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**Thermal Electrons and Thermal Conductivity in Oxide Minerals at P and T Relevant to Terrestrial Exoplanets**[1] PHILIP B. ALLEN, Stony Brook University, KOICHIRO UMEMOTO, University of Minnesota, RENATA M. WENTZCOVITCH, University of Minnesota — The recent discovery of an extra-solar planet, with 7.5 times the mass of the Earth, has prompted investigation of a new range of parameter space, 3 times higher in temperature T and 10 times higher in pressure P than the Earth's mantle. We estimate thermal conductivity k(T) of minerals under these extreme conditions. The radiative portion of k(T) is large above the mid-lower post-perovskite mantle, where T reaches 5000-6000K. At T higher than 5000 K, free electron carriers are thermally activated with the population n(T) increasing as exp(-E*/2kT), where E* is the band gap energy of around 5 eV. Free carriers damp electromagnetic waves at frequencies below the plasma frequency, estimated to be close to 1 eV, shutting down radiative heat transport. Although thermal holes have low mobility, we find that thermal electrons are quite mobile, with small effective masses and weak scattering. Therefore, they become dominant carriers of heat. We predict electrical resistivity as low as 1000 micro-ohm cm.

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