Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.19922

Lasting imprints of older felsic crust in the primary basalts and their differentiated products of Archean greenstone belts: Implications for the crust-mantle evolution of the Archean Earth

RAJAGOPAL ANAND AND SUBARNA BAIDYA

Indian Institute of Technology (Indian School of Mines) Dhanbad

Presenting Author: anandr@iitism.ac.in

The trace element geochemical signatures of preserved magmatic belts of Archean greenstone-granite terranes reflect the composition of the Archean mantle and help in demonstrating the involvement of subduction zone processes. The Dharwar craton of India presents a case of amalgamation of discrete terranes with records of both distinct and shared histories of crustal growth and mantle evolution. The elevation and preservation of the continental crust above a fluctuating mean sea level, the destruction of continental crust, the subsequent generation of magmatic rocks in distinct tectonic settings and their differentiation can be deciphered by a detailed study of trace element systematics of the rocks of the greenstone belts. In the present work, a synthesis of the trace element characteristics of the primary basalts from different greenstone belts of the Dharwar craton has validated the heterogeneous nature of the Archean mantle during the Mesoarchean-Neoarchean crustal evolution. The existence of an older crust in parts of the craton inferred from the Nd model ages and its imprints in the primary basalts of the greenstone belt attest the involvement of continental crustal detritus in the subduction-zone magmatism. Incompatible trace element enrichment in the differentiated magmas from the known tectonic settings of the Phanerozoic was modelled using the Magma Chamber Simulator tool. Extrapolation of this understanding on the extent of enrichment of selected trace elements to the differentiated magmas of the rocks of the Dharwar greenstone belts clearly reveals the involvement of copious amounts of continental crust-derived materials, which could be possible only in subduction-zone magmatic processes. Simple trace element modelling could unambiguously show evidences for the presence of vast amounts of continental crust above the sea level in the Paleo-Mesoarchean Earth, which could be eroded and deposited in deep oceans, and brought back to the surface effectively by subduction tectonic processes.