



Detection of Snow/Ice in the cloud mask

**EUMetrain Snow Event Week
8-12 February 2021**

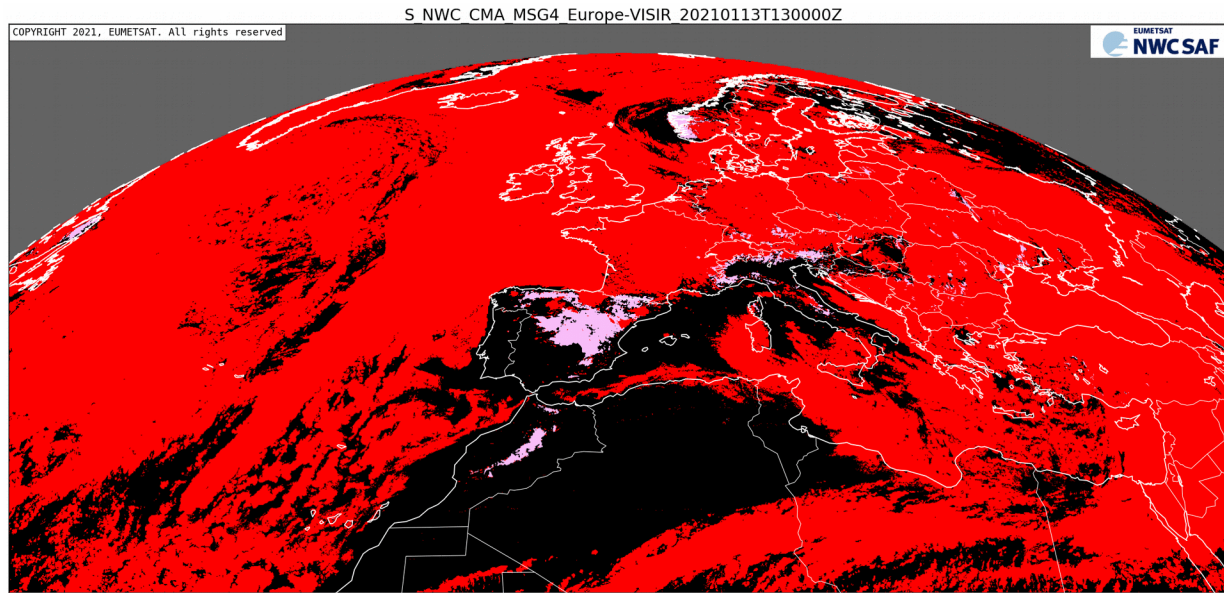
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France

Outline

- Presentation of the cloud/snow mask and the cloud type
- Snow/ice detection, algorithm outline
- Illustration
- Purpose of this snow/ice detection in the cloud mask
- Limitations
- Perspectives and conclusion

NWC/GEO Cloud mask CMA

- Cloud mask for GEO satellites in the framework of NWCSAF
 - Identification of pixels contaminated by clouds or snow/ice

