Case nr. 2: Downslope Windstorm at High Tatras

The simulations in this case were done with initial and lateral boundary conditons from model ALADIN SLOVAKIA with 9 km resolution that was operational on November 19, 2004 (using mainly parameterization of the cycle 25t2). Thus, the results are fully comparable with outputs of the reference high resolution hydrostatic ALADIN run (Fig. 33) which was successful in the forecast of the downslope windstorm (Simon, Horváth and Vivoda, 2006). However, later parameterizations (e.g. cycle 28) showed worse performance of forecasting the windstorm.

The run with GC05 mixing length (Fig. 34) shows weaker effect of the downslope wind, although still relatively high wind gusts for lowland.

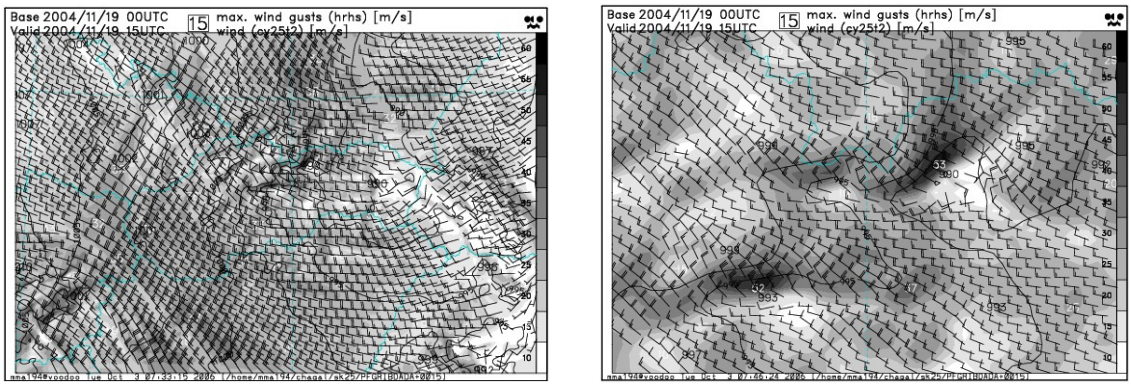

Fig. 33: Forecast of 10m wind (barbs), wind gusts (shaded) and mean sea level pressure in the situation of 19 November 2004 with the reference high resolution hydrostatic ALADIN run of cycle 25t2. The figure on the right side shows zoomed area of High Tatras (middle side of the right figure) and Low Tatras (bottom left side).

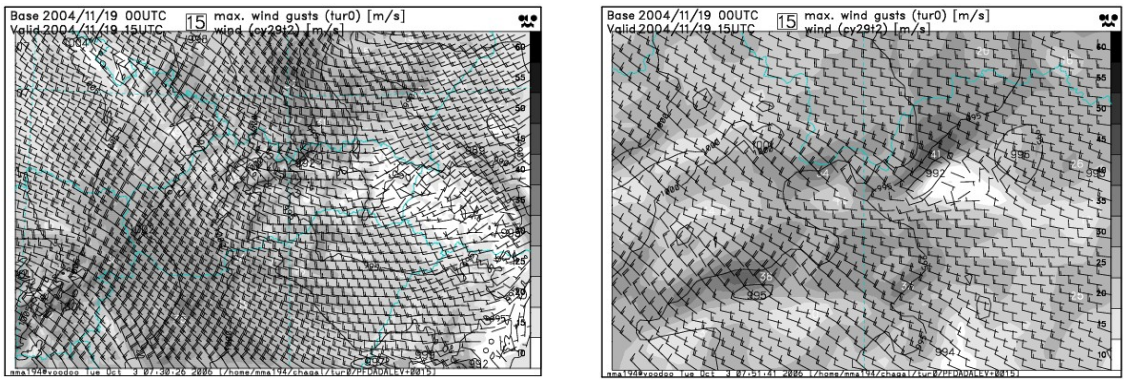

Fig. 34: The same as Fig. 31, except for the ALARO -3MT run with GC05 type of mixing length

Full application of the BL89 mixing length (Fig. 35) has a consequence of systematic increase in wind speed, which is not realistic (wind gusts exceeding 40 m/s in Hungary were not observed). On the other hand, the wind gusts at southern slopes of High Tatras are still underestimated against the reference simulation and observation. The merged GCS06-BL89 run (Fig. 36) gives similar forecast as the simulation with GC05 mixing length parameterization.

