

Is the Gop rift oceanic? A reevaluation of the Seychelles-India conjugate margins

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Recent studies reevaluated the timing and evolution of the breakup process between the Seychelles continental ridge and India, and the relationship between this evolution and mantle melting associated with the Deccan Igneous Province^{1,2,3}.

Those studies, mainly based on gravity and seismic refraction surveys, point that the oceanic domain located between the Seychelles and the Laxmi Ridge (here designed as the Carlsberg Basin) is the youngest oceanic domain between India and the Seychelles. To the East of the Laxmi Ridge, the aborted Gop Rift is considered as an older highly magmatic extensional continental system with magmatism, breakup and oceanic spreading being coeval with or even predating the emplacement of the major pulse of the Deccan traps. This interpretation on the oceanic nature of the Gop Rift conflicts with other extensive surveys based on magnetic and seismic reflection data⁴ which suggest that the Gop Rift is an extended syn-magmatic continental domain.

In our work based (a) on the existing data, (b) on new deep-seismic reflection surveys (already published by Misra⁵) down to the Moho and underlying mantle and (c) on new concepts on the geometry of volcanic passive margins, we propose a distinct interpretation of the Seychelles-India system.

As proposed by former authors^{6,7}, the Indian margin suffered some continental stretching and thinning before the onset of the Deccan traps during the Mesozoic. Thus continental crust thickness cannot be used easily as a proxy of syn-magmatic stretching-thinning processes or even to infer the presence or not of oceanic-type crust based, solely, on crustal thickness. However, some remarkable features appear on some of the deep penetration seismic lines we studied.

We illustrate that the whole Seychelles/India system, before the opening of the present-day “Carlsberg Basin” may simply be regarded as a pair of sub-symmetric conjugate volcanic passive margins (VPMs) with inner and outer SDR wedges dipping towards the Gop Rift axis. We propose that the conspicuous buoyant central part of the Gop Rift is likely associated with a continental C-Block as described in a recent paper on conjugated VPMs⁸, at least in the southern part of the Gop Rift. The crust below the Laxmi basin is probably transitional continental i.e. strongly intruded. West of India and west of the Laxmi Ridge, the transition to the Carlsberg Basin occurs along a clearly-expressed transform fault, not through an extended and thinned continental margin. We reinterpret the whole system based on those observations and propositions, giving some explanations on controversial magnetic anomalies based on similar observations from the southern Atlantic Ocean.

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