



## Helicopter-borne New Radiative Retrievals of Microphysical and Optical Properties of Trade Wind Cumuli

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Data from collocated cloud solar spectral reflection and microphysical in situ measurements of trade wind cumuli over Barbados are presented. Microphysical and optical properties (liquid water content,  $LWC$ , effective droplet radius,  $R_{eff}$ , droplet number concentration) were measured in situ by the Airborne Cloud Turbulence Observation System (ACTOS) attached to a helicopter by a 140 m long rope. The same data are independently retrieved from solar spectral reflectivity measurements which were performed by the Spectral Modular Airborne Radiation measurements sysTem (SMART-HELIOS). To mitigate the effect of overlying cirrus during most of the campaign, which obscures the usual bi-spectral retrieval method of microphysical parameters, trade wind cumuli properties ( $\tau$ ,  $LWC$ ,  $R_{eff}$ ) are derived by means of a new retrieval method. The new approach effectively corrects for the influence of cirrus above the cumuli. The retrieved data are compared to the usual retrieval method and respective in situ results.

It is shown that the new algorithm enables reliable retrievals under thin ( $\tau_{ci} < 1$ ), overcast cirrus conditions. The retrieval error caused by the simultaneous presence of the cirrus can be reduced by up to 50%.

The retrieval results are finally combined with in situ measurements of microphysical properties and aerosol number concentrations to illustrate the influence of aerosol particles on cloud microphysical properties and the radiative field on various cloud scenes.