Geochemistry and Petrogenesis of Precambrian Khairagarh Mafic Magmatic Suite of Rocks: Constraints on Precambrian Crustal Evolution in Central India

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ABSTRACT

The Khairagarh Group (study area) is one of the Proterozoic volcano-sedimentary sequences exposed in the north western part of the Bastar Craton, having close chemical affinity with island-arc magmas and Andean-type rift tectonic setting. In this area the basement comprises of the Archaean Amgaon gneisses which is unconformably overlain by the Dongargarh supergroup rocks, which further branches out into the volcanic group (Nandgaon group) and the volcano-sedimentary group (Khairagarh group).

From the detailed petrographic studies and on the basis of mineralogical compositions, the Khairagarh volcanic has been divided into: Low-Ti volcanics Intermediate-Ti volcanics High-Ti volcanics and High Magnesium Andesite (HMA). The basic volcanic sample ranges from basalt to basaltic-andesite. The other volcanic HMA sample ranges from basaltic-andesite to andesitic field. Enriched nature of LREEs and other incompatible elements from the overall data probably indicates continental tholeiites or P-type MORB characteristics. Variable depletion of HREE probably indicates a shallow garnet free to garnet bearing sources for the observed large compositional variation. Depletion of Eu is an indicative of plagioclase fractionation. The depleted mantle model ages for the Khairagarh volcanic vary from 2489 to 2984 Ma. The aim of the study is to characterize the volcanic sand to put constraints on their genesis, source characteristics and tectonic environment. Based on the Nd model ages of these rocks, we also explore the possibility of understanding the connection between the Khairagarh volcano-sedimentary sequences and the Precambrian Supercontinents—Ur and Columbia, as the evolution of the Khairagarh rocks are contemporaneous with these supercontinents.