A new Devils Hole chronology and orbital forcing of Great Basin climate

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The Devils Hole oxygen isotope record has been a source of controversy for 3 decades, as early records [1, 2] could not be explained with straightforward mechanisms tied to orbital forcing. Of note were two observations. The shift to inter-glacial values around the time of Termination II (TII) pre-ceeded the rise in boreal summer insolation by ~10 ky and the duration of the last interglacial peak, as recorded at Devils Hole was ~10 ky longer than other estimates of last intergla-cial duration. Early on, questions were raised about the possi-bility of water-derived ^{230}Th leading to artificially old ages [3, 4], but were seemingly put to rest with subsequent measure-ments. We tested the Devils Hole record [5] by analyzing new samples collected from nearby Devils Hole #2, as well as one analyzed in the original paper [1]. Considering all records, virtually all characteristics replicate, with the clear exception of the timing of shifts to interglacial values around the time of terminations. The ^{230}Th age of the shift around TII correlates with depth of sample collection, suggesting water-sourced ^{230}Th does lead to anomalously old ages for samples collected at depth. Because the chronology of the shallowest core agrees with those of nearby dripstone records, its ^{230}Th anomaly appears to be negligible, consistent with accurate ages. For this core, the age of the shift around TII is ~8 ka younger and the duration of the last interglacial peak about ~8 ka shorter than in earlier Devils Hole records [1, 2]. As recorded in this core, Great Basin climate history is consistent with processes ultimately tied to orbital forcing, notably during TII, thus resolving a longstanding enigma.

[1]Winograd *et al*. (1988) *Science* **242** 1275–1280. [2] Wino-grad *et al*. (1992) *Science* **258** 255–260. [3] Edwards, Gallup (1993) *Science* **259** 1626–1627. [4] Shackleton (1993) *Nature* **362** 596. [5] Moseley *et al*. (2016) *Science* **351** 165-168.