COMPARISON OF LIDAR AND COSMIC RADIO OCCULTATION TEMPERATURE PROFILES AT HIGH LATITUDES

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The verification of the accuracy and quality of atmospheric properties retrieved from Constellation of Observing System for Meteorology (COSMIC) measurements with the radio occultation (RO) technique requires a comparison with independent datasets. Passive satellite data, radiosonde profiles, and climatological reanalysis were used to obtain reliable comparison with RO data. In this paper we present a comparison of COSMIC temperature profiles with high latitude LIDAR (Light Detection And Ranging) observations Carried out within an intensive LIDAR measurement campaign at Thule (76.5°N, 68.8°W), Greenland, during winter 2006-2007. In winter the lidar at Thule samples stratospheric air masses belonging alternately to the inner and outer part of the Arctic polar vortex, as the vortex edge sweeps above Thule. The LIDAR system uses two receiving channels to obtain vertical profiles of backscattering from the upper troposphere, stratosphere, and lower mesosphere at 532 nm in two polarizations. Aerosol and cloud profiles in the upper troposphere and lower stratosphere, and temperature profiles between 25 and 70 km altitude are derived from the lidar data. About 200 occultations from COSMIC RO constellation were registered in the area around Thule in correspondence to lidar soundings. LIDAR and COSMIC temperature profiles in the 25-50 km altitude range were used in the comparison. When the polar vortex includes both LIDAR and RO profiles, the temperature differences are small (less than 5 K), due to the high spatial homogeneity of the temperature field inside the polar vortex. Outside the polar vortex temperature differences increase, due the smaller homogeneity of the atmospheric structures.In some cases, when Thule is close to the vortex edge and the polar vortex is vertically tilted, differences between LIDAR and COSMIC are within 7 K only in the portions of the temperature profile belonging to the inner part of the vortex. Observations show that the sudden increase in temperature difference between LIDAR and COSMIC could be used as an additional tool to identify the polar vortex edge.