



Regional pattern of Late Quaternary deglaciations and paleoclimate of Turkey inferred from cosmogenic isotopes and glacier modeling

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Mountain glaciers are extremely sensitive indicators of climate change and they react in a relatively simple way to it. They promptly respond to the minute changes on climate via changing their mass balances, and therefore sizes, which can be used as a climate proxy. By analogy, past glacier record in mountain settings offers direct and valuable information to the timing and magnitude of past climate changes. Modeling ice flow under prescribed climatic conditions can be used to infer paleoclimate during the past glaciations. Recent improvements in understanding Pleistocene glacial chronologies in Turkish mountains provide a valuable opportunity to infer paleoclimate of Turkey. Glacial-geological evidences of Turkey show that glaciers exist in Turkey and much bigger glaciers were existed in the past, providing information on paleoclimate. Recent cosmogenic ^{10}Be and ^{36}Cl dating of glacial deposits and modeling of glacier flow on the mountains of Turkey reveals Late Quaternary paleoclimate of the region. Last Glacial Maximum glaciers were the most extensive ones in the last 22 ka (thousands years) and they developed in cold (9-11 degree C colder than today, according to the paleoclimate proxies) and slightly wetter (approximately 1.5 times) climates on the southern mountains, and slightly drier (approximately 30%) on the northern and interior regions. We hypothesize that these results are related with the southerly location of polar arctic front (at around 40 degree N) which increased the moist westerly circulation over the Mediterranean, and reduced the precipitation in northern and inner Anatolia. Late Glacial (14.1 ± 1.3 ka ago) climate was colder by 5 to 8 degree C based on 50% wetter and 25% drier conditions, respectively. Early Holocene moraines (range from 10.2 ± 0.2 ka to 8.6 ± 0.3 ka ago) in the central Turkey show that glaciers were extraordinarily large and climate was up to twice as wet as today. Glaciers present in Turkish mountains today may be remnants from the last advance (possibly the Little Ice Age). Glaciers in Turkey are retreating at accelerating rates and historical observations of the retreat are consistent with the behavior of other glaciers around the world. We applied the glacier flow model to the recent retreat of Mount Erciyes glacier and found that the best match is a warming rate of between 0.9 and 1.2 degree C for the last century, which is consistent with the temperature trends published in the IPCC report in 2007.