3-D MT modeling in an anisotropic Earth with egde-based FE

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In this work, we present the magnetotelluric (MT) electrical anisotropy effects of a three dimensional earth. To calculate MT responses for regional and deep scale, we made use of regular grids which are useful for large-scale simulations to discretize the modeling domain, then an edge-based finite element (FE) method was utilized to solve the curl-curl equation of electric fields. Based on an anisotropic marine model of Yin (2006), our results were validated as shown in Fig.1, they agree well with each other. In order to investigate the deep Earth electrical properties, we also simulated the synthetic 1-D anisotropic GSLsz model with our 3-D code, the GSLsz model comprises four layers, namely, the upper crust, lower crust, lithospheric mantle and asthenosphere, detailed parameters can be seen in the work of Jones (2012). Fig. 2 shows that our algorithm holds for modeling deep tectonic MT responses including anisotropy. Thereby, we are able to simulate the anisotropic effects of more complicated large-scale structures, such as the plate junction between the Yangtze and Huaxia plates and other lithosphere models, and provide electrical constraint for geological interpretations.

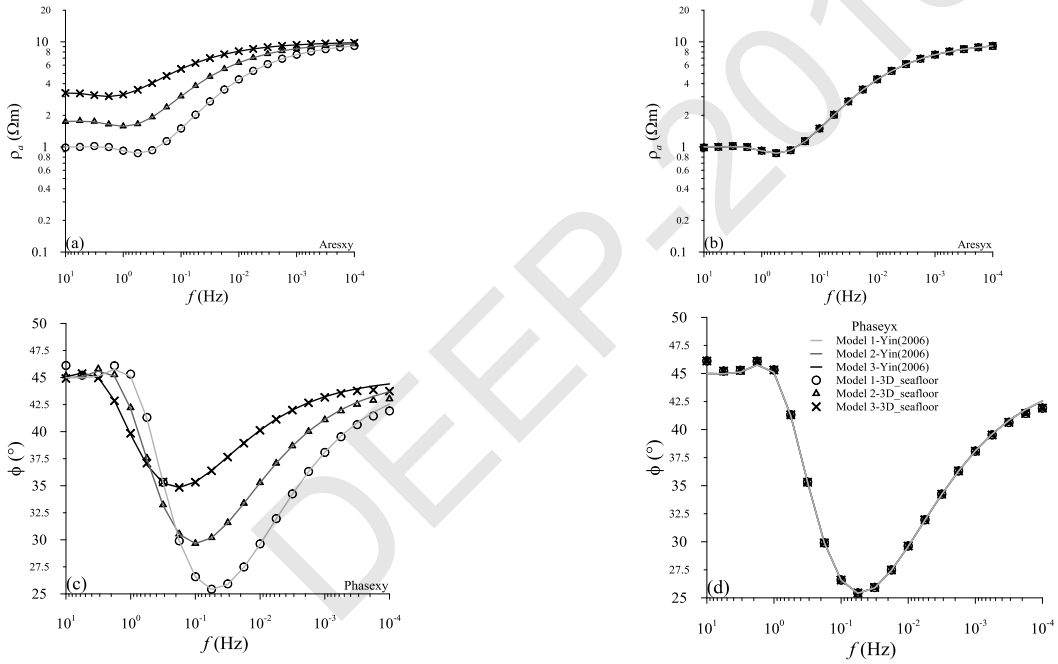

Figure 1. Appearent resistivity and phase compared with the work of Yin (2006), which demonstrates the validity of our algorithm.

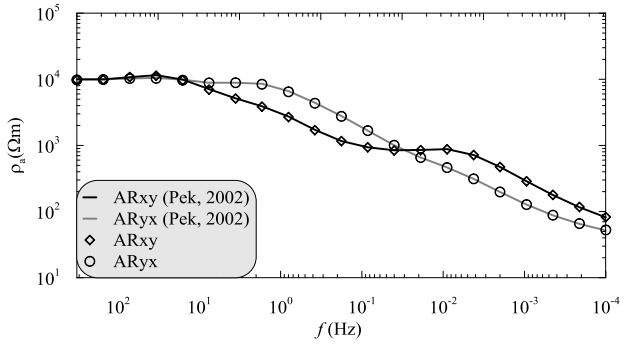

Figure 2. Apparent resistivity of the synthetic 1-D anisotropic GSLsz model solved by our code and the code of Pek & Santos (2002), they are consistent with each other.

References

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