



Multi-stage breakup of Rodinia in northwest Laurentia: new insights from the Yukon

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Integrated stratigraphic, geochronological, geochemical, and structural data from the Neoproterozoic inliers of the western Yukon (the Ogilvie Arch) provide important new constraints on the tectonic evolution of north-western Laurentia. On the northern margin of the Coal Creek inlier, syn-sedimentary normal faulting initiated a northwest-facing shelf-break marked by prograding stromatolite reefs during deposition of the lower Fifteen-mile Group (lower assemblage). The lower assemblage of the Fifteenmile Group appears to correlate with the basinal/platformal assemblage of the lower Little Dal Group in the Mackenzie Mountains, implying both successions were related to a single basin-forming event. An 811.5 Ma tuff above the reef complex constrains the timing of passive margin development and the onset of the Bitter Springs negative carbon isotope anomaly. The 780 Ma Gunbarrel igneous event is manifested in a major unconformity that developed beneath the Callison Lake Dolostone in the upper Fifteenmile Group. The Dawson Thrust, which is the southern limit of Neoproterozoic carbonates in the Yukon, is interpreted to be a reactivated, south-facing normal fault that marks the southern edge of a rifted margin that formed ca. 720 Ma. Extension was accompanied by emplacement of the 717.4 Ma Mount Harper Group Volcanics in the Coal Creek inlier and the correlative Pleasant Creek Volcanics in the Tatonduk inlier, which are the southwestern-most expressions of the Franklin igneous event. Magmatism continued through deposition of the basal Rapitan Group glaciogenic diamictites, which contain a 716.5 Ma tuff that pins the age of early Cryogenian snowball glaciation. A thin and incomplete Cryogenian–Cambrian section, as compared to the Wernecke and Mackenzie Mountains, suggests that the western Yukon was a paleo-high during much of the late Neoproterozoic. Together, these new data and interpretations point to a multi-stage break-up of the northwestern margin of Laurentia from Rodinia, perhaps related to a long-lived plume beneath the Ogilvie arch.