Title: Viscosity jump in the lower mantle inferred from melting curves of (Mg, Fe)O ferropericlase

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Abstract: Stagnation of subducting slabs and deflection of plumes in Earth's shallow lower mantle has been suggested to result from an increase in viscosity in that depth range. However, the mechanism for this viscosity jump remains elusive. We have examined the melting phase relations in the MgO-FeO binary system at high pressures using the laser-heated diamond-anvil cell. Both the liquidus and solidus curves of $Mg_xFe_{1-x}O$ ferropericlase (x = ~0.5-0.95), exhibit a maximum at ~40 GPa, likely caused by the electronic spin transition of iron. Based on these melting curves, we calculate the relative viscosity profiles of ferropericlase of Earth-relevant compositions using homologous temperature scaling. We find that the viscosity of ferropericlase shows a 10-100 times increase near the top of the lower mantle and a subsequent similar decrease a few hundred kilometers deeper, irrespective of deformation mechanism or mantle heterogeneity.