

H-SAF CASE STUDY

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|--------------------------|------------------------|-------------------------------------|----------------|
| Product Name | H10 – SN-OBS-01 | Validation Institute | FMI |
| Case Study Period | 09-10-2009 | Case Study Geographical Area | Finland |

METEREOLOGICAL EVENT DESCRIPTION

The area investigated in this case study covers the whole of Finland. The study is performed for October 9, 2009.

DATA/PRODUCTS USED

The H10 product (snow recognition) is shown in Figure 30 (left) and the same area from MSG SEVIRI in fig 30 (right) is a false-color RGB composite from channels 1 (VIS, 600 nm, used for R-channel in the composite image), 3 (NIR, 1600 nm, G) and 9 (thermal infrared 10.8 um, B). For the thermal infrared, temperatures are mapped to brightness so that cold objects are bright and warm objects dark.

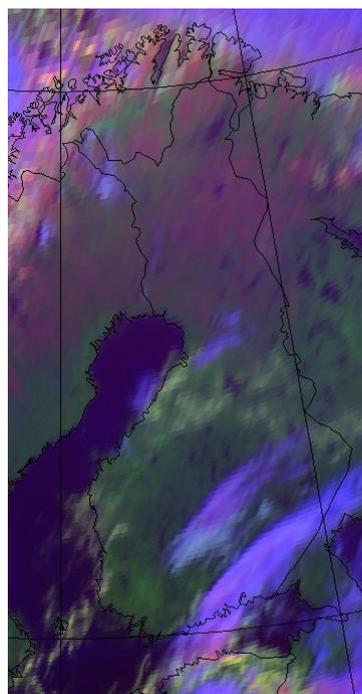
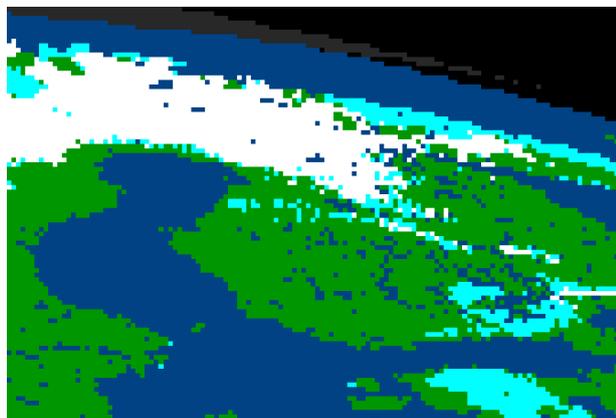


Figure 1: (left): H10 product (snow recognition) of 9.10.2009 (right): MSG SEVIRI RGB composite of 9.10.2009 10:00 UTC

The different colours in fig 1 (right) are as follows:

green: snow-free, vegetated terrain (high reflectance on NIR channel, low on VIS)

yellow: low clouds (warm temperature, high reflectance on both VIS and NIR)

blue-cyan-purple: high clouds (high reflectance on VIS, low to very low reflectance on NIR, very low temperature)

magenta: snow-covered terrain (low surface temperature, high reflectance on VIS, very low

reflectance on NIR).

In addition, the figure 2 shows the snow/no snow information at FMI weather stations based on the validation methodology described in *Validation methodology for H10*. That is, blue markers depict a snow depth of 2 cm or more, red markers less than 2 cm. There were altogether 198 observations available for this date, of which 162 were located on non-cloudy ground pixels.

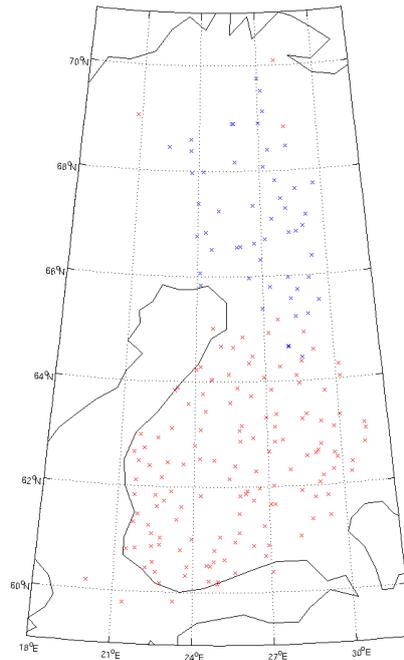


Figure 2: snow/no snow information at FMI weather stations of 09.10.2009

RESULT OF COMPARISON

By comparing the 1 and 2 images, we see that the correspondence of snow covered area is generally very good. There are two areas where the analysis has not been successful. The more evident is the clouds that are classified as snow-covered ground in Eastern Central Finland. The other area is at the northern coast of Gulf of Botnia on the border of Finland and Sweden. In the RGB composite, it is not entirely clear whether there is snow or not, but according to snow depth data there were snow at least at the weather station (blue marker approximately at 66 N, 24 E). On both sides of this area, it is clear that the coastal areas are snow free. In the RGB composite in 27 (right), there is a cloud band oriented in SSW-NNE direction, which may have caused the problem.

As the product contains accumulated data over the whole day, the cloud patterns seen in 1 (right) are not clearly visible in 1 (left) due to cloud movement during the day. There are some residual clouds on areas where cloud cover has been persistent for most of the day.

Visual comparison of the product (Figure 1) and snow depth data (Figure 2) show good correspondence. Statistical values are shown below.

For this case, there were 46 hits, 7 false alarms, 2 misses and 107 correct negatives with a total of 166 validation points. Table below lists several statistical scores calculated from these figures.

| Metric | Score |
|--------|-------|
| POD | 0.94 |
| FAR | 0.13 |
| CSI | 0.84 |
| POFD | 0.06 |
| ACC | 0.94 |
| HSS | 0.87 |

Table: Statistical scores evaluated for case study of 09.10.2009

CONCLUSION

The main focus on this comparison was on snow edge location and the residual clouds. The snow edge is located very well, apart from the slightly ambiguous patch at the northern coast of the Gulf of Botnia on the border between Finland and Norway.

There are some erroneous classification results from the clouds in Eastern Central Finland, where clouds are interpreted as snow.

The statistical scores calculated for this case are very good. The seven false alarms come from the clouds misinterpreted as snow, and the two missed snow cases are at the northern coast of Gulf of Botnia.