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Mini Review

Granitic Magmatism in the South-Eastern Part of Central Indian Tectonic Zone: A Review with Emphasis on the Bilaspur-Raigarh Belt

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Abstract

The Central Indian Tectonic Zone (CITZ) is a notable Proterozoic tectonic zone that came into existence after the amalgamation of North and South Indian Blocks, recording the events of the Mesoproterozoic Grenvillian orogeny and the assembly of the Rodina supercontinent. The Bilaspur Raigarh Belt (BRB), located in the eastern part of CITZ, consisting of granite, gneiss, and metasedimentary rocks, including slate, phyllite, and schist, which is a relatively under-researched belt. This review-based study presents the current status and consolidates the knowledge of granitic magmatism in the BRB, emphasizing its litho-tectonic assemblages. The BRB granitoids vary from tonalite to granite, displaying metaluminous to peraluminous compositions with I- and S-type characteristics generated by melting heterogeneous sources at different depths. This study highlights the necessity for additional research to clarify the tectonic evolution of the BRB within the CITZ.

Introduction

The Central Indian Tectonic Zone (CITZ), a notable Proterozoic linear E-W trending tectonic zone, where the North Indian Block (Bundelkhand-Marwar craton), and South Indian Block (Bastar-Singhbhum-Dharwar Craton) (Figure 1a), were amalgamated at around 2.5 Ga, this amalgamation resulting the formation of Satpura mobile belt or CITZ [1-4]. The CITZ documents the global Mesoproterozoic Grenvillian orogeny and its significance in the Rodinian supercontinent assembly [5]. The CITZ contains several supracrustal units, viz., the Mahakoshal Belt, the Sausar Mobile Belt (SMB), the Betul Belt, and granulite belts over a large extent of undifferentiated gneisses and granitoids (Figure 1b). From these lithounits, extensive geochemical, geochronological, and structural studies have been carried out by various workers in recent years [6-14]. However, the dismembered supracrustal belt that is located in the eastern part of CITZ in the Bilaspur and Surguja districts of Chhattisgarh, known as the Bilaspur Raigarh Belt (BRB) (Figure 1b), [15], is less studied in comparison to other domains within CITZ. Therefore, in the current review, we are trying to contribute to the BRB's current status of granitic magmatism within CITZ.

