



Polar Stratospheric Clouds as a Climate Forcing: Seasonal and Interannual Variability of PSC Optical Depth

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In addition to their critical role in ozone depletion, polar stratospheric clouds (PSCs) can also affect stratospheric radiation and dynamics. Earlier studies indicated that PSCs could significantly affect radiative heating rates, but the magnitude and even the sign of the effect varied greatly from study to study, depending on many factors, e.g. PSC optical depth and underlying tropospheric cloud cover. A more recent study, which assumed nominal PSC conditions of 100% cloud fraction and visible optical depth of 0.01 for non-ice PSCs and 0.04 for ice PSCs, suggested that PSCs could produce significant perturbations to the radiative heating rates in the Antarctic stratosphere. A comprehensive evaluation of the radiative effects of PSCs requires more accurate knowledge of PSC characteristics over the entire polar region and throughout complete seasons. With the advent of the Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) mission in 2006, a more complete picture of PSC composition and occurrence is becoming available. The polarization-sensitive CALIOP (Cloud-Aerosol Lidar with Orthogonal Polarization) lidar system onboard the CALIPSO spacecraft is acquiring, on average, over 300,000 backscatter profiles per day at latitudes poleward of 55° (including the polar night region up to 82°), providing a unique opportunity to examine the distribution of PSC optical depth on vortex-wide scales and over entire PSC seasons. In this paper, we examine the CALIOP record of PSC 532-nm optical depth for the Arctic and Antarctic over the entire CALIPSO measurement period. The distribution of PSC optical depth in each of four longitudinal quadrants is compiled for weekly time periods to examine the spatial and seasonal variability over the polar regions. Multi-year composites provide insight to the interannual variability. Preliminary estimates of the radiative impact of PSCs will be shown if available.