Joint modeling of seismic, magnetic and gravimetric data unravels the extent of the Late Cretaceous Magmatic Province on the Estremadura Spur offshore West Iberia

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Geographic location

This work consists in a seismic-stratigraphic interpretation of five 2D profiles of multichannel seismic in the surrounding region of the Fontanelas submarine volcano (Estremadura Spur, West Iberia) and a joint forward magnetic and gravimetric modeling.

The Fontanelas seamount is a volcanic building about 3000m high, from the top to its underground base. It is located in the Estremadura Spur, a 100 km wide upright continental crust block (Pereira et al., 2016).

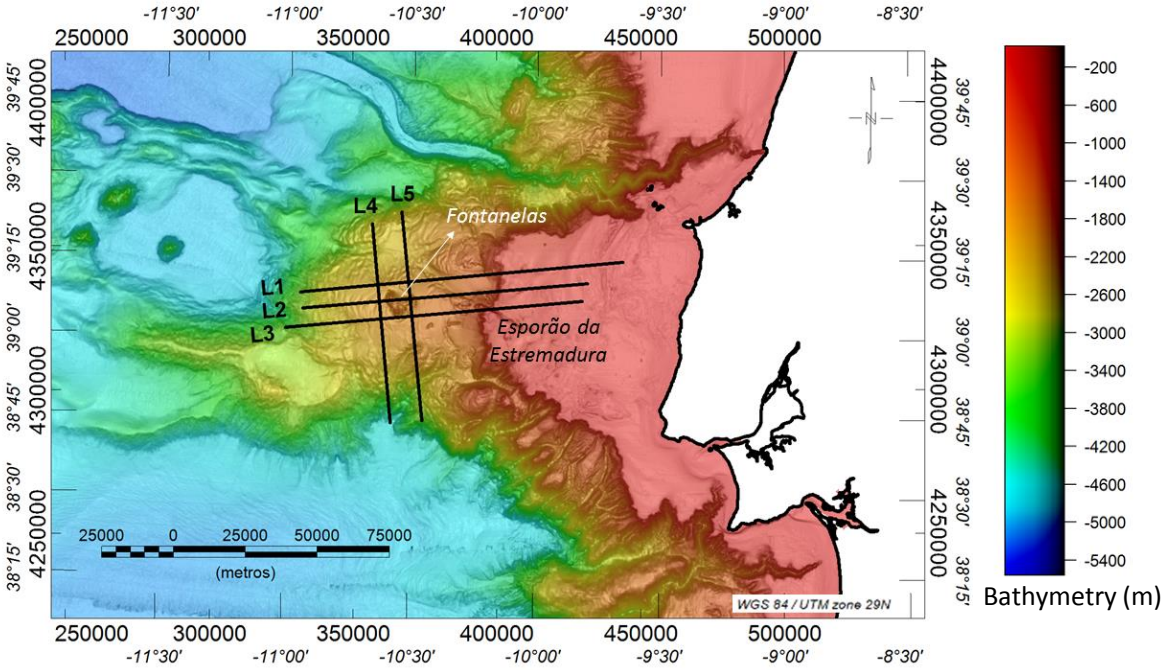


Fig. 1 – Location of the seismic lines, aquired from TGS Nopec and bathymetric map of the area (EMODNET Bathymetry http://www.emodnetbathymetry.eu/).

