



Barbados Cloud Observatory: Raman Lidars for air temperature, humidity, aerosols and cloud characterization

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Processes governing the development and evolution of shallow cumulus clouds in trades remain a large uncertainty in climate studies. To enrich the experimental database, Max Planck Institute for Meteorology in cooperation with Caribbean Institute for Meteorology and Hydrology have established and maintain since April 2010 the Barbados Cloud Observatory (13.1627 N, 59.4289 W) equipped among other instrumentation with multi-channel Raman lidar to profile routinely the cloud stratification, aerosol properties, air temperature and humidity. More than six years of operation with nearly continuous data flow resulted in quite extensive and statistically representative dataset. In this presentation we describe and evaluate three generations of Raman lidars that have been or are begin deployed at the observatory. Focusing primarily on our first lidar initially deployed on the site, an EARLI system (the MPI-M Raman lidar originally designed for EARLINET, the European Aerosol Research Lidar NETwork) that gave us most of the lidar data collected, we compare it to the presently deployed instrument, the LICHT system (Lidar for Clouds, Humidity and Temperature) designed to extend the observation with daytime measurements of water vapor. Third-generation lidar, a high power Raman lidar component of the upcoming CORAL system (Cloud Observation with RAdar and Lidar) developed for high resolution water vapor measurement is being prepared for deployment and will be described conceptually. Giving an overview on the technique implemented, we touch briefly the lidar calibration algorithms, some aspects of quality assurance, and present the data available with a particular focus on the ability of the instruments to measure atmospheric humidity and extinction.