

Geodynamic evolution of the northeastern Murchison Domain, Yilgarn Craton

by

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A preliminary compilation of recent mapping and geochronological results from the northeastern Murchison Domain, Yilgarn Craton, suggests that there are four volcanic packages deposited as mafic–ultramafic through to felsic volcanic cycles: i) at c. 2970 Ma; ii) 2814–2799 Ma; iii) ≥ 2785 to 2745 Ma; and iv) 2720 to 2704 Ma. Emplacement of clotty-textured, hornblende tonalites accompanied eruption of volcanic package 3, whereas pillowed, pyroxene spinifex-textured komatiitic basalts of package 4 were accompanied by the widespread emplacement of thick differentiated mafic–ultramafic subvolcanic sills. Voluminous post-volcanic, but pre- to syn-tectonic granitic plutons were emplaced into the crust from 2676 to 2660 Ma, followed by shearing and the emplacement of post-tectonic granite plutons at c. 2623 Ma (Table 1).

Two main deformational events are recognized. Early east-trending folding (D_1) was accompanied by the emplacement of granitic rocks, probably at around c. 2676 Ma and resulted from greenstone sinking into partially melted middle crust. Second-generation structures (D_2) formed between 2660 and 2637 Ma and include north to north-northeasterly trending foliations, north- to northeast-plunging folds and lineations, and north-northwesterly striking sinistral shear zones and northeast-striking dextral shear zones that collectively indicate east–west compression. Structures relating to this event are concentrated within, but not exclusively to, the north-northeasterly striking Meekatharra Structural Zone (Spaggiari, 2006), which hosts significant gold mineralization.

References

- Spaggiari, CV, 2006. Interpreted bedrock geology of the northern Murchison domain, Youanmi Terrane, Yilgarn Craton. Geological Survey of Western Australia, Record 2006/10, 19p.
- Van Kranendonk, MJ, in prep., New evidence on the evolution of the Cue–Meekatharra area of the Murchison Domain, Yilgarn Craton: Geological Survey of Western Australia, Annual Review 2006–07.

Table 1. Comparison between the timing of deposition/intrusion for the three areas of the northeaster Murchison Domain (age data from several sources, as quoted in Van Kranendonk, in prep.)

Age (Ma)	Dalgaranga greenstone belt (southwest)	Cue–Glen Homestead area and Weld Range	Meekatharra area (northeast)	Volcanic package/ granite suite
2600				
		2623 Ma K-feldspar monzogranite		Post-tectonic granite 5
			2637 Ma shear Au	D ₂
			2644, 2648 Ma granite	Pre- to syn-D ₂ granite 4
2650				
			2665, 2660 Ma granite	Pre- to syn-D ₂ granite 3
		2676 Ma layered granodiorite	2670 Ma granite	D ₁
2700				
		2716 Ma rhyolite		
	2719 Ma gabbro	komatiitic basalt		Volcanic 4
2750	2747 Ma felsic volcanic rocks	2747 Glen tonalite	2755 Ma andesite	
		2759 Cue tonalite	2760 Ma tonalite	Syn-volcanic granite 2
		2761 Ma rhyolite tuffs		Volcanic 3
		Tholeiitic and komatiitic basalt	2784 Ma dacite 2785 Ma hornblende granite	
		BIF and quartzite	komatiite, komatiitic and tholeiitic basalt	
2800			2799 Ma volcanoclastic sandstone	
			2804 Ma rhyolite	Volcanic 2
			2814 Ma felsic sedimentary rocks	
			tholeiitic basalt	
2850				
Σ				
		× 2920 Ma	× 2898 Ma	
	× 2970 Ma	2970 Ma Weld Range		Volcanic 1
3000	× 3034 Ma	× 2998, 3010 Ma	× 3027 Ma	Early TTG granite 1

NOTES: TTG = Tonalite-trondhjemite-granodiorite
 × = xenocrystic zircons
 Red lettering denotes granitic events
 Darker shading denotes volcano-plutonic events
 Dark green lines denote base of volcanic packages
 Gold denotes gold mineralization