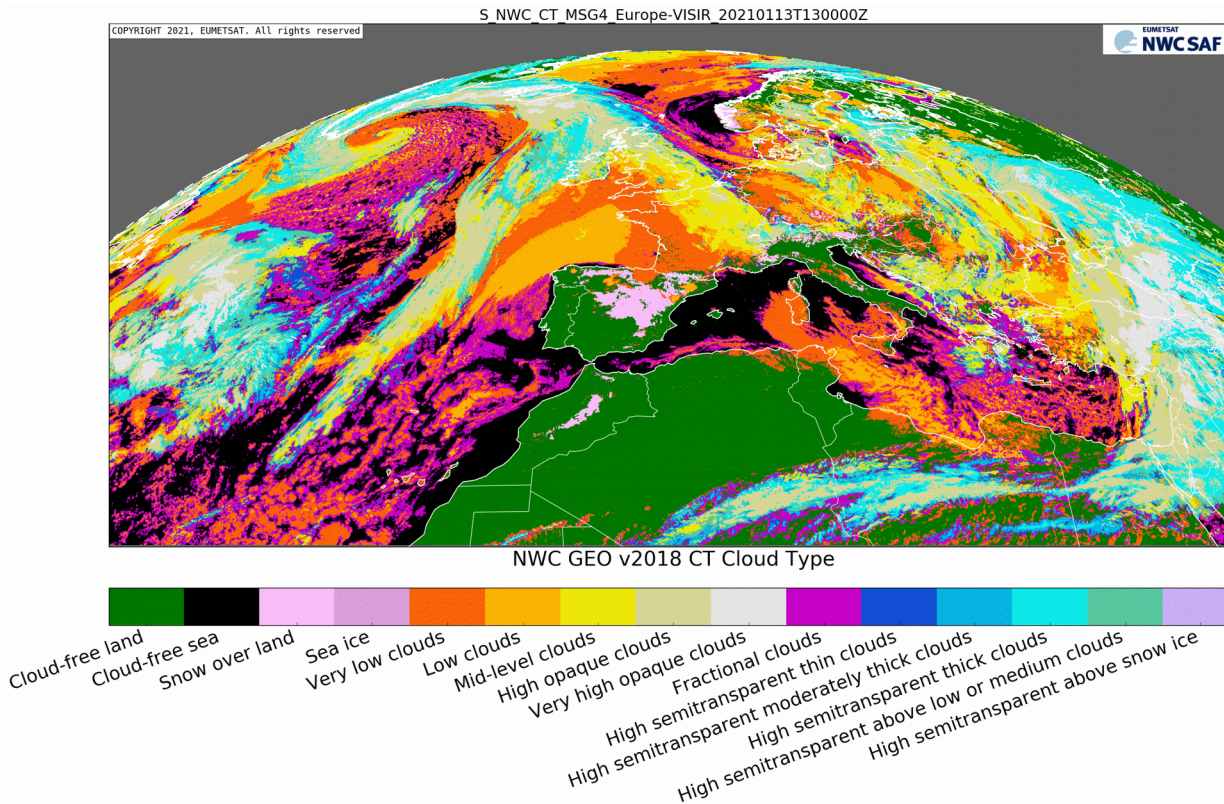


NWC GEO v2018 CMA Cloud and Snow Mask



NWC/GEO Cloud type CT

- To provide a detailed cloud analysis : contains information on the major cloud classes
- The CT takes the Cloud Mask as input
 - Snow over land, Ice over sea



Algorithm for snow/ice detection in the CMA

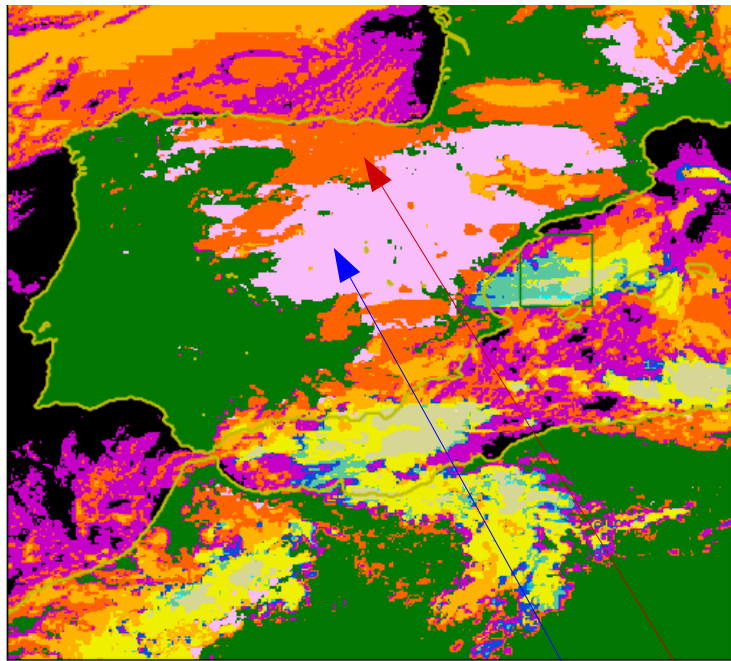
- Snow/Ice detection is the first step of the cloud mask (daytime and twilight)
 - Snow and Ice may be confused with clouds (especially low clouds) and must be identified first
 - Sun elevation greater than 5 degrees
- Basis of the detection :
 - Ice and snow appear rather cold and bright
 - Snow & ice are separated from water clouds by their low reflectance at $1.6\mu\text{m}$ and $3.8\mu\text{m}$
 - Snow and Ice are separated from cloud free sea or continental surfaces by their higher $0.6\mu\text{m}$ visible reflectance and slightly colder $10.8\mu\text{m}$ BT
 - Snow and Ice are separated from cirrus clouds by lower $3.8\mu\text{m}$ – $10.8\mu\text{m}$ BT difference

