Cloud vertical profiling and cloud types over Thessaloniki using active and passive remote sensing.

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In this work, we utilize 10 years of space-based radar products from the CloudSat mission (Stephens et al., 2002) to provide statistics on the geometrical and microphysical properties of the clouds observed above Thessaloniki station (40.5°N, 22.9°E), in the Eastern Mediterranean.

The CloudSat cloud profiling radar was launched on 28 April 2006, part of the A-Train constellation of satellites. It operates at 94 GHz and has a sensitivity of −30 dBZ. Radar reflectivities are sampled every 240 m and have a vertical resolution of around 480 m. In this study, we use the 2B-GEOPROF radar reflectivity product (Marchandet al., 2008) and the 2B-CLDCLASS cloud type product (Sassen, K. et al., 2008). Reflectivities with a "CPR_cloud_mask" value ≥ 30 indicating high confidence in the retrieval are selected in our analysis. The cloud geometrical and microphysical properties at a spatial resolution of 1°× 1° around Thessaloniki are processed and presented. We herein analyze the data record collected between January 2007 and December 2017 to characterize the cloud properties over the study area.

The statistics of the CloudSat target classification per month are presented in Figure 1. Clouds dominate above Thessaloniki during spring (MAM) and winter (DJF). The observed clouds are classified into eight categories: stratus (St), stratocumulus (Sc), cumulus (Cu), nimbostratus (Ns), altocumulus (Ac), altostratus (As), deep convective clouds (deep), and high-level clouds (high). Stratus, altocumulus, and high clouds are persistent in the region during all months, whilst low clouds are dominant, with an exception during the summer period.

In next steps, we plan to investigate the vertical variations of the observed cloud types and compare the CloudSat retrievals with the cloud products from passive sensors, such as the EUMETSAT Climate Monitoring Satellite Applications Facility, CMSAF, products based on Seviri/MTG and AVHRR/NOAA and Metop. Additionally, the impact of clouds on radiation above Thessaloniki, will be studied using scenes with collocated CloudSat and ground-based radiation measurements.

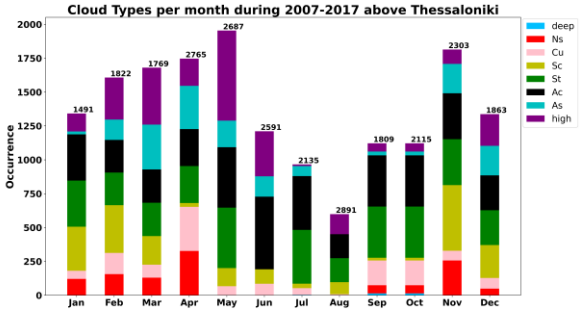

Figure 1. Monthly variation of the CloudSat aerosol types observed around Thessaloniki for the period 2007-2017. Annotated are the cloud profiles per month.

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