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Coupling of an atmospheric Limited Area Model with a sequential Land Surface Temperature Assimilation scheme

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Exchanges of moisture and energy between the land surface and the atmosphere are of great importance in many meteorological and hydrological phenomena. However, measuring these fluxes is very difficult especially at temporal and spatial resolutions which are significant for the study of two-way land-atmosphere interactions such as the soil moisture feedback on precipitation. Such processes are of major importance for climate studies and one of the classical issues in this respect is the precipitation recycling. In this study sequences of satellite-derived estimates of land surface temperature (LST) are used as input in a data assimilation scheme in order to retrieve parameters that describe energy balance at the land surface. Satellite data from SEVIRI sensors (aboard the Meteosat Second Generation), that provides estimates at different spatial and temporal resolutions, are used as LST input. A parsimonious 1-D multiscale variational assimilation procedure is followed, that requires also near surface meteorological variables such as wind speed, air temperature and incident solar radiation. This assimilation scheme is here coupled with the non hydrostatic limited area atmospheric model RAMS, in order to improve in the latter the quality of the energy and moisture fluxes simulation at the surface, replacing the lower boundary condition of the atmospheric domain. Coupling is realized using both the atmospheric model for producing consistent meteorological forcing fields and products of the assimilation procedure inside the meteorological simulation. Comparison between meteorological simulation results with and without coupling with the assimilation scheme is discussed, both in terms of reconstruction of surface variables and of vertical characterization of the atmosphere. In particular, the effects of the coupling on the moisture

feedback between soil and atmosphere are considered and estimates of the recycling ratio are provided. The area of study is the Arno River Basin (8000 km2), in central Italy, in a period of 4 months, from June to September 2005.