Illustration of the algorithm: Filomena storm

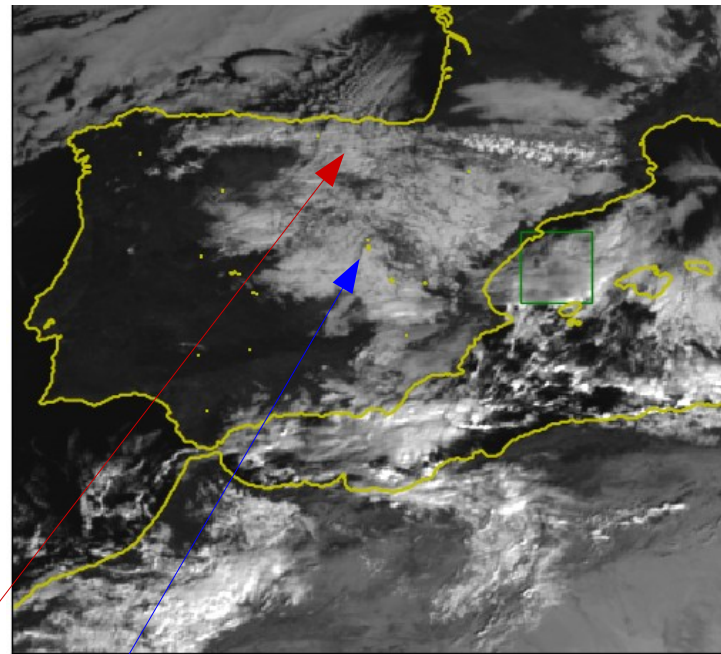


Madrid 9 January 2021

Algorithm for snow/ice detection in the CMA



Cloud type



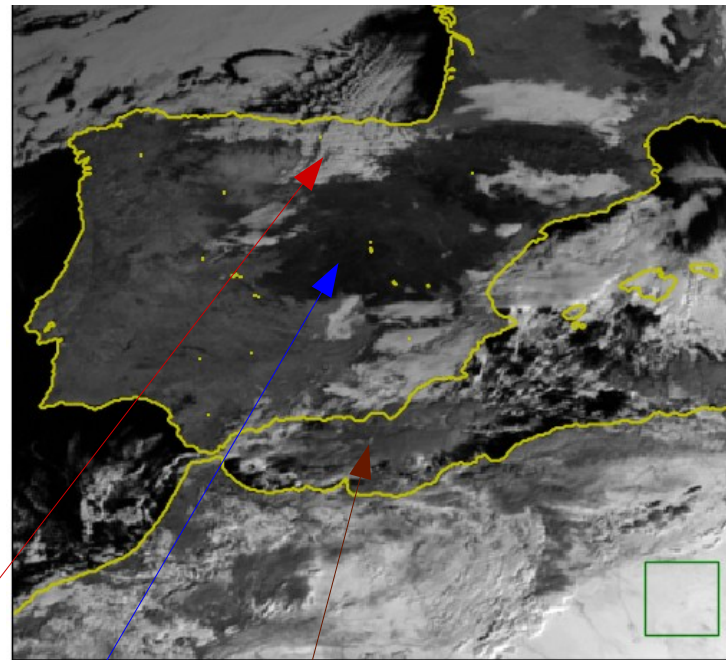
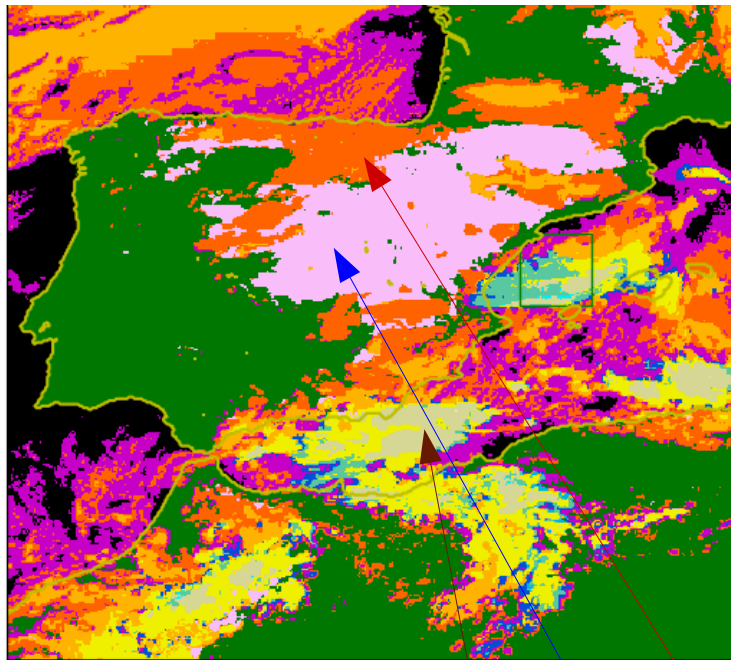
Vis 0.6 μ m

