Emergence of continents above sea-level influences composition of sediment melts

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The Archean-Paleoproterozoic transition is characterized by fundamental changes in the geologic record due to global-scale transformations in Earth's geodynamics and atmosphere. One striking change during this interval is a rapid shift in the oxygen isotope composition of felsic magmas, as recorded by an increase in zircon $\delta^{18}O$ values. Potential nonexclusive causes for this increase include variations in the composition of supracrustal rocks and their availability for recycling, as well as, enhanced crustal reworking. Numerical models imply that at the end of the Archean, continents were mostly submerged due to a weaker continental lithosphere and limited crustal thickening. In contrast, the emergence of subaerial continents in the Paleoproterozoic Period is consistent with an increase in subaerial large igneous province volcanism and subaerial sediment deposition. Here we present isotopic data of magmatic zircon crystals in migmatites and sediment-derived granitoids of the North China Craton with crystallization ages from 2.5 to 1.9 Ga. We use zircon U/Pb ages, oxygen and hafnium isotopes to track the incorporation of supracrustal material into magmas spanning the Archean-Proterozoic boundary. Our results support the increase of continental freeboard in the Paleoproterozoic Period which led to the formation of a sedimentary reservoir with enriched ^{18}O (as compared to the Archean) that in turn influenced the $\delta^{18}O$ composition of sediment-derived magmas.