Description of the case study

On the 5th of January 2012 Poland was covered with layer clouds. The precipitation (both rain and snow) was recorded in northern parts of the country (western Pomerania region) and snow in the mountains on South. On average 10 mm (western part of Poland) up to 15 mm (South of Poland) of rain was detected. In Sudety and Tatra Mountains the snow layer was built up by 15 cm to 20 cm of fresh snow. The maximal temperature in Poland on that day was 1°C to 5°C. Minimal temperature from 2°C to -2°C but on the greater part of the country thermometers indicated 0°C. Wind conditions varied from SW with 85 km/h on West to S with 120 km/h in mountains on SE. Later on 5th of January 2012 the melted snow precipitation was forecasted.

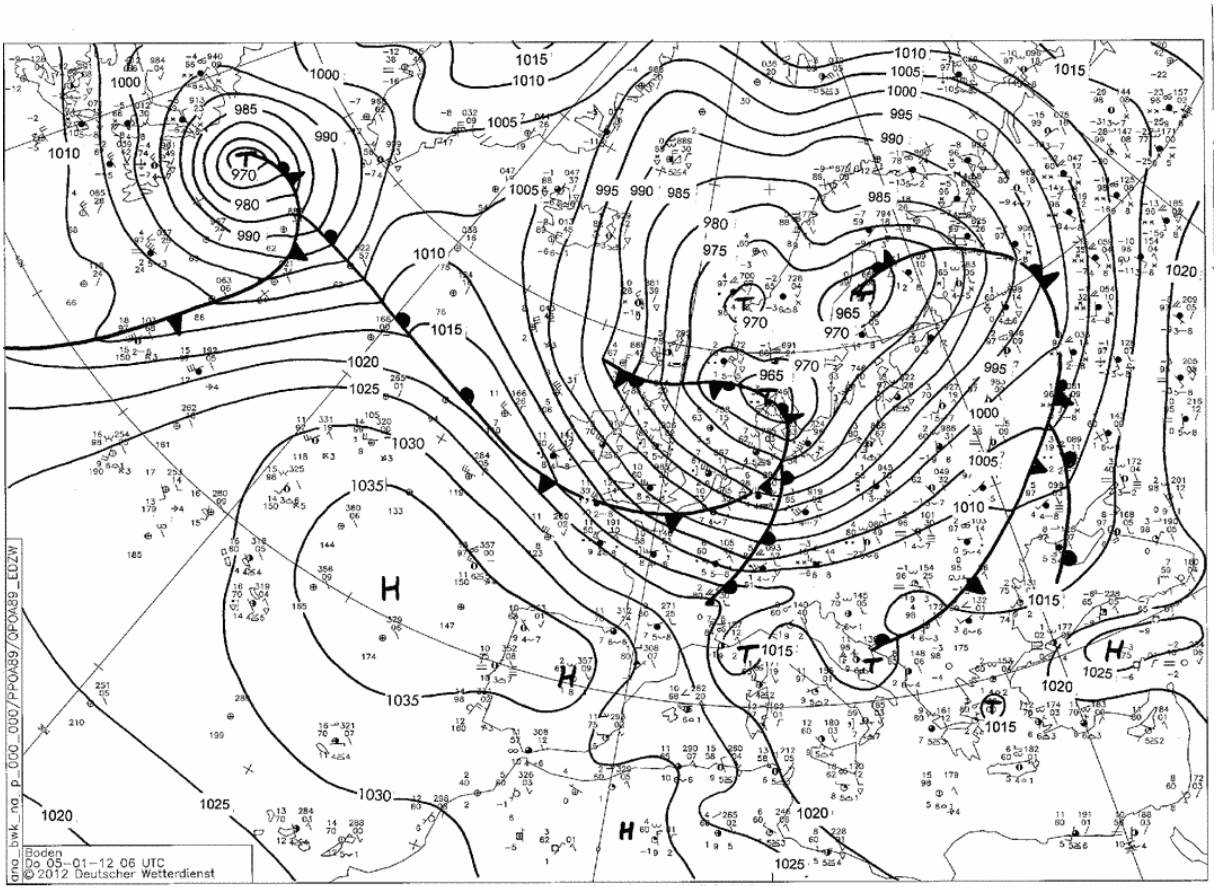

Fig.1 Synoptic chart at 0600 UTC on 5th of January 2012. Courtesy of Deutscher Wetterdienst.

Data and products used

Reference data: data from Polish automatic rain gauges network (IMWM-NRI)
H-SAF product: PR-OBS-4
Ancillary data (used for case analysis):
Polish meteorological radar network, POLRAD (IMWM-NRI)
Weather charts (courtesy of Deutscher Wetterdienst)

Comparison

This event is dominated by stratiform system moving SE across Poland. The highest peak measured by rain gauges is of about 3.5 mm/h, at the same time radar recorded 1.3 mm/h while PR-OBS-4 shows a peak value of 3.0 mm/h.

