

Electrical conductivity constraints on the origin of the oceanic asthenosphere

*Samer Naif¹

1. Lamont Doherty Earth Observatory

Recent seafloor magnetotelluric (MT) surveys have imaged the electrical conductivity structure of the oceanic upper mantle. Most regions show high conductivities (0.02 to 0.2 S/m) between 50 and 150 km depths that are inconsistent with dry mantle. Instead, the conductivity observations require either volatiles stored in nominally anhydrous minerals or the presence of interconnected partial melts, leading to dramatically different interpretations on the origin of the asthenosphere. To determine which mechanism is more plausible, I apply several competing empirical models to estimate an upper bound on the conductivity of hydrated oceanic mantle in a thermodynamically self-consistent framework. The results indicate that a subset of the MT observations exceed the maximum conductivity of hydrated mantle regardless of which empirical model is applied.