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Variability of liquid water path in marine stratocumulus clouds

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Our recent research†develops a method that allows investigation of the seasonal variability of in-cloud Liquid Water Path (LWP) in the West African Stratocumulus region, by exploiting co-located data from instruments on the Aqua satellite, which is a part of the A Train Amongst other instruments, Aqua carries two Clouds and the Earth's Radiant Energy System (CERES) instruments, FM3 and FM4, as well as a MODerate Resolution Imaging Spectroradiometer (MODIS) instrument, and the microwave imager Advanced Misrowave Sounding Unit for EOS (AMSR-E). We use information from MODIS measurements of cloud properties, including in-cloud liquid water derived from measurements in the near-IR part of the spectrum, CERES measurements of broadband radiation, and AMSR-E measurements of scene total Liquid Water Path, and column integrated water vapour. Using this information we construct a dataset of the microphysical and radiative properties of overcast MBL cloud in the West African Stratocumulus region. We exploit the co-location of these instruments to generate two independent measurements of in cloud liquid water for overcast Stratocumulus cloud. †The seasonal and interannual variability of liquid water path, overcast cloud extent, and radiative properties of the cloud, together with information from CERES and MODIS on OLR and droplet effective radius respectively provide a comprehensive overview of the variability of cloud liquid water, micro- and macrophysical properties and the changing radiative impact of Marine Boundary Layer (MBL) cloud throughout the annual cycle. Understanding of these changes and the processes that govern them are fundamental to the understanding of the cloud systems and their possible responses to a changing environment. The aim of this research is to provide a statistical analysis of independently derived estimates of cloud liquid water in Marine Boundary Layer clouds, which may be used† to improve understanding of the complex properties of the system and the representation of cloud microphysical properties in global climate models.