VERY STRONG CONVECTION AT THE BALTIC COAST OF LITHUANIA ON 25 NOVEMBER 2008

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I. INTRODUCTION

According to Lithuanian criteria for meteorological phenomena, > 30 mm/12 h of snow and a snow cover >30 cm/12 h is named a catastrophic event.

The case, which has being analysed and presented, is an exceptional one for Lithuania. During the night of 25 November 2008, 66 mm of snow precipitated in a resort city of Nida located on a narrow peninsula of the Curonian Lagoon.

FIG. 1: The location of catastrophic event (lat. E55°, long. N21°) on Lithuanian map.

During 12 h period, snowcover increased by 36 cm, thus totalling to 45 cm by the morning! It was the largest single snowfall in Lithuania ever measured and the biggest increment of snow cover (over 12 hours) since 1936.

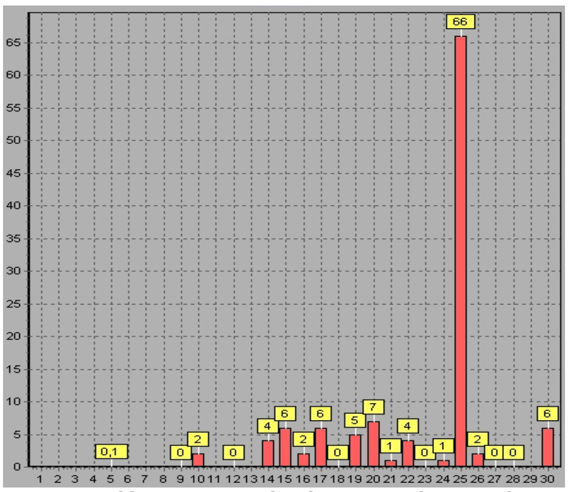

FIG. 2: Monthly precipitation distribution in Nida, November 2008; abscissa - days, ordinate - amount of precipitation (mm).

II. PHYSICAL PARAMETERS AND CONCEPTUAL MODEL

Combining satellite imagery and numerical model parameters leads to the right definition of conceptual model (CM). According to physical parameters of atmosphere (ECMWF data) and to satellite (MSG-2) information obtained, the presented situation was typical for Comma CM, which was connected with strong Rapid Cyclogenesis (RaCy) process. Initiation of deep moist convection can be connected to a favourable thermodynamic environment, created by large-scale flows, and sufficient lift, usually provided by mesoscale process (Doswell, 1987). Wind gusts and a thunderstorm confirmed the intensity of convection at the Baltic coast.

The first appearance of deep convection happens in 66% of all cases at WV-Boundaries (Krennert T., Zwatz-Meise V., 2002). WV-Boundaries are connected to dry air.

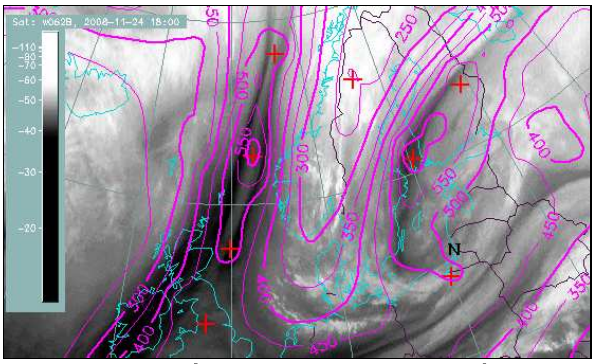

FIG. 3: WV image and PV1 18 UTC 24-11-2009; **N**-Nida city.

An upper level PV anomaly, with its associated lowered tropopause, overrunning a low-level baroclinic zone, induces a cyclonic circulation within the upper levels of the troposphere (Hoskins and others, 1985).

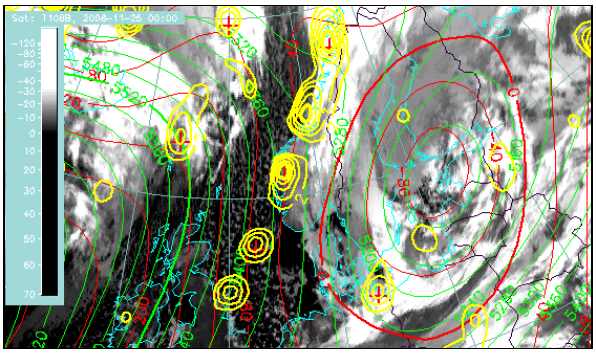

FIG. 4: IR image, PVA on 500 hPa, AT1000 hPa and AT500 hPa, 00 UTC, 25 Nov.

