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Earth's Climate History from Glaciers and Ice Cores¹

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Glaciers serve both as recorders and early indicators of climate change. Over the past 35 years our research team has recovered climatic and environmental histories from ice cores drilled in both Polar Regions and from low to mid-latitude, high-elevation ice fields. Those ice core –derived proxy records extending back 25,000 years have made it possible to compare glacial stage conditions in the Tropics with those in the Polar Regions. High-resolution records of $\delta^{18}\text{O}$ (in part a temperature proxy) demonstrate that the current warming at high elevations in the mid- to lower latitudes is unprecedented for the last two millennia, although at many sites the early Holocene was warmer than today. Remarkable similarities between changes in the highland and coastal cultures of Peru and regional climate variability, especially precipitation, imply a strong connection between prehistoric human activities and regional climate. Ice cores retrieved from shrinking glaciers around the world confirm their continuous existence for periods ranging from hundreds to thousands of years, suggesting that current climatological conditions in those regions today are different from those under which these ice fields originated and have been sustained. The ongoing widespread melting of high-elevation glaciers and ice caps, particularly in low to middle latitudes, provides strong evidence that a large-scale, pervasive and, in some cases, rapid change in Earth's climate system is underway. Observations of glacier shrinkage during the 20th and 21st century girdle the globe from the South American Andes, the Himalayas, Kilimanjaro (Tanzania, Africa) and glaciers near Puncak Jaya, Indonesia (New Guinea). The history and fate of these ice caps, told through the adventure, beauty and the scientific evidence from some of world's most remote mountain tops, provide a global perspective for contemporary climate.

¹NSF Paleoclimate Program