Planetary Boundary Layer Heights from COSMIC and CALIOP over Ocean

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Accurate characterization of the evolution of the planetary boundary layer (PBL) height is critical to quantify the exchange of energy and moisture from the Earth surface to the free troposphere, which in turn impacts the formation of clouds and water and energy cycles. Recent studies have shown that the high vertical resolution Global Positioning System (GPS) radio occultation (RO) data from FORMOSAT-3/Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC) are very useful to detect the PBL heights. However, due to lack of high vertical resolution in situ observations, validation of RO PBL height especially over the oceans is very difficult. In this study, the PBL heights derived from COSMIC RO data are compared to those derived from the Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP) measurements over ocean where widespread persistent stratocumulus clouds occurred. The PBL height is usually well defined by the height of these clouds. On board the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observation (CALIPSO) satellite, CALIOP is a two-wavelength (532 nm and 1064 nm) polarization-sensitive lidar that provides high-resolution vertical profiles of aerosols and clouds. The cloud-top layer determined by CALIOP has been intensively validated. In this study, the cloud-top heights derived from CALIOP level 1 total attenuated backscatter products for 2008 are used to validate the RO-derived PBL heights over ocean. Results show that PBL heights determined by RO measurements are quite accurate compared to the CALIOP observations. The seasonal variation of RO derived PBL heights in different regions are also presented.