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Modeling of the adjacency effects for the AERONET-OC sites

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The AERONET-OC network of in-situ autonomous sensors for the measurement of optical water properties has been established in the last years to allow for an accurate validation of retrieved ocean color satellite products. Consistent effort has been done over the years to investigate, quantify (and eventually correct) all possible sources of uncertainties affecting the validation process.
The AERONET-OC sites are all located in coastal areas, with a distance from the coast ranging between 4 and 144 km [1]. Consequently, the radiation reflected by nearby mainland and then scattered by the atmosphere in the sensor line of sight, may represent a source of uncertainty affecting satellite products at the sites. Such phenomenon is called adjacency effect, and always arises in presence of a scattering atmosphere over a non-uniform underlying reflecting surface [2]. This signal contribution is usually neglected by main ocean color conventional atmospheric correction schemes.
Investigations on uncertainties induced by adjacency effect at AERONET-OC sites have been already performed using both a simple parametric relationship [1] and analyzing the spatial variability of satellite-derived products along transects extending from the coast and intercepting selected sites [3]. The somehow contradictive results underlined the need to address once more the topic, modeling the effect with significantly increased accuracy.
The adjacency effect, quantified as the difference in adjacency contribution between the inhomogeneous and the homogeneous case, has been here parameterized in order to decouple surface reflectivity properties from geometric and atmospheric dependencies. The simulation exercise has been carried out in a specific area of the Northern Adriatic Sea along a transect crossing the Venice Lagoon (characterized by a complicated coastal pattern) and embracing the Aqua Alta Oceanographic Tower (AAOT, 45.31N, 12.51E), 15 km away from the coast, selected as a representative AERONET-OC site. A set of realistic geometric, atmospheric, water and land parameters encountered in typical ocean color observations has been selected. The Novel Adjacency pertUrbation Simulator for CoastAl Areas (NAUSICAA) full 3D backward MonteCarlo code has been developed to accurately perform the simulations, while the highly accurate plane-parallel FEM numerical algorithm [4], based on the finite element method, has been used as reference.
Results show the adjacency effects strongly depend on illumination and observation conditions. Simulations indicate the adjacency effects at the AAOT site to give a negligible contribution in the visible spectral region, while giving in the near infrared a contribution to the total signal at the sensor up to few percent.

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