Geophysical Research Abstracts
Vol. 19, EGU2017-17524, 2017
EGU General Assembly 2017

Reliable retrieval of atmospheric and aquatic parameters in coastal and inland environments from polar-orbiting and geostationary platforms: challenges and opportunities

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Simultaneous retrieval of aerosol and surface properties by means of inverse techniques based on a coupled atmosphere-surface radiative transfer model, neural networks, and optimal estimation can yield considerable improvements in retrieval accuracy in complex aquatic environments compared with traditional methods. Remote sensing of such environments represent specific challenges due (i) the complexity of the atmosphere and water inherent optical properties, (ii) unique bidirectional dependencies of the water-leaving radiance, and (iii) the desire to do retrievals for large solar zenith and viewing angles. We will discuss (a) how challenges related to atmospheric gaseous absorption, absorbing aerosols, and turbid waters can be addressed by using a coupled atmosphere-surface radiative transfer (forward) model in the retrieval process, (b) how the need to correct for bidirectional effects can be accommodated in a systematic and reliable manner, (c) how polarization information can be utilized, (d) how the curvature of the atmosphere can be taken into account, and (e) how neural networks and optimal estimation can be used to obtain fast yet accurate retrievals. Special emphasis will be placed on how information from existing and future sensors deployed on polar-orbiting and geostationary platforms can be obtained in a reliable and accurate manner. The need to provide uncertainty assessments and error budgets will also be discussed.