Geophysical Research Abstracts
Vol. 16, EGU2014-11346, 2014
EGU General Assembly 2014
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Impact of the assimilation of satellite soil moisture and LST on the hydrological cycle

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The reliable estimation of hydrological variables (e.g. soil moisture, evapotranspiration, surface temperature) in space and time is of fundamental importance in operational hydrology to improve the forecast of the rainfall-runoff response of catchments and, consequently, flood predictions. Nowadays remote sensing can offer a chance to provide good space-time estimates of several hydrological variables and then improve hydrological model performances especially in environments with scarce ground based data.
The aim of this work is to investigate the impacts on the performances of a distributed hydrological model (Continuum) of the assimilation of satellite-derived soil moisture products and Land Surface (LST).
In this work three different soil moisture (SM) products, derived by ASCAT sensor, are used. These data are provided by the EUMETSAT's H-SAF (Satellite Application Facility on Support to Operational Hydrology and Water Management) program. The considered soil moisture products are: large scale surface soil moisture (SM OBS 1 - H07), small scale surface soil moisture (SM OBS 2 - H08) and profile index in the roots region (SM DAS 2 - H14). These data are compared with soil moisture estimated by Continuum model on the Orba catchment (800 km2), in the northern part of Italy, for the period July 2012-June 2013.
Different assimilation experiments have been performed. The first experiment consists in the assimilation of the SM products by using a simple Nudging technique; the second one is the assimilation of only LST data, derived from MSG satellite, and the third is the assimilation of both SM products and LST. The benefits on the model predictions of discharge, LST and soil moisture dynamics were tested.