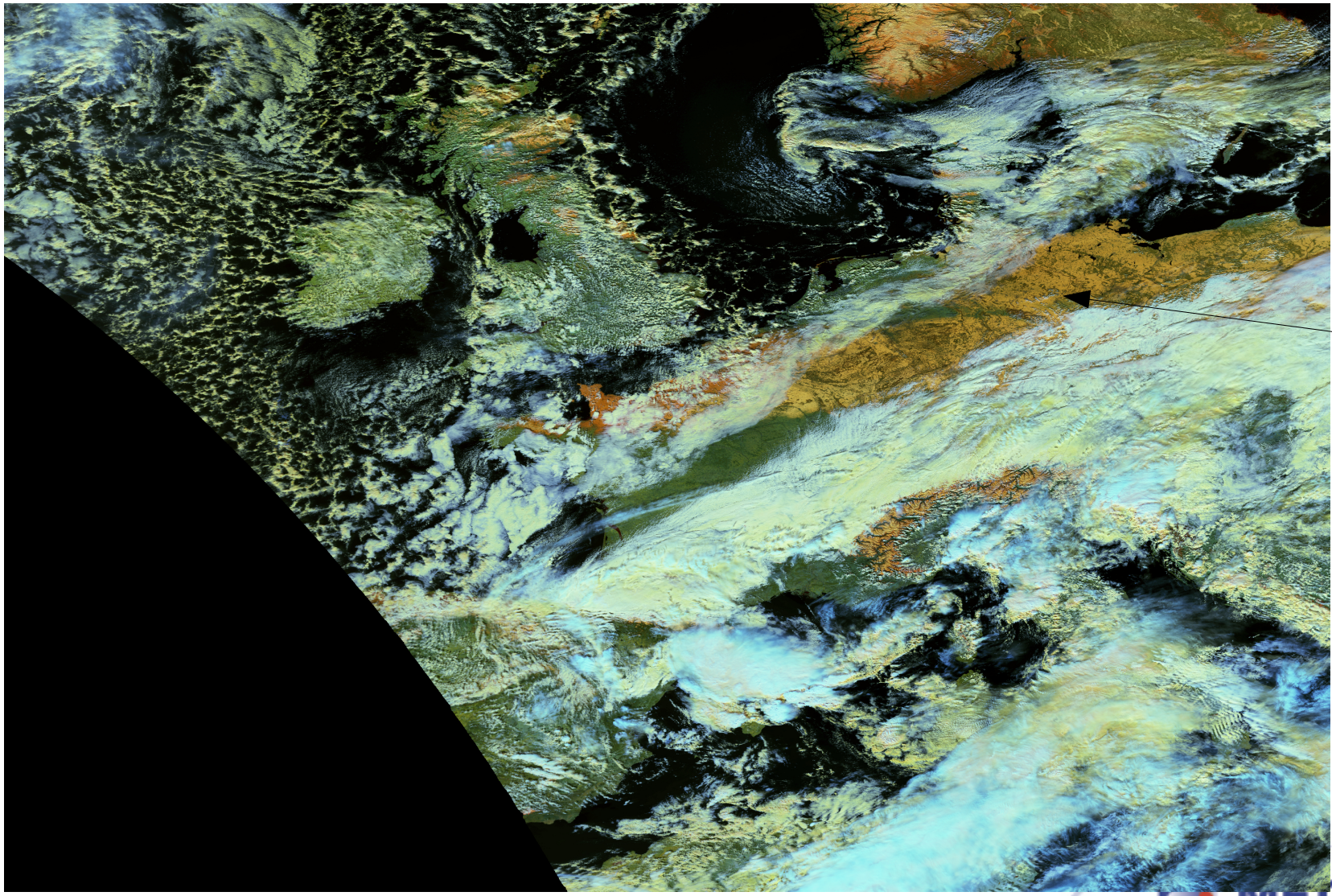
- Input : **M7** (0.86µ) **M8** (1.24µ) **M9** (1.38µ) **M10** (1.61µ) **M11**(2.26µ)
- (0,1.6) => (0,255)

- Compute cumulus identification : refcu = Max(0, **M11 – M10**)

- R_snow = **M7** - 1/2 refcu - 1/4 **M9**
- G_snow = **M8** + 1/4 refcu +1/4 **M9**
- B_snow = **M11** + **M9**

