Subtropical and polar Cirrus clouds characterized by ground-based lidars and CALIPSO/CALIOP observations

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Abstract: Cirrus clouds are product of weather processes, and then their occurrence and macrophysical/optical properties can vary significantly over different regions of the world. Since Cirrus clouds usually are located from 7 km height up to tropopause altitudes, active remote sensing techniques, mainly lidar systems, are usually used for detection of Cirrus clouds from ground-based and space observations. Lidars can provide height-resolved measurements with a relatively good both vertical and temporal resolutions, making them the most suitable instrumentation for high-cloud observations. The aim of this work is to show the potential of lidar observations on Cirrus clouds detection in combination with a recently proposed methodology to retrieve the Cirrus clouds macrophysical and optical features. In this sense, a few case studies of cirrus clouds observed at both subtropical and polar latitudes are examined and compared to CALIPSO/CALIOP observations. Lidar measurements are carried out in three stations: Sao Paulo (Brazil, 23.6°S/46.8°W) and Sta. Cruz de Tenerife (Spain, 28.5°N/16.3°W), being both subtropical sites, and the Belgrano II base (Argentina, 78ºS/35ºW) in the Antarctic continent. Local radiosounding profiles are also used for cirrus-temperature correlation analysis. Optical (COD-cloud optical depth and LR-Lidar Ratio) and macrophysical (top/base heights and thickness) properties of both the subtropical and polar cirrus clouds are reported. This study is focused on the classification of the daily cloud features into three Cirrus COD-related categories: svCi-subvisual (COD < 0.03), stCi-semitransparent (COD: 0.03 - 0.3), and opCi-opaque (COD > 0.3) clouds. In general, subtropical Cirrus clouds present lower LR values and are found at higher altitudes than those detected at polar latitudes. Additionally, a higher svCi presence is observed over the polar station along the day, since svCi clouds are formed at lower temperatures. A good correlation agreement is also achieved between groundbased lidars and space-borne CALIOP measurements.

Keywords: CALIPSO, Cirrus clouds, LIDAR observations; Polar and subtropical regions

VIII WLMLA Topic: Lidar applications in environmental sciences