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# Strong plates enhance mantle mixing in early Earth

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In the present-day Earth, some subducting plates (slabs) are trapped above the upper-lower mantle boundary at ∼670 km depth while others go through, indicating a mode between layered and whole-mantle convection. Previous models predicted that in a few hundred degree hotter early Earth, convection was likely more layered due to dominant slab stagnation. In self-consistent numerical models where slabs have a plate-like rheology, strong slabs and mobile plate boundaries favour stagnation for old and penetration for young slabs, as observed today. We now show that such models predict slabs would have penetrated into the lower mantle more easily in a hotter Earth, when a weaker asthenosphere and decreased plate density and strength resulted in subduction almost without trench retreat. So heat and material transport in the Earth's mantle was more (rather than less) efficient in the past, which better matches the thermal evolution of the Earth.