



Andes Mountain Snow Distribution, Properties, and Trend: 1979–2014

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Andes snow presence, absence, properties, and water amount are key components of Earth's changing climate system that incur far-reaching physical ramifications. Modeling developments permit relatively high-resolution (4-km horizontal grid; 3-h time step) Andes snow estimates for 1979–2014. SnowModel, in conjunction with land cover, topography, and 35-years of NASA Modern-Era Retrospective Analysis for Research and Applications (MERRA) atmospheric reanalysis data, was used to create a spatially distributed, time-evolving, snow-related dataset that included air temperature, snow precipitation, snow-season timing and length, maximum snow water equivalent depth, and average snow density. Regional variability is a dominant feature of the modeled snow-property trends from an area northeast of Quito (latitude: 2.65°S to 0.23°N) to Patagonia (latitude: 52.15°S to 46.44°S). For example, the Quito area annual snow cover area changed -45%, -43% around Cusco (latitude: 14.75°S to 12.52°S), -5% east of Santiago (including the Olivares Basin), and 25% in Patagonia. The annual snow covered area for the entire Andes decreased 13%, mainly in the elevation band between 4,000–5,000 m a.s.l. In spite of strong regional variability, the data clearly show a general positive trend in mean annual air temperature and precipitation, and a decreasing trend in snow precipitation, snow precipitation days, and snow density. Also, the snow-cover onset is later and the snow-cover duration – the number of snow cover days – decreased.