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Rare meteorites common in the Ordovician period

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Abstract

 Most meteorites that fall today are H and L type ordinary chondrites, yet the main belt asteroids best positioned to deliver meteorites are LL chondrites 1,2. This suggests that the current meteorite flux is dominated by fragments from recent asteroid breakup events 3,4 and therefore is not representative over longer (100-Myr) timescales. Here we present the first reconstruction of the composition of the background meteorite flux to Earth on such timescales. From limestone that formed about one million years before the breakup of the L-chondrite parent body 466 Myr ago, we have recovered relict minerals from coarse micrometeorites. By elemental and oxygen-isotopic analyses, we show that before 466 Myr ago, achondrites from different asteroidal sources had similar or higher abundances than ordinary chondrites. The primitive achondrites, such as lodranites and acapulcoites, together with related ungrouped achondrites, made up ~15-34% of the flux compared with only ~0.45% today. Another group of abundant achondrites may be linked to a 500-km cratering event on (4) Vesta that filled the inner main belt with basaltic fragments a billion years ago 5. Our data show that the meteorite flux has varied over geological time as asteroid disruptions create new fragment populations that then slowly fade away from collisional and dynamical evolution. The current flux favours disruption events that are larger, younger and/or highly efficient at delivering material to Earth.

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