Clue to the Subduction Initiation from Andaman-Nicobar Ophiolite: A computational petrologic approach

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Subduction is a key process in present day plate tectonics. However, how and when this subduction initiates is debatable. Subduction could either be spontaneously initiated by subsidence of dense lithosphere in absence of existing downgoing plate motion, or be induced by push of a distant ocean floor spreading or slab pull [1]. Tracing back the mode of subduction initiation is extremely difficult. However, recent ocean drilling expeditions in Izu-Bonin-Mariana region, reveal the possibility of spontaneous subduction initiation around 52 Ma ago [2]. It usually starts with trench roll back, asthenospheric-upwelling leading to decompressional melting, leaving behind relatively refractory mantle. Further melting is dominated by fluxing of downgoing slab derived fluid [3]. These processes produce a magmatic lithostratigraphy that resembles the architecture of a Supra-Subduction Zone ophiolite; thus ascribed to be an indicator of spontaneous subduction initiation. An alternative view in relation to ophiolite genesis and subduction initiation (induced?) also exists [4]. By means of computational petrologic modelling [5], we have attempted to understand the linkage between mantle processes and magmatism, in possible subduction zone environments (from initiation to maturity) using Andaman-Nicobar Ophiolite (ANO) as a reference. ANO is a late Cretaceous dismembered ophiolitic occurrence along the eastern margin of the Andaman and Nicobar Islands, India that displays a broad spectrum of lithological variation of mantle peridotite (lherzolite to harzburgite) and volcanic rocks (from basalt to andesite). The bulk rock and clinopyroxene REE data of mantle peridotites indicate that although 6 to 8% of near fractional melting of depleted MORB mantle roughly produces less depleted peridotite residues, but fluxing and source hybridization might have played crucial role. This study particularly aims to shed some light on the inception of subduction in Andaman-Nicobar region that has significant importance in the late cretaceous subduction geodynamics of Southeast Asia.

[1] Stern (2004*) EPSL* **226**, 275-292. [2] Arculus et al. (2015) *Nat Geosci* **8**, 728-733. [3] Reagan et al. (2017) *Int Geol Rev* 10.1080/00206814.00202016.01276482. [4] van Hinsbergen et al. (2015) *G3* **16**, 1771-1785. [5] Smith & Asimow (2005) *G3* **6**, 10.1029/2004GC000816