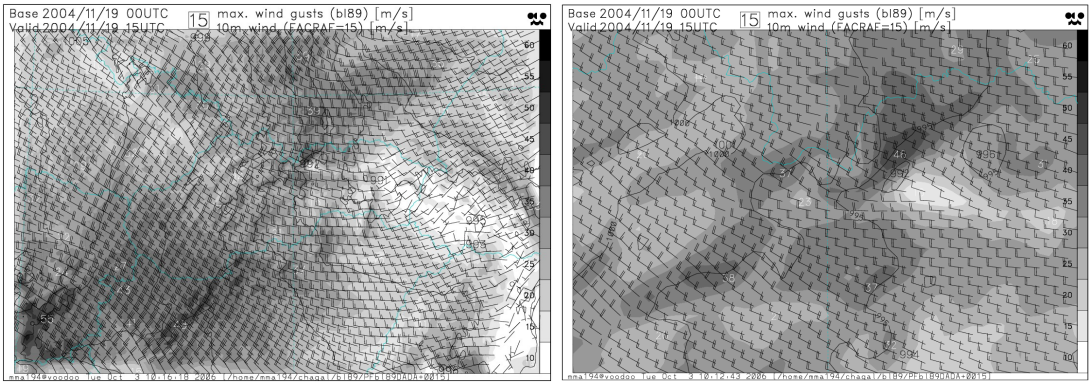

Fig. 35: As in Fig.33 except for the fully applied BL89 type of mixing length

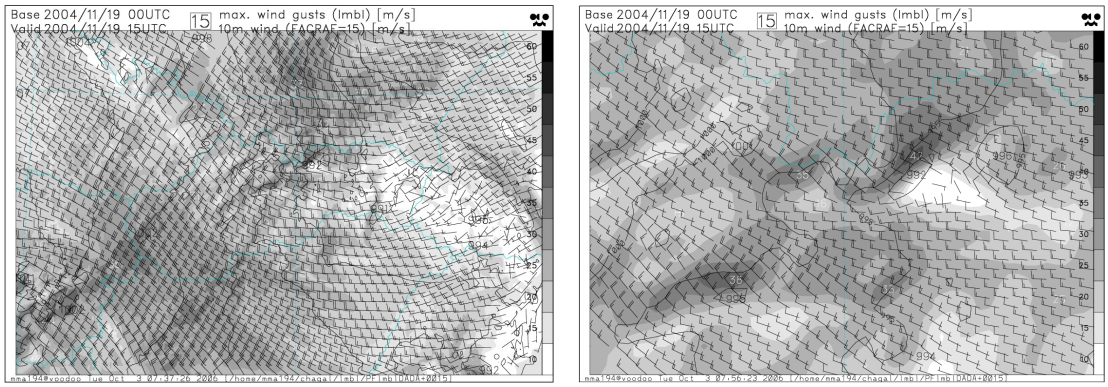

Fig. 36 As in Fig. 33 except for the GCS06-BL89 merged parameterization

Case nr. 3: Front passage and wind gusts in Hungary

The 16 May 2006 00 UTC forecast run of this situation with ALADIN SLOVAKIA model was accompanied by false cyclogenesis and very strong wind gusts, over 45 m/s in the eastern part of Hungary. This false signal was significantly reduced (though not eliminated) by application of SLHD (planned to be published by Váňa et al. in Q.J. R. Meteorol. Soc.). The operational CHMI ALADIN model (Fig. 37 a) forecasted the situation very well (except some parts of southwestern Slovakia, where the wind speed was exaggerated). Maximum wind speed was actually measured at Bakony mountains in Hungary (automatic station on Kab hegy, over 20 m/s). The ALARO -3MT run with GC05 mixing length did not alter to much from the operational ALADIN CHMI forecast. The experiment with merged GCS06-BL89 mixing length was also not worse, the forecasted wind speed are a bit higher than by the operational run (Fig. 37b).

