Petrogenetic characterization of Palaeoproterozoic basement rocks from Bangladesh: A remnant of magmatism associated with the Columbia supercontinent amalgamation

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Although there are no exposed igneous or metamorphic rocks in Bangladesh, geological investigations from the Maddhapara area, northwestern part of Bangladesh reveals that basement rocks, exhibiting spatial association of diorite, monzodiorite, quartz monzonite and granite, occur at a shallow depth (~128 m). U-Pb SHRIMP zircon geochronological results indicate Palaeoproterozoic age (~1.7 Ga) for these basement rocks. Geothermometric estimates indicate P-T conditions of ~840 to 720ºC at ~6.2 kbar.

Of the different rock types, dioritic rocks are the least siliceous (~50 wt%), with quartz monzonite showing intermediate silica contents (~55 – 60 wt%), and granite showing the highest silica content (~75 wt%). Within the constraints imposed by near continuous trends in major and trace element variation diagrams from the least siliceous to the silica rich rocks, parallel REE patterns, major and trace element modeling, and comparison with experimental melt compositions, the dioritic rocks and quartz monzonite were probably derived from a basaltic source, with assimilation fractional crystallization explaining the higher levels of incompatible elements in the quartz monzonite. The granitic rocks on the other hand show affinity to metagreywacke derived melts.

A comparison of geochemical features of basement rocks from Bangladesh with similar ~1.7 Ga geologic units in the Central Indian Tectonic Zone and Meghalaya-Shillong Plateau in Indian Shield suggest their apparent continuation. This together with the occurrence of similar ~1.7 Ga geologic units in the Albany-Fraser belt in Australia and East Antarctica are used to suggest that the basement rocks in Bangladesh formed towards the final stages of the assembly of Columbia supercontinent. We propose a refined configuration of Columbia based on a review of magmatism during the period ~2.1 – 1.7 Ga, which is slightly different from previously proposed ones.

S and P travel-time curves: Using raw data to constrain mineralogical and chemical changes near the CMB

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An initial analysis of long-period S-wave travel-time curves in the deep mantle [1] showed that a signal from post-perovskite may exist in this raw form of the data. Travel-time curves are independent of seismic tomography whose interpretation is dependent on the assumptions of the 1D structure near the base of the mantle. We have improved the fitting technique used to define the travel-time curve and extended the analysis to P-wave arrivals. There remains uncertainty in the sign of the P-wave velocity contrast from perovskite to post-perovskite or if there is even a velocity contrast at all. This study is the first systematic comparison of long-period S and P arrival times across the globe (where ray coverage permits). Our results shed light on the behavior of materials in the lowermost mantle and indicate that regions beneath the Caribbean, Alaska, and the central Pacific are consistent with post-perovskite. Other regions under central Eurasia and Pacific show more complex behavior that is best explained in terms of chemical variations, while some areas under the northern Pacific show little evidence of any heterogeneity.

[1] Houser, C. (2007) *Post-Perovskite, The Last Mantle Phase Transition*, edited, American Geophysical Union **174**, 191-216.