Self noise determination of CMG-3ESPC seismometers

The performance of a seismic station is characterized by the properties of seismic instruments, such as self noise of a seismometer and its generator constant. The Office of Seismology and Geology of the Environmental Agency of the Republic of Slovenia has planned to install three new CMG-3ESPC-seismometers in seismic stations of the Slovenian National Seismic Network. Prior to the installation, the self noise of each CMG-3ESPC-seismometer was evaluated at the Conrad Observatory using a STS-2-seismometer as reference.

The performance of a seismic station is characterized by the properties of seismic instruments, such as the self noise of a seismometer and its generator constant. Prior to the installation of new seismometers in a seismic station it is worth to evaluate these parameters.

The modernization of the Slovenian National Seismic Network started at 2000 and was finished in 2006 (Vidrih, 2007). The standard equipment was a Quanterra Q730-data logger together with a Guralp CMG-40T-seismometer with frequency response flat from 50 Hz to 0.0333 Hz (30 sec). The Environmental Agency of the Republic of Slovenia (ARSO), the Office of Seismology and Geology, which is responsible for the national seismic network, has planned to upgrade some seismic stations with CMG-3ESPC-seismometers with frequency response flat from 50 Hz to 0.083 Hz (120 sec), which have been designed for low noise sites.

The aim of the project was the comparison and the test of three new Guralp CMG-3ESP Compact-seismometers, having a flat frequency response from 50 Hz to 0.0083 Hz) (s/n T35893, T36081, T36082) at a low noise location. For this reason, the Conrad Observatory was chosen. The Conrad Observatory of the Central Institute for Meteorology and Geodynamics (ZAMG) is a multidisciplinary geophysical observatory, which provides all necessary equipment and logistics to perform this type of testing. The seismometers were installed together with a STS-2-seismometer (s/n 4977), which was provided by ZAMG. All four seismometers were installed in a tunnel side by side (Figure 1), with the same orientation. The seismometers were also well temperature isolated and were connected to two “low self noise” 6-channel EarthData PR6 acquisition units. The experiments were performed during winter 2009/2010. After the experiment, the data were analyzed and the self-noise each CMG-3ESPC-seismometer was evaluated (Figure 2).

Figure 1: Installation of seismometers.

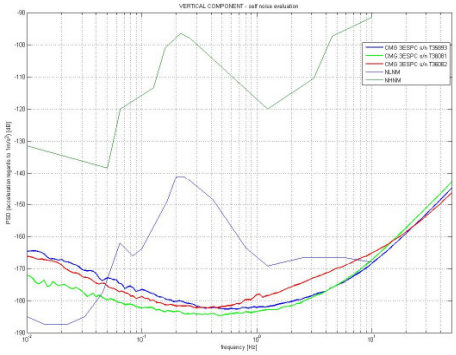

Figure 2: Self-noise of three CMG-3ESPC - seismometers, for vertical component only, compared to the standard seismic noise models of the Earth (Peterson, 1993).

References:

Vidrih, R. (Editor), 2006. Seismic Network of Slovenia, Agencija RS za okolje, Urad za seizmologijo in geologijo.

Peterson, J., 1993. Observations and modelling of background seismic noise. Open-file report 93-322, U. S. Geological Survey, Albuquerque, New Mexico.

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