Meteorites and the composition of Earth

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Meteorites are often considered as leftover material from accretion of Earth and other planets. A comparison of the chemical and isotopic composition of meteorites with Earth excludes major contributions to Earth from the two most abundant chondrite groups, carbonaceous (CC) and non-carbonaceous chondrites (NCC). Chemically CV-meteorites closely fit the bulk silicate Earth (BSE) composition, but stable isotopes exclude major contributions by CC. Ordinary, and in particular, enstatite chondrites come close to Earth in isotopes but fail to fit with chemistry, being too low in refractory elements and too high in the moderately volatile elements Na and Mn [1].

The angrite parent body as a major component of Earth is favoured by [2]. Angrites are highly differentiated meteorites and the composition of their parent body is not known [3]. Other chondrite related meteorites (Acapulcoites, Tafassasset etc.). do not match both, chemistry **and** isotopic composition of Earth.

As it seems unlikely that a single, rare group of meteorites makes up the major fraction of Earth, one could imagine the Earth to represent an average of meteorite types. But Earth has in some elements endmember composition, in chemistry and stable isotopes. Massive addition of a refractory component (CAI) to solar abundances is required to produce the Earth source material. Sun like stars (solar twins) are higher in refractory elements than the Sun. There may be a causal relationship between the refractory element poor photosphere of the Sun and refractory element rich planets around the Sun, as suggested by [4].

Lit.: [1] Palme H. & Zipfel J. (2016) LPSC, #2252. [2] Fitoussi et al. (2015) EPSL 434, 151. [3] Longhi (1999) GCA 63, 573. [4] Melendez et al. (2009) AJ 704, L66.