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A Synopsis of CALIPSO PSC Observations from 2006-2014

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Polar stratospheric clouds (PSCs) are known to play key roles in the springtime chemical depletion of ozone at high latitudes. PSC particles (primarily supercooled ternary solution, or STS droplets) provide sites for heterogeneous chemical reactions that transform stable chlorine and bromine reservoir species into highly reactive ozone-destructive forms. Furthermore, large nitric acid trihydrate (NAT) PSC particles can irreversibly redistribute odd nitrogen through gravitational sedimentation (a process commonly known as denitrification), which prolongs the ozone depletion process by slowing the reformation of the stable chlorine reservoirs. The observational database on PSCs has been augmented tremendously in recent years by data from the polarization-sensitive CALIOP (Cloud-Aerosol LIdar with Orthogonal Polarization) lidar system onboard the CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations) spacecraft.

CALIOP began data collection in mid-June 2006 and has since acquired, on average, over 300,000 backscatter profiles daily at latitudes between 55^o and 82^o in both hemispheres. PSCs are detected in the CALIOP backscatter profiles using a successive horizontal averaging scheme that enables detection of strongly scattering PSCs (e.g., ice) at the finest possible spatial resolution (5 km), while enhancing the detection of very tenuous PSCs (e.g., low number density NAT) at larger spatial scales (up to 135 km). CALIOP PSCs are also separated into composition classes (STS; liquid/NAT mixtures; and ice) based on the ensemble 532-nm scattering ratio (the ratio of total-to-molecular backscatter) and 532-nm particulate depolarization ratio (which is sensitive to the presence of non-spherical, i.e. NAT and ice particles). The composition classification scheme has been modified recently to account for denitrification, the primary effect of which is the misclassification of ice clouds as liquid/NAT mixtures. This paper will use these CALIOP observations to examine the vertical and spatial distribution of PSCs in the Arctic and Antarctic on vortex-wide scales for entire PSC seasons over the nearly eight-year data record.