# Modelling tippers in a spherical geometry

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## SUMMARY

Several continental-scale magnetotelluric (MT) surveys have been initiated in the past decades. This motivates exploiting spherical geometry to model MT responses. However, while the MT impedances in spherical coordinates can be modelled by using different polarizations of a uniform external magnetic field as the source, for tippers, one needs another type of excitation. This is because the uniform external magnetic field of any polarization contains a non-zero radial component.

To overcome this issue, we elaborate a new source model, which leads to valid MT tippers in spherical geometry. This, in particular, allows researchers to exploit an immense amount of magnetic field data around the globe and probe the three-dimensional distribution of electrical conductivity at lithosphere and upper mantle depths on a global or semi-global scale.

The proposed source model has been validated by a novel, accurate, computationally efficient solver called GEMMIE. This solver is based on the nested domain integral equation approach and allows us to calculate high-resolution EM fields and responses, including tippers, globally and regionally, taking into account realistic oceans, sediments and mantle structures.

**Keywords:** Magnetotellurics; Electromagnetic theory; Geomagnetic induction; Numerical modelling