Description of the case study

On the 6th of July 2011 Poland was under a very strong influence of huge, built up and mature low pressure system of the Mediterranean origin. The Low center was located over Poland recently but on 6th of July it started to move towards East (western Ukraine). On the eastern peripheries of that Low a few shallow centers of low pressure were developed on a frontal zone fed by two air masses of different physical characteristics. The warm front heading from NE was losing its power and cloud layer due to downdrafts which resulted with no precipitating areas in the western regions of Poland. The eastern part of the country was cowered by stratiform layer of precipitating clouds of moderate and monotonous rainfall events.

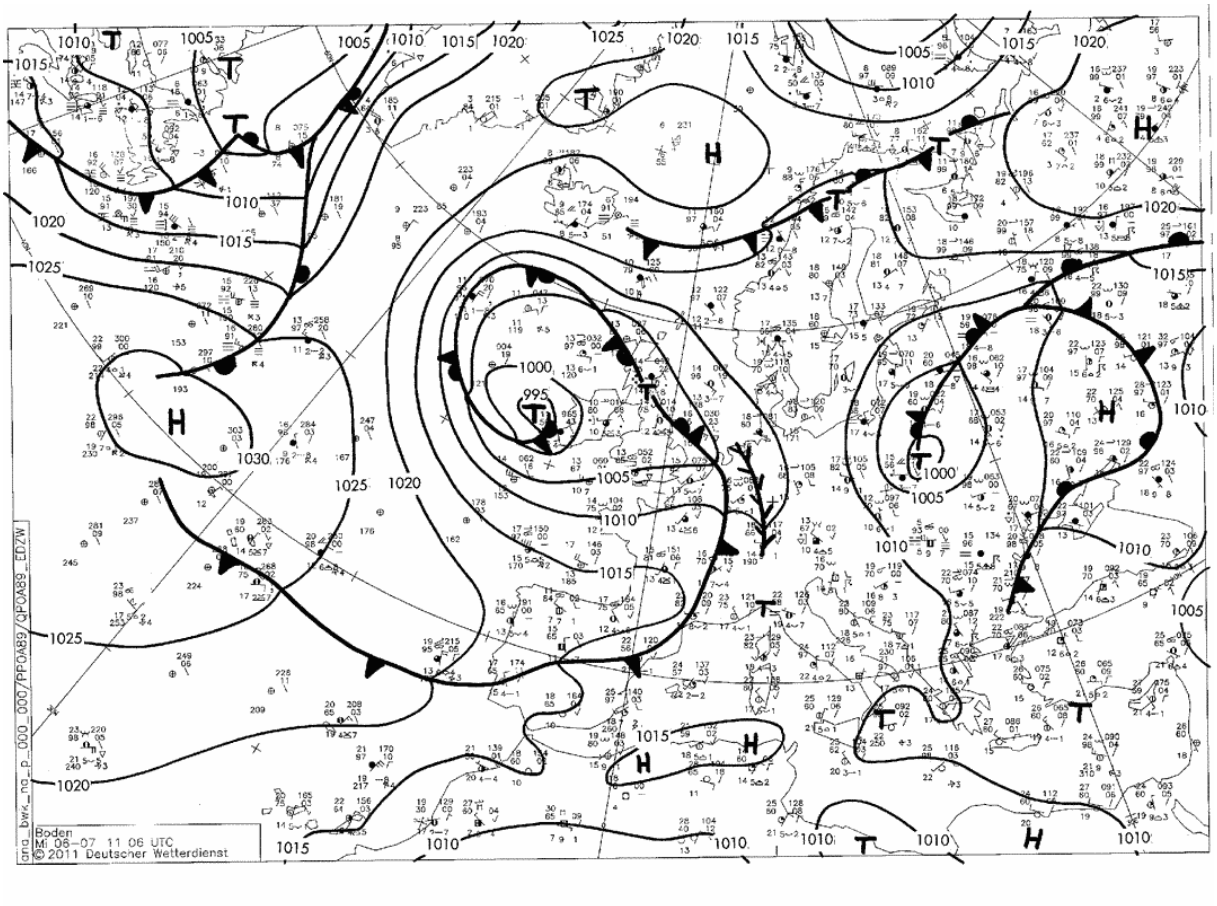

Fig.1 Synoptic chart at 0600 UTC on 6th of July 2011. Courtesy of Deutscher Wetterdienst.

