4.4 Case study analysis in Bulgaria (NIMH)

4.4.1 Case study: 13 March 2018

PRODUCT NAME	H02B
CASE STUDY PERIOD	13 March 2018
CASE STUDY AREA	Maritsa Basin, South-East Balkans, Bulgaria
METEOROLOGICAL EVENT	Intensive precipitation
VALIDATION INSTITUTE	NIMH - Bulgaria
PRODUCT DEVELOPER INSTITUTE	CNR-ISAC
OPERATIONAL CHAIN INSTITUTE	CNMCA

METEOROLOGICAL EVENT DESCRIPTION

The 500hPa geopotential map (Figure 53) for the 13th of March 2018 at 12 UTC shows a deep trough from Baltic Sea to the East-Southeast Europe, giving rise to a shallow cyclone over the Balkan Peninsula. The trough originates from very deep (the MSLP in the cyclone center is below 990 hPa, see Figure 54) and mature cyclone located over the Baltic Sea.

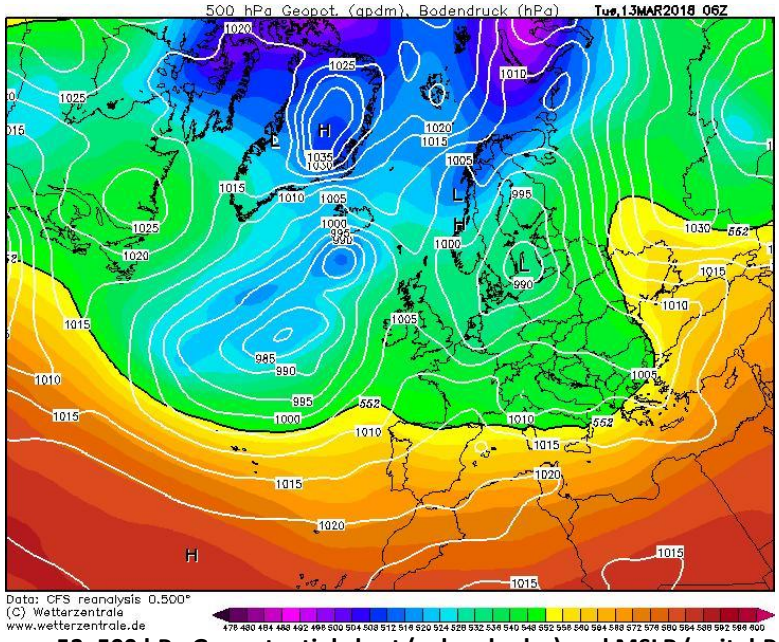

Figure 53: 500 hPa Geopotential chart (color shades) and MSLP (unit: hPa) valid for the 13th of March 2018 at 12 UTC.

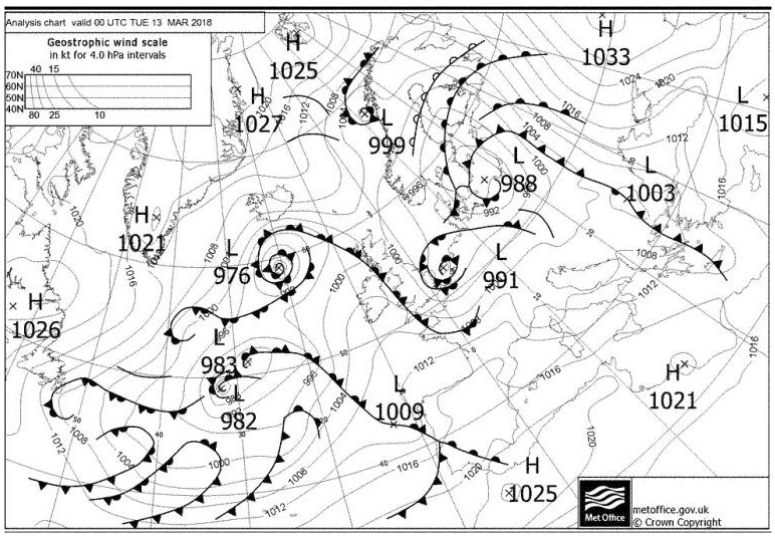

Figure 54: MSLP (unit: hPa) chart valid for the 13th of March 2018 at 00 UTC.