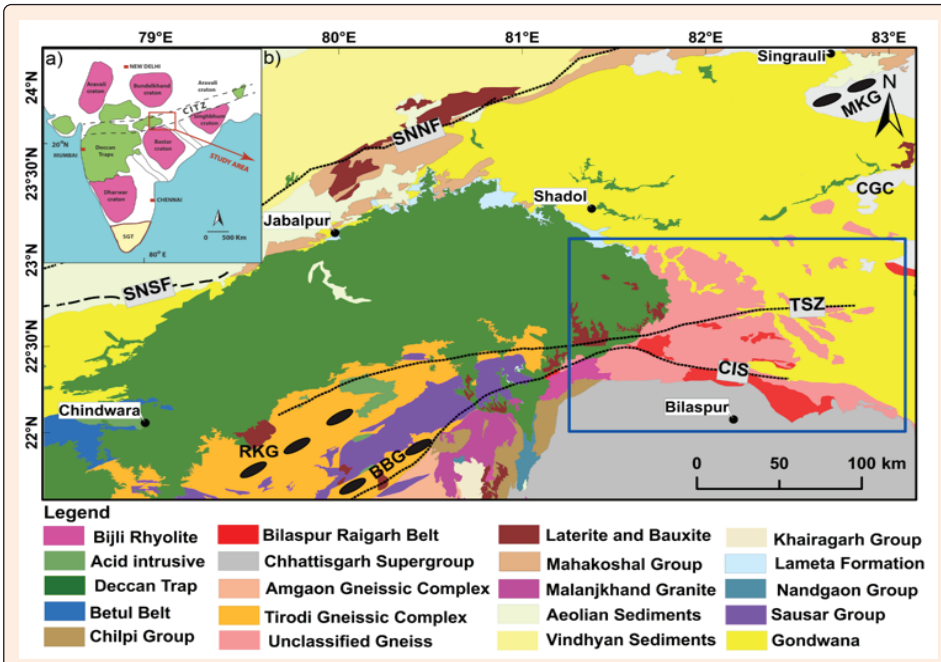

Figure 1: (a) Inset map showing Archean cratons and CITZ (modified after [16]). (b) Geological map of CITZ showing different supracrustal, major shear zone, granulite belts, the blue rectangle showing the review area. SNNF: Son Narmada North Fault, SNSF: Sone Narmada South Fault, TSZ: Tan Shear Zone, CIS: Central Indian Shear. (Source: https://bhukosh.gsi.gov.in/Bhukosh/Public).

Current Status of Granitic Magmatism in Bilaspur Raigarh Belt (BRB)

The BRB is an integral part of CITZ and comprises granite, gneiss, and supercrustal, occurring in Chhattisgarh's Bilaspur, Raigarh, and Surguja districts along the Gondwana contact. Previously, various workers equated the supercrustal belt with the Sausar group [17,18]. The litho assembly of BRB comprises slate, phyllite, mica schist with or without garnet, staurolite, anthophyllite, marble, chert, and banded magnetite quartzite occurring as an enclave with migmatite and porphyroblastic gneiss reported by Thorat et al. [16]. The following contributions from various workers have been cited to decipher the current status of granitic magmatism in the BRB.

Bhattacharya & Bhattacharya [15] classified the BRB into three litho tectonic units based on mineral assemblages, viz. (a) Northern Supracrustal Lithoassembleges (NSL), (b) Central Supracrustal Lithoassembleges (CSL), and (c) Southern Supracrustal Lithoassembleges (SSL), separated from each other by granite gneisses, granulite, granite, and Gondwana rocks. Two-pyroxene mafic granulite (Chhatuabhavna Granulite) interleaved with anhydrous garnet-bearing granite is located to the North of the Gondwanas, and the granulite is a dark-colour banded rock characterized by banding formed by prismatic hornblende, feldspar, clinopyroxene, orthopyroxene, and garnet [15].

Sahu et al. [19] studied the Khuria Ratanpur Belt (KRB), which comprises metasedimentary, metabasic, gneiss, granitoid, and minor intrusive viz. dolerite, pyroxenite, quartz porphyry, pegmatite, and quartz veins, collectively constituting the western part of the BRB. The granitoid around KRB possesses a major oxide ratio with SiO_2 1ranging from 70.9% to 83.58%, Al_2O_3 ranging from 7.59% to 15.36%, $Fe_2O_{3(total)}$ ranging from 0.82% to 2.41%, alkali (Na_2O+K_2O) ranging from 5.01% to 9.56% and MgO ranging from 0.10% to 1.41% [19].

Roy & Prasad [1] suggest that the syn-kinematic granites in the eastern region of the Central Indian Shear (CIS), specifically in the Bilaspur district, comprise diffusely banded biotite-granite, megacryst-bearing granite, and coarse-grained homophanous granite. Petrographically, the rocks belong to the granodiorite-quartz monzonite-granite suite, and geochemically, the granitic rocks are peraluminous to metaluminous with I- and S-type character [1].

Saket & Alam [20] examine the granitoids around the Tan-Shear Zone (TSZ) and suggest that the granitoids constitute a combination of coarse to medium-grained pink granite, medium to fine-grained grey granite, and coarse to medium porphyritic biotite-rich pink granite with metaluminous to peraluminous composition. The granitoids are A-type and form under the anorogenic to post-collisional environment [20].

Panda et al. [21] Investigate the granitoids from BRB and suggest that the granitoids range from tonalite, granodiorites, adamellite to granites and are metaluminous to peraluminous with calc-alkaline affinity, ferroan to magnesian, and I-type to S-type character. According to the authors, the granitoids of BRB were formed by the melting of diverse sources at varying depths [21].

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