

Institut für Geophysik

Geophysikalisches Kolloquium
Sommersemester 2022

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Subduction styles on the early Earth and the Generation of Archean Continental Crust

The style of tectonics that operated on the Hadean and Archean Earth is poorly constrained and highly debated. Mantle dynamics at this time was impacted by likely elevated interior temperatures and rates of internal heat production. Previous models of mantle convection using a pseudoplastic yield stress rheology have found these conditions promote stagnant-lid convection. Here, I use global scale models of mantle convection with grain damage, a mechanism for generating mobile-lid convection via grain size reduction, to reassess this issue. These models show that subduction can persist at early Earth conditions, however with a style that is distinct from modern-style plate tectonics. Subduction becomes sluggish and drip-like at elevated mantle temperatures and internal heating rates, due to periodic tearing, or necking, of the slab. I develop scaling laws for the time scale of this subduction episodicity. Applying these scaling laws to the early Earth shows the timescale is consistent with observations of alternating sequences of "arc" and "non-arc" assemblages seen in some Archean cratons. Moreover, this style of subduction may explain how TTGs, the dominant felsic rock type of Archean cratons, form in the first place. Models of modern-style subduction at early Earth mantle temperatures find that slabs would sink too steeply and quickly for downgoing crust to melt and form TTGs. However, I show that the sluggish, drip-like subduction style that develops with grain damage allows subducting crust to heat up enough to melt. Das Kolloquium findet um **16 Uhr** t. als Zoom-Videokonferenz statt.

Der Link dazu wird auf der Homepage und per eMail rechtzeitig mitgeteilt.

Alle an dem Thema Interessierten sind hierzu herzlich eingeladen.

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