

Understanding Climate Change

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Over the last 30 years ice core records have been systematically recovered from eleven high-elevation ice fields, ten of which are located in the low latitudes. Three lines of evidence for abrupt climate change both past and present are presented. First, annually and decadal averaged $\delta^{18}\text{O}$ (temperature proxy) and net mass balance histories (precipitation proxy) for the last 400 years and 2000 years, respectively, demonstrate that the current warming at high elevations in the mid- to lower latitudes is unprecedented for at least the last two millennia. Second, the continuing retreat of most mid to low-latitude glaciers, many having persisted for thousands of years, signals a recent and abrupt change in the Earth's climate system. Finally, rooted, soft-bodied wetland plants, now exposed along the margins as the Quelccaya ice cap (Peru) retreats, have been radiocarbon dated and when coupled with other widespread proxy evidence, provides strong evidence for an abrupt mid-Holocene climate event that marked the transition from early Holocene warmer conditions in Peru to cooler, late Holocene conditions. This abrupt event, roughly 5200 years ago, was widespread and spatially coherent through much of the world and was coincident with structural changes in several civilizations. These three lines of evidence argue that the present warming and associated glacier retreat are unprecedented in some areas for at least 5200 years. The ongoing global scale, rapid retreat of mountain glaciers is not only contributing to global sea level rise, but threatening fresh water supplies in many of the world's most populous regions. The current and present danger posed by ongoing climate change and the human response will be discussed.