

Mars: A major ingredient to the Earth's recipe

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The Earth formed in a swarm of Moon to Mars-sized objects that collided together to build our planet. A large body of work has been dedicated to make the Earth out of single groups of chondrites, however, these models could not account for the isotopic and elemental characteristics of the Earth. Here, we tested mixtures of meteorites, including achondrites, analyzed for seven isotope systems to reproduce the terrestrial isotopic compositions. Our Monte-Carlo inversion yielded a new model where Earth and Mars almost entirely came from the same source material. This finding is in striking agreement with recent planetary formation models in which Earth and Mars formed in a common narrow zone of the protoplanetary disk. In addition, our model matches all isotope compositions for both planets, reproduces volatile element budgets in Mars, and accounts for the enrichment in refractory elements of the Earth compared to chondrites.