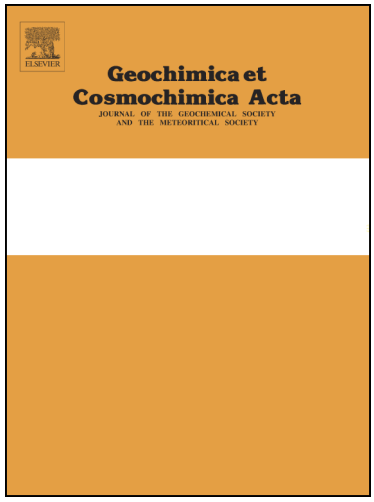

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Maghemite soil nodules reveal the impact of fire on mineralogical and geochemical differentiation at the Earth's surface

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Abstract

Fires occur frequently over large parts of the Earth's surface. They potentially exert a significant influence on the mineralogical and geochemical characteristics of an environment that is otherwise considered to be dominated by low temperature processes. We test this hypothesis by comparing the mineralogy and geochemistry of i) magnetic, iron-rich soil nodules, ii) non-magnetic iron soil nodules and iii) a published dataset of surficial sediments from Eastern Australia.

Maghemite-rich nodules are present in soils from around the world. It has been argued that they are thermal alteration products of non-magnetic precursors, but this remains controversial. We use detailed petrographic and mineralogical analyses to demonstrate that maghemite occurs as part of a high temperature mineral assemblage including hematite and χ-alumina, within a magnetic nodule microfabric indicative of fire-induced dehydroxylation and sintering of non-magnetic precursors at