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Sensitivity of atmospheric correction to loading and model of the aerosol

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The physically-based atmospheric correction requires knowledge of the atmospheric conditions during the remotely data acquisitions [Guanter et al., 2007; Gao et al., 2009; Kotchenova et al. 2009; Bassani et al., 2010]. The propagation of solar radiation in the atmospheric window of visible and near-infrared spectral domain, depends on the aerosol scattering. The effects of solar beam extinction are related to the aerosol loading, by the aerosol optical thickness @550nm (AOT) parameter [Kaufman et al., 1997; Vermote et al., 1997; Kotchenova et al., 2008; Kokhanovsky et al. 2010], and also to the aerosol model. Recently, the atmospheric correction of hyperspectral data is considered sensitive to the micro-physical and optical characteristics of aerosol, as reported in [Bassani et al., 2012].
Within the framework of CLAM-PHYM (Coasts and Lake Assessment and Monitoring by PRISMA HYperspectral Mission) project, funded by Italian Space Agency (ASI), the role of the aerosol model on the accuracy of the atmospheric correction of hyperspectral image acquired over water target is investigated. In this work, the results of the atmospheric correction of HICO (Hyperspectral Imager for the Coastal Ocean) images acquired on Northern Adriatic Sea in the Mediterranean are presented. The atmospheric correction has been performed by an algorithm specifically developed for HICO sensor. The algorithm is based on the equation presented in [Vermote et al., 1997; Bassani et al., 2010] by using the last generation of the Second Simulation of a Satellite Signal in the Solar Spectrum (6S) radiative transfer code [Kotchenova et al., 2008; Vermote et al., 2009].
The sensitive analysis of the atmospheric correction of HICO data is performed with respect to the aerosol optical and micro-physical properties used to define the aerosol model. In particular, a variable mixture of the four basic components: dust- like, oceanic, water-soluble, and soot, has been considered. The water reflectance, obtained from the atmospheric correction with variable model and fixed loading of the aerosol, has been compared.
The results highlight the requirements to define the aerosol characteristics, loading and model, to simulate the radiative field in the atmosphere system for an accurate atmospheric correction of hyperspectral data, improving the accuracy of the results for surface reflectance process over water, a dark-target.
As conclusion, the aerosol model plays a crucial role for an accurate physically-based atmospheric correction of hyperspectral data over water. Currently, the PRISMA mission provides valuable opportunities to study aerosol and their radiative effects on the hyperspectral data.

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