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Synchronous age progressive hotspot trails on the African Superswell

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Establishing if and when South Atlantic hotspots interacted with surface processes during rifting and continental breakup is important for understanding the mechanisms that control the evolution of passive margins and their adjacent continents. One approach is to reconstruct the volcanic history of hotspot trails located on the African Superswell in order to find the locations of hotspots during rifting and breakup to determine if, for example, they caused extreme fluxes of magma and post-rift uplift along the continental margin. However, because hotspot trails located south of the classical Tristan-Gough are virtually un-sampled we don't know how many hotspots might have existed or for how long, and whether they originated from the core-mantle boundary or much shallower depths. In 2006 we dredge sampled hotspot trails located on the African Superswell using the RV Polarstern, an icebreaker capable of working in the poor weather conditions in the Southern Ocean. Combining new and existing Ar/Ar isotopic ages shows that volcanism migrated synchronously along co-parallel hotspot trails consistent with northeastern African plate motion relative to the leading edges of the African Superswell and an underlying stable Superplume (large low-shear-velocity province) extending from the core-mantle boundary. Between roughly 132 and 100 million years ago only the Tristan-Gough hotspot trail developed where rifting and breakup facilitated the rise of hotspot melts to the surface, while along rest of the leading edge hotspot volcanism was suppressed by the African continent. Such a notion implies that the African passive continental margin was migrating relative to the leading edge of the African Superplume for as long as 30 million years after continental rifting and breakup had facilitated the 132 Ma Parana-Etendeka continental flood basalts and initiation of the Tristan-Gough hotspot trail. This provides a mechanism for extended late stage interplay between deep mantle processes and the passive margin and adjacent continents that might explain extensive magmatism, lithospheric thinning and phases of post-rift uplift.