The cold front passes through Bulgaria from west to east on the 13th of March causing significant cooling, precipitation and thunderstorm activity over the bigger part of the country, as shown on the surface weather map on Figure 55.

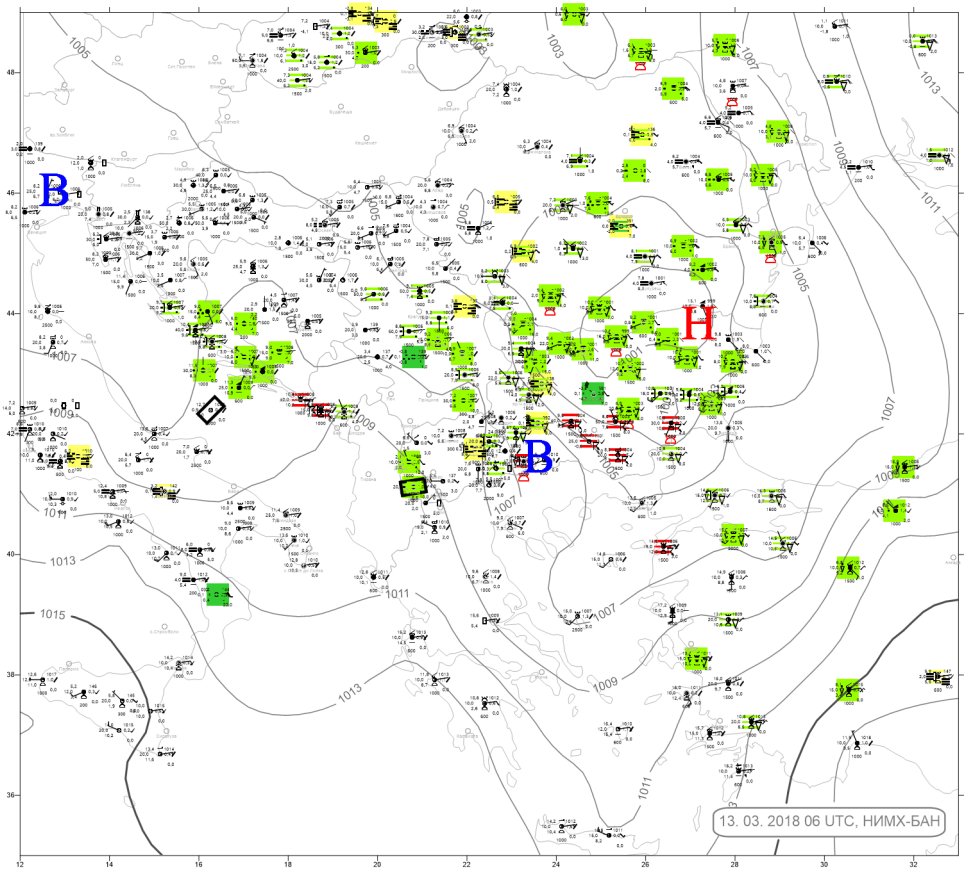

Figure 55: Surface weather map (on the left) valid for 3th of March 2018 at 06 UTC. The thunderstorms are traditionally highlighted with red, the rain with light- and the snow with dark-green.

The massive vertical extent of the frontal clouds is clearly distinguishable on the colour enhanced cloud product ('Satellite Cloud Tops Alert ') as well as on the water vapour one.