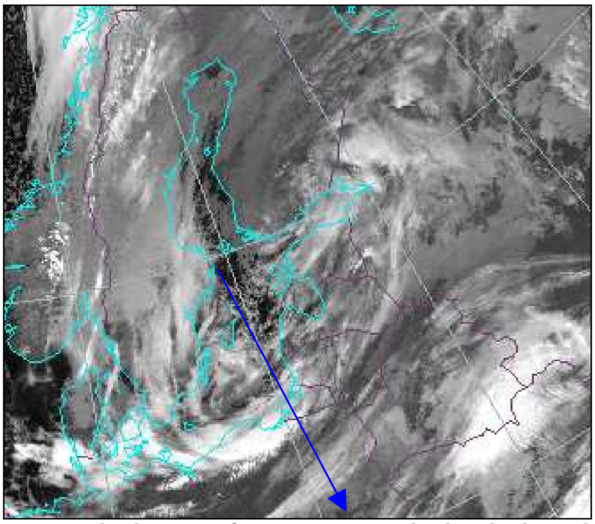

FIG. 5: The location of cross-section inside the cloud spiral (METOP IR).

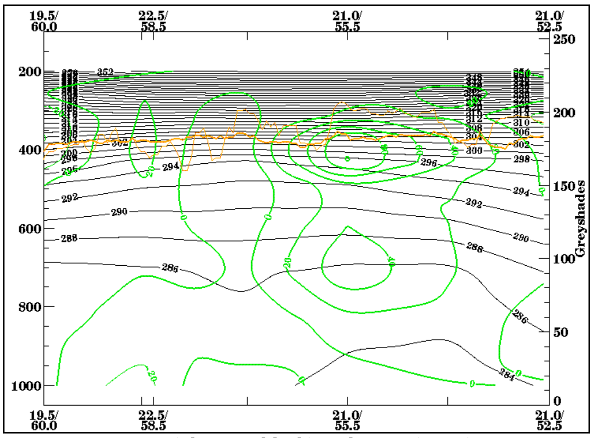

FIG. 6: Isentropes (Theta E; black) and PVA (green), 18 UTC 24 Nov.

Combination of convergence, cold dry air intrusion from higher levels and mesoscale upward motion leads to rapid cyclogenesis with convective activity at the rear and within frontal cloud bands (Zwatz-Meise V. and Mahringer G., 1990). In this case, a local-scale heavy snow was formed.

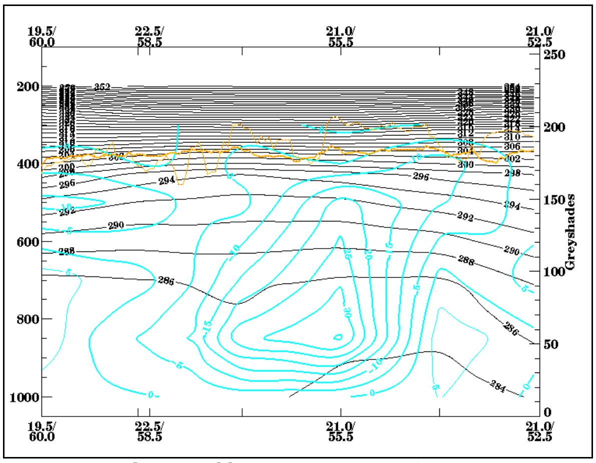

FIG. 7: Vertical motion (blue: Omega parameter), 18 UTC 24 Nov.

FIG. 8: Nida in the morning after the event, 25 Nov.

III. SUMMARY

To conclude, the main features and reasons for development of this catastrophic phenomenon were:

- Involuted cloud spiral as a result of RaCy action was extended along the Baltic Sea – from Finland to Lithuania;
- The "tail" of this cloud system had been discontinued and a new Comma cloud structure formed in cold air mass;
- Deep intrusion of dry stratospheric air into lower levels of troposphere (PV=1 low down up to 500-550 hPa); it lowered the level of tropopause;
- Comma was in front of upper level trough and PVA max in left exit region of a jet streak;

Obviously, it was not difficult to detect the formation of RaCy in advance, unfortunately, it was impossible to predict the magnitude of the phenomenon. Firstly, it was a local-scale event; secondly, during late autumn season heavy snow is very rare and unusual in western Lithuania.

As regards the impact of this hazardous event, only a limited damage was caused to forestry and roads in and around Nida.

IV. ACKNOWLEDGMENTS

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V. REFERENCES

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