The Mérida Andes of Venezuela: Magnetotelluric forward modelling and comparison with real data

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**Abstract**

The interaction of the Caribbean and South American plate in the western part of Venezuela and its relationship with the Venezuelan Andes, is not well understood from a geophysical point of view. The aim of the project is to develop a geodynamic model of the Mérida Andes and Western Venezuela, employing a wide range of geophysical methods such as gravity, seismology, seismic, GPS, MT and others.

**MT data acquisition and processing**

Between March and April 2015 a total of 72 MT stations were acquired across the Venezuelan Andes

**Acquisition settings:**
- 5–3 km site spacing
- 5-component MT stations
- Sampling rate: 25 kHz (10 min/day) – 1250 Hz (10 min/24h) – 50 Hz (continuous), using S.P.A.M. Mk IV.
- Recording time: 3 days/site.
- Remote Reference Station approx. 300 km east of profile.

**Data processing**

MT transfer functions were processed using single site and remote reference processing techniques.

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**Summary**

- Off-profile structures have strong influence on MT profile data: inversion strategy based on 3D modelling with 3D control and 3D inversion with geophysical content.
- The interaction of the Caribbean Sea has little influence (Fig. 5).
- Considering topography is important.

**1D forward modelling**

1D forward models were developed to better understand the influence of far away structures and the effect of topography.
- Models were created on 3D grid (version 2.3.4) and NOEM (Biggert & Kelbert 2012, Meqbel 2009, Kelbert et al. 2014) with varying structural and topographic conditions.
- Topography in the survey area varies from 0 m to 3600 m a.s.l.

**Data analyses**

- Dimensionality and directionality analysis:
  - Phase tensor (PT) (Caldwell et al., 2004) were used to describe the surface complexity of the area.
  - PT data values deviating from zero and variable orientation of PT ellipses indicate a 3D response for most of the sites towards medium/long periods.
  - A strike analysis using the algorithm of Becken & Burkhardt (2004) suggest a regional electrical strike of N 54° E.
- Data indicates that there is more than one strike direction varying from north to south along the profile.

**References**