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ICESTAR: POLAR MESOSPHERIC CLOUDS OBSERVED BY AN IRON BOLTZMANN LIDAR AT THE SOUTH POLE AND ROTHERA, ANTARCTICA

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Lidar observations of polar mesospheric clouds (PMC) were made with an iron Boltzmann temperature lidar at the South Pole from 1999 to 2001, and at Rothera (67.5°S, 68.0°W), Antarctica from 2002 to 2005. Detailed characterization of PMC properties and comparison between two sites are given in this paper. Overall 437 h of PMC were detected at the South Pole, giving a mean occurrence frequency of 67.4%, while 128 h of PMC were detected among the 459 h observations, giving a mean occurrence frequency of 27.9%. The mean PMC centroid altitude is 85.03 ± 0.05 km at the South Pole and 84.12 ± 0.12 km at Rothera, the mean PMC total backscatter coefficient is $5.45 \pm 0.19 \times 10^{-6}$ sr^{-1} at the South Pole and $2.34 \pm 0.11 \times 10^{-6}$ sr^{-1} at Rothera, and the mean layer rms width is 0.75 ± 0.02 km at the South Pole and 0.93 ± 0.03 km at Rothera. The distribution of PMC centroid altitudes over all observations is symmetric (nearly Gaussian) with the most probable altitude (~85 km at the South Pole and ~ 84 km at Rothera) near the

center of the distribution. The distribution of PMC brightness is non-Gaussian and dominated by weak PMC. The observed PMC altitudes support the earlier lidar findings that southern hemispheric PMC are on average 1 km higher than corresponding northern hemispheric PMC and higher PMC occur at higher latitudes. Significant interannual and diurnal variations are observed in PMC centroid altitude and brightness at both sites. Mean PMC altitude varies more than 1 km from one year to another. In addition, 24-h, 12-h and 8-h oscillations are clearly shown in PMC centroid altitude and brightness. The altitude distribution of PMC brightness peaks at a nearly constant altitude of 85 km at South Pole and 84 km at Rothera with weaker PMC found on either side of the peak altitudes. On average, the PMC altitudes are proportional to the logarithm of the PMC brightness, which can be explained by the micro-dynamics of PMC particle sedimentation and PMC brightness dependence on particle radius.