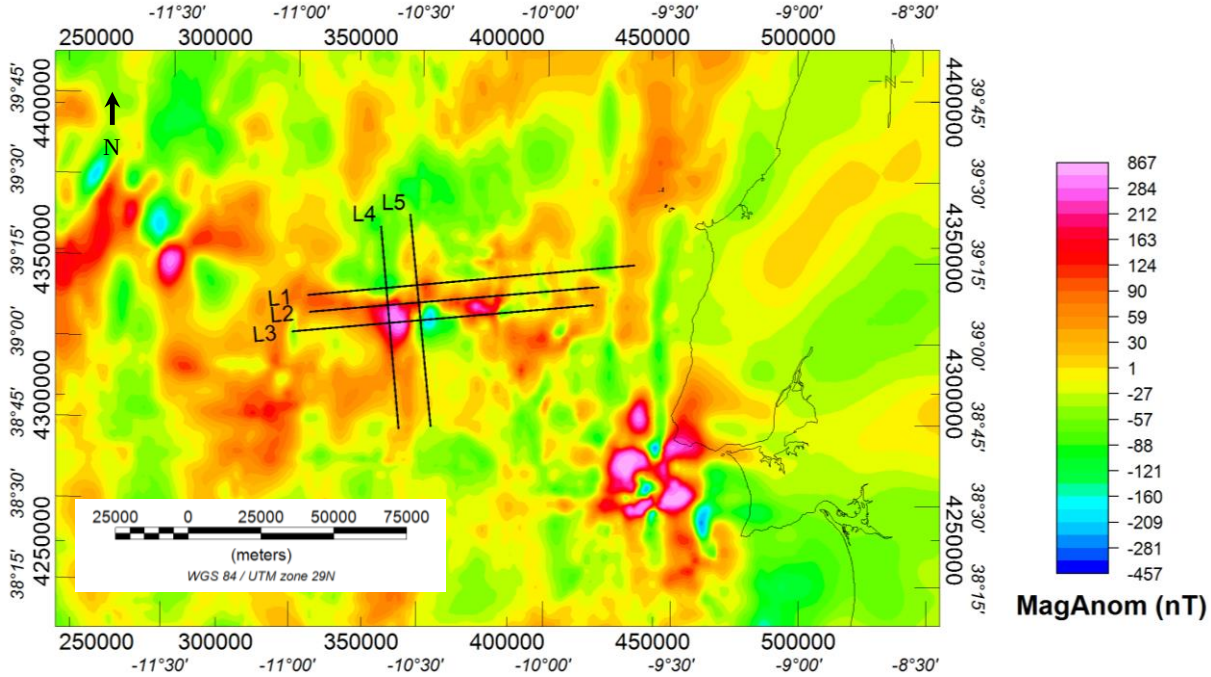


Fig. 2 - Magnetic anomaly map taken from the updated compilation by Luis and Miranda (2008). Data acquired from shipborne and airborne.

