Archaean BIFs from Karnataka, India: genetic insights from the Dharwar craton, India, and implications for post-depositional hematitic iron deposits

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The inferred genesis of the Dharwar craton encompasses initial ocean plateau formation leading to an early oceanic crust upon which widespread BIF sedimentary rocks were deposited in the Western Dharwar Craton (WDC); later deformation and metamorphism during cratonisation led to distinct greenstone belts and embracing granitisation, but where the once sedimentary successions now extensively altered are correlatable and coeval. The BIFs themselves include both oxidised and enriched deposits of iron as well as extensive sulphidic facies BIF.Here we provide a brief overview of the BIF deposits of the Dharwar craton of India, and their genesis, and then shift to a brief discussion of the implication of their unique geodynamic history for a later hydrothermal iron deposit enrichment, as postulated for the Pilbara craton. Pilbara (Western Australia) and the Kaapvaal (Southern Africa) cratons encompass relatively minor BIF lithologies within crustal greenstone belts, which were deformed, metamorphosed as the proto-cratons grew through island arc complex accretion and late stage and voluminous granites enveloped these to form the initial cratonic basement. These early crusts are overlain by widespread sedimentary successions of chemical and clastic affinity, largely laid down in shallow marine environments under initially low continental freeboard conditions, including widespread sheetlike and very large BIF deposits such as those of the Hammersley (Pilbara) and Transvaal (Kaapvaal) basins. These BIF represent enormous oxide facies iron ore sources, initially believed to have formed at c. 2.7-2.6 Ga, and enriched and oxidised to hematitic ore bodies during the ‘Great Oxidation Event’ at c. 2.2-2.0 Ga. However, recent work on Pilbara (with some minor comparisons to Kaapvaal), applying direct dating of platy hematite in the ore deposits clearly demonstrates that the oxide mineralisation dates to a much later, c. 1.4-1.1 Ga geodynamically driven hydrothermal enrichment event.