Influence Of Upper Air Conditions On The Patagonia Icefields

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On the solid rock the ugly houses stand;
Come see my shining palace built upon the sand.
Edna St.Vincent Millay, *Second Fig*

ABSTRACT. Upper-air conditions archived in the NCEP-NCAR Reanalysis have been used to investigate changes in precipitation and snowfall over the Patagonia icefields during 1960-99. Apparently, whereas total precipitation has not changed, warming has caused a decrease in the amount falling as snow. Precipitation at a site is taken to be proportional to the product of the relative humidity and the component of the wind in a particular critical direction, both at 850 hPa (≈1400 m) at a point over the ocean to the west of the icefields; whether it falls as rain or snow is assumed to depend on whether the temperature at the elevation of the site is above or below +2°C. The critical direction is assumed to be 270°, which is perpendicular to the north-south trending Andes and is also the prevailing wind direction in this zone of strong westerlies. Because of the scarcity of precipitation records on or near the icefields, the constant of proportionality cannot be determined, so the investigation is limited to examining relative changes in those upper air variables. Warming at 850 hPa has been ≈ 0.5°C over the 40 years, both winter and summer, with the effects that it has: (1) shifted from snow to rain ≈5 percent of the precipitation, the total of which has changed little, and (2) increased annual melt in the ablation areas by ≈0.5 m w.e. The icefields have been losing mass since at least 1870, so this 40-year trend represents only an acceleration of the longer-term trend of adjusting to climate change since the Little Ice Age.