On the Fig.3 the PR-OBS-4 product is visualized for the morning overpass. For comparison, the distribution of 10 minute precipitation obtained from RG and radar data measured at closest to the given time slot are presented. All precipitation maps were prepared using Nearest Neighbor method.

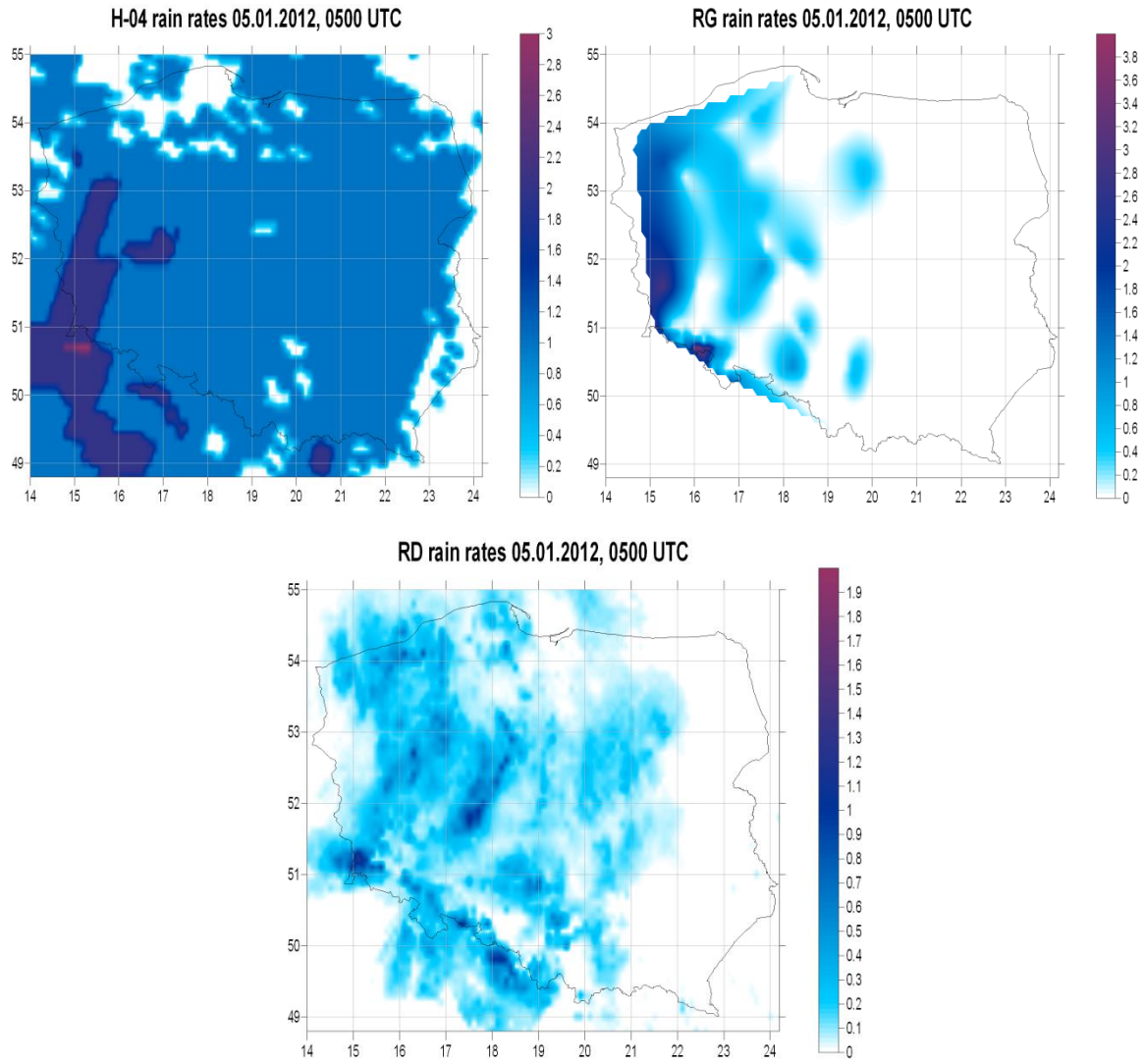

Fig.3 PR-OBS-4 at 0500 UTC on the 5th of January 2012 (left panel), 10 minute precipitation interpolated from RG data at 0500 UTC (right panel) and 10 minute precipitation derived from radar data at 0500 UTC (bottom panel). *Note diverse scale notation!*

All maps show precipitating area moving SE over West Poland. The radar field and H-04 data are consistent with no agreement with rain gauge map. Both radar and satellite maps show too much reliability on detected cloud shapes with no prove of rainfall (see rain gauge map). The H-04 rainfall area seems to be artificially enlarged. Despite mentioned above differences, the amount of the rainfall is similar according to all data sources.