Methodological process

1. Geological interpretation of 2D multi-channel seismic reflection profiles;

2. Forward magnetic and gravimetric modeling;

3. Final seismic interpretation.

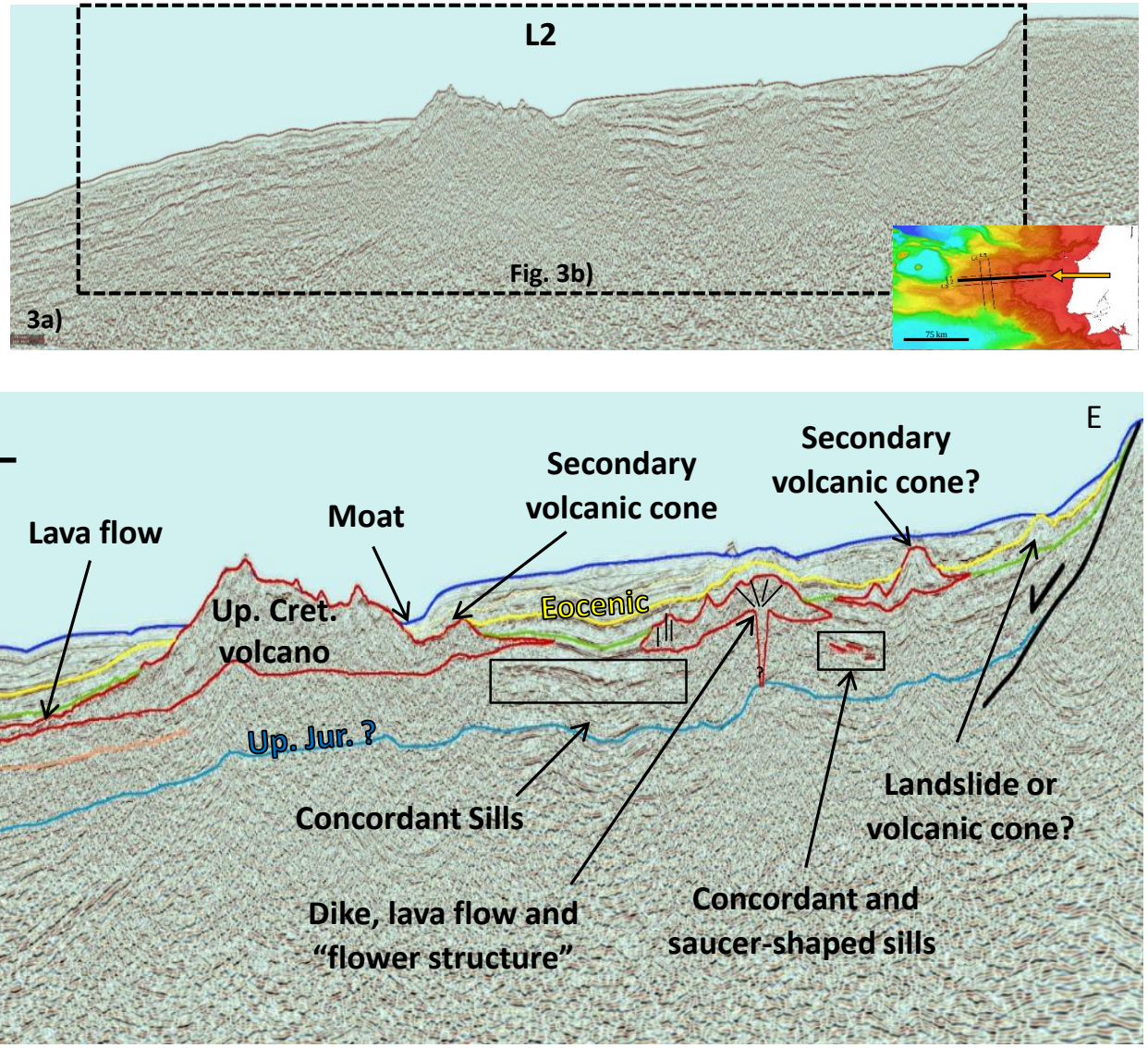
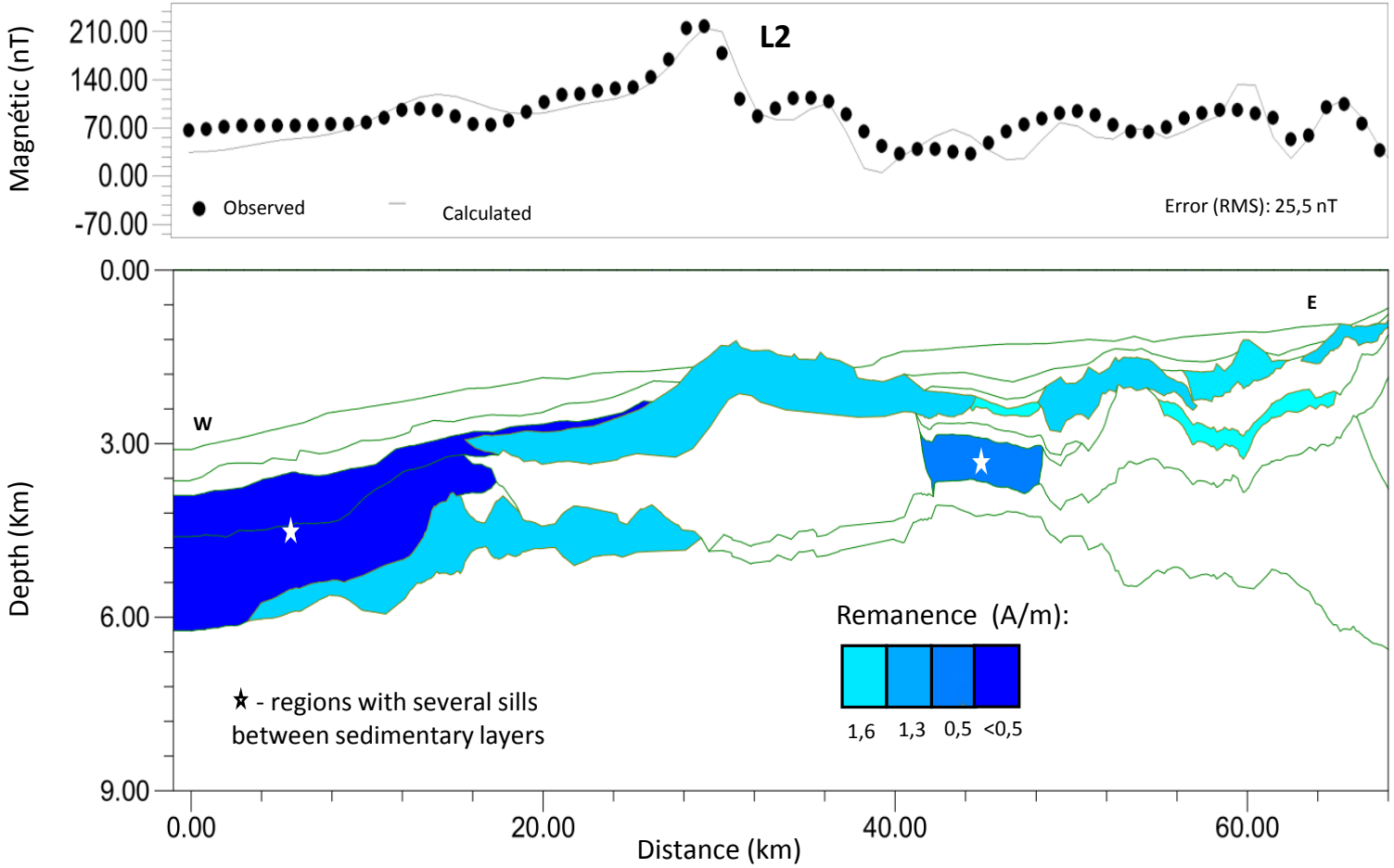


Fig. 3 – a) Seismic profile L2 (PD00-304) without interpretation and its location. b) Seismic profile L2 (PD00-304) with geological interpretation before the magnetic modeling.

