Petrogenesis of TTG magmatism: Generating chemical diversity in different tectonic settings

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Although the detailed geochemical studies on Jack Hills zircons tell us that felsic crust was formed soon after accretion and provide important insight into potential compositions, they cannot tell us *how* this crust was formed. This point was emphasized in a recent paper on early Earth and orgin of the earliest crust by Blichert-Toft & Albarede [1] and whether or not TTG's represent this earliest crust and with it, subduction zone processes? Their potenital presence in the earliest Earth can help determine whether or not subduction was active during the Hadean. There is debate within the TTG community on their petrogenesis and whether or not subduction is required. Lowermost crustal melting of mafic material may be as viable an option as partial melting of subducting crust The Hadean link places the processes that can produce TTGs in an important new light.

Experiments on mafic material have been conducted in order to assess the generation of TTG suites in a lowemost crustal setting and include melt segregation processes. The expeirmental testing of the genesis of TTGs by a combined partial melting and segregation process uses the results of the numerical model developed by Jackson *et al*. [2] which explores the production of volumetrically significant TTG magmas in the lowermost crust. This work is based on the hypothesis that arc crust is generated by a combination of physical and chemical migration steps allowing re-equilibration of melt as it segregates upwards through a thermal gradient. Experimental results have demonstrated that it is possible to change the Mg-numbers in a tectonic setting that involves only a mafic underplate. TTGs form from partial melting of a hydrous mafic protolith, but their associated tectonic setting may vary. This research does not support either the hypothesis that TTG petrogenesis is required through slab melting alone nor a model requiring subsequent melt interaction with the mantle wedge to increase Mg-numbers. These results will be applied to new experiments on the most ancient mafic crust [3].

[1] Blichert-Toft & Albarede (2008) *EPSL* **265**, 686-702. [2] Jackson *et al*. (2005) *Lithos* **79**, 43-60. [3] O'Neil *et al*. (2008) *Science* **321**, 1828-1831.

Linking particulate matter sources to health

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There are an estimated 2.8 million premature deaths annually from exposure to particulate matter (PM). Most of those are in the home from smoke due to solid fuel use, but over 800,000 come from exposure to ambient PM in urban areas. However, it is not currently apparent which sources of ambient PM have the greatest health concerns. Two links are currently uncertain. First, we do not know which constituents of urban PM are responsible for the health impacts. Historically, epidemiologic studies have developed associations between PM and its components with health endpoints. These studies suggest that there are differences between PM components and health endpoints, and this is substantiated by toxicological studies. However, the source contributions of those components are uncertain. The various methods used for source apportionment can lead to significantly different results. More recently, investigators are trying to directly associate sources with health endpoints by using source apportionment analyses.

Analysis of approaches for conducting source apportionments shows that the typical techniques have significant weaknesses. Here, examination of the weaknesses of using different source apportionment techniques in health studies are presented, along with weaknesses of individual methods, as well as how methods can be combined to alleviate limitations. Two new approaches, using ensembles and multi-method optimization, are found to improve performance.