Statistical scores

The results presented below were calculated on the satellite sub-dataset for which satellite pixels were attached to rain gauges. It means that precipitating satellite pixels which were not set in pairs with rain gauges (but are still present on the maps above) were excluded from this calculation.

The ability of PR-OBS-4 product to recognize the precipitation was analysed using dichotomous statistics parameters. The 1 mm/h threshold was used to discriminate rain and no-rain cases. In the Table 1 the values of Probability of Detection (POD), False Alarm Rate (FAR) and Critical Success Ratio (CSI) are presented.

Table 1 Results of the categorical statistics obtained for PR-OBS-4 on the 5th January 2012

Parameter	Scores
POD	0.43
FAR	0.83
CSI	0.14

Higher value of FAR than the value of POD indicates that the product ability to recognize the stratiform precipitation is very low.

The quality of PR-OBS-4 in estimating the stratiform precipitation is presented on the Figure 4. The points on the scatter plot are mostly arranged above and along the diagonal, what indicates that PR-OBS-4 tends to overestimate the precipitation.

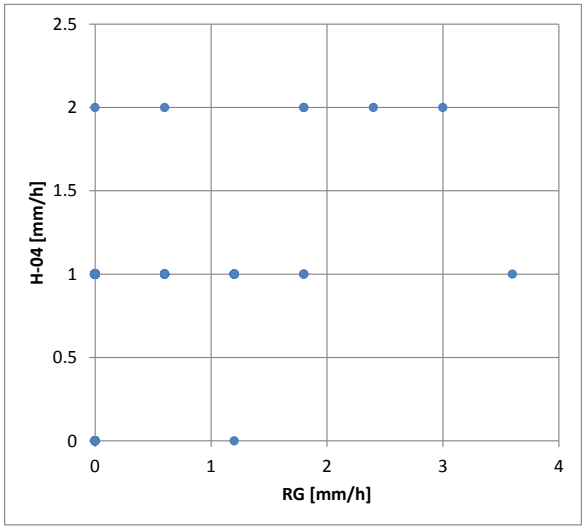

Fig.4 Scatter plot for measured (RG) and satellite derived (H-04) rain rate obtained for all PR-OBS-4 data on the 5th of January 2012.

Finally, the analysis of rain classes was performed. The categories were selected in accordance with the common validation method. Figure 5 shows the percentage distribution of satellite derived precipitation categories within each precipitation class defined using ground measurements.

One can easily notice very good ability of PR-OBS-4 to recognize, moderate precipitation situations – 19 cases out of 20 were properly allocated by satellite product. When no rain is considered, the PR-OBS-4 quality is also very low: only 19 out of 167 of the observed precipitation in this class are properly recognized.

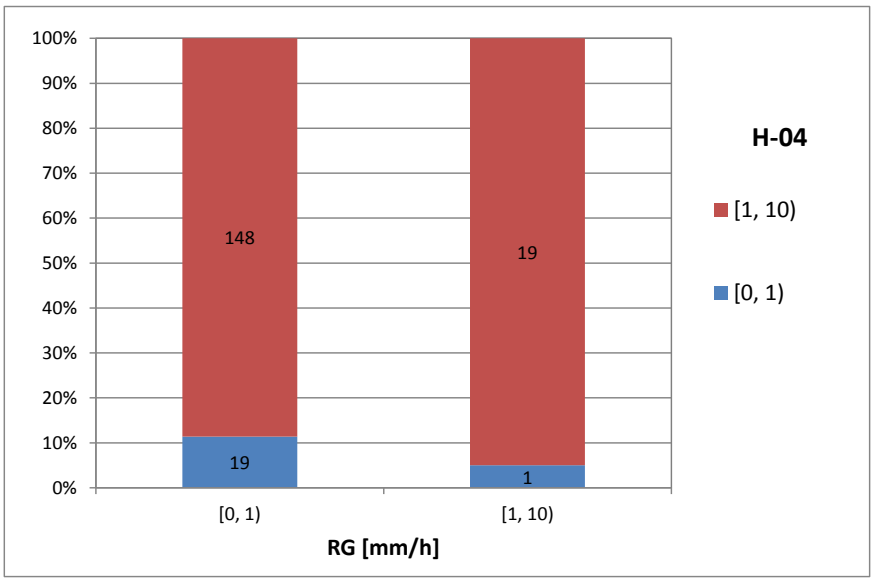

Fig.5 Percentage distribution of PR-OBS-4 precipitation classes in the rain classes defined using rain gauges (RG) data on the 1st of January 2012.

Some Conclusions

To sum it up, the analysis performed for situation with stratiform precipitation showed very poor ability of PR-OBS-4 product in recognition of precipitation amounts. Unfortunately, the precipitation area is also wrong.