a) b)

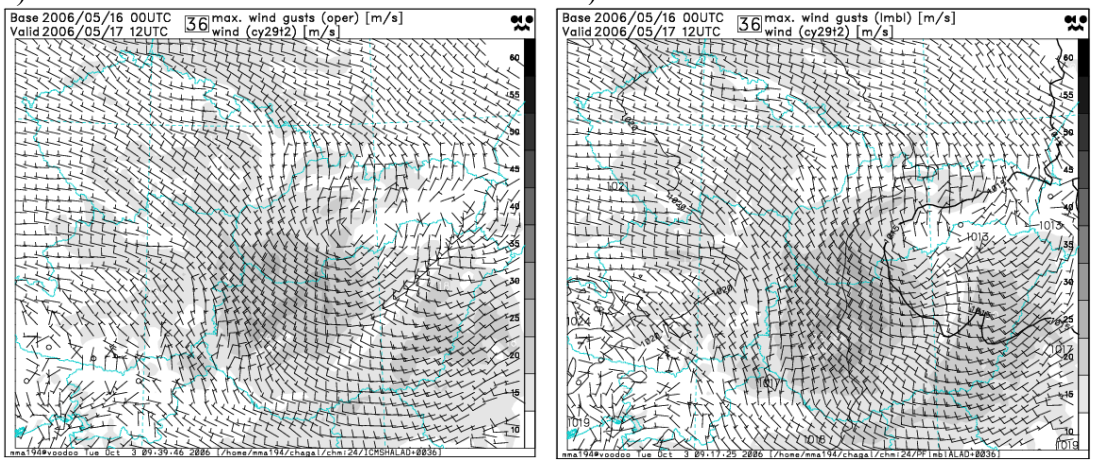

Fig. 37: a) Forecasts of 10m wind and wind gusts in the 17 May 2006 situation (cold front passing through Hungary and eastern Slovakia) by operational ALADIN CHMI model.

b) the same, except for the ALARO 3-MT with GCS06-BL89 mixing length

Case nr. 4: 20 December 1998 rapid cyclogenesis in Northern Atlantic

This case of rapid cyclogenesis is very known for its sensitivity on the parameterization of turbulent transport of enthalpy. Successful forecasts of the cyclogenesis in ARPÈGE model were given by CYCORA and CYCORA-ter parameterizations, where the vertical discretisation and limitation of critical Richardson number supported the development of the cyclone (though at the cost of large decrease of static stability in certain areas). Return to more stable parameterization (cycle 25 and 28) had rather negative influence on the predictability of the 20 December 1998 event. The TKE scheme of ARPÈGE CLIMAT (tests with cy24, in 2002) was able to forecast the cyclone, however, with not realistic evolution (probably linked with the parameterization of stratiform precipitation).

The ALARO -3MT was run on large domain that was specially designed for the ALADIN experiments in northern Atlantic (horizontal resolution in scale of the GCM models). The initial and boundary conditions are from ARPÈGE run of cycle 25 (already used for experiments with the mixing length in ALADIN at Mètèo France). Besides the 84 hour forecasts of the cyclone, attention was paid on its 3-D structure during the early stage of its evolution (24 hour forecast).

The reference forecast with GC05 mixing length (Fig. 38) is predicting only shallow low, as well, as the merged GCS06-BL89 run that is about something deeper (Fig. 39).

