Influence of the micro-physical properties of the aerosol on the atmospheric correction of OLI data acquired over desert area

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This paper focuses on the evaluation of surface reflectance obtained by different atmospheric correction algorithms of the Landsat 8 OLI data considering or not the micro-physical properties of the aerosol when images are acquired in desert area located in South-West of Nile delta.

The atmospheric correction of remote sensing data was shown to be sensitive to the aerosol micro-physical properties, as reported in Bassani et al., 2012. In particular, the role of the aerosol micro-physical properties on the accuracy of the atmospheric correction of remote sensing data was investigated [Bassani et al., 2015; Tirelli et al., 2015].

In this work, the OLI surface reflectance was retrieved by the developed OLI@CRI (OLI ATmospherically Corrected Reflectance Imagery) physically-based atmospheric correction which considers the aerosol micro-physical properties available from the two AERONET stations [Holben et al., 1998] close to the study area (El_Farafra and Cairo_EMA_2). The OLI@CRI algorithm is based on 6SV radiative transfer model, last generation of the Second Simulation of a Satellite Signal in the Solar Spectrum (6S) radiative transfer code [Kotchenova et al., 2007; Vermote et al., 1997], specifically developed for Landsat 8 OLI data.

The OLI reflectance obtained by the OLI@CRI was compared with reflectance obtained by other atmospheric correction algorithms which do not consider micro-physical properties of aerosol (DOS) or take on aerosol standard models (FLAASH, implemented in ENVI software).

The accuracy of the surface reflectance retrieved by different algorithms were calculated by comparing the spatially resampled OLI images with the MODIS surface reflectance products.

Finally, specific image processing was applied to the OLI reflectance images in order to compare remote sensing products obtained for same scene.

The results highlight the influence of the physical characterization of aerosol on the OLI data improving the retrieved atmospherically corrected reflectance.

One of the most important outreach of this research is the retrieval of the highest possible accuracy of the OLI reflectance for land surface variables by spectral indices. Consequently if OLI@CRI algorithm is applied to time series data, the uncertainty into the time curve can be reduced.

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