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Evolved crustal melts in dynamically hot planetary embryos

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Earth sustains crustal recycling driven by plate tectonics in a watery setting that produces abundant granitic melts, and ultimately, continents. Evidence from the oldest terrestrial zircons shows that this process was underway within the first $\sim$190 Myr. Earth, however, is not unique in the solar system for the production of granitic crust. Granitoid (granodiororite) and intermediate felsic rocks of unconstrained ages are documented on Mars, lunar granophyres and other felsites have long been known, and broadly "felsic" poly-mineralic rock fragments akin to granophyres are found in some asteroidal meteorites. I will report new petrologic and geochemical data to show how the oldest of these meteoritic granitoid mineral assemblages yield information on an hitherto unquantified dynamically "hot" population of large (»50 km), planetary embryos which were disrupted in the epoch of planetary mergers during the first ca. 10-50 Myr of the solar system. These objects were large enough to be differentiated, to have a crust, atmosphere and hydrosphere in the first 50 Myr of the solar system. "Granitic" fragments in the Adzhi-Bogdo LL3-6 chondrite breccia represent highly fractionated melt production on an extinct parent body ca. 40 Myr after CAIs. Another such fragment was recently reported from the polymict ureilite EET87720. Previous U-Pb geochronology on a $\sim$15 μm zircon grain from Adzhi-Bogdo gave an imprecise age of 4.6 $\pm$ 0.2 Ga. Further Pb-Pb measurements on phosphates and other co-genetic phases yielded a Pb-Pb isochron age of 4.48 $\pm$ 0.12 Ga (2σ), and a (re-calculated) weighted mean age of 4.533 $\pm$ 0.04 Ga (2σ; mswd=0.6), respectively. These ages represent either (i) crystallization of the parent magma before the oldest lunar granophyres at ca. 4.417 Ga, or (ii) reset ages. Similar ca. 4.53 Ga ages may be igneous- or impact-related on the HED parent body, 4Vesta.