EMS Annual Meeting Abstracts
Vol. 12, EMS2015-109, 2015
15th EMS / 12th ECAM

Representing turbulence in the grey zone

Rachel Honnert (1), Fleur Couvreux (1), Pascal Marquet (1), and Dàvid Lancz (2)
(1) CNRM, GMAP, Toulouse, France (rachel.honnert@meteo.fr), (2) HMS, Hungary(lancz.d@met.hu)

Numerical weather prediction model forecasts at horizontal grid lengths in the range of 100 m to 1 km are now possible. This range of scales is the “grey zone of turbulence”. Previous studies, based on LES analysis from the MésoNH model, showed that some assumptions of some turbulence schemes on boundary-layer structures are no valid. Indeed, boundary-layer thermals are now partly resolved and the sub-grid remaining part of the thermals is possibly large or completely absent of the model columns. First, some modifications of the equations of the shallow convection scheme have been tested in the MésoNH model and in an idealised version of the operational AROME model. In particular, the impact of modifying the closure will be presented. Secondly, although the turbulence is mainly vertical at mesoscale (>2km resolution), it is isotropic in LES (<100 m resolution). It has been proved by LES analysis that, in convective boundary layers, the horizontal production of turbulence cannot be neglected at resolutions finer than the thermals height. Thus, in the grey zone, fully unidirectional turbulence scheme should become tridirectional around 500m resolution. At Météo-France, the dynamical turbulence is modelled by a K-gradient in LES as well as at mesoscale in both MésoNH and AROME which needs mixing lengths in the formulation. Horizontal and vertical mixing lengths have been calculated from LES of neutral and convective cases at resolutions in the grey zone.