ABSTRACT FINAL ID: V53G-08;

TITLE: Ninetyeast Ridge Formed as a Single, Near Spreading Center, Hotspot Track

SESSION TYPE: Oral

SESSION TITLE: V53G. Seamount Trails: Implications for Global Plate and Hotspot Motion, Mantle Flow, and the Geochemical Evolution of Mantle Plumes II

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ABSTRACT BODY: Over 50 new Ar/Ar ages on basalt from 16 dredge sites extending 3200 km along the >5000 km Ninetyeast Ridge (NER) in the eastern Indian Ocean are consistent with a single hotspot track on the Indian plate formed as it moved rapidly northward over the Kerguelen hotspot. The trace of the hotspot begins before 80 Ma in the north as the NER emerges from underneath the sediments of the Bengal Fan, and terminates at 43 Ma in the south when a major spreading center reorganization left subsequent products of the hotspot exclusively on the Antarctic plate. One anomalously young (22 Ma) sample in a dredge of otherwise Kerguelen hotspot age samples suggests that the Amsterdam-St Paul hotspot contributed some c. 20 Ma volcanism to the southernmost NER. Critical to the success of the Ar/Ar dating program has been acid cleaning of plagioclase separates, including not only warm 6N HCl to remove most low temperature alteration, but also cold HF and heavy liquid centrifuge steps to remove HCl-resistant authigenic potassium feldspar and/or albite.

Because the Antarctic plate was essentially stationary, the c. 120 km/my propagation rate of volcanism along the NER not only describes relative Indian plate-hotspot motion between c. 80 and 43 Ma, but also the full spreading rate of the Indian-Antarctic (Wharton) spreading center. Similarly, the c. 60 km/my half spreading rate also describes the rate at which the Wharton spreading center migrated northwards, and implies that essentially half of the NER accreted on the Antarctic plate and then transferred to the Indian plate through a series of discrete spreading center jumps and/or relocation events. However, we have found no significant age reversals along the NER, i.e., most dredge samples are within 1-2 million years, and no dredge samples are more than 4 million years older, of that predicted by a simple monotonic age progression. Thus, transfer events occurred at least every 4 million years, or no more than 500 km apart, at least for ocean crust directly under the NER. In other words, the Kerguelen hotspot forming the NER was never farther than 500 km south of the Wharton spreading center, and was usually much closer.

A globally important tectonic question is when did India first slow from its rapid dash north to the significantly slower rates found today. Within the resolution of the Kerguelen hotspot age progression, no slowing is detectable until the major tectonic reorganization just after Chron 20, i.e., after 43 Ma. However, there is limited magnetic lineation data that suggests seafloor spreading slowed in the vicinity of the NER after about 50 Ma. This would be consistent with either (i) overall plate velocities slowing after about 50 Ma but not detectable in the Kerguelen hotspot age data given

the current sample distribution, or (ii) Wharton center spreading slowing after about 50 Ma, but the overall spreading system did not slow because a second spreading center developed to the south of the Wharton center, creating a microplate between India and Antarctica in the vicinity of the NER for at least part of the period between about 50 and 43 Ma.

KEYWORDS: [1115] GEOCHRONOLOGY / Radioisotope geochronology, [8137] TECTONOPHYSICS / Hotspots, large igneous provinces, and flood basalt volcanism, [8157] TECTONOPHYSICS / Plate motions: past, [8415] VOLCANOLOGY / Intra-plate processes.

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Additional Details

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