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ABSTRACT

The active spreading processes at ultraslow spreading mid-ocean ridges are still poorly explored because the main representatives, the Arctic Ridge System and the Southwest Indian Ridge (SWIR) lie in regions with difficult working conditions.

The structure of the oceanic crust generated by the ultraslow-spreading Knipovich Ridge still remains relatively uninvestigated compared to the other North Atlantic spreading ridges further south. The complexity of γ_{Θ} . the Knipovich Ridge, with its oblique ultraslow-spreading and segmentation, makes this end-member of Spreading Ridge Systems an important and challenging ridge to investigate. The aim of this work is to better understand the lithospheric structure beneath the rare ultraslowspreading ridges, using as example the Knipovich Ridge along its spreading direction. Ultraslow spreading ridges, namely the Arctic ridge system with the Gakkel Ridge, Lena Trough and Knipovich Ridge and the Southwest Indian Ridge (SWIR), greatly differ in their morphology from faster spreading ridges. The Ocean Bottom Seismometer (OBS) data along a refraction/reflection profile (~280 km) crossing the 76° Knipovich Ridge off the western Barents Sea was acquired by use of RV G.O. Sars on July 24 - August 6, 2019. The project partners are University of Bergen, Institute of Geophysics, Polish Academy of Sciences, and Hokkaido University. The acoustic energy was emitted every 200 m by an array of air-guns with total volume of 80 I. To receive and record the seismic waves at the seafloor, ocean bottom seismometers were deployed at 12 positions with about 15-km spacing in 2 deployments. All the stations were recovered and correctly recorded data. Clear seismic energy from airgun shots were obtained up to 50 km from the OBSs. The profile provides information on the seismic crustal structure of the Knipovich Ridge and oceanic and continental crust in the transition zone. With this survey we have to some extent overlapped the previously performed profile 20090200 by Hermann & Jokat (2013). Seismic record sections were analyzed with 2D trial-and-error forward seismic modeling.

Equipment:

The wide-angle data were acquired with **seismic receivers** deployed at the sea bottom. Two kinds of ocean bottom seismometer stations (OBS) were deployed along the acquisition profile KNIPSEIS: short-period Japanese construction's OBSs without hydrophone took positions 105-109 for both deployments (University of Bergen) and Guralp Liber semi-broadband (60 s) OBSs with a hydrophone were located at 101-104 positions for the first deployment and 110-112 for the second deployment (Institute of Geophysics PAS).

Seismic source: 4 x BOLT LL 1500 airguns of 1200 cu.in, total volume 4800 cu.in., depth 12 m, shot interval ~200 m (University of Bergen).



Ocean Bottom Seismic Model in the Knipovich Ridge Area (KNIPSEIS)

Wojciech Czuba (1), Rolf Mjelde (2), Yoshio Murai (3), Tomasz Janik (1)

(1) Institute of Geophysics Polish Academy of Sciences, Warszawa, Poland; (2) University of Bergen, Bergen, Norway; (3) Hokkaido University, Sapporo, Japan.











Two-dimensional model of P-wave velocity in the crust and upper mantle derived by forward modelling using the SEIS83 package (Červený and Pšenčík, 1983). P-wave velocities in km/s are shown in white boxes. Black lines represent velocity discontinuities (interfaces). Labelled white triangles show positions of OBSs.











Examples of normalized seismic record sections with modelling along the KNIPSEIS profile, reduction

- Červený, V. & Pšenčík, I., 1983, 2-D seismic rav tracing package SEIS83 (software package)
- Wessel, P. & Smith, W.H.F., 1995. The Generic Mapping Tools GMT Version 3. Technica

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The public domain Generic Mapping Tool (GMT) software (Wessel and Smith, 1991; Wessel and Smith, 1998; Wessel et al., 2013) has been used for preparation of selected maps and figures. Seismic Unix (Cohen and

PRESENTING & CONTACT AUTHOR: Wojciech Czuba



