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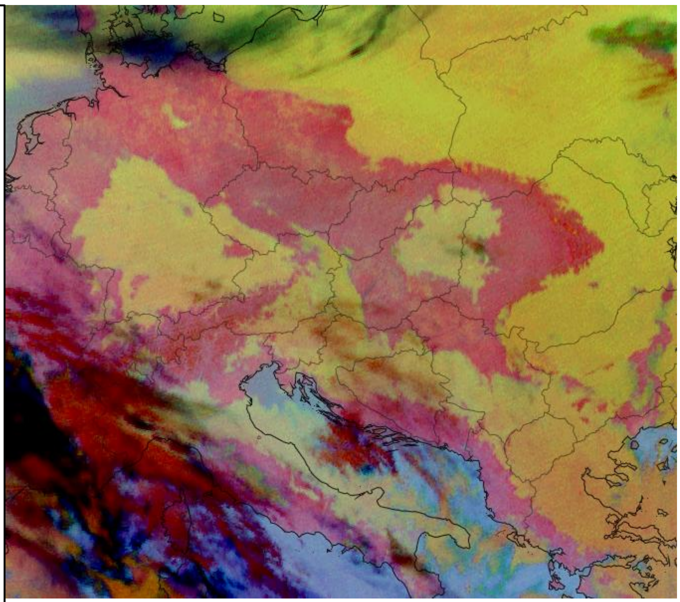
# SEVIRI 24-hour Microphysics RGB Quick Guide

**Primary aim: 24-hour cloud analysis:** Distinguishing ice from water clouds and detection of high level cirrus clouds.
**Secondary aims:** Identification of low level **moisture boundaries** and low level **water clouds**, detection of **dust and volcanic ash** in the atmosphere (not as good as in the Dust RGB).
**Time period and area of its main application:** This RGB can be used day and night throughout the year. Its use over deserts is not recommended.
**Guidelines:** The **24-hour Microphysics RGB** is identical to the Dust and to the Ash RGB as far as the involved channels are concerned, except that the temperature ranges (and the gamma correction) have been tuned for the detection of **low-level water clouds**. It better depicts **low-level water clouds** under cold winter conditions, at high latitudes, and at dusk and dawn, than the Night Microphysics RGB, but otherwise is less suitable for this purpose. Among all RGBs, it better discriminates **thin and thick ice clouds** (e.g. cirrus clouds from Cb clouds), and thin from thick **mid-level water clouds**. The colour of the cloud-free land strongly varies with surface temperature (and low-level moisture) from night to day, and from winter to summer.



**SEVIRI, 24-hour Microphysics RGB, 13 February 2017, 00:00 UTC**

## Background

The 24-hour Microphysics RGB makes use of the three **window channels** of MSG which reduces the dependency from the viewing angle.
The **IR12.0 – IR10.8** difference (**red** colour beam) distinguishes optically thin from optically thick clouds in mid and high levels and helps to identify low-level moisture boundaries.
The **IR10.8 – IR8.7** difference (**green** colour beam) is large for water clouds, low for ice clouds and medium for cloud-free surfaces, except for sandy deserts. For sandy deserts, this difference is high.
**IR10.8** (**blue** colour beam) helps to separate optically thick clouds according their top temperature. On cloud-free areas the blue contribution depends on the surface temperature, warmer surfaces appear more bluish, while cold surfaces appear more reddish.

| Colour | Channel [µm] | Physically relates to | Smaller contribution to the signal of | Larger contribution to the signal of |
|---|---|---|---|---|
| Red | IR12.0 – IR10.8 | Cloud optical thickness<br>low-level moisture | Thin clouds<br>Moist atmosphere | Thick clouds<br>Dry atmosphere |
| Green | IR10.8 – IR8.7 | Cloud phase | Ice clouds | Water clouds |
| Blue | IR10.8 | Temperature | Cold thick clouds<br>Cold surfaces | Warm thick clouds<br>Warm surfaces |

Notation: IR: infrared; channel number: central wavelength of the channel in micrometer [µm].
Remark: The channel combination is the same as for the Ash and the Dust RGBs, but the tunings are different (not shown here).

### Benefits

- The 24-hour Microphysics RGB is applicable day and night.
- It allows monitoring of the formation and dissipation of fog and low stratus at high temporal resolution day and night.
- It has a better performance for low cloud detection during winter at high latitudes than the Night Microphysics RGB.
- It is best suited to thin cirrus cloud detection.
- It shows a good colour contrast between thin and thick mid-level clouds and between thin and thick ice clouds.
- It provides information on low-level moisture boundaries in cloud-free areas.
- It is able to detect dust clouds.