Forward magnetic modeling

- The joint foward modeling allowed the indentification of several intrusive and extrusive magmatic bodies in this region.
- It was possible to date the main volcano as being before the Campanian (83.6 Ma) through seismic stratigraphy, associated with the alkaline magmatic event of the Upper Cretaceous known onshore (eg Miranda et al. 2009).

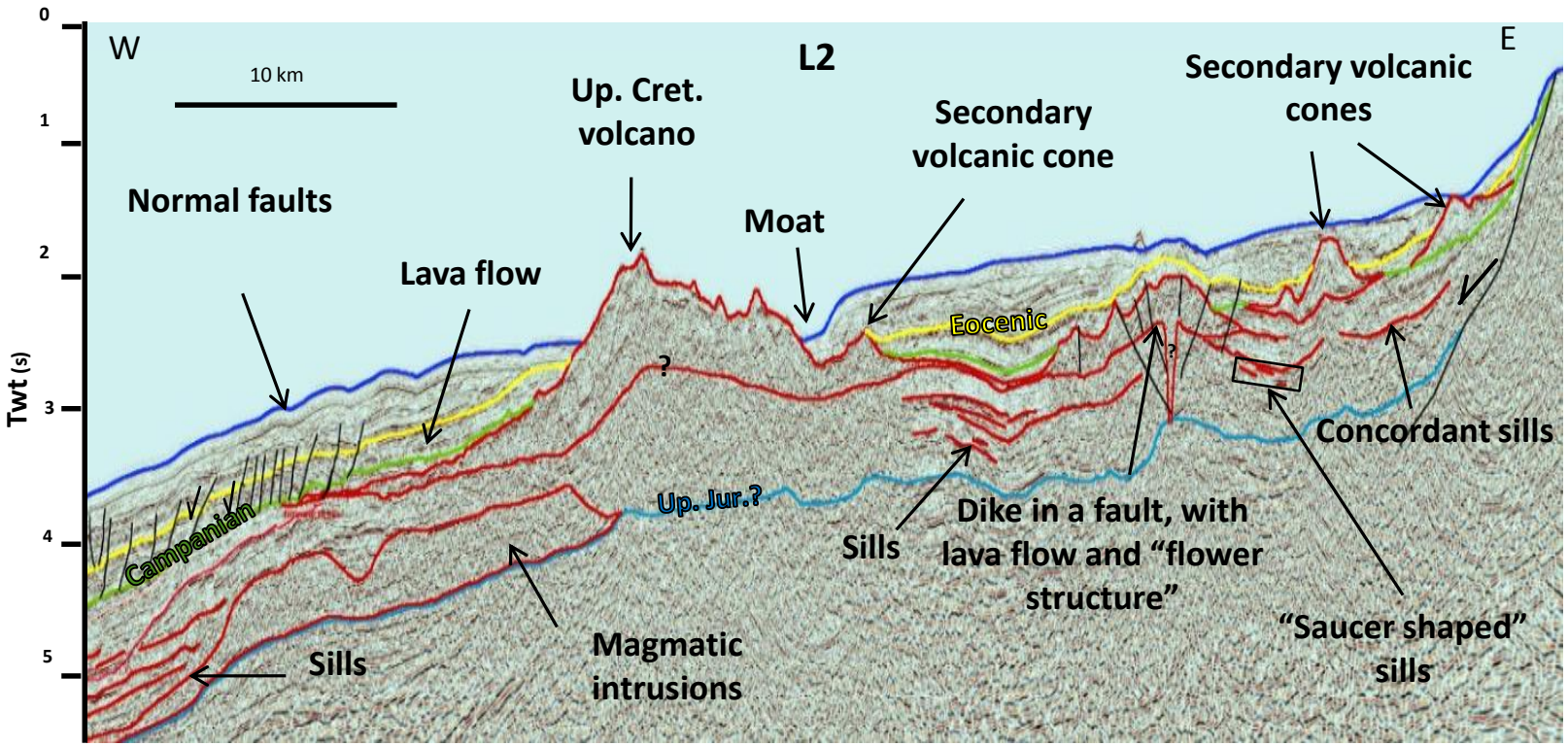
Forward magnetic modeling



Final seismic interpretation and conclusions

- The magnetization that best fits the main volcano is similar to the observed in alkaline magmatic rocks of the Upper Cretaceous from onshore of Portugal.
- Some intrusive magmatic bodies found are intruded into originally normal faults, which during tectonic inversion, may have been reactivated as inverse faults
- Compressive deformation often matches magmatic intrusions.

Seismic interpretation after the magnetic modeling



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