# Anomalous Phase in Elongated Prism Body: A Synthetic 3D MT Forward Modelling

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**Summary:**

The magnetotelluric (MT) method is one of the successful geophysical techniques to investigate subsurface structures from shallow to great depths. In this method, two horizontal components of the electric field and three components of magnetic fields are measured and are transformed into transfer functions such as impedance tensor. Normally, the impedance phases for the off-diagonal components of the impedance tensor lie in the first ($0°<\Phi<90°$) and third quadrant ($-90°<\Phi<-180°$) for the XY and YX components, respectively. Sometimes, some phases may lie out of these quadrants. Such phases are termed Anomalous phases (AP). The AP acts as a barrier to the proper interpretation of the MT data. Simple 1D or 2D structures do not cause AP. Previously, complex 3D models are used to demonstrate and discuss the AP. In this study, we present a simple 3D model that can also generate AP. A conductive prism orientated N60°W is embedded in half space at a shallow depth. The impedance tensor was computed at a regular grid. From the simulated data, we observed AP near the two edges of the prism. The electric field vector rotates more than 90° at these places for a period greater than 10 s. The simple structure is able to produce the AP due to the current channeling toward the conductor and reversal of the electric field. The AP depends on the length/width ratio and orientation of the prism and the conductivity contrast between the prism and the background. Further, a discontinuity was introduced at the center of the prism. Using the computed forward responses, AP was observed around the discontinuity region.

**Keywords:** Magnetotelluric, Anomalous phase.