Extremely rainy period in Lithuania on 5-8 July 2007

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This rainy episode (locally up to 85-86 mm/12 h of precipitation, while monthly rate in Lithuania is 79 mm) between 5 and 8 July 2007 is a good example of the rapid cyclogenesis to analyze. The evolution from an emerging cloudhead, as the main feature in the initial stage, towards the V-pattern of the dry tongue, in the advanced stage and, eventually, the spiral in the mature stage could be found in different MSG images. RGB Airmass, Microphysics, HRI, WV, IR images together with analysis of physical parameters helped to, firstly, predict and explain the processes behind this unusual event in Lithuania (such a heavy prolonged rainy period in summer was for the second time over the last 50 years).

An upper low with sharp trough approaching from Southern Europe triggered-off the deepening of a lower tropospheric cyclone within unstable warm and wet airmass boundaries over the Ukraine. Especially intense cyclone development and powerful release of the energy of instability occurred in a zone of occluded front moving slowly from Belarus to South-Eastern Lithuania (on 6th of July) and towards the North approaching Latvia and moulding into expressive occlusion spiral (on 7-8th day). The centre of cyclone in the upper level coincided with the centre of a low-level cyclone – this determined the prolonged nature of the process. Confluence at the surface in combination with upward vertical motion in upper-surface layer provided heat and moisture for powerful Cb clouds and heavy rains forming over Lithuania and neighbouring countries.

Vertical cross sections of main NWP parameters show the conditions suitable for convection within the airmass boundaries: high equivalent potential temperature, wind shear in the lower troposphere, and a potentially unstable stratification of the air in a rather deep layer. Potential vorticity shows an anomaly protruding deep into the atmosphere to the rear in the region of the highest gradient of the isentropes of the front. These conditions were favourable for the rapid cyclogenesis to occur. Obviously, the most intensive convection appeared over the Eastern and Western Lithuania at the point of coincidence of the wet bulb maximum potential temperature and the strongest convergence near the surface.

ECMWF, MetOffice and DWD numerical models as well as HIRLAM provided very good guidance on the cyclogenesis 2-3 days in advance of the event. It allowed forecasters to predict extremely dangerous rainy episode quite well and issue their warnings in time.

During this extreme meteorological phenomenon, a significant damage had been done – mainly by river floods. Moreover, it spoiled the Lithuanian open-air festival of folk songs and dances, which is organized every four years only.