Test of seismometers CMG-3ESPC (s/n T34238) and CMG-40T (s/n T4B19) - seismometers self noise evaluation.

The performance of a seismic station is characterized by the properties of seismic instruments, such as the self noise of a seismometer. The Office of Seismology and Geology of the Environmental Agency of the Republic of Slovenia, which is responsible for the national seismic network, planned to replace some seismometers CMG 40T with CMG-3ESPC. Before replacement, the self noise of both type of seismometers were evaluated, to clarify the benefits of the replacement. The self noise both seismometers (CMG-3ESPC and CMG-40T) was evaluated at the Conrad Observatory using a STS-2-seismometer as reference.

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

Tests of the two seismometers were performed at the Conrad Observatory of the Central Institute for Meteorology and Geodynamics (ZAMG). The observatory is situated about 50 km SW of Vienna and 390 km N from Ljubljana, within a nature reserve at the outskirts of the Eastern Alps. A part of the observatory is a 145 m long tunnel with several piers for seismometers, with a GPS-timing system and almost constant temperature in the tunnel. The tested seismometers, first a CMG3-ESPC (s/n T34238, having a flat frequency response from 50 Hz to 0.0083 Hz) and after that a CMG - 40T (s/n T4B19, having a flat frequency response from 50 Hz to 0.033 3Hz), were installed in a tunnel next to an STS2-seismometer (s/n 4977), which was provided by ZAMG. The seismometers were installed on a glass plate, which was coupled to the pier via a fine sand layer. The seismometers were also well temperature isolated and were connected to a 6-channel EarthData PR6 acquisition unit during the experiments. Experiment were performed in winter 2007/2008 (between 1.10.2007 and 4.3.2008). After the experiment, the data were analyzed and self-noise for both seismometers was evaluated (Figure 1). Results: Self-noises of horizontal components of CMG-40T seismometer differ form the self noise of a vertical component. As expected, CMG-3ESPC has a lover self noise than CMG-40T. In both cases, self-noises of seismometers are higher then presented by the producer (Guralp, 2000).

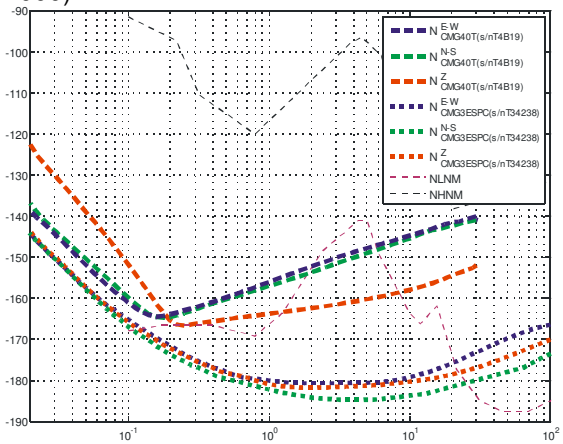

Figure 1: Estimated self-noise for a CMG40T seismometer and a CMG3ESPC seismometer for all three components, compared to the standard seismic noise models of the Earth (Peterson, 1993).

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