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Sensitivity of the Planetary Boundary Layer simulation in RAMS meteorological model to the solar radiation input

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The dynamics of the Planetary Boundary Layer is determined by the surface conditions, not only in terms of roughness, topography and land cover but also, and mainly, by the turbulent energy fluxes at the interface between the land and the atmosphere. In a vegetated area such fluxes, namely sensible heat and evapotranspiration, are part of the surface energy budget that is driven by the incoming solar radiation input. The modern LAM (Limited Area Model) meteorological models, the last years saw an increasing interest in the reconstruction of this surface balance, in order to provide, to the atmospheric simulation, more accurate conditions for the lower boundary. In particular, the meteorological model RAMS (Regional Atmospheric Modeling System, Colorado state University) employs a detailed SVAT model for the surface phenomena, LEAF-3, that includes vegetation dynamics, evapotranspiration, soil moisture, longwave and shortwave radiation budget, etc. An incorrect input in terms of solar radiation can lead to distortions in the simulation of the energy fluxes at the surface and, consequently, to the dynamics of the whole boundary layer. In this work a sensitivity analysis of a Large Eddy Simulation of the PBL was performed with respect to the available radiation schemes in RAMS, also comparing with the observations of a ground radiometer. The solar radiation input of the model was then replaced with the observations in order to study the changes in terms of dynamics of the PBL. The domain of the simulation was an area of 5 km2 in central Italy, in a period in Summer 2008. A discussion of the results is provided.