Cenozoic and proterozoic A-type silicic magmas of the Western US

ERIC H CHRISTIANSEN

Department of Geology, Brigham Young University, Provo, Utah, 84602, USA (eric_christiansen@byu.edu)

The principal episodes of A-type magmatism in the western US were in the Mesoproterozoic and in the Neogene. The compositional characteristics of these disparately aged groups are remarkably similar so understanding the young rocks will help constrain the origin of the older suite. Both include rocks with all of the classical characteristics of A-type granites and range from peralkaline to peraluminous. However, both age groups include rocks with a wide range of Fe/Mg ratios. Moreover, not all of the silicic rocks of either age have A-type characteristics; volcanic arc granites are found in both suites.

Extension is a fundamental control on the generation of the Neogene A-type magmas and a link to contemporaneous mafic magmas produced during extension seems clear. Nd isotope ratios are higher in the A-type rocks than in slightly older volcanic arc rocks: their isotopic compositions overlap with contemporaneous mafic rocks. These data and trace element patterns indicate that A-type magmas probably form by melting of hybridized continental crust which contains a significant juvenile mantle component not derived from a subduction zone. Mafic magmas appear to have lodged in the crust and then re-melted by subsequent injections. Parental mafic magma formed as a result of lithospheric extension and decompression or as a result of decompression related to convective-flow driven by the foundering of a subducting lithospheric plate. The variable subduction signatures are probably the result of lithospheric contamination and not an indication of tectonic setting. The evidence from the young rhyolites shows that A-type granites are not simply melts of continental crust at low pressure or of crust that is dehydrated or melt depleted.

1.4 and 1.2 Ga bimodal A-type magmatism in SW New Mexico and SE Arizona, USA

V.T. MCLEMORE[1] AND O.T. RÄMÖ[2]

[1]New Mexico Bureau of Geology and Mineral Resources (NMBGMR), New Mexico Tech, Socorro, NM 87801, USA (ginger@gis.nmt.edu)
[2]Department of Geology, P.O.Box 64, FI-00014 University of Helsinki, Finland (tapani.ramo@helsinki.fi)

The tectonic evolution of southern Laurentia in the mid-Proterozoic (1.6 to 1.0 Ga) is only vaguely understood, although growing evidence from the Grenville Province of eastern North America indicates that a long-lived, predominantly convergent margin may have governed the tectonic evolution of southeastern Laurentia during most of Proterozoic time. Our work in the northern Burro Mountains, southern New Mexico have demonstrated that at least three magmatic events are present, a 1633 Ma, ~1440-1460 Ma and a 1200-1000 Ma (cf. Rämö et al., 2003). Recent data (lithology, Nd isotopes) from other Proterozoic areas in southwestern New Mexico and southeastern Arizona have confirmed the presence of these magmatic events over a wider region, although more geochronology is still required for precise temporal characterization. Three areas are now known to have an A-type bimodal magmatic assemblage: Jack Creek granite and comingled minette (~1465 Ma) and the Redrock pluton with xenoliths of anorthosite and leucogabbro (~1220-1225 Ma) in the northern Burro Mountains, rapakivi granite and diabase in the Little Hatchet Mountains, and the Morenci area in southeastern Arizona with a rapakivi granite - leucogabbro association; the latter two are suspected to be consanguineous with the Redrock granite association based on field relationships, chemistry, and isotopic signature. The metamorphic (cratonic) rocks from the Burro Mountains and the Sierra Vista region have Nd model ages up to 1.9 Ga and thus register an unusually old source component in the Mazazal crust. The 1.4 and 1.2 Ga associations presumably reflect recurrent extension or transtension-related magmatic events in southern Laurentia, but the overall textonic context is yet to be determined.

References

Rämö O.T., McLemore, V.T., Hamilton, M.A., Kosunen, P.J., Heizler, M. and Haapala, I. (2003), *Geology* **31**, 335-338.