Richard Mladek defended his thesis

"Study of indirect influence of orographic obstacles in numerical weather prediction models"

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A complete description of all effects of the model orography is one of the basic condition for successful weather forecast in state-of-art numerical weather prediction models (NWPM). The model orography is still very coarse comparing the real Earth surface and regarding present-day models` resolutions. Hence, at the scale around ten kilometres in the NWPM the sub-grid scale orography has important effects on the atmospheric flow and has to be parameterized. Well proposed and tuned sub-grid scale orography parameterization (SSOP) gives better global waves pattern but a positive influence can be seen in almost every regularly verified atmospheric quantities. The orography-induced precipitation is an important manifestation of the indirect impact of the SSO where many complicated atmospheric processes are combined. This kind of precipitation is a main subject of interest of presented thesis. The changes of vertical profiles of the most important atmospheric quantities which can be related to the SSOP are studied as well. The stratospheric ozone is of a special interest as a possible indicator and indirect consequence of dynamics-induced changes in the higher levels of the atmosphere.

In the first chapter a summary of the most important phenomena related to the SSOP in NWPM is presented. The operational and newly modified parameterization scheme used in the numerical model ALADIN are more precisely described. The new SSOP combined with mean orography replaces the older one based on the envelope orography concept complemented with gravity wave and form drag scheme.

The evaluation and intercomparison of precipitation forecasts over the Alpine region of four different atmospheric models is presented in second chapter. Operational precipitation forecasts of Swiss, Italian, German and French models are compared to the new analysis of Alpine rainfall (Frei and SchÃ¤r, 1998) for two periods of interest to the Mesoscale Alpine Programme (MAP).

The influence of the tuned new SSOP on ARPEGE/ALADIN is further studied in the Alpine region and on the Czech domain where high resolution precipitation analyses are available. Short term (up to +30 hour) as well as monthly ?climatic? integrations are done to see the impact of various time scales. The last chapter presents the study of changes in vertical ozone, temperature, wind speed and geopotentiel profiles due to new SSOP. The climatic version of global model ARPEGE has been used because it treats the ozone as a prognostic variable including its simplified chemistry, diffusion and deposition.