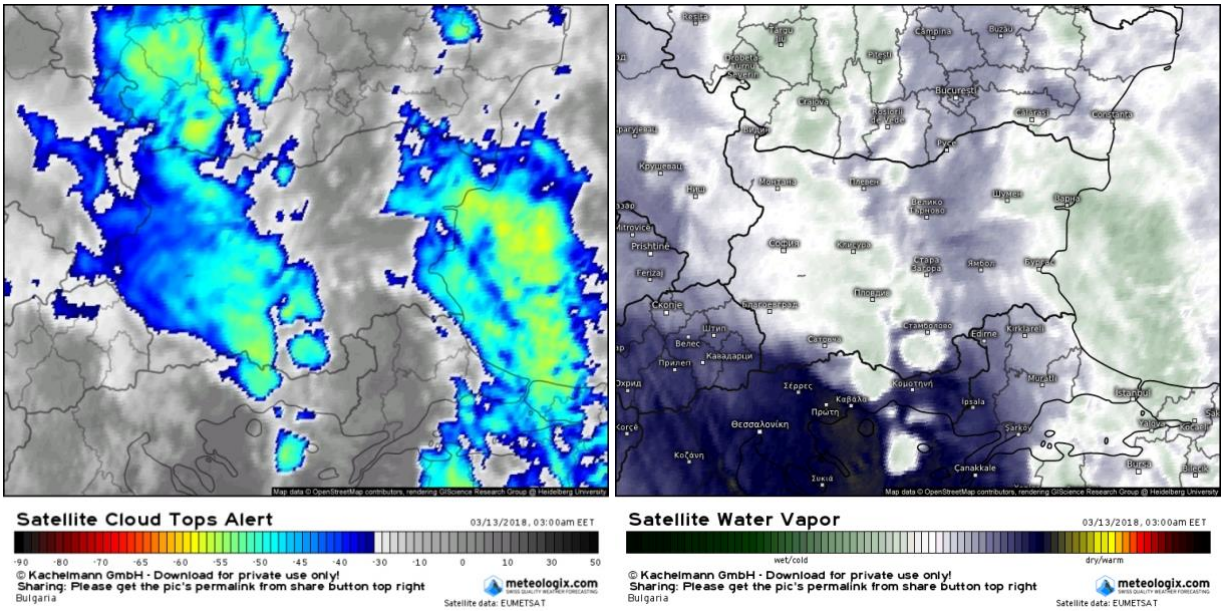

Figure 56: Satellite Cloud Tops Alert – product of the EUMETSAT (on the right) shows temperatures of 53°C \in yellow\ at 03:00 UTC. At the right – water vapor and temperature.

On the 14th of March the MSLP remains relatively low; the precipitation, as well as the thunderstorm activity, continues but with significantly lowers intensity and spatial extent in comparison with the previous day.

DATA/PRODUCTS USED

EUMETSAT products – Meteologix https://meteologix.com/bg/
Plymouth State Weather Center https://vortex.plymouth.edu/
Wetterzentrale, License: Creative Commons Attribution-NonCommercial 4.0 International License.

RESULTS OF COMPARISON

Region into consideration is relatively small – about 34000 km^2. The area is chosen because of existing denser network of hourly measuring rain gages – up to 75 rain gages except for winter months.

