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Application of coupled ocean-atmospheric RTM SCIATRAN to retrieve CDOM fluorescence from space: first results

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Colored dissolved organic matter (CDOM) is the main abiotic photoreactive constituent in marine waters. It strongly absorbs light in UV and blue region of light spectrum, reducing potentially harmful UV radiation, but also - when abundant - limiting the amount of light available for photosynthesis. DOM is a significant element in the carbon cycle and thus its optical properties have been studied extensively to estimate CDOM concentration and characterize its chemical composition. It has been known for several years that part of the CDOM pool is also fluorescent (FDOM), but only for the
last 20 years fluorescence measurements became feasible. Measurements of fluorescence are more sensitive than of absorption and permit a better discrimination of CDOM sources. However, although CDOM the absorption coefficient is routinely retrieved from space CDOM (e.g. Maritorena et al., 2002), such attempts have not yet been made to derive information about CDOM
fluorescence.
Here we propose a method to retrieve CDOM fluorescence information from SCIAMACHY onboard ENVISAT using Differential Optical Absorption Spectroscopy (DOAS). In order to do so, CDOM fluorescence was firstly implemented into radiative transfer model SCIATRAN (Rozanov et al., 2005). Though CDOM fluorescence only slightly changes the radiation at the top of atmosphere, its presence can be noticed in filling-in of Fraunhofer lines in Earth spectra and hence derived. Another inelastic processes - Vibrational and Rotational Raman Scattering - have already proven to alter trace gases and chlorophyll DOAS retrievals (Vountas et al., 1998, Vountas et al., 2003, Vountas et al., 2007). Different scenarios of CDOM fluorescence have been run to assess how CDOM fluorescence changes light radiation and if its signal can be detected by satellite instruments. First results, presenting CDOM retrieval of both simulated and real satellite data, prove that it can be feasible to retrieve CDOM fluorescence from space.

References:

Maritorena, S., D.A. Siegel and A.R. Peterson, (2002). Optimization of a semianalytical ocean color model for global-scale applications. Applied Optics-LP, 41, 2705-2714.
Rozanov, A., Rozanov, V.V., Buchwitz, M., Kokhanovsky, A., and Burrows, J.P., SCIATRAN 2.0 - A new radiative transfer model for geophysical applications in the 175-2400 nm spectral region, Adv. in Space Res. 36, 1015-91019 (2005)
Vountas, M., Rozanov, V., and Burrows, J. P.: Ring effect: Impact of rotational Raman scattering on radiative transfer in earth's atmosphere, J. Quant. Spectrosc. Radiat. Transfer, 60, 943-961, 1998.
Vountas, M., Richter, A., Wittrock, F., and Burrows, J. P.: Inelastic scattering in ocean water and its impact on trace gas retrievals from satellite data, Atmos. Chem. Phys., 3, 1365-1375, 2003.
Vountas, M., Dinter, T., Bracher, A., Burrows, J. P., and Sierk, B.: Spectral studies of ocean water with space-borne sensor SCIAMACHY using Differential Optical Absorption Spectroscopy (DOAS), Ocean Sci., 3, 429-440, 2007.