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Estimation of soil moisture-thermal infrared emissivity relation in arid and semi-arid environments using satellite observations

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The retrieval of surface parameters is very important for various aspects concerning the climatological and meteorological context. At this purpose surface emissivity represents one of the most important parameters useful for different applications such as the estimation of climate changes and land cover features. It is known that thermal infrared (TIR) emissivity is affected by soil moisture, but there are very few works in literature on this issue.
This study is aimed to analyze and find a relation between satellite soil moisture data and TIR emissivity focusing on arid and semi-arid environments.
These two parameters, together with the land surface temperature, are fundamental for a better understanding of the physical phenomena implied in the soil-atmosphere interactions and the surface energy balance. They are also important in several fields of study, such as climatology, meteorology, hydrology and agriculture.
In particular, there are several studies stating a correlation between soil moisture and the emissivity at 8-9 μm in desertic soils, which corresponds to the quartz Reststrahlen, a feature which is typical of sandy soils.
We investigated several areas characterized by arid or semi-arid environments, focusing our attention on the Dahra desert (Senegal), and on the Negev desert (Israel). For the Dahra desert we considered both in situ, provided by the International Soil Moisture Network, and satellite soil moisture data, from ASCAT and AMSR-E sensors, for the whole year 2011. In the case of the Negev desert soil moisture data are derived from ASCAT observations and we computed a soil moisture index from a temporal series of SAR data acquired by the Cosmo-SkyMed constellation covering a period of six months, from June 2015 to November 2015.
For both cases soil moisture data were related to the retrieved TIR emissivity from the geostationary satellite SEVIRI in three dierent spectral channels, at 8.7 μm, 10.8 μm and 12 μm. A Kalman lter physical approach was used to obtain surface emissivity from SEVIRI TIR radiances.
We discuss our preliminary results on the soil moisture-emissivity correlation in order to develop a proper model for arid soils.