ESC2016-313, 2016
35th General Assembly of the European Seismological Commission

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4–10 September 2016 Trieste

Complex study of seismicity and Earth's structure on Livingston Island and surroundings

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First stage of the project "Creating an information base for study of seismicity and Earth's structure on Livingston Island and surroundings through complex research in the Bulgarian Antarctic Base area", supported by the Science Research Fund to Bulgarian Ministry of Education and Science, was implemented from December 2015 untill February 2016 in the frame of the XXIV Bulgarian Antarctic expedition. First broad band Bulgarian seismological station on Livingston Island (international station code LIVV) was installed near Bulgarian Antarctic Base "St. Kl. Ohridski". The station equipment consisted of seismometer Guralp CMG40T, geophone GS 11D, digitizer Reftek 130 and was running for 73 days. The both sensors were installed on a special foundation prepared on the site and thermal isolation was installed over the equipment. The redundancy of the power supply was provided by battery and solar panel.

More than 1000 seismic events with different nature were recorded for the period of exploitation. Registered local and regional earthquakes were localized by a software developed on the base of Gallitzin method, using amplitudes and phase arrival times obtained by the three components of the seismograms. The results were compared to the hipocentral estimations produced by other seismological centers.

During the recording period of LIVV station 126 teleseismic earthquakes with magnitude between 5 and 7.5 and epicentral distances in range 30o-95o were registered. Receiver functions for 41 teleseismic events with clear distinct P phase amplitudes within the background noise were computed.

Rayleigh waves dispersion curves for several located earthquakes were determined. The averaged shear-wave velocity structure between the epicenters and the station LIVV were obtained by optimized non-linear inversion ONLI. The depth and the resolution of the defined models depended by the epicentral distance and the period range of the dispersion curves.

The Power Spectral Density and Probability Density Functions of ambient seismic noise were estimated in the environment not polluted by human being action.

The assessment of the Earth's crust movement was defined by GNSS measurements. One permanent GNSS station was implemented and three series of GNSS measurements in 30 observation points, covering 2 km2 of Perunika glassier were carried out. The evaluated Glassier velocity was from 0.2 m to 2.0 m per month.