ELECTRICAL CONDUCTIVITY STRUCTURE BENEATH EUROPE ESTIMATED BY GDS METHODS

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We had estimated a 1-D reference model of the electrical conductivity beneath the Pacific by inverting MT and GDS responses calculated from long submarine cable voltage data as well as geomagnetic data from several observatories/stations, taking into account the effect of conductivity contrast of the ocean and land in the inversion (Utada et al., 2003). This structure indicates jumps at 400 km and 650 km depths by two and a half orders of magnitude, respectively. The profile is very similar to the result of the laboratory measurement of electrical conductivity of mantle materials (Xu et al., 1998). Next question is whether this radially symmetric model can be used as a global reference. In this study we tried to examine whether the present model obtained from Pacific data is consistent with data from Europe.

Hourly mean values for 1960 - 1999 at 7 geomagnetic observatories in Europe were used. The GDS responses were estimated in the periods from 5 to 100 days, in which the external source of geomagnetic field variations can be well approximated by P_1^0 distribution in the geomagnetic coordinate. As the result of D+ and Occam's inversions, these responses indicate that the electrical conductivity at the lower mantle is higher by two orders of magnitude than one at the upper mantle. Sharp boundaries of the electrical conductivity in the transition zone were not detected because we used GDS responses at only long periods and they are not sensitive to jumps of the electrical conductivity around this zone. These responses are consistent with the model response from the 1-D reference model beneath the Pacific.

On the other hand, the joint D+ analysis by using all the magnetic field data showed that the observed responses are inconsistent with a 1-D model. This means significant 3-D heterogeneity may exist beneath Europe.