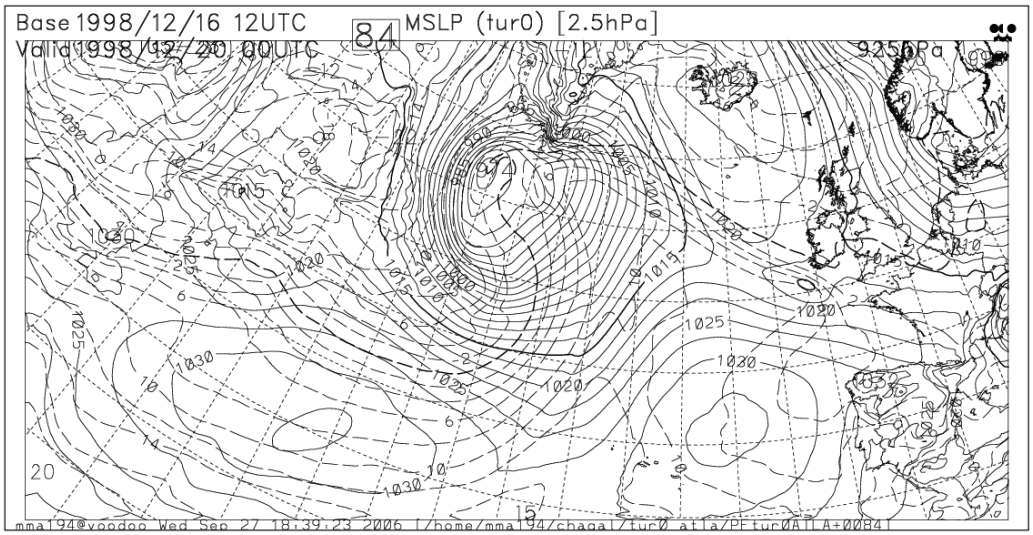

Fig. 38: Forecast of the 20 December 1998 cyclone by ALARO-3MT with GC05 type of mixing length

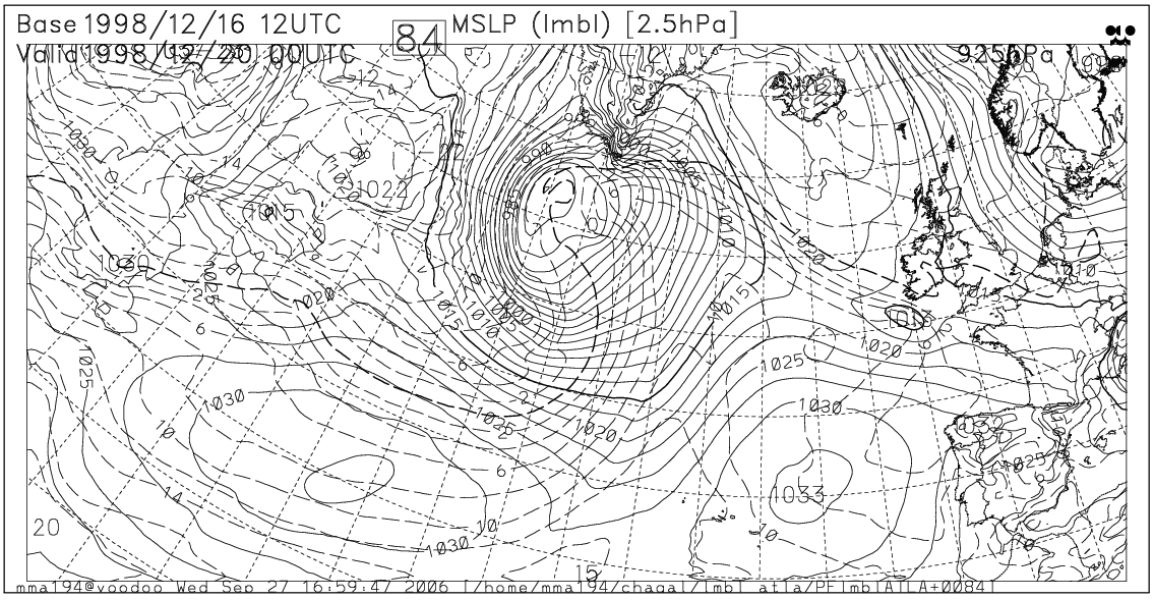

Fig. 39: The same as Fig. 38, except for the GCS06-BL89 parameterization.