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Glacial climate variations in southwestern Iran, 50 to 10 ka

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Records of paleoclimate in the Middle East are particularly sparse in comparison with other regions around the world. In order to better resolve how Middle East climate responded to large global climate and environmental changes in the past, here we present the first glacial record of southwestern Iran climate constructed using speleothem climate proxies. We analyzed two stalagmites collected from a cave on the western side of the Zagros mountains, ~100 km north of the Persian Gulf. The average annual precipitation and temperature close to the cave site are ~350 mm and ~21.6 °C, respectively. Our data yield continuous $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ records from 45-35 kyr and 25-10 kyr BP, which show prominent millennial-scale events during the last glacial period and Termination I. The timing of these events is in agreement with North Atlantic Heinrich events and Greenland Dansgaard-Oeschger events, within the respective records' age errors. Moreover, unlike the generally stable NGRIP $\delta^{18}\text{O}$ record, a proxy for high-latitude Northern Hemisphere temperatures, the stalagmite $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ records reveal clearly evident periodic variations during the Last Glacial Maximum. $\delta^{18}\text{O}$ values are consistently heavier than eastern Mediterranean stalagmite $\delta^{18}\text{O}$ values during both the glacial period and throughout Termination I, suggesting at least one source of moisture to the southwestern Iran site in addition to the westerlies.