Evolution of the Early Earth

Thursday, March 20, 2003
EVOLUTION OF THE EARLY EARTH
1:30 p.m.  Salon C

Chairs: T. Rushmer  M. J. Drake

Drake M. J. *  Domanik K.  Bailey E.
Vanadium, Cr, Si, and the Mg/Si Ratio of the Earth [#1150]
The relatively high abundances of V and Cr in the Earth’s upper mantle indicate that the high Mg/Si ratio of the
Earth’s upper mantle cannot be attributed to extraction of Si into the core and must be an intrinsic bulk property
of the silicate Earth.

Burbine T. H. *  O’Brien K. M.
Determining Possible Building Blocks of the Earth [#1193]
To determine what material could possibly be the building blocks of the Earth, we have looked at hundreds of
millions of possible combinations of different chondritic material to try to match the Earth’s oxygen isotopic
composition and its bulk chemistry.

Palme H. *  O’Neill H. St. C.  Benz W.
Evidence for Collisional Erosion of the Earth [#1741]
The Fe/Mg ratio of the bulk Earth is at least 10% higher than that of the average solar system, reflecting
preferential removal of silicates from the Earth by large impacts on the growing Earth or on differentiated Earth
forming planetesimals.

Jacobsen S. B. *  Yin Q.
Hf-W, Accretion of the Earth, Core Formation and the Origin of the Moon [#1913]
The main stage of accretion of the Earth is completed in 10 Myr and the remaining growth must be effectively
finished in another 20–40 m.y. The formation of the Moon, if by a giant impact, happened at ~ 25–30 m.y.
subsequent to solar system formation.

Brandon A. D. *
The Osmium Isotopic Composition of Tagish Lake and Other Chondrites, Implications for Late Terrestrial
Planetary Accretion [#1776]
Osmium isotopes and highly siderophile element concentrations were measured on Tagish Lake and other
chondrites to assess whether these meteorites have the characteristics of potential late accretion materials on
Earth and Mars.

Becker L. *  Poreda R. J.  Nuth J.
Fullerenes and the Nature of Planetary Gases [#1482]
We present evidence that suggests the Earth’s atmosphere was supplied with noble gases from a fullerene
component that was Xe-deficient. Subsequent mixing with “solar type gases” from the interior of the Earth
ultimately produced the atmosphere that exists today.

Busemann H. *  Baur H.  Wieler R.
Solar Noble Gases in Enstatite Chondrites and Implications for the Formation of the
Terrestrial Planets [#1665]
We report evidence for tiny amounts of — most likely primordial — noble gases with solar-like elemental and
isotopic composition admixed to Q-type primordial noble gases in an E chondrite. We will discuss possible
implications of this finding for terrestrial planet formation.
Genda H. * Abe Y.  
*Survival of a Protoatmosphere Through the Stage of Giant Impacts* [#1623]
We examined the relation between the global ground motion exited by giant impact and the loss fraction of atmosphere. Unlike the previous studies, estimated loss fraction is <30%. It should affect the origin and evolution of planetary atmosphere.

Rusher T. * Humayun M.  Campbell A. J.  
*Siderophile Elements in Metal Segregated from Partially Molten Ordinary Chondrite: Implications for Early Differentiation Processes* [#1174]
Siderophile elements have been measured in metallic liquid segregated from partially molten ordinary chondrite. Siderophile concentrations in quench metal are similar to natural IIE irons.

Holzheid A. * Balog P.  Rubie D. C.  
*The Effect of Pressure on Sulfide Melt Distribution in Partially Molten Silicate Aggregates: Implications to Core Formation Scenarios for Terrestrial Planets* [#1367]
The effect of pressure on the wetting behavior of sulfide melt in partially molten solid silicate matrices was studied. The sulfide melt distribution indicates possible interconnected liquid metal phases in a silicate matrix at higher pressures.

Watson H. C. * Fei Y.  Watson E. B.  
*Diffusion of Siderophile Elements in Iron-Nickel Alloys at High Pressure and Temperature* [#1871]
Experimental determination of diffusion coefficients for several siderophile elements (Au, Re, and Pd) at 10–20 GPa and up to 1600°C in 90 wt% Fe, 10 wt% Ni alloy.

Boyet M. * Rosing M.  Blichert-Toft J.  Storey M.  Albarede F.  
*142Nd Evidence for Early Earth Differentiation* [#1945]
Evidence of a 30 ppm 142Nd anomaly in three Greenland metabasalts is presented. The preferred interpretation draws on the formation of thick protocrust in the wake of core segregation.

Papanastassiou D. A. * Sharma M.  Ngo H. H.  Wasserburg G. J.  Dymek R. F.  
*No 142Nd Excess in the Early Archean Isua Gneiss IE 715-28* [#1851]
We have remeasured, with greatly improved precision, 142Nd in an Archean Isua Gneiss and find no excess in 142Nd, in contrast with an earlier report.