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CHARACTERIZATION OF CIRRUS CLOUDS IN CENTRAL AMAZON (2.89° S 59.97° W) USING A GROUND-BASED LIDAR SYSTEM

Interactions between aerosols, clouds and precipitation

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Cirrus cloudshave been recognized as important agents of the climate system as they cansigni?cantly alter the radiation balance of the atmosphere. Despite beingrelatively transparent to solar radiation (optical depth < 3.0), they trapthe infrared radiation that would be lost to space, and thus have a positiveradiative forcing. They are found near the tropopause and are formed mainly bynon-spherical ice crystals, with a lifetime that can go from hours to a fewdays. Its importance grows due to its large coverage area. The global cirruscover has been estimated to be about 20-25% and their occurrence can be morethan 70% over the tropics. In this paper, we report on tropical cirrus cloudscharacteristics as measured by a Lidar station operational in the centralAmazon region since 2011. An automated algorithm for the detection of cirrusclouds was developed, which is used to determine the clouds geometricalproperties. The transmittance of the lidar signal was used to derive the cirrusoptical depth. The Klett and Raman methods were used to derive thebackscattering coe?cient and to estimate the lidar-ratio of the cirrus clouds.As the results from the ?rst two years of measurements (2011-2012), we foundthat the occurrence of cirrus clouds was approximately 71.0% of the total timeof observation, and approximately 24.2% of all cirrus were subvisual (t<0.03),40.7% were thin cirrus (0.03<t<0.3) and 35.1% were cirrus stratus(t>0.3). The average values of the cirrus base and top altitudes were 12.4±2.4kmand 14.3±2.2km, respectively, being found at temperatures down to -90°C theyreside most frequently near the tropopause. The lidar-ratio was estimated as20.0±6.8sr, indicating a mixed composition of thick plate and long column icecrystals. The behavior of these quantities with respect to temperature wasstudied. The diurnal cycle of the frequency and altitude, during both summerand winter, indicate anvil outflow to be the most important generationmechanism.