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Dynamical adaptation of climatologic data

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The global climatic models (GCM) and ERA data resolution are not sufficient for the regional climatic analysis. From GCM and ERA data one can obtain applicable information, but without regional aspect. These considerations could be in some cases important and have influence to the climatic results interpretation. For these reasons sophistical methods are implemented to obtain climatologic fields with more detailed structure than GCM and ERA are provided. Dynamical adaptation and regional numerical models are one way, how to do this assumptions. The differences between dynamical adaptation and regional model are not large. Dynamical adaptation is the method that is differed from classical approach applied in regional or limited area climatic models in the using of lateral boundary conditions and in the complexity of the algorithm. Dynamic adaptation is a process, which allows improving the quality of analysed meteorological data effectively. This method improves the density of grid points with preservation of dynamic consistency among meteorological variables. Dynamical adaptation, which we apply for regional analysis of atmospheric properties, has base in the governed equations of fluid motion. The resolution of investigated input data is from 2.5 to 3.5 degree in meridional and zonal direction. For Slovakia territory, it means that resolution is about 250 km in both directions. The orography with resolution above hundred square kilometers is absolutely inconvenient for investigation of features, which are observed in regional scale. The varied orography in Slovakia forces us to use dynamical adaptation. To prevent a big stress from resolution transition, from hundred to tens kilometers resolution, it is convenient apply multi nesting technique. It means, that resolution of the model is changed gradually. For the first transition, where it is supposed that advective and macro-synoptic processes are important, the more simplified governed equations are used. We have chosen quasi-geostrophic equivalent barotropic model for this reason. This kind of model is characterized with balance of

the wind and the mass field, the gravity waves are absent in this case, but orography is implemented and acts as forcing force on the right side of equation. These simplifications are valid for large atmospheric processes. This approach is used for the reason of possibility to compute model on the all sphere. These results, as one alternative, are used as initialization of limited area model, which works as 3D model. The base of this model is an Arakawa and Lamb energy conservation scheme for nondivergent flow. These features allow us to use this model in higher resolution, which can be above 10 km. This model works with surface pressure, zonal and meridional wind components and temperature as prognostic variable. Geopotential of general sigma levels and generalize vertical velocity are diagnostic variable. In vertical direction, staggered grid is used and top of the models is at 500 hPa in this time. The vertical layer is divided on 22 layers and sub-layers. In horizontal direction staggered 'C' grid is used. As told above, dynamical adaptation is differed from standard numerical integration mainly in the boundary conditions forcing. In our case we take daily data. For integration we take every day separately and we perform integration (dynamical adaptation) on the fields for chosen day. These fields are adapted to the new orography and can be interpreted as new dynamically consistent fields on the higher dense grid in the same time. This cost effective methods, which increase the data resolution, allow us to apply these results, for example, to the investigation of land-energy utilization, create the maps for prevalent wind and choose the suitable territory for wind power-plant building.