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Detection capability of 3-component seismic stations and tripartite mini-arrays: CTBT monitoring of artificial nanoevents with M<0

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Monitoring of aftershocks after an underground nuclear explosion is an important tool for on-site inspections (OSI) within the Comprehensive Nuclear Test-ban Treaty (CTBT). Anticipated Ml of aftershock may be as low as -2. Thus, detection capability of seismic stations is a critical issue in monitoring these aftershocks. The capability determines deployment strategy at a site of an investigated explosion.

We have installed two profiles with up to eight 3-