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Magnetotelluric anomalies, computed over models having high magnetic permeability bodies

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In magnetotellurics it is assumed that the relative magnetic permeability is 1. We carried out systematic magnetotelluric numerical modelling studies to analyse the magnetotelluric effect due to a hypothetically high-permeability body in the subsurface, e.g. due to a thin (a few hundred meter thick) layer in state of second-order magnetic phase transition at the Curie depth (Kiss et al, GRL, 2005).
In one-dimensional case, we have demonstrated that a thin, highly magnetized layer produces the same size of a magnetotelluric anomaly as a similarly thin high-conductivity layer, but with the opposite sign. Its signatures are as follows. 1) extremely thick and extremely high-resistivity layers as results of magnetotelluric inversion, and 2) consistent magnetotelluric and geomagnetic depth estimations for the top of the highly magnetized thin layer.
Various two-dimensional cases (both in E and H polarisations) give further insights into this phenomenon.
If the enhancement of the magnetic permeability is exceptionally high, the effect may really distort the conventional magnetotelluric results. Such indications have already been observed in some magnetotelluric field curves in Hungary.
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