PRODUCT NAME: **PR-OBS-1 v1.5 (H01)**		
CASE STUDY PERIOD: 22 June 2012 05:20 UTC	METEOROLOGICAL EVENT: Night time thunderstorms over Slovakia formed on a cold front	
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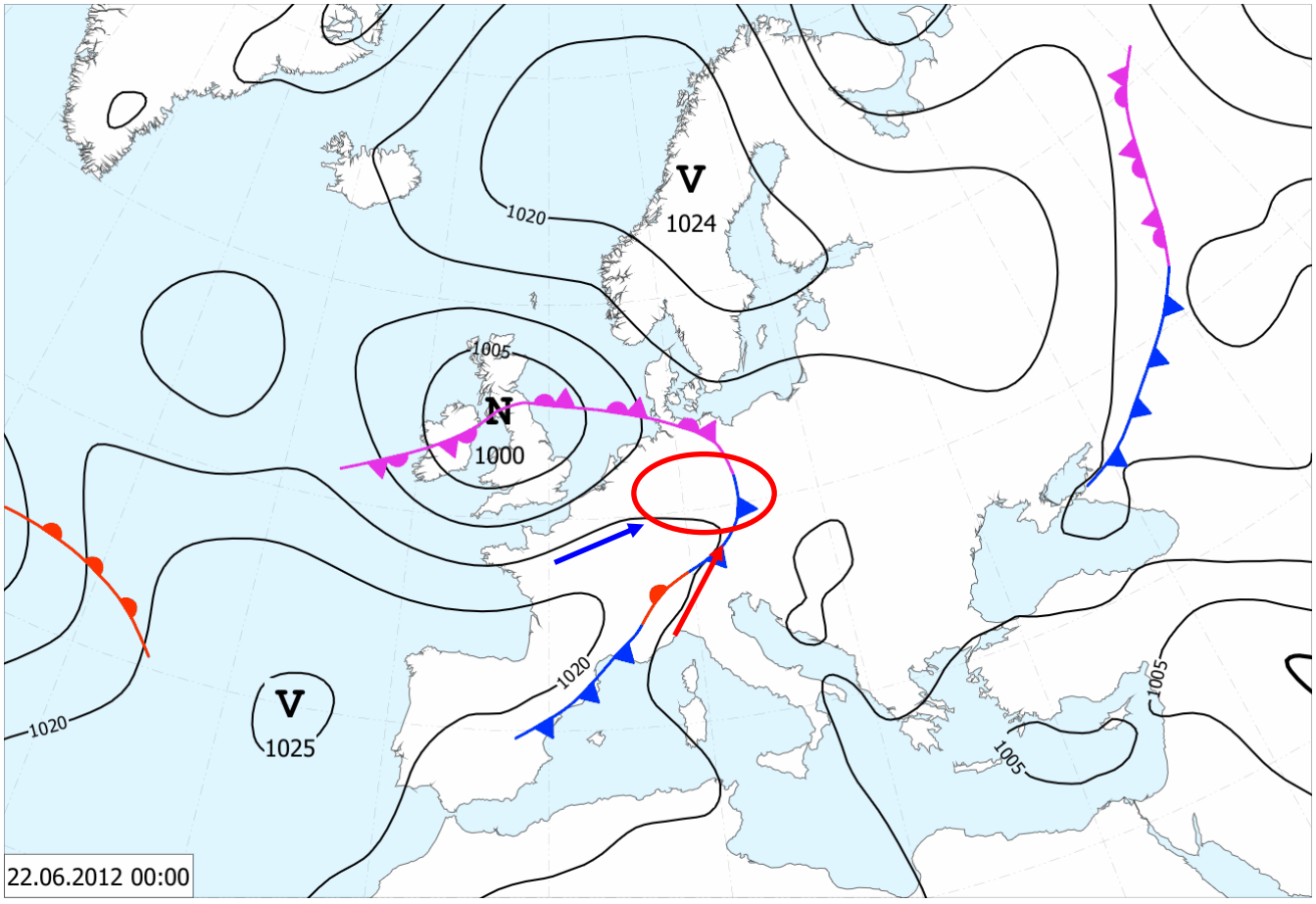
METEOROLOGICAL EVENT DESCRIPTION

Synoptic situation is characterised by high pressure over east Europe with flow of hot air from the south to Slovak region. Cold front connected with low pressure over England passed Slovakia during day 21 June and early morning 22 June. This front brought convection with precipitation and drop of temperatures to the region of Slovakia.
Convective event is demonstrated also by MSG HRV&IR RGB composite time image sequence on figure 1.



