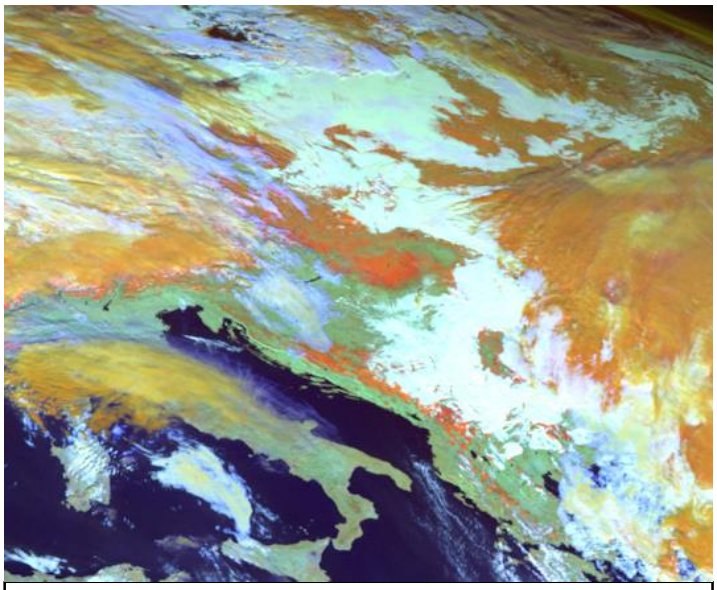
SEVIRI Snow RGB
Quick Guide

Primary aim: To detect cloud-free snow with very good colour contrast against water clouds and clear ground not covered by snow.
Secondary aim: Distinguishing **ice from water clouds** and ice clouds from snow on ground.
Time period and area of its main application: Daytime, throughout the year. Restrictions during winter for higher latitudes.
Guidelines: The Snow RGB provides **the best colour contrast** between snow-covered land and water clouds/fog. In most of the cases it discriminates water and ice clouds, and ice clouds from snow on the ground.
Water clouds with **large** droplets are similar to mixed phase cloud tops or water clouds with thin cirrus on top.
Particle size in cloud tops plays a role regarding the colour shade of the clouds in the Snow RGB (see the back side of the guide).



SEVIRI Snow RGB, 22 January 2018, 12:00 UTC

Background

The table below lists the channels used in the **Snow RGB**.
The red colour beam (**VIS0.8**) reflects cloud optical thickness. Optically thick clouds (e.g. stratus and fog) show a high contribution to the red colour beam while thin ice clouds (e.g. cirrus) are barely visible.
The **NIR1.6** channel used for the green colour beam is primarily sensitive to the ice and water phase. At 1.6 µm, **snow and ice crystals** usually have a **low** reflectivity (~30%), while **water clouds** strongly reflect (~60-70%) the incoming radiation. Therefore, snow and ice are usually darker than water clouds in the **NIR1.6** image. Additionally, there is a less pronounced dependency upon cloud particle size at 1.6 µm. Ice clouds with very small ice crystals may be as bright as water clouds, and water clouds with very large droplets may be as dark as ice clouds.
During the day, IR3.9 radiation includes reflected solar and emitted thermal radiation. The blue channel (**IR3.9refl**) uses only the reflected part of the solar radiation at 3.9 µm. The solar component strongly depends on **cloud phase** on one hand and on **particle size** on the other. Water droplets reflect more solar radiation at this wavelength than ice crystals. This property is overlaid by the particle size effect: large water drops or ice crystals reflect less solar radiation than small water droplets or ice crystals.

Colour	Channel [µm]	Physically relates to	Smaller contribution to the signal of	Larger contribution to the signal of
Red	**VIS0.8**	Cloud optical thickness **Snow and ice**	Thin clouds	Thick clouds **Snow covered land/sea ice**
Green	**NIR1.6**	Cloud top microphysics **Snow and ice**	Ice clouds with large ice crystals on the cloud top **Snow-covered land/sea ice**	Thick water clouds with small droplets
Blue	**IR3.9refl**	Cloud top microphysics **Snow and ice**	Ice clouds with large ice crystals on the cloud top **Snow-covered land/sea ice**	Thick water clouds with small droplets

Notation: NIR: near-infrared, VIS: visible; channel number: central wavelength of the channel in micrometer.
IR3.9refl: 3.9 µm reflectivity computed from the solar component of the measured IR3.9 radiation.