### Limitations

- Very cold cloud-free land and high reaching ice clouds have a similar red colour.
- Fog and low stratus detection over low emissivity surfaces (e.g. deserts) is not possible.
- No good colour contrast between bare soils/deserts and low water clouds.
- Cloud-free land in the 24-hour Microphysics RGB strongly changes its colour with seasons and between day and night due to the RGBs strong dependency on temperature (blue channel).

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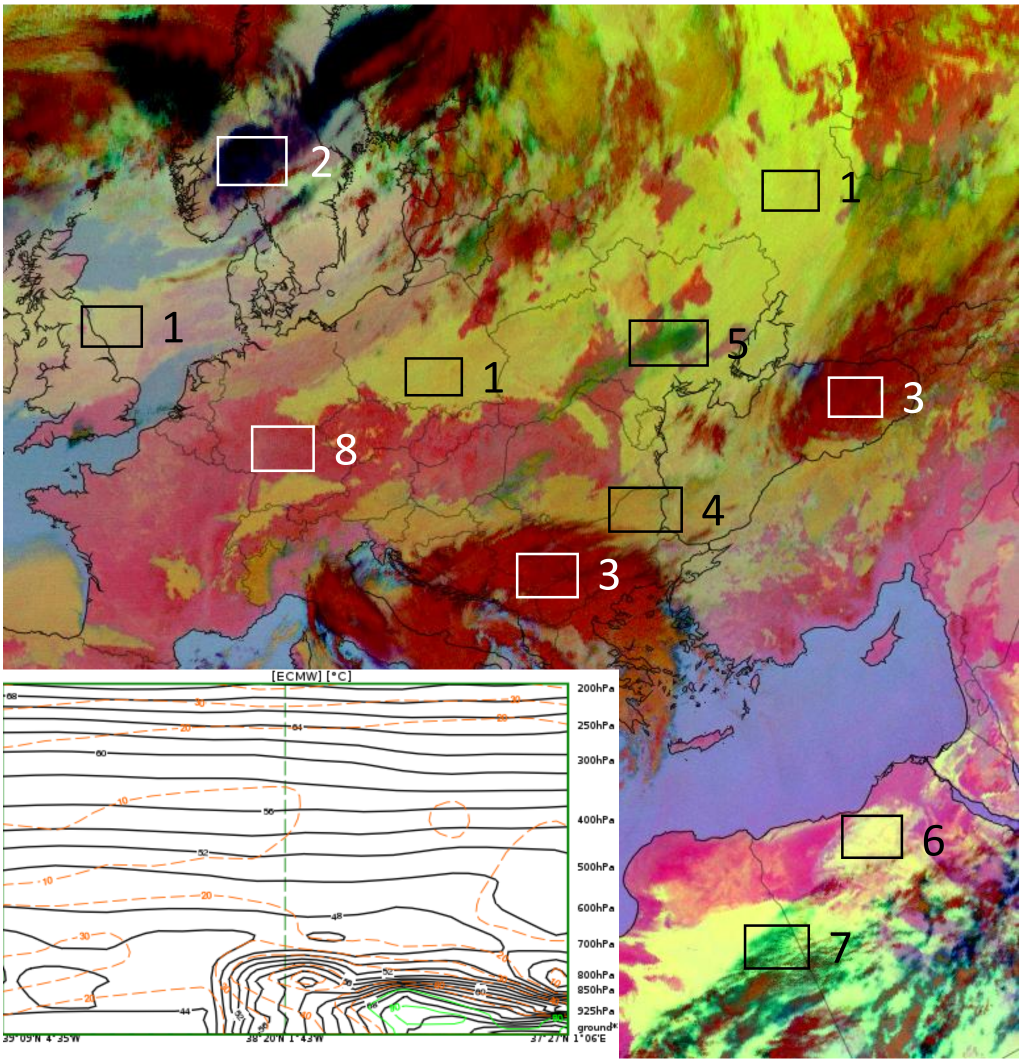
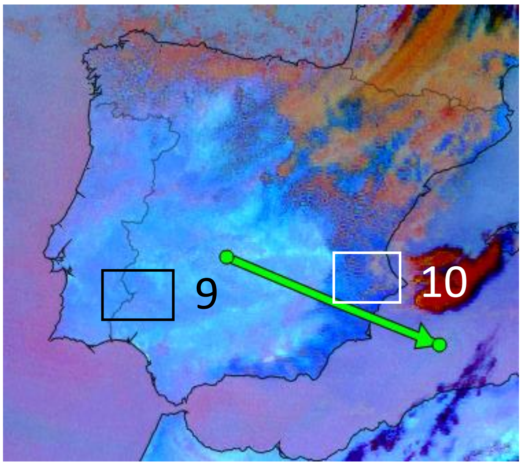
## Colour Interpretation