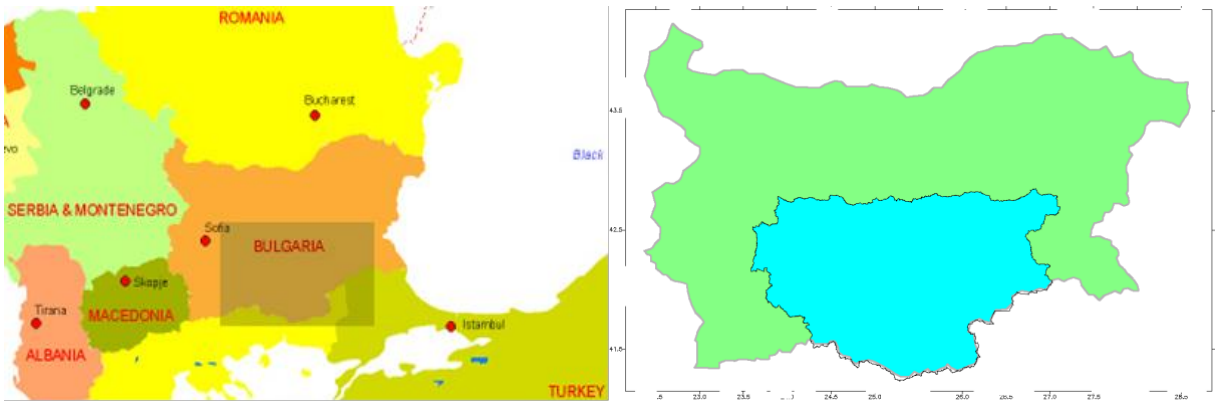

Figure 57: Location of the detailed map (Figure 6) over Balkan Peninsula (left) and on Bulgaria map (right).

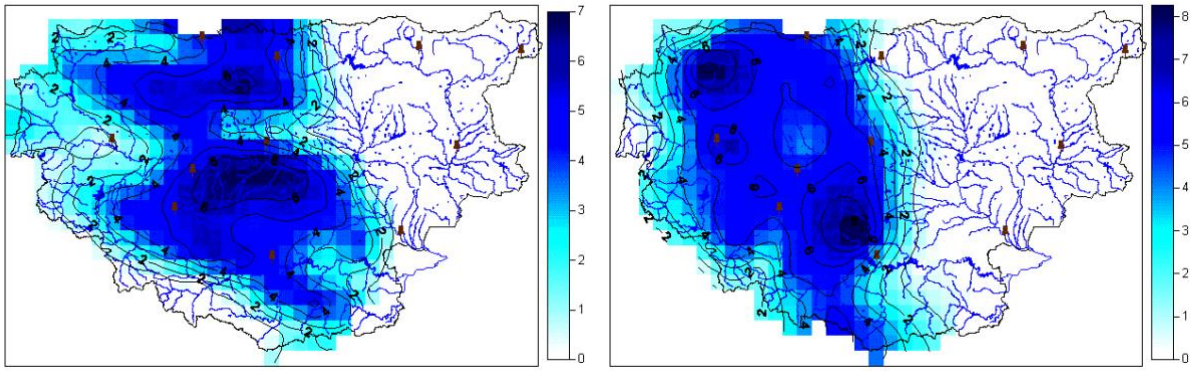

Figure 58: On the left H02B product (converted to hourly precipitation intensity) image on South- Bulgaria for 02:10UTC. On the right - precipitation in [mm/h] as interpolated from automatic rain gages data for 03:00 UTC.

For this overpass, the statistical scores have been computed with "Unique_Common_Code version 1.4" script and shown in Table 23 and Table 24 (H02B in comparison with GRISO).

H02B VS GRISO	>0.25 <999 mm/h	>0.25 < 1 mm/h	>1 < 10 mm/h
ME [mm/h]	1.86	3.27	1.45
STD [mm/h]	2.42	1.82	2.42
MB [-]	1.81	7.17	1.52
RMSE [mm/h]	3.05	3.74	2.82
FSE [%]	1.33	7.06	1.01

Table 23: Statistical scores obtained by the comparison between H02B and GRISO map.

	>0.25 mm/h	>1 mm/h
POD [-]	1.0	0.92
FAR [-]	0.18	0.33
CSI [-]	0.82	0.63

Table 24: POD, FAR and CSI statistical scores obtained by the comparison between H02B and GRISO map

FINAL COMMENTS

The H02B precipitation intensity that is measured for a relatively short time is compared to the interpolated by GRISO hourly sum of precipitation. The H02B product matches intensities of the GRISO map so the POD and CSI statistics are very high. For this overpass the product performs well for the BG territory. Perhaps the conversion of units from [mm/m^2/s] to [mm/h] in order to achieve the same unit for the comparison (validation) leads to some additional uncertainty.