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Accretion of volatiles by Earth

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Recent isotopic measurements for H [1], N [1,2], Zn [3,4,5], K[6] in the framework of the so-called isotopic dichotomy between inner and outer solar system material revealed that Earth accreted volatile elements from both reservoirs, with a slight predominance for the inner solar system source. On the other hand, an isotopic cometary signature is present for Xe [7] and Kr [8] in the terrestrial atmosphere.

I will present an updated scenario of Earth accretion that explains these isotopic constraints. Pebble accretion played no role in the formation of Earth, which instead accreted ~95% of its mass from planetesimals formed near 1 au, on average much more depleted in volatile elements than enstatite or ordinary chondrites, plus ~5% of carbonaceous asteroids scattered from the vicinity of Jupiter. This inventory is completed by the accretion of <0.01% Earth masses of cometary material in the aftermath of the Moon-forming event.

The existence of even small amounts of volatiles of non-solar isotopic composition in inner solar system planetesimals raises interesting constraints on the evolution of dust and gas in the protoplanetary disk.

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