Data and products used

Reference data: data from Polish automatic rain gauges network (IMWM-NRI)
H-SAF product: PR-OBS-1
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 precipitating areas moving slowly across Poland. The highest peak measured by rain gauges is of about 10.6 mm/h, radar shows at the same time 24.4 mm/h while PR-OBS-1 shows a peak value of 6.2 mm/h.

On the Fig.3 the PR-OBS-1 product is visualized for the early 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.

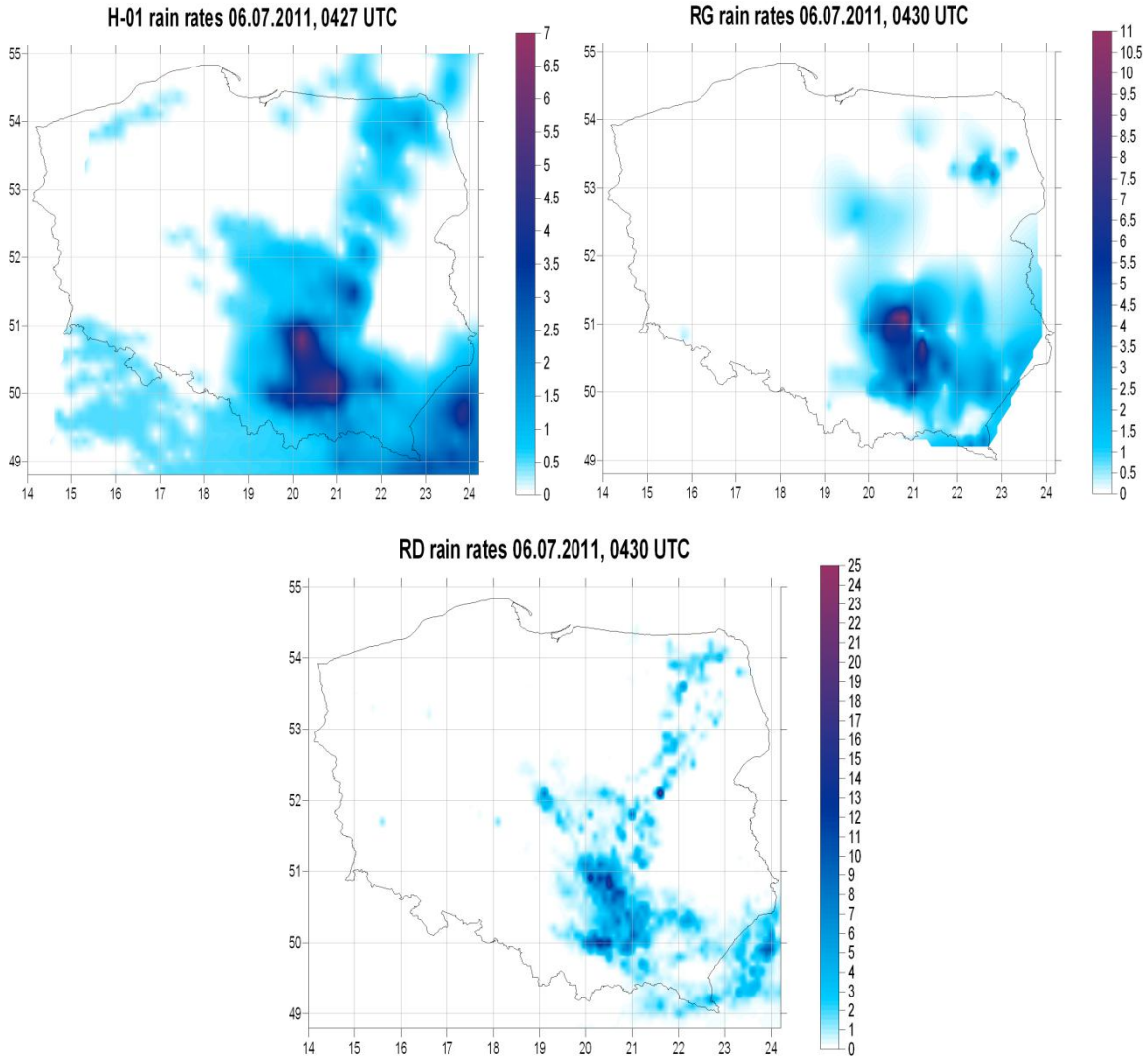

Fig.3 PR-OBS-1 at 0427 UTC on the 6th of July 2011 (left panel), 10 minute precipitation interpolated from RG data at 0430 UTC (right panel) and 10 minute precipitation derived from radar data at 0430 UTC (bottom panel). *Note diverse scale notation!*

All three maps show well located precipitating areas over Poland. The main cores of the precipitation are located similarly NE from Krakow. The rain gauge network interpolation performed on less dense than radar (1km) resolution field shows more diffuse rainfall but still well correlated with H-01

satellite product. The H-01 algorithm tends to present precipitation area in close reference to cloud shape derived from the satellite instrument scan.

