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WRF tests on sensitivity to PBL and LSM schemes during atmospheric transition periods: validation with BLLAST case study

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The structure and properties at a certain time of the atmospheric or planetary boundary layer (PBL) has a major importance in land-atmosphere interaction and exchange processes, i.e. in pollutants concentration, humidity or different energy vertical fluxes. Transition periods at this part of the troposphere are found difficult to properly interpret, as far as among all the processes taking place at that timing, it is not clearly stated the predominance of just one of them; moreover, a drastic change in the motion scales present in the lower atmosphere is sometimes produced. Atmospheric global models fail at representing transitional events in the PBL, mainly because of sub-grid scale phenomena. These micrometeorological processes require to be better simulated.
Weather Research and Forecast (WRF) mesoscale model offers a considerable amount of physical options and parameterizations, including different PBL and land surface model (LSM) schemes. This fact justifies a model experiment to evaluate its behavior and try to understand the differences in model performance for transition periods in the atmosphere, specifically when it moves on from a convective to a stratified stable structure at its lower region.
The Boundary Layer Late Afternoon and Sunset Turbulent (BLLAST) project organized and conducted a field campaign [1] during summer 2011 in Lannemezan (France), getting together a wide amount of meteorological instrumentation. The available extensive experimental dataset from that campaign offers an excellent opportunity for model validation.
Results of WRF sensitivity tests are presented, comparing simulations among themselves and validating them with the observational data. Different atmospheric variables involved in the late afternoon and evening transition processes are considered, both at surface (i.e. energy balance) and at higher levels (thermodynamic vertical structure), in order to obtain a wider view of the problem.

[1] Lothon, M. and co-authors (2012): The Boundary-Layer Late Afternoon and Sunset Turbulence field experiment. Paper 14B.1, 20th Symposium on Boundary-Layers and turbulence, Boston, MA, Amer. Meteor. Soc., 12 pp.