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Formation and composition of Earth's Hadean protocrust

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Although the Earth together with other terrestrial planets must have had an early-formed protocrust, the chemical composition of this crust has received little attention. The protocrust was extracted from an extensive magma ocean formed by accretion and melting of asteroidal bodies. Both experimental and chronological data suggest that the silicate melt ascending from this magma ocean formed in equilibrium with, or after, metal was extracted to form the Earth's core. Here, we show that a protocrust formed under these conditions would have had incompatible trace element characteristics remarkably similar to those of the current average continental crust. There are major implications for subsequent planetary evolution. Many geochemical arguments for when and how plate tectonics began implicitly assume subduction is required to produce the continental trace element signature. These are severely compromised if this signature was already a feature of the Hadean protocrust.