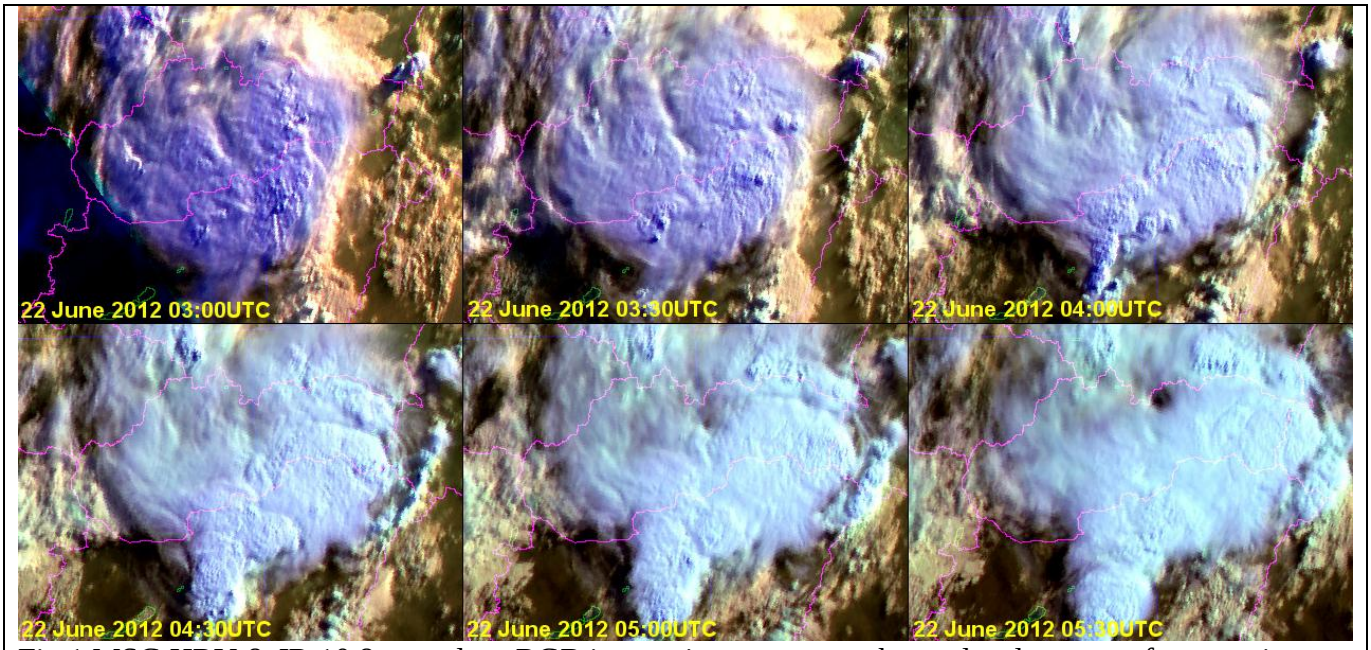


Fig 1 MSG HRV & IR 10.8µm colour RGB image time sequence shows development of convection from 22 June 2012 03:00 UTC to 05:30 UTC over south Slovakia and northern Hungary. In early morning hours overshooting tops of severe convection can be seen very clearly as high contrast spots.

DATA/PRODUCTS USED

PR-OBS-1 v1.5 precipitation intensity field from DMSP16 overpass on 22 June 2012 05:13 UTC and DMSP17 overpass on 22 June 2012 05:13 UTC

Precipitation intensity field from SHMI radars upscaled into satellite projection

RESULTS OF COMPARISON

By visual comparison the PR-OBS-1 precipitation pattern matched radars very well in case of both satellite overpasses (see Fig 2). All significant precipitation was detected and correctly located by PR-OBS-1 without serious cases of false detection, but there is also evidence of overestimation by satellite product, especially in the region of south-east borders of Slovakia and Hungaria (blue and green pixels).

