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Numerical models of subduction of the oceanic and continental crust.

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Light continents and islands characterized by a crustal thickness of more than 30 km float over a convective mantle, while the thin basaltic oceanic crust sinks completely in subduction zones. The normal oceanic crust is 7 km thick. However, anomalously thick basaltic plateaus forming as a result of emplacement of mantle plumes into moving oceanic lithospheric plates are also pulled into the mantle. One of the largest basaltic plateaus is the Ontong Java plateau on the Pacific plate, which arose during the intrusion of a giant super-plume into the plate ˜100 Myr ago. Notwithstanding its large thickness (averaging ˜30 km), the Ontong Java plateau is still experiencing slow subduction. On the basis of numerical modeling, we have analyzed the oceanic crust subduction process as a function of Rayleigh number and the density, thickness, viscosity, and shape of the crust. Even a simplified model of thermocompositional convection in the upper mantle is capable of explaining the observed facts indicating that the oceanic crust and sediments are pulled into the mantle and the continental crust is floating on the mantle.