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ASTERICS (= Geophysical studies near the Ascension Transform: evolution of ridge segmentation and crustal structure) - segment A3

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The project ASTERICS deals with the investigation of the crustal structure in the area of the Ascension Transform (AT) at the Mid-Atlantic-Ridge (MAR). The AT is a 'double transform fault' consisting of two parallel transform fracture zone systems sandwiching a very short segment. The aim of the seismic studies carried out within ASTERICS is to investigate the tectonics and structure of the double transform and to constrain the processes of segmentation occuring on the MAR just south of the South Ascension Fracture Zone (SAFZ). South of the SAFZ four spreading segments can be identified. Segment A1 is formed by a typical axial ridge with a distinct graben. To the south segment A2 continues with an intermediate shaped seafloor topography. Segment A3, the topic of the poster, is marked by a well-defined axial high that might correspond to a site of excess magmatism. The MBA (Mantle-Bouger-Anomaly) of earlier measurements shows a well-developed bulls-eye gravity low here consistent with either thickened crust and/or active mantle upwelling. Wide angle studies with Ocean-Bottom- Seismometers (OBS) and deep towed multichannel seismic streamer profiles are used to investigate the crustal fabric in order to distinguish between the two models.

Forward modelling with MacRay was applied to inline traveltime observations from a grid of five profiles. The resulting models show a high of the uppermost crustal layers in the centre of each profile. Further model development using the First Arrival Seismic Tomography (FAST) code confirm this. Within the inversion models lower crustal velocities (> 7 km/s) are found to spread almost horizontal across the model.

Mantel velocities (> 7.5 km/s) are found at about 10 km depth. Exact position of the MOHO will be confirmed by modelling of PMP reflection events. First tests in MacRay expect a flat MOHO at a depth of about 10 km. These observations argue for an increased crustal thickness of about 8 km in the centre of the high, compared to 6 km - 7 km at the sides in the segment A3. Which is much thicker than observed along segment A1 (about 4 km). 3-D inversion of OBS data recorded within a grid of 12 profiles will be accomplished with FAST to further image the crust with more detail.