Geophysical Research Abstracts
Vol. 16, EGU2014-17036, 2014
EGU General Assembly 2014

Origin and timescale of volatile element depletion in crustal and mantle reservoirs

Frederic Moynier (1) and James M. D. Day (2)

(1) Institut de Physique du Globe de Paris and Université Paris Diderot, 1 rue Jussieu, Paris, 75005, France. moynier@ipgp.fr,
(2) Scripps Institution of Oceanography, La Jolla, CA 92093-0244, USA. jmdday@ucsd.edu

Volatile elements play a fundamental role in the evolution of planets. Understanding of how volatile budgets were set in planets, and how and to what extent planetary bodies became volatile-depleted during the earliest stages of Earth and Solar System formation remain poorly understood, however. It has been proposed that the depletion is due to incomplete condensation (volatile elements were not there in the first place, in which case the timing would have to be fast, <1Myr), or that planetary bodies lost volatile elements through evaporation (post-accretion volatilization). Volatilization is known to fractionate isotopes, thus comparing isotope ratios of volatile element between samples is a powerful tool for understanding the origin of volatile element abundance variations. For example, recent work has shown that lunar basalts are enriched in the heavier isotopes of Zn ($\sim$1 ‰ for 66Zn/64Zn) compared to chondrites, terrestrial and martian basalts. We will discuss these Zn isotopic data of crustal and mantle rocks, as well as other stable isotopic systems (e.g., Si) in relation with the giant impact theory of lunar origin, as well as the lunar magma ocean and expand to other parent bodies (e.g., angrites). The timescale of depletion in volatile elements of Solar System material is estimated by using radiogenic systems for which the parent and daughter elements have different volatility. Here we focus on the Rb-Sr and Mn-Cr isotopic systems and discuss the timescales and implications for the origin of volatile element depletion (solar nebula stage vs. planetary stage).