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AB: Abstract
Geological and morphologic evidence from the western escarpment of the Dead-Sea-Rift (DSR) and cosmogenic isotope analysis of fluvial sediments from above, below, and on the Great Escarpment of Namibia suggest that in contrast to the commonly held belief of escarpment-parallel retreat, the location of water divides along rift margins is relatively constant. Fluvial activity and slope processes cause only minor changes in the location of the water divide but do not cause substantial retreat of the divide from its original location. This phenomenon is observed along rift shoulders of varying sizes and ages. The main water divide on the western side of the DSR was formed during the Neogene. Two types of rift margin response to the development of the DSR were observed: 1) uplift of the rift's shoulder and the formation of a main water divide at the top of the escarpment. Thus, the area adjacent to the rift is drained away from the rift to a distant base level, and 2) arching of the area west of the rift margin and the establishment of the water divide tens of kilometers away from the rift. In this case, two equally sized drainage systems develop: one flowing from the divide eastward to the DSR and another flowing westward to the Mediterranean. In both the DSR cases, the location of the water divide is determined by the tectonic activity of the rift's margin and the water divide does not migrate due to surface processes. In Namibia, erosion rates of 10 m/my, calculated from 26Al and 10Be concentrations in a stream draining the Great Escarpment, imply that the escarpment has retreated <1.5 Km since the opening of the Atlantic Ocean. These rates are several times higher than rates measured both above and below the escarpment. Together, our data suggest that retreat rates of other large-scale escarpments might be overestimated and that the location of water divides that develop along rift margins is relatively stable even after long periods of time. The concept of rapid escarpment retreat should be reconsidered.