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Sequential assimilation of land surface temperatures from satellite coupled with an atmospheric limted area model

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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. At the same time, 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 soil moisture feedback on precipitation. In this work sequences of satellite 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 MODIS (aboard Terra and Aqua) and SEVIRI (aboard the Meteosat Second Generation), that provides LST estimates at different spatial and temporal resolutions, are used as LST input. A parsimonious 1-D multiscale variational assimilation method is followed, that requires also near surface meteorological variables such as wind speed, air temperature and incident solar radiation. Such an assimilation scheme is here coupled with the atmospheric limited area model (LAM) RAMS, in order to improve in the latter the quality of energy and moisture fluxes simulation in the atmospheric boundary layer. RAMS (Regional Atmospheric Modeling System) is currently utilized at LaMMA (Laboratorio di Meteorologia e Modellistica Ambientale) to produce meteorological forecasts on central Italy region at a 6-8 km spatial resolution. Coupling is realized both using the atmospheric model for producing consistent meteorological forcing fields and using products of the assimilation procedure inside the meteorological simulation. Comparison between meteorological simulation results with and without coupling with the assimilation scheme is discussed. Effects of cloud cover variability during the period of simulation is also considered. The area of study is the Arno River Basin (8000 km2), in central Italy, in a period of 4 months,

from may to august 2005.