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Evolution of continental-scale drainage in response to mantle dynamics and surface processes: an example from the Ethiopian Highlands.

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Ethiopia offers an excellent opportunity to study the effects and linkage between mantle dynamics and surface processes on landscape evolution. The Ethiopian Highlands (NW Ethiopia), characterized by a huge basaltic plateau, is part of the African Superswell, a wide region of dynamically-supported anomalously high topography related to the rising of the Afar plume. The initiation and steadiness of dynamic support beneath Ethiopia has been explored in several studies. However the presence, role, and timing of dynamic support beneath Ethiopia and its relationship with continental flood basalts volcanism and surface processes are poorly defined. Here, we present a geomorphological analysis of the Ethiopian Highlands supplying new constrains on the evolution of river network. We investigated the general topographic features (filtered topography, swath profiles, local relief) and the river network (river longitudinal profiles) of the study area. We also apply a knickpoint celerity model in order to provide a chronological framework to the evolution of the river network. The results trace the long-term progressive capture of the Ethiopian Highlands drainage system and confirm the long-term dynamic support of the area, documenting its impact on the contrasting development of the Blue Nile and Tekeze basins.