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Thermal conductivity of hydrous silicate liquid

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Silicate liquid plays a critical role in the thermal evolution of Earth. The rate of transport of heat through silicate liquid is governed by the thermal conductivity, which remains largely unexplored. Recently, we studied the thermal conductivity of pure $MgSiO_3$ liquid, and found silicate liquid is relatively thermally insulating compared with its solid counterparts throughout the Earth's mantle. Silicate liquid can dissolve a significant amount of water. It is unclear, however, how the addition of water may affect the thermal conductivity of silicate liquid. By combining the Green-Kubo method with a machine learning potential of ab initio quality, we investigated the thermal conductivity of hydrous silicate liquid over the entire pressure regime of the mantle. In this presentation, I will present our results of the thermal conductivity of hydrous and anhydrous silicate liquid, and will discuss the implications for the magma ocean cooling and the heat flux across the core-mantle boundary.

[1] Deng, J., & Stixrude, L. (2021b). Thermal conductivity of silicate liquid determined by machine learning potentials. *Geophysical Research Letters*, *562*, 116873