Geophysical Research Abstracts, Vol. 9, 11190, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-11190

CloudSat radar retrievals for evaluation of snowfall and snowpack characteristics

N. Wood, G. Stephens, T. L'Ecuyer, R. Austin and J. Haynes

Department of Atmospheric Science, Colorado State University, Fort Collins, CO, USA (nbwood@lamar.colostate.edu)

The detection and quantification of snowfall from space has the potential to significantly enhance our understanding of a number of key features of the global hydrological cycle. On a macrophysical scale, snowfall determines the distribution of snowpack, which in turn affects distribution of fresh water resources, the surface energy balance, and ice sheet mass balance. At finer scales, the microphysical properties of snowfall help determine the physical properties of the resulting snowpack and influence such things as the timing of ripening and intensity of freshwater output. In polar regions, observations of precipitation processes are infrequent, but such observations are also uncommon in remote high altitude sites.

Space-based observations have typically relied on passive sensing of microwave emission, a technique that is difficult to employ effectively over land surfaces. Active systems using radar may offer some advantages, but to date such systems have focused on tropical rainfall. This work explores the use of 94-GHz cloud radar observations from a space-based platform in a high inclination sun-synchronous orbit, allowing routine observations of precipitating systems at high latitudes. The radar provides reflectivity for the atmosphere and the underlying surface. An optimal estimation retrieval technique is applied to profiles of radar reflectivity to produce estimates of snowfall rates and snow microphysical properties. Where possible, these estimates are evaluated versus in situ observations from ground and aircraft.