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The Barbados Cloud Observatory measurements as validation for future satellite missions

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Since 2010, the Barbados Cloud Observatory (BCO) has been located on the east coast of the island of Barbados, where it is exposed to the relatively undisturbed easterly trade winds. In this study, we aim to demonstrate the potential of the measurements at the BCO as a ground-based validation for future satellite missions like the upcoming Earth Cloud Aerosol and Radiation Explorer (EarthCARE) mission launching in late 2019/early 2020. The EarthCARE satellite is composed of four instruments: a 94 GHz millimeter wavelength Cloud Profiling Radar (CPR) with Doppler capability (a first for satellite observations), a high spectral resolution Atmospheric Lidar (ATLID) operating with a 355nm laser and depolarisation detector, a pushbroom-style Multispectral Imager (MSI) providing cross-track observations with seven spectral channels in the visible and near, shortwave and thermal infrared and a Broadband Radiometer (BBR) with three telescopes pointing in different viewing angles (forward, nadir, and backward) each containing a shortwave (0.25 - 4.0μm) and total wave channel (0.25 - 50μm).

To show the benefit of using the BCO measurements as validation for future missions, we will present a comparison between the BCO and current satellite instruments on CloudSat and CALIPSO, which are part of the A-train constellation of satellites. The Cloud Profiling Radar (also CPR) is a nadir-looking millimeter wavelength cloud radar operating at 94 GHz and measures the backscattered power from clouds and precipitation. The Cloud-Aerosol Lidar with Orthogonal Polarisation (CALIOP) is a Nd-YAG two-wavelength vertical aerosol and cloud profiler capable of characterising aerosol properties from linear depolarisation. Thus, we will present a comparison of the BCO Ka-band radar with the CPR and a further comparison of seasonal mean clear-sky aerosol distribution between the BCO multi-channel Raman lidar and CALIOP.