

Sr-Nd isotopic evidence for juvenile components and extensively reworked ancient crustal materials in the Vijayan Complex, Sri Lanka

*M A Sanjeewa P K Malaviarachchi¹, Madhusoodhan Satish-Kumar², Toshiro Takahashi²

1. Department of Geology, Faculty of Science, University of Peradeniya, Sri Lanka, 2. Department of Geology, Faculty of Science, Niigata University, Japan

The Vijayan Complex (VC) of Sri Lanka comprises a significantly large volume of calc-alkaline amphibolitic and granitic orthogneisses (biotite gneiss, hornblende-biotite gneiss and granitoids) of ages known as ~1-1.1 Ga. A considerable volume of basic and felsic to intermediate magmatic intrusions also occur concordant with the main amphibolitic-granitic suite. In the present study, we present major and trace elements and Sr-Nd isotope systematics of a range of orthogneisses from the Vijayan Complex of Sri Lanka. Two groups of samples were recognized geochemically; (1) rocks having OIB-like trace and rare earth element composition with less-radiogenic $^{87}\text{Sr}/^{86}\text{Sr}$ isotope ratios (Depleted Group) and (2) rocks having MORB-like composition with extremely high-radiogenic $^{87}\text{Sr}/^{86}\text{Sr}$ ratios (Enriched Group). The majority of the samples in both groups show depleted mantle-model ages (TDM) in the range of 1.4-3.3 Ga, which is considerably older than the published magmatic crystallization age (~1 Ga) of the VC. High and variable Sr initials and negative epsilon Nd values of > +4 are compatible with their derivation by melting of older basement rocks with a long crustal residence history. The rest of the samples have model ages in the range of 0.9-1.1 Ga, nearly-coeval with the crystallization age of the VC, indicating their separation from the mantle as juvenile inputs. Therefore, protolith sources of the majority of these rocks could be mixtures of distinctive components formed much earlier than the time of predominant magmatism (~1 Ga) in the VC. Hence, we envisage that the VC constitutes a collage of juvenile components and extensively reworked ancient crustal materials in variable proportions within the main amphibolitic-granitic suite.

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