Benefits

- It provides **the best colour contrast** between snow/ice covered ground and water clouds.
- Provides a good discrimination between cloud-free land/sea and clouds.
- In most of the cases it provides information on cloud phase.
- It provides acceptable colour contrast between snow-covered ground and ice clouds.

Good to remember

- Limited use to discriminate soil surface characteristics.
- Limited ability to detect thin cirrus clouds. Thin ice clouds (e.g. cirrus) are barely visible.

Limitations

- Available during the day only.
- Pixel colour fades during dawn/dusk when the Sun's angle is low.
- Not applicable for higher latitudes during winter season.
- Water clouds with large droplets are similar to mixed phase cloud tops or water clouds with thin cirrus over them.
- Not usable over sandy deserts.

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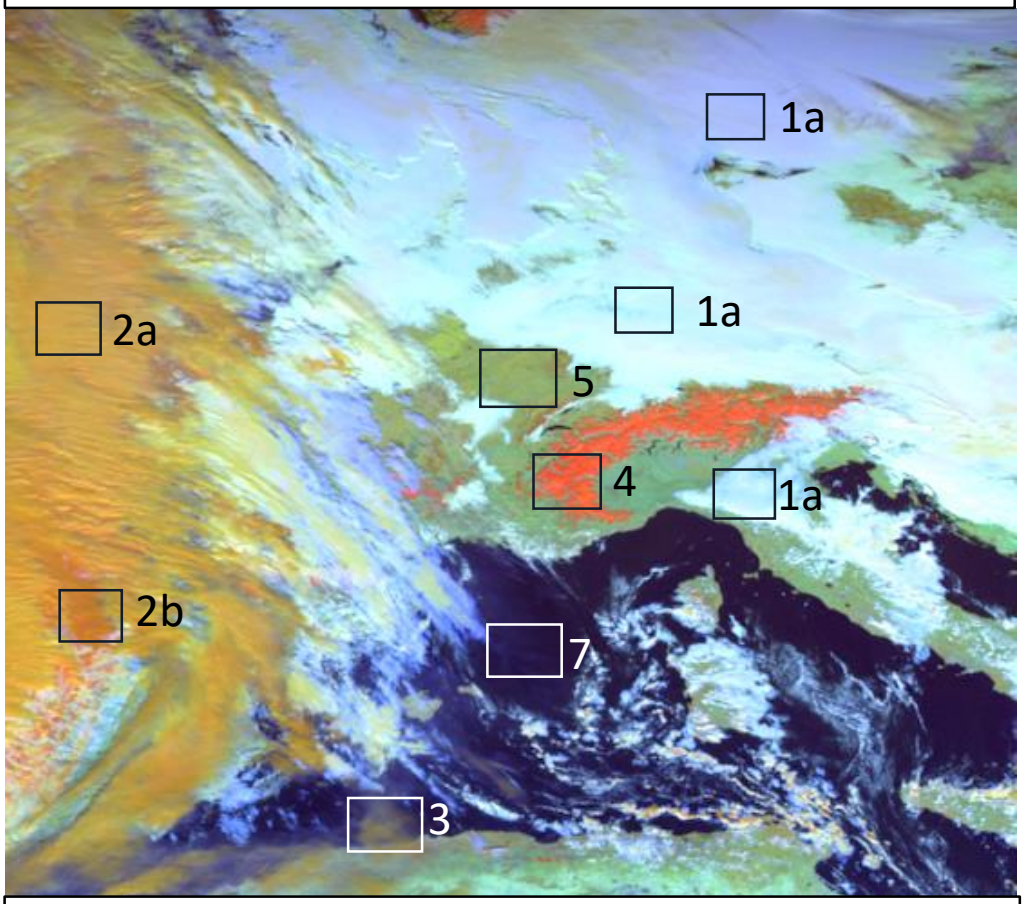
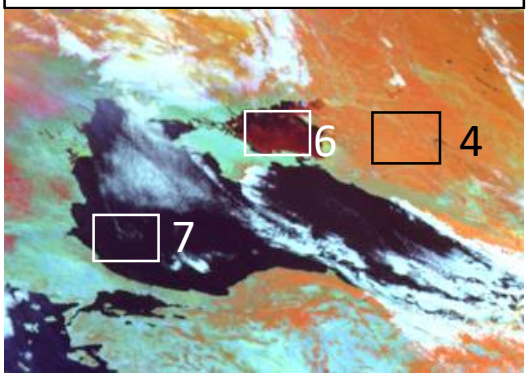
Colour Interpretation

