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Supplemental Material for

Phosphorus deficit of continental crust induced by recycling of apatite-bearing cumulates

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DATA SOURCE

All geochemical data for igneous rocks from subduction zones used in this study were taken from Precompiled Files of Convergent Margins (DIGIS Team, 2021, "GEOROC Compilation: Convergent Margins", https://doi.org/10.25625/PVFZCE, GRO.data, V1) in the GEOROC database (http://georoc.mpch-mainz.gwdg.de/georoc/). The compiled data include nearly all active continental and island arcs (they do not display obvious differences in P/Nd). We filtered out sedimentary and metamorphic rocks and only retained Cenozoic samples to ensure they represent recent arc magmatism. The chemical compositions of minerals (amphibole, apatite, clinopyroxene, feldspar, garnet, mica, orthopyroxene, titanite, and zircon) were also taken from Precompiled Files in the GEOROC database (DIGIS Team, 2021, "GEOROC Compilation: Minerals", https://doi.org/10.25625/SGFTFN, GRO.data, V1). The chemical compositions of monazite were taken from Bea, (1996). We only retained the minerals from mafic to granitic igneous rocks and excluded those from peridotite xenoliths and carbonatites because they are not related with arc magmatism. These minerals are from all geological backgrounds and have different ages. The major element data of arc cumulates or arclogites were taken from the supplementary material in Chin et al. (2018), and Th/La data were compiled in this study. These cumulates are from continental arc (e.g., Sierra Nevada, Arizona, Andes) and island arc (e.g., Kohistan, Marianas, Sunda) and the details can be found in the literature (Lee et al., 2006; Erdman

et al., 2016; Chin et al., 2018). The data of glacial diamictite are taken from Gaschnig et al. (2014, 2016). The oceanic island basalts (OIB) and mid-ocean ridge basalts (MORB) data were respectively taken from Precompiled Files in the GEOROC and the supplementary material in Yang et al. (2021). The continental crust and primitive mantle values are from Rudnick and Gao (2013) and McDonough and Sun (1995) respectively. All data used in this study are available at Supplementary Excel tables and https://figshare.com/articles/dataset/Phosphorus_depletion_of_continental_crust_induced_by_recycling_of_apatite-bearing_cumulates/20449146.

Table S1 Th-La-Nd partition coefficients between apatite and silicate melts

D Th	D La	D Nd	Ref	Note
	14.5-28.2	32.8-61.2	Fujimaki 1986 CMP	Melt composition is andesite to diorite
41	456	855	Bea 1994 CG	Mineral/leucosome trace-element partitioning in a peraluminous migmatite
0.33-1.08	1.91-19.7		Prowatke 2006 GCA	1250°C; 1Gpa; melt composition is basalt to granite
	2.5-11.9		Watson 1981 EPSL	950-1120°C; 7.5-20kbar; Melt composition is basanite to granite
	4.8-6.7	7-7.9	Fleet 1997 GCA	700-800°C; 0.1-0.15Gpa
4-13	77-281	159-520	Li 2017 CG	800°C; 2.5Gpa; apatite and sediment melt at subduction zone conditions

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