Water vapor content retrieval in cloudy sky conditions from SWIR satellite observations in the context of C³IEL, a French Israeli space mission project

Peroni Raphaël [a,*], Cornet Céline [a], Pujol Olivier [a], Penide Guillaume [a], and Pierangelo Clémence [b]

[a] Laboratoire d'Optique Atmosphérique – LOA, CNRS, Université de Lille – France
[b] Centre National d'Etudes Spatiales – CNES, Toulouse – France

[*]**corresponding author**: raphael.peroni@univ-lille.fr

Atmospheric water vapor plays an important role in the formation and development of convective clouds which redistribute water vapor in the atmosphere through entrainment and detrainment processes (Blyth 1993). It is also involved in dynamical processes which defines the global atmospheric circulation, through the release of latent heat during the process of water vapor condensation. Consequently, a better knowledge of the water vapor content above and around clouds is required to better understand the aerosols-water-vapor-clouds interactions and to better constraint **L**arge **E**ddy **S**cale (LES) and numerical weather prediction models. Our work focuses on the development of an **I**ntegrated **W**ater **V**apor **C**ontent **A**bove **C**loud (IWVC AC) retrieval algorithm in cloudy sky conditions through an **O**ptimal **E**stimation **M**ethod (OEM). This work is part of a French Israeli space mission project named C³IEL, for **C**luster for **C**loud evolution, **C**l**I**mat**E** and **L**ightning. This mission aims at studying with a high spatiotemporal resolution, convective clouds development, electrical activities, and the atmospheric water vapor content above and around convective clouds. Water vapor content retrieval is based on the use of three **S**hort**W**ave **I**nfra**R**ed (SWIR) spectral bands: a non-water-vapor-absorbing band (centered at 1.04 µm) and two other ones for which water vapor is absorbing (centered at 1.13 µm and 1.37 µm). Several studies have shown the feasibility to retrieve a water vapor content from NIR or SWIR spectral bands, but mainly in clear sky conditions through the differential absorption method e.g. Vesperini et al. 1999. However, these parameterizations developed for studies in clear sky conditions are no longer suitable in the presence of clouds, and few studies address the feasibility of such a retrieval in cloudy sky conditions (Albert et al. 2001). We will present the developed retrieval algorithm which permits us to retrieve the **C**loud **O**ptical **T**hickness (COT) and the IWVC AC and the results obtained for several profiles in cloudy sky conditions above the ocean.

Keywords: Retrieval algorithm, Optimal estimation method, clouds, water vapor, C³IEL

References

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