Geophysical Research Abstracts
Vol. 21, EGU2019-10259, 2019
EGU General Assembly 2019

Processing multichannel seismic data from 13°N at the Mid-Atlantic Ridge: the complication of out-of-plane reflections.

Chisomaga Opara-Nestor (1), Murray Hoggett (1), Timothy Reston (1), Gael Lymer (1), Christine Peirce (2), Richard Hobbs (2), and the JC132 team ()

(1) University of Birmingham, Birmingham United Kingdom, (2) Durham University, United Kingdom

Oceanic core complexes (OCCs) are some of the largest exhumed fault surfaces on Earth and can be up to 30km long in the slip direction, with hundreds of meters of relief. OCCs form, exhuming lower crustal and mantle rocks, when spreading rates are low and where magma supply is limited. However, the geometry of OCCs at depth, their ridge parallel connectivity, and their mechanisms and modes of formation are poorly understood.

Seismic reflection data should be able to image the detachment with depth sub-seabed. However, the rugged seabed topography and lack of sediment cover of slower spreading mid-ocean ridges cause high seafloor reflection coefficients, severe scattering and attenuation of the down-going seismic signal. The extreme faulted and volcanic topography leads to many of the brightest reflections in the subsurface actually being reflections from fault planes exposed at the seafloor and the relative paucity of reflectors in the subsurface causes failure of regular velocity analysis methods such as semblance and constant velocity-stacks.

Using multichannel seismic data acquired at 13°N at the Mid-Atlantic Ridge, here we present a methodology for optimizing the processing of 2D seismic reflection data to address these problems, including; applications of water velocity dip move-out (DMO) to suppress out of plane reflections, the use of theoretical velocity models and forward phase screen seismic modeling to differentiate out of plane reflections and aid interpretation.