Very low clouds

11 January 2021 10UTC

Snow

Algorithm for snow/ice detection in the CMA



Nir 1.6 μ m

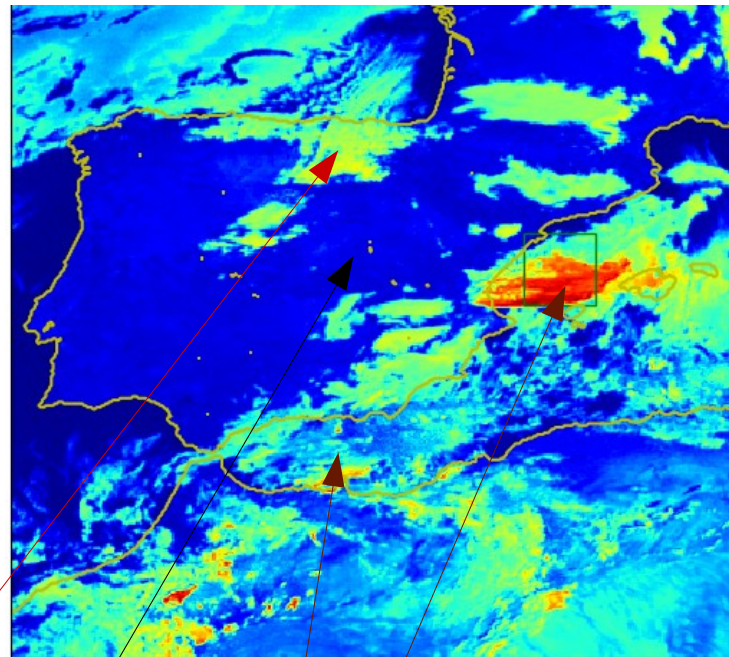
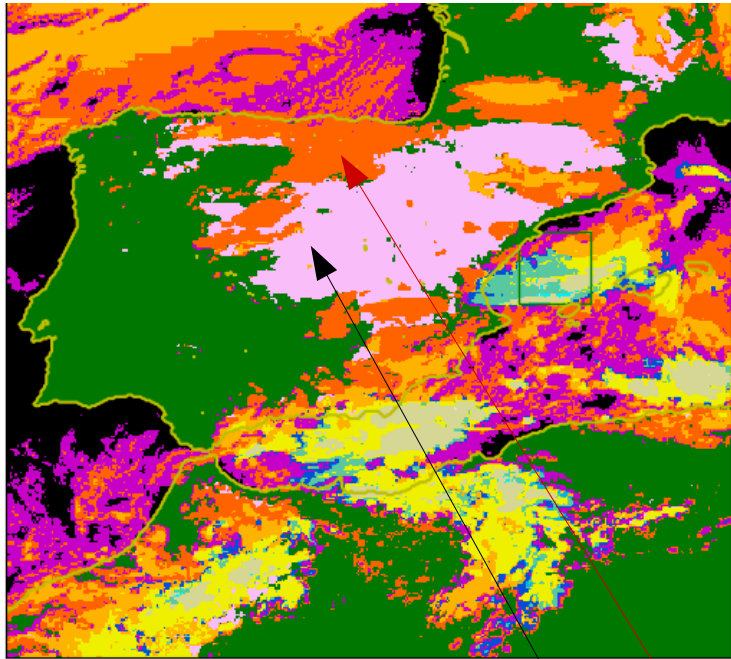
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Very low clouds

Snow

High opa q clouds (ice clouds)

Algorithm for snow/ice detection in the CMA



T3.8 - T108

T3.8 -T10.8
Blue : -1° , 1°
Yellow : $\sim 20^{\circ}$
Red : $\sim 30^{\circ}$

Very low clouds

Snow

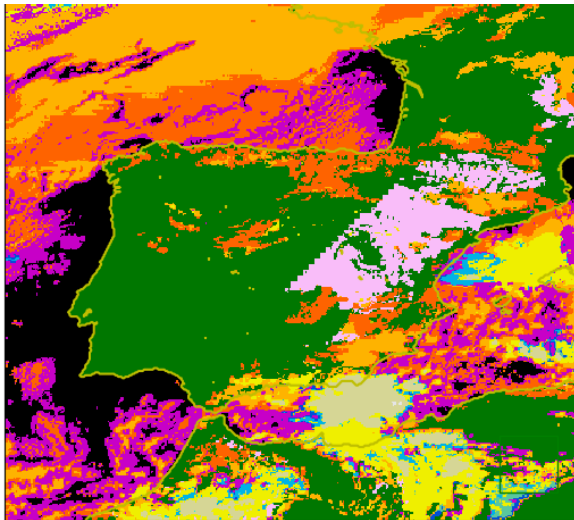
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High opa q clouds

