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Supply rate of subducting continental crust to the deep mantle

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Subductions of granitic materials by tectonic erosion, sediment-trapped subduction, and direct subduction of immature oceanic arcs are indicated by recent geological and geophysical surveys. Geological studies have estimated the volume of subducted tonalite-trondhjemite-granodiorite (TTG) materials is 7 times larger than the volume of the present continental crust. Such a huge volume of subducted granitic materials have a large influence on the chemical evolution of the Earth, and therefore their destination in the mantle has long been debated.

A recent study indicates the TTG materials are gravitationally stable in the mantle transition zone. Capacity of this layer is large enough to reserve subducted continental crust, which might control the mantle convection to some extent. However, it is unclear how and how much they subduct dynamically through the mantle under the lithosphere.

In this study, we conducted a numerical and an analytical approach on an entanglement of a granitic layer by a slab. Sustainable thickness of the subduction channel and supply rate of the granitic materials to the deep mantle are estimated.

Keywords: Continental crust, slab