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Large scale forcing in mesoscale modeling

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Since the early pioneering work of many atmospheric scientists mesoscale models are now a widely used tool. Compared to large scale models they are capable of simulating a wide spectrum of atmospheric phenomena and have the advantage to get rid of many insufficient parametrisations of smaller scale phenomena. On the other hand they bear the disadvantage of spanning only a relatively small area of the globe and the results of mesoscale simulations are therefore relatively soon depending on the varing influences of the outside larger scale regions. For longer time applications most often mesoscale models need therefore to be nested inside into the model domains of a larger scale model. Applications are therefore often hampered by the lack of an additional large scale model or boundary values can only be updated off-line in coarse time steps. Also nesting into larger scale models demands extremely large computer resources.

For specific frames of applications other possibilities may be helpful to overcome those difficulties. In this paper a method of splitting up the spectrum of atmospheric phenomena into a slower varying large scale field and a faster varying small scale field modelled by the mesoscale model itself is presented. The input for the large scale part may then be made available from data sets of reanalyses of larger atmospherics conditions from past years. These data may be used to drive a simplified set of equations for the large scale field. \\ Such a system has been realised within the mesoscale modelling system KAMM (Karlsruhe Atmospheric Mesoscale Model) in order to study the influence of regional land surface changes on regional climate, of changes of large scales on the small scales in specific areas characterised especially by the orography and to study the origin of processes triggered by mountains or by other regional terrain features. \\ Some specific experiences have been made with this modelling procedure, especially in formulating the boundary conditions. Examples of results will be discussed within the last part of the presentation.