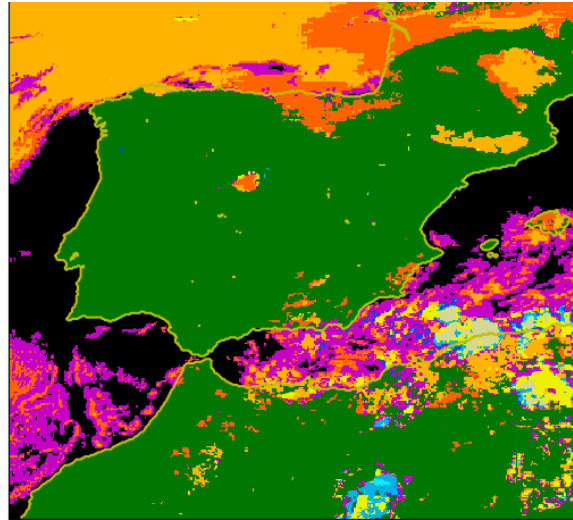


Limitations

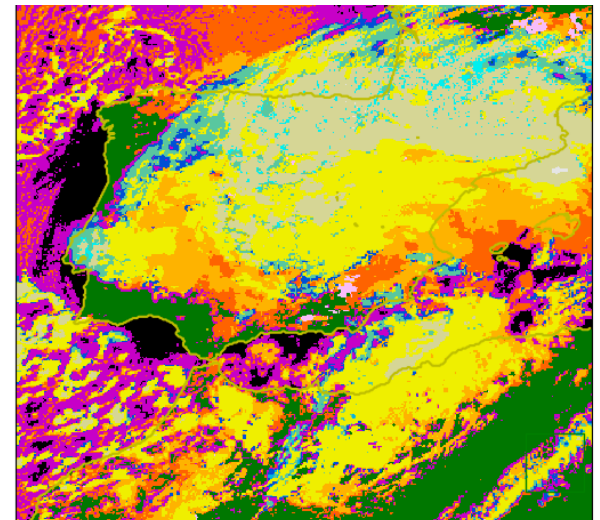
- No detection during night, when sun elevation $< 5^\circ$
- No detection when the scene is cloudy



