THE YILGARN CRATON WESTERN AUSTRALIA : A TECTONIC SYNTHESIS : I

R.E.P. Fripp, Western Australian Institute of Technology

The Yilgarn Craton in Western Australia is one of the larger contiguous preserved Archaean crustal fragments, with an area of about 650,000 square kilometres. Of this, by area, about 70% is granitoid and 30% greenstone. The Craton is defined by the Darling Fault on its western margin, by Proterozoic deformation belts on its southern and northwestern margins, and by unconformable younger sediments on its eastern and northeastern margins.

A regional geotectonic synthesis at a scale of 1:500,000 is being prepared. This is based largely upon the 1:250,000 scale mapping of the Geological Survey of Western Australia together with interpretation using geophysical data, mainly airborne magnetic surveys.

On a regional basis the granitoids are classified as pre-, syn- and post-tectonic (1) with respect to greenstone belt deformation. The post-tectonic granitoids yield Rb-Sr isochrons of about 2.6 b.y., close to Rb-Sr ages for the greenstones themselves which are up to about 2.8. b.y. old (2), although data for the latter is sparse.

Contacts between earlier granitoids and greenstones which are not obscured by the post-tectonic granitoids are most commonly tectonic contacts, intensely deformed and with mylonitic fabrics. The general concensus however is that there is a pre-tectonic, pre-greenstone sialic gneiss preserved in places (1,3).

Existing models for the evolution of the belts involve 3 large basinal structures ("broad elongate downwarps"), of which the Eastern one (the Noreseman-Wiluna Belt) is considered to be a rift fault-bounded graben (1). The postulated basins are separated by large tabular belts of discordant post-tectonic granite when viewed regionally. This may be a 'red herring'. It is possible that, for example, the entire greenstone package preserved on the Craton was part of one basin, or numerous combinations and parts of basins. There is no compelling diagnostic evidence collated to date to postulate on the original disposition, geometry and relationships between belts.

This synthesis is a preliminary attempt at addressing this problem, by attempting to decipher the broad tectonic-stratigraphic sequences preserved and thereby to reconstruct, as far as is possible, the original nature of the greenstones. There is structural evidence to suggest that the deformation histories of the greenstones and some of their surrounding and occluded granitoids involves early fold-nappe tectonics in places, and possibly thrust nappes, as well as late large-scale imbrication or slicing. During early deformation of the belts, massif-style nappe tectonics may have occurred in places, on scales not dissimilar to those seen in young fold belts.

It is intended, with future work, to test these postulates and to examine whether the tectonic history of the Yilgarn Craton is indicative of the loss of considerable greenstone (back to the womb?) and perversely (sic), its local preservation by obduction and stacking. How well can we reconstruct the deformed granitoids and greenstones, in their undamaged state?

REFERENCES

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