| | |
|---|---|
| 1 | Low level water clouds (fog or stratus), pinkish for larger drops |
| 2 | Cirrus clouds with no clouds below, dark blue for the thinner parts |
| 3 | Thick, high and cold ice clouds |
| 4 | Thick mid-level water or mixed phase clouds |
| 5 | Semi-transparent mid-level clouds |
| 6 | Cold sandy Deserts |
| 9 | Hot land, dry bound. layer |
| 7 | Cirrus clouds over deserts (same colour as item 5) |
| 8 | Cold land |
| 10 | Hot land, moist bound. layer |

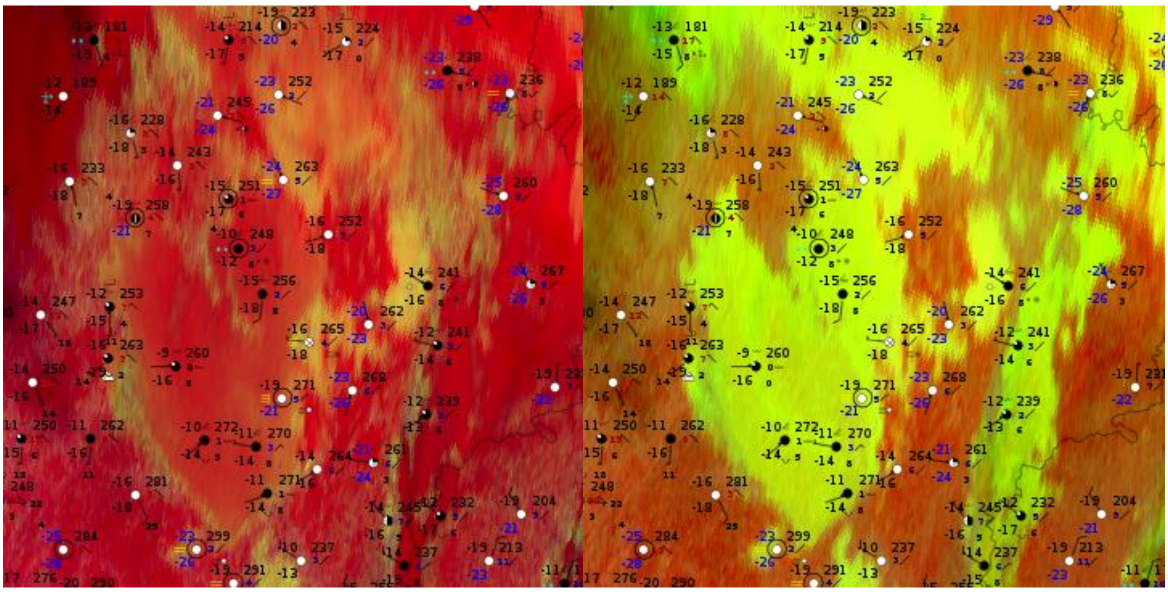
**SEVIRI 24-hour Microphysics RGB, 19 January 2017, 00:00 UTC**




Left hand image: The 24-hour Microphysics RGB from **9 July 2017, 12:00 UTC** shows the strong influence of surface temperature and low-level moisture. Blue colours stand for warm land (light blue for a dry boundary layer and dark blue for a humid boundary layer). Top image (small): The vertical cross section through the moisture boundary (green arrow) shows high humidity values (green isolines) up to 800 hPa near the Spanish coast. Humidity values below 80% are depicted in brown isolines, potential temperature in black.

## Comparison between 24-hour Microphysics and Night Microphysics RGB



**17 February 2017, 00:00 UTC: Night Microphysics RGB (left); 24-hour Microphysics RGB (right)**

**Low stratus and fog** is better depicted in the **24-hour Micro-physics RGB** under **cold winter conditions at high viewing angles** (e.g. Scandinavia or Russia). The Night Micro-physics RGB uses channel IR3.9 instead of channel IR8.7 which can be noisy at very low temperatures. Moreover, IR3.9 is increasingly affected by $CO_2$ absorption with increasing viewing angle (the so-called limb cooling effect). Both effects, $CO_2$ absorption and the noisiness of channel IR3.9 at very low temperatures reduce the ability to detect fog at high latitudes in winter.