Age and paleomagnetism of the Mundine Well dyke swarm, Western Australia: implications for an Australia - Laurentia connection at 755 Ma

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Abstract

Integrated U-Pb geochronology and paleomagnetic studies of the Mundine Well dyke swarm (MDS) of the Pilbara Craton, Western Australia, are employed to test the hypothesis that Australia and Laurentia were joined as part of the Rodinia supercontinent. Ion microprobe U-Pb dating of zircon and baddeleyite indicates that the MDS was emplaced at 755 ± 3 Ma (95% CI) and paleomagnetic results confirm that the swarm is equivalent in age to dykes of the Northampton Inlier. A positive contact test between an MDS dyke and an older dolerite sill indicates that the MDS magnetisation dates from the time of dyke emplacement and cooling at 755 Ma. Combining new paleomagnetic data for eight MDS dykes with previous results for six Northampton dykes yields a paleopole for Australia at 135°E, 46°N (A95 = 4°). The MDS paleopole lies 30° away from the 780 to 740 Ma APW path segment for Laurentia, indicating that, if the Rodinia reconstruction is correct, breakup between Australia and Laurentia occurred prior to 755 Ma. It has been suggested elsewhere that the Sturtian glaciation in Australia preceded or accompanied breakup. If so, the Sturtian rocks should be older than 755 Ma and hence may not be coeval with glaciogenic rocks of the post-755 Ma Rapitan Group in Laurentia.