11 January 08UTC



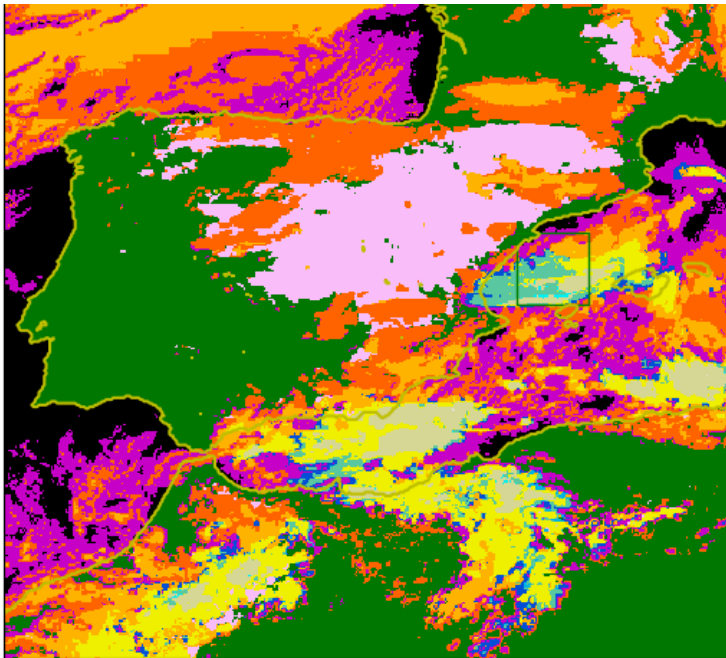
21UTC



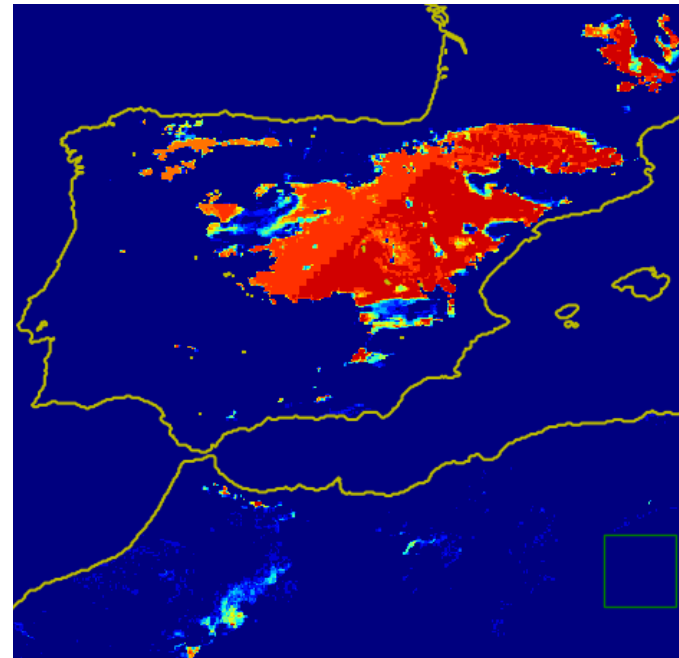
9 January 10UTC

Skill of this detection

- Keep the flag Snow/Ice in memory \$SAFNWC/tmp/CLD_SNOW_XXXX
- Correction of some thresholds (night) if snow suspected \Rightarrow avoid false cloud detections
