

Insights into the tectonic evolution of the Central Indian Tectonic Zone based on granite geochemistry and zircon geochronology

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Tectonic evolution of Proterozoic mobile belts holds the key in understanding large-scale crust building processes that have been continuously shaping the evolution of the Earth's lithosphere since the initiation of plate tectonics as the dominant heat-loss mechanism. The assembly and break-up of supercontinents during the Precambrian is exemplified by the deeply eroded orogens that were once the sutures that juxtaposed Archean cratons. The Central Indian Tectonic Zone (CITZ) is on such long and continuous orogen that had sutures the northern and southern Indian cratonic blocks forming a large continental landmass that would eventually form the mighty Himalayas in the late Cenozoic orogenic event. The cyclicity of supercontinent assembly and break-up implies the involvement of the same continental fragments in multiple orogenic collisional and rifting events. Here we combine new zircon dates obtained from the Mesoproterozoic granites of the CITZ with the existing geochronologic database and granite geochemistry to trace the involvement of the CITZ in supercontinent assembly – break-up events during the Proterozoic eon. The CITZ is a multi-metamorphosed and multi-deformed terrane with records of polycyclic granitoid intrusive events that were emplaced in distinct tectonic environments during the amalgamation and dispersal of supercontinents that have global correlation in the Nuna and Rodinia assembly – break-up events. The granitic magmatism considered in the present study exhibits a range of ages from 1.7 Ga to 0.9 Ga in a narrow zone akin to the Cenozoic orogens. This time period broadly coincides with the tectonic quiescence commonly described as the 'boring billion'. The granite geochemistry also records transitions from collisional – extensional – collisional tectonic environments that are key for the reconstruction of Proterozoic supercontinents. We investigate the implications of the tectonic setting and timing of emplacement of the CITZ granites in the supercontinent assembly – break-up events, from the perspective of granite geochemistry, petrogenesis, geochronology and metamorphism-deformation history, and attempt to comment on the global-scale supercontinent cyclicity and associated crustal growth.