

OBSERVATIONS OF SEASONAL SNOW COVER AND SNOW MASS IN
THE SOUTHERN HEMISPHERE FROM 1979-2006 USING PASSIVE MICROWAVE
DATA

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Seasonal snow in extra-tropical areas in the Southern Hemisphere was examined in this study using passive microwave satellite data from the Scanning Multichannel Microwave Radiometer (SMMR) on board the Nimbus-7 satellite and from the Special Sensor Microwave Imagers (SSM/I) on board the Defense Meteorological Satellite Program (DMSP) satellites. For the period from 1979-2006, both snow cover extent and snow mass were estimated during the months May-September in the Patagonia and Andean regions of South America, which is where most of the seasonal snow is found in the Southern Hemisphere. However, snow can cover the ground in high elevations of South Africa and Australia, and seasonal snow packs can be substantial in the Southern Alps of New Zealand and on the Antarctic Peninsula.

In regards to evaluating the derived snow cover and snow mass values, it is worth noting that snowfall and snow on the ground data from the limited meteorological stations in Patagonia and in the Andes are not always reliable, nor are they always available. Nonetheless, they can be used to “spot check” remotely sensed snow cover and snow depth. For those dates when snow was reported at the available stations, snow cover, from SSM/I observations, was observed in their vicinity. On some occasions, SSM/I observed snow but a given station site did not, and on fewer occasions, individual stations recorded snow but SSM/I did not. These peculiarities may result from incomplete station records (the former) as well as the inability of SSM/I to detect shallow snow cover (the latter).

Evaluating snow depth is even more difficult. In some cases, only new snowfall is reported at the selected stations rather than the total snow depth, and of course, even reliable measurements of snow depth made in cities and towns are apt to be quite different from what would be measured in locations outside of population centers and at upland sites. On most occasions when an increase in snow depth was denoted at those operational meteorological stations in proximity to one another, lower brightness temperatures (increases in SWE) were also observed.

With these qualifications in mind, for this long term climatology, in South America snow mass and snow cover extent are shown to vary considerably from month to month and season to season. The average snow cover extent for July, the month with the greatest average extent during the 28-year period of record, is 321,674 km². The seasonal (May-

September) average snow cover extent was greatest in 1984 (464,250 km²) and least in 1990 (69,875 km²). No significant trend was found over the 28 year period of record for either snow cover extent or snow mass. Efforts will be directed at determining if a relationship exists between the South American seasonal snow extent (and mass) and climate indicators including the Southern Oscillation Index (El Nino and La Nina) and the Antarctic Circumpolar Wave.