 - **T108, T38T108, T87T108**

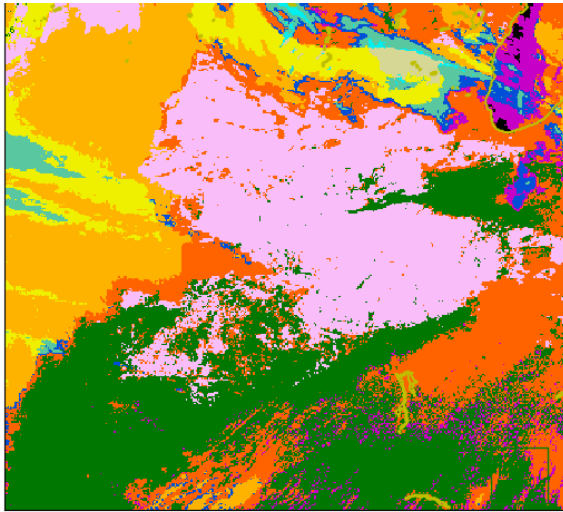


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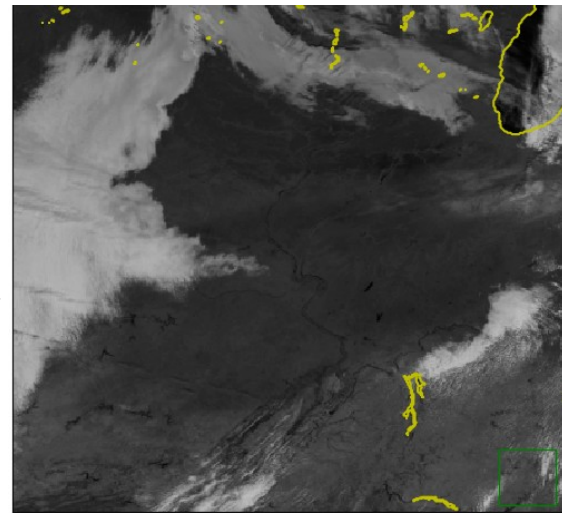


Flag Snow/Ice

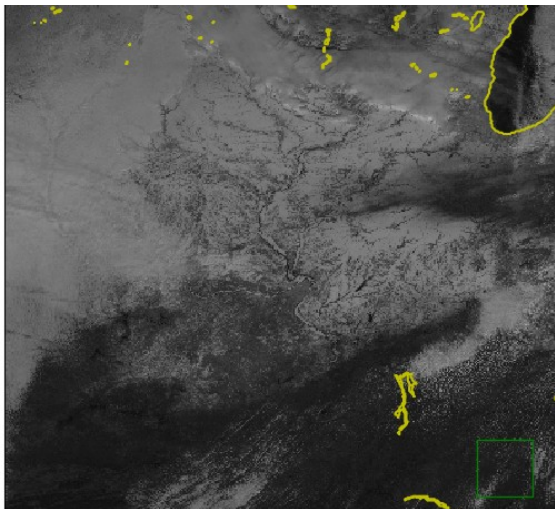
Perspective : use of Channel 2.2 μ m ?