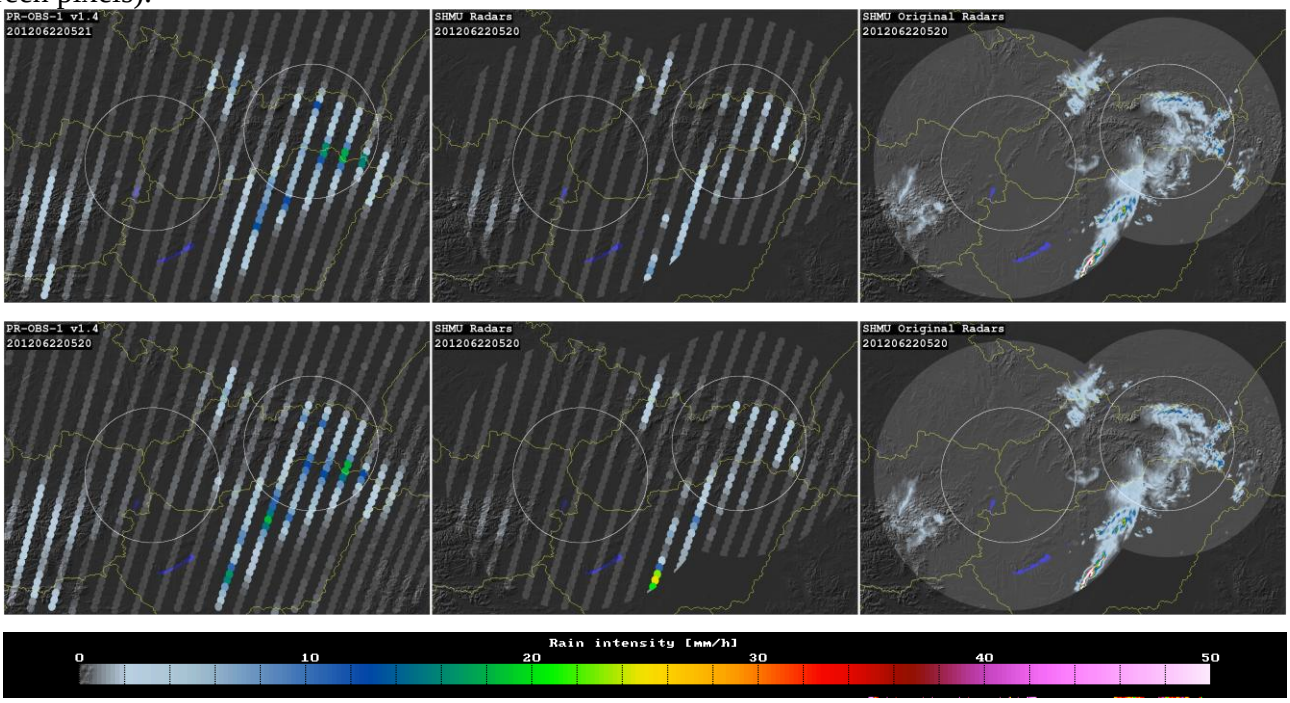


Fig 2 Instantaneous precipitation fields from 22 June 2012 observed by H01 product (left column), SHMU radar network data upscaled to satellite grid (middle) and SHMU original radar network data (right column) corresponding to DMSP16 overpass at 05:13 UTC (top row) and DMSP17 overpass at 05:13 UTC (second row). The precipitation values are shown as satellite IFOVs projected over the radar composite domain. White contoured circles represent 120 km rain effective range of the radars.

Results of statistical processing of radar and satellite data are shown in following tables 1 and 2. For processing of long data series we are using only data inside radar rain effective region for statistical computation but in this particular case we processed twice: data inside rain effective range and the whole area covered by radar signal. The reason is to evaluate impact of detection of the strong but narrow strip of precipitation located over central Hungary. In spite of fact that both polar orbiting satellites measured this area practically in the same time, due to low density of satellite grid only DMSP17 caught the precipitation maxima in this region. In tables black figures correspond to statistics only in radar rain effective range, blue figures correspond to the whole radar range.

Table 1 Selected scores of continuous statistics

Precipitation class (mm/h)	0.25 - 1	1 - 10	≥ 10	≥ 0.25
Mean error (mm/h)	4.40 2.72	3.54 3.35	-	3.88 3.02
Multiplicative bias	7.90 5.80	2.77 2.44	-	3.65 3.05
Correlation coefficient	0.33 0.32	-0.04 0.43	-	0.06 0.46
URD-RMSE (%)	946 724	364 303	-	659 557

Table 2 Selected scores of dichotomous statistics

Precipitation threshold (mm/h)	≥ 0.25	≥ 1
POD	1.00 1.00	0.97 0.98
FAR	0.59 0.63	0.45 0.58
CSI	0.41 0.37	0.54 0.41

POD values are very close to 1 for all precipitation classes and for the whole area measured by radar, but FAR increased when we expanded radar range, which we explain by typical radar characteristics – beam attenuation in precipitation, orographic blockage and radar beam overshooting the clouds.
Scores of continuous statistics are better when calculated for the whole radar range; especially Correlation coefficient is improved from value 0.06 to 0.46, mean error decreased from 3.88 to 3.02. We explain this fact by effect of well-developed convective clouds, which can be detected by radar in the whole range more effectively then stratiform clouds. The most overestimation by H01 product (ME=4.40) is observed in case of low precipitation rain rate 0.25-1 mm/h inside the radar rain effective range.

COMMENTS

Some results of statistical comparison may not be representative due to small number of compared precipitation pixels, especially in the case of use radar rain effective range only.

INDICATIONS TO DEVELOPERS

The PR-OBS-1 showed good spatial match of precipitation pattern with radars in this case. The satellite product overestimated low precipitation intensities compared to radars especially inside the radar rain effective range. Disadvantage of this product is low density of satellite FOVs and omitting of small-size precipitation areas.