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-1 product to recognize the precipitation was analysed using dichotomous statistics parameters. The 0.25mm/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-1 on the 6th July 2011.

Parameter	Scores
POD	0.77
FAR	0.61
CSI	0.35

Higher value of POD than the value of FAR indicate that the product ability to recognize the stratiform precipitation is quite good.

The quality of PR-OBS-1 in estimating the convective 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-1 tends to overestimate the light precipitation but also underestimates the moderate ones.

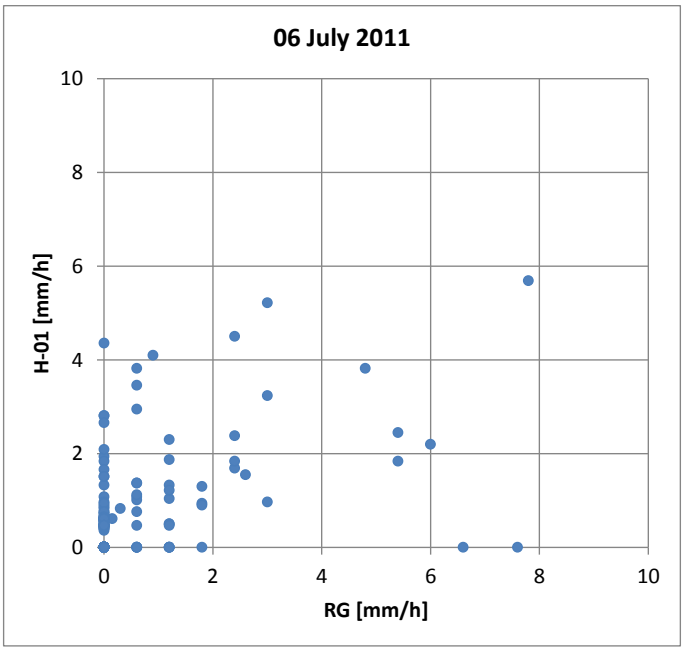

Fig.4 Scatter plot for measured (RG) and satellite derived (H-01) rain rate obtained for all PR-OBS-1 data on the 6th of July 2011

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-1 to recognize both, no-rain and moderate precipitation situations – respectively, more than 62 out of 119 and 18 out of 31 ground cases was properly allocated by satellite product. The light precipitation is not properly recognized in most cases and is generally overestimated.

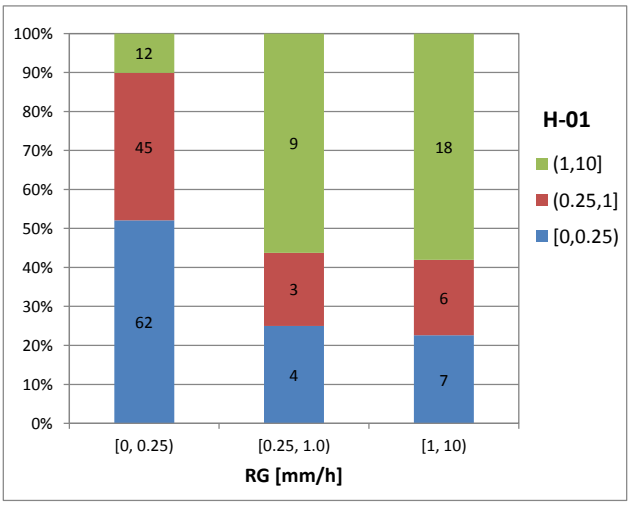

Fig.5 Percentage distribution of PR-OBS-1 precipitation classes in the rain classes defined using rain gauges (RG) data on the 6th of July 2011.

Some Conclusions

To sum it up, the analysis performed for situation with stratiform precipitation showed very good ability of PR-OBS-1 product in recognition of precipitation, especially moderate ones while the light precipitation is overestimated.

The core precipitation areas detected by H-01 are in good correlation with rain gauges and radar detection.