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A LATE QUATERNARY EPISODE OF WEATHERING, EROSION, AND DEPOSITION IN NAHAL YAEL, ISRAEL: TO THE 'IMPACT OF CLIMATIC CHANGE ON AN ARID WATERSHED'

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The conceptual model for geomorphic response to Pleistocene to Holocene climate change proposed by Bull and Schick (1979, Quat. Res. 11: 153-171) was probably based on observations from the southwestern US, but was first applied in a journal article to the hyperarid Nahal Yael watershed in the southern Negev desert. In this model, the climate change from semiarid late Pleistocene to hyperarid Holocene reduced vegetation cover, increased yield of sediments from slopes, and accelerated aggradation of terraces and alluvial fans. The model is now >30 years old and during this time chronologic, paleoenvironmental and hydrogeomorphic research have all advanced but the discussions are still within the framework put forward then. The model is revaluated here by using data acquired in Nahal Yael over the 30 years since the original model was proposed. Recent studies indicate late Pleistocene climate was hyperarid and the transition from semiarid to hyperarid climates did not occur. The revised chronology reveals a 35-20 ka episode (probably already beginning at ~50 ka with lower rates) of accelerated weathering and sediment production and talus accretion on slopes. At the same time of accretion on slopes, these sediments were transported and aggraded in fluvial terraces and alluvial fans, without noticeable lag time. This intensified sediment production and delivery phase is unrelated to the Pleistocene-Holocene transition. The depositional landforms were rapidly incised during 20-18 ka; since the LGM incision, sediment yield is from the storage in these depositional landforms and is not produced from bedrock. We propose that in this hyperarid environment, an episode of frequent storms and floods is the driver of change regardless the mean climatic conditions. It created a pulse of intense weathering due to numerous cycles of wetting and drying on slopes and sediment transport to fluvial terraces and alluvial fans; its impact continues today. We suggest that even if aspects of the original conceptual model of Bull and Schick (1979) are correct, it has been applied too frequently, too generally, across very diverse arid climates and settings, and for too long in lieu of collecting new data at a full basin scale and testing the model.

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