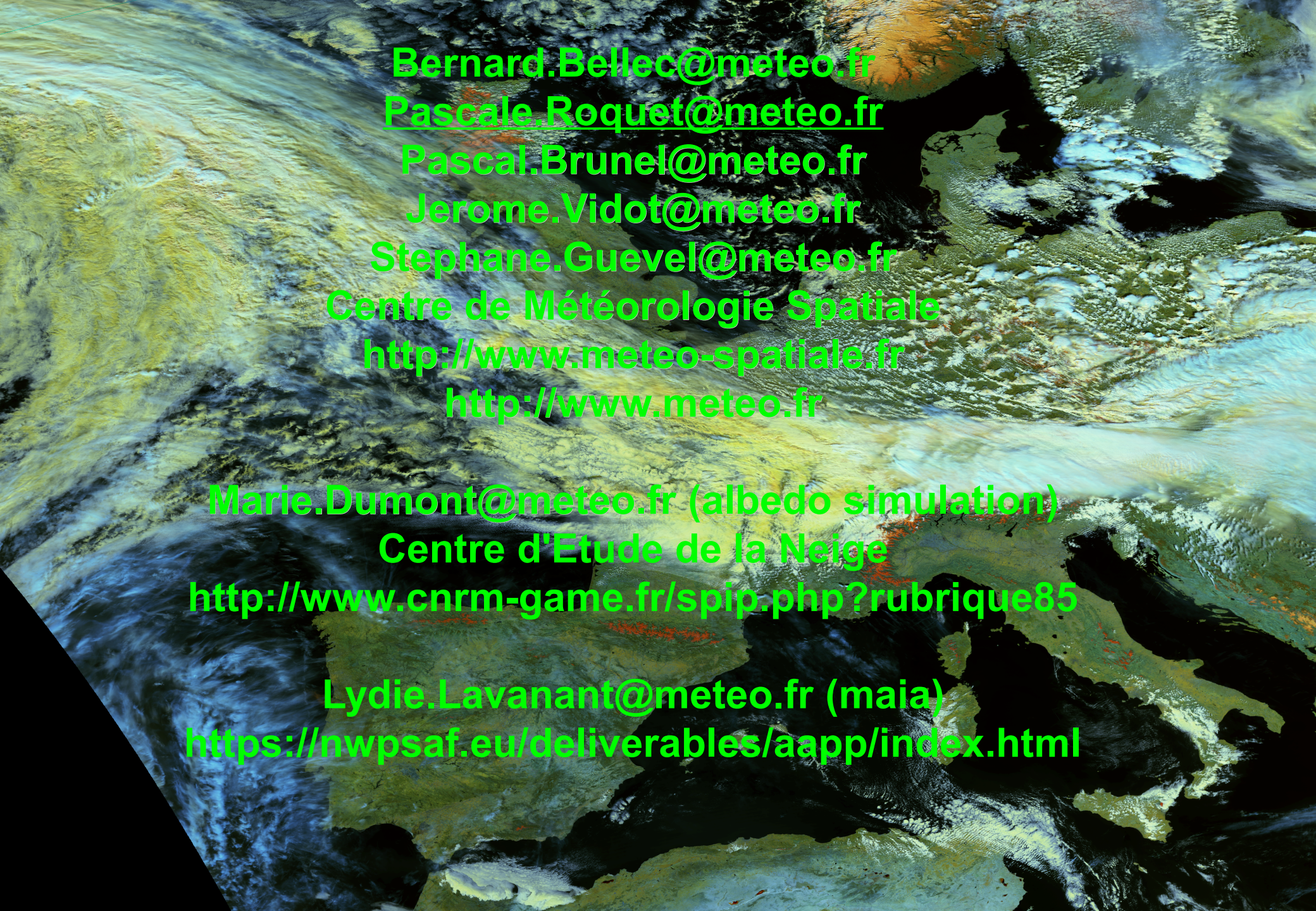
- **RGB_snow = (*R_lut* (R_snow) , *G_lut*(G_snow) , *B_lut*(B_snow))**

(II) Algorithm 2



Conclusion

- The NPP RGB SNOW product has been operational since November 2014
- Simple algorithm to code. Could be implemented in CSPP or pytroll.
- Good feedback from Meteo-France Forecasters.
- Snow cover is seen even under thin or fractional clouds.
- Algorithm works also for polar regions.
- Information about the snow melting.
- Some false detections over salted lakes and turbid coastal waters.
- Further developpements :
  - Add I2 and I3 (pansharpening)



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