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The three-dimensional electrical upper mantle beneath the EPR - 18 S

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We analyse the MELT magnetotelluric data to infer the mantle structure down to the transition zone. MELT full magnetotelluric response tensors were inverted for a 3-D isotropic conductivity structure. The inversion algorithm finds sets of regularized models that fit the data to a minimum level of misfit. We carried out a sensitivity analysis to investigate the horizontal and vertical resolution scales. The introduction of 3-D structures allowed fitting the four component of the magnetotelluric tensor at all sites. We did not take account for anisotropy in conductivity to decrease number of parameters to be solved. Although previous studies found strong anisotropy in two-dimensional (2-D) structure at depths of ∼60-120 km, our 3-D isotropic model obtained alternative but qualitatively consistent representation of the 2-D anisotropic structure in the same depth range although we leave further discussion of the feature to focus on deeper structure in this paper. The electrical conductivity is strongly heterogeneous at all depths. Here, we considered the mantle structure from ∼160-520 km in depth. Large conductive structures were observed in the transition zone and above to the south and to the north. In the central part of the model, the conductivity is markedly the lowest in the depth range ∼330-520 km while above (∼170-330 km), the conductivity decreases significantly to the north and to the south and increases in the central part. The results suggest a fairly complicated scheme for melt migration under this portion of the EPR. We discuss the implication for the upper mantle dynamics and melt migration from the conductivity model in view of different hypotheses from petrophysics.