Cloud Height Retrieval with Oxygen A and B bands for the Deep Space Climate Observatory (DSCOVR) Mission

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Abstract

Planned to fly in 2014, the Deep Space Climate Observatory (DSCOVR) would see the whole sunlit half of the Earth from the L1 Lagrangian point and would provide simultaneous data on cloud and aerosol properties with its Earth Polychromatic Imaging Camera (EPIC). EPIC images the Earth on a 2Kx2K CCD array, which gives a horizontal resolution of about 10 km at nadir. A filter-wheel provides consecutive images in 10 spectral channels ranging from the UV to the near-IR, including the oxygen A and B bands.

This paper presents a study of retrieving cloud height with EPIC's oxygen A and B bands. As the first step, we analyzed the effect of cloud optical and geometrical properties, sun-view geometry, and surface type on the cloud height determination. Second, we developed two cloud height retrieval algorithms that are based on the Mixed Lambertian-Equivalent Reflectivity (MLER) concept: one utilizes the absolute radiances at the Oxygen A and B bands and the other uses the radiance ratios between the absorption and reference channels of the two bands. Third, we applied the algorithms to the simulated EPIC data and to the data from SCanning Imaging Absorption SpectroMeter for Atmospheric CartograpHY (SCIAMACHY) observations. Results show that oxygen A and B bands complement each other: A band is better suited for retrievals over ocean, while B band is better over vegetated land due to a much darker surface. Improvements to the MLER model, including corrections to surface contribution and photon path inside clouds, will also be discussed.