1a	Thick water cloud with **small** droplets (shades close to white, maybe slightly greenish or bluish)
1b	Thick water clouds with **large** drops or mixed phase clouds
2a	Thick ice clouds with **small** ice crystals on the cloud top
2b	Thick ice clouds with **large** ice crystals on the cloud top
3	Thin ice cloud over sea *
4	Snow on the ground
5	Cloud-free land (winter conditions)
6	Sea ice not covered by snow
7	Oceans, seas and lakes

SEVIRI Snow RGB, 13 January 2018, 12:00 UTC

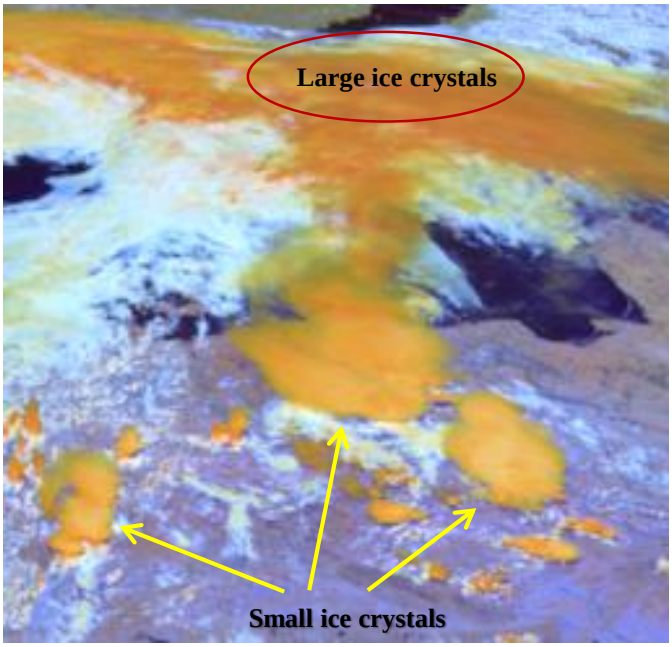


Snow RGB, 17 February 2017, 12:00 UTC



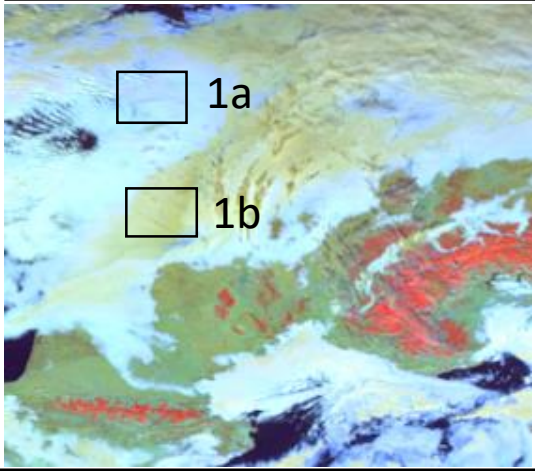
The colour shades depend on the position of the Sun and the viewing angle of the satellite.
*** Semi-transparent clouds** can appear in different shades: very thin ice clouds are not seen, others add some orange/greyish shade to the colour of the underlaying surface.
Snow-covered land and sea ice (items 4 and 6) can vary in colour shade depending on how compact both the sea ice and snow cover on the ground are. Extended snow fields on mountain tops will show brighter red-orange tones than snow cover in urban areas or forests.

Drop size effects



Snow RGB, 30 May 2017, 12:00 UTC

Left hand image: In the case of small ice crystals, both channels, NIR1.6 and IR3.9refl show higher reflectivity of solar radiation. Hence, the green and blue colour beam contribute more than in case of large ice crystals, turning the prevailing colour from a darker orange to a brighter orange hue.



Snow RGB, 25 December 2017, 12:00 UTC

In the case of small water drops (left hand image), the **Snow RGB** appears **whitish**, while larger drops are **light yellowish green.**
This effect is due to the particle size sensitivity of both the NIR1.6 and the IR3.9 channel.

More on RGBs on eumetrain.org