GEOCHRONOLOGICAL CONSTRAINTS FOR A TWO-STAGE HISTORY OF THE ALBANY-FRASER OROGEN, WESTERN AUSTRALIA

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Abstract
Based on structural, petrographic and geochronological work (SHRIMP zircon, monazite and rutile), the Mesoproterozoic Albany-Fraser Orogeny is divided into two discrete thermo-tectonic stages, between c.1345 and 1260 Ma (Stage I) and c.1214 and 1140 Ma (Stage II). The existence of a two-stage history is confirmed by the discovery of 1321±24 Ma detrital zircons and 1154±15 Ma metamorphic rutiles in metasedimentary rocks from Mount Ragged. The detrital zircons demonstrate that the Mount Ragged metasedimentary rocks unconformably overly, and were derived from, Stage I basement. Metamorphic rutile formed as a consequence of overthrusting by high-grade early-Stage II rocks along an inferred NE-SW striking structure (the Rodona Fault). This interpretation is supported by zircon geochronology, which demonstrates that granulite facies metamorphism on the northwestern side of the structure predates that on the southeastern side by ~100 Ma. Rocks to the northwest record a low-grade imprint relating to the younger (Stage II) event.
The two-stage thermo-tectonic history of the Albany-Fraser Orogen correlates with adjacent Grenville-age orogenic belts in Australia and East Antarctica, implying that Mesoproterozoic Australia assembled in two stages subsequent to the amalgamation of the North Australian and West Australian cratons. Initial collision between the combined West Australian-North Australian craton and the South Australian-East Antarctic continent at c.1300 Ma was followed by intracratonic reactivation affecting basement and cover at c.1200 Ma. Two comparable and contemporaneous compressional orogenies controlled the formation of the Kibaran Belt in Africa and the Grenville Belt in Canada, suggesting that tectonic events in Mesoproterozoic Australia follow a similar pattern to that recognised for Rodinia amalgamation world-wide.

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