



Eroding a large continental area by tilting it over a source of mantle upwelling to explain the late Cretaceous South African erosional event

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New sedimentary flux data confirms that a large pulse of erosion affected the South African Plateau in the late Cretaceous and is likely to be related to a major uplift episode of the plateau. This rapid phase of erosion (i.e. less than 30 Myr in duration) is difficult to reconcile with a possible mantle origin for the plateau anomalous uplift: given its size, the rise of the African superswell is likely to have taken one to several hundred million years. Here we demonstrate by using a simple model for fluvial erosion that tilting of the continent as it rides over a wide dynamic topography high can not only cause rapid uplift of the plateau but greatly accelerate erosion and lead to substantial erosion of large surface areas in a relatively short amount of time. We show that embedding a lithological contrast, such as the one that might have existed between a thick layer of Karoo volcano-clastic sediments overlying basement, greatly amplifies the rate of erosion (and sedimentation) during the tilting episode. Similarly, a shift in rainfall intensity during the same period, as suggested by paleo-precipitation data, results in a similarly enhanced erosional efficiency. Finally, we demonstrate that our scenario is consistent with paleogeographic reconstructions of the position of the African continent with respect to the African superswell and the temporal and spatial evolution of kimberlite eruptions across southern Africa.