AGU FALL MEETING
San Francisco | 14 – 18 December 2015

V21A-3027: Seismic structure of an amagmatic section of the *ultra-slow spreading South West Indian Ridge: the 2014 Sismosmooth cruise*

ABSTRACT

Tuesday, 15 December 2015
08:00 - 12:20
Moscone South - Poster Hall

Exhumation of mantle derived rocks at the seafloor is common at slow spreading ridges, and is observed or inferred in the distal parts of many divergent continental margins (Ocean Continent transition-OCT). It is therefore a fundamental plate tectonic process. It involves large normal fault displacements, and has consequences in terms of magmatic and hydrothermal processes, two parameters that (with divergence rates) control the thermal evolution of the plate boundary. Mantle exhumation may also favor specific deep seafloor ecosystems (hydrogen and methane produced during serpentinization may be used as a fuel for microbial activity). Key questions at both slow-spreading ridges and OCTs are: how do exhumation faults work? how deep does serpentinization extend? and what is the proportion between serpentinized mantle and intrusive magmatic rocks within the seismic crust?

In order to address these questions, and to characterise the nature of oceanic crust formed in an amagmatic section of an ultra-slow spreading ridge, we acquired 3D seismic reflection and refraction data across the South West Indian Ridge at 64.3°E in October 2014 aboard R/V Marion-Dufresne. The study area is a corridor of nearly amagmatic spreading, where previous sampling indicates that continuous tectonic exhumation of mantle-derived peridotites occurred over the past 8-10myrs (Sauter et al., Nature Geosc. 2013). We used a 4.5 km long streamer and 38 ocean bottom seismometers in 56 deployment. Our cruise was designed to characterize velocity-depth profiles and Vp/Vs ratio in variably serpentinized ultramafic basement, their lateral variability, and the differences between axial and off-axis areas, as well as the seismic reflectivity structure in exhumed ultramafic domains. We also aimed to image the active detachment fault responsible for on-going mantle rocks exhumation at the ridge. In this poster presentation, we provide details on the experimental setting, and an overview of the results of preliminary processing of the data. These indicate that the seismic crust is thin and comprises an uppermost layer of very low velocity overlying a higher velocities domain. The seismic crust and the underlying mantle show several reflectors that could be interpreted as faults, magmatic injections or contrasted degrees of serpentinization.

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