



Noise level analysis for BURAR seismic array, Romania

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The Romanian station BURAR (Bucovina Seismic Array) is a small-aperture array designed to monitor teleseismic and regional seismic activity, as long as underground nuclear explosions. The system has been established since July 2002 in the Northern part of Romania, in a joint effort of the Air Force Technical Applications Center, USA, and the National Institute for Earth Physics (NIEP), Romania. The array consists of 10 seismic sensors (9 short-period and one broad band) located in boreholes and distributed over a 5x5 km² area. Presently, the seismic data are continuously recorded by the BURAR and transmitted in real-time to the Romanian National Data Centre, in Bucharest and to the National Data Center of USA, in Florida. The noise level analysis for BURAR is an essential step for an accurate data processing recorded by the system. The understanding of the site noise characteristics is important within the array specific techniques (beamforming, f-k analysis), to apply the correct bandpass filtering in order to obtain noise suppression and conservation of the 'true' seismic signal. To optimize the use of array data by filtering and beamforming and to improve the monitoring potential of very small earthquakes and explosions with obtaining the best signal-to-noise ratio, an analysis on noise level of BURAR recordings was carried out. The study has been performed over one-year period, considering the noise spectra in a 0.1 to 10 Hz frequency interval, for every 24 hours: 5 minutes during day and 5 minutes during night. The database obtained was used to investigate diurnal and seasonal variations in the background noise level at the BURAR site. Noise analysis results pointed out a low level of noise at the BURAR site, mostly for low frequencies (0.1 to 0.7 Hz), comparing to Peterson NLNM. Furthermore, between 0.3 and 2 Hz the average noise power density spectrum shows a fall of slope (from -20 to +20 dB rel nm²/Hz). Systematic diurnal variations were observed between day and night times noise level: an approximate 40% decreasing in night noise level at 1 Hz frequency. On average, there is also a systematic variation in noise level between workdays and week-end days, caused particularly by a specific local activity (roads traffic and distant

mining activity), as long as between seasons, due to the agricultural and farm activities in the array area. To summarize the BURAR noise spectra for one-year observations, a model curve for array noise level has been estimated, including upper and lower bounds of noise power density together with average spectrum. The BURAR noise model will be useful in the process of local site conditions estimation, by eliminating the noise contribution from the array recording. Therefore, the site effects for the BURAR array will be assessed more accurately, as long as the contribution of background noise in data will be eliminated from the seismic recordings, and a reliable identification of the geological structure influence can be obtained.