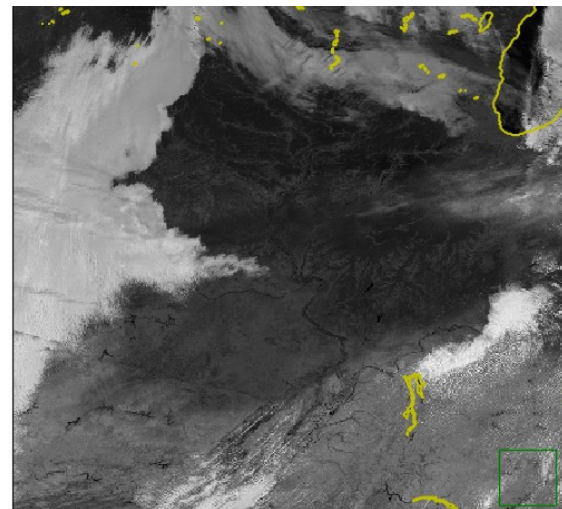
Cloud type
GOES16/ABI
28 January 2021
at 17UTC



NIR 2.2 μ m
0-50 %



Vis 0.6 μ m
0-80 %



NIR 1.6 μ m
0-50 %

Less contrast between clouds and snow with NIR 2.2 μ m than NIR 1.6 μ m

Conclusion and perspectives

- Cloud mask and cloud type are not « Snow/Ice » products
 - No flag sea/ice during night and if the scene is cloudy
- Tests with channel 2.2 Goes16/ABI and Hima08/AHI to prepare MTG
 - Mainly usefull for phase determination
- Use of a Snow product as input in the cloud mask
- Cloud products available for several GEO satellites

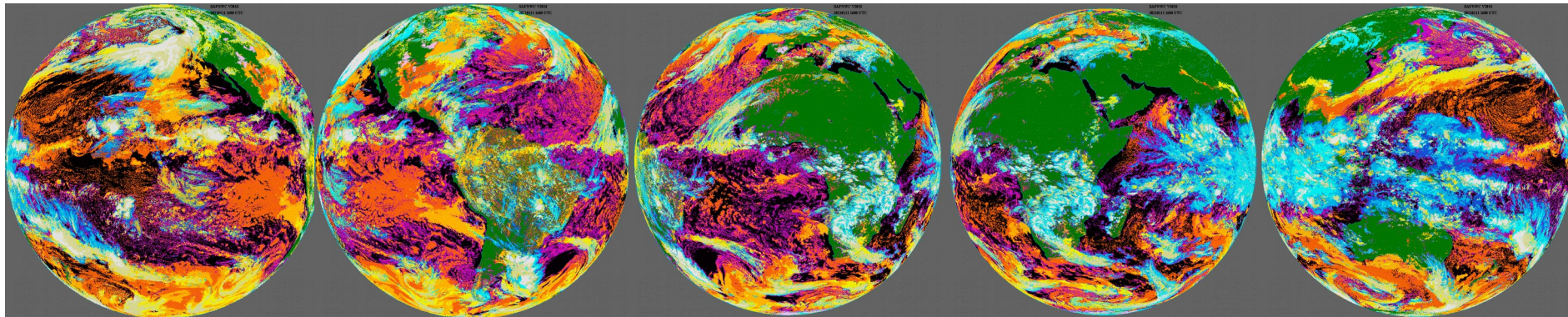
Goes17

Goes16


Msg4

Msg1_IO

Hima08



11 January 2021 at 16UTC

A photograph of a sunset over a body of water. The sun is low on the horizon, creating a bright orange glow that reflects on the water. The sky transitions from a deep orange near the horizon to a pale, clear blue at the top. In the foreground, the dark silhouettes of rocks and vegetation are visible against the water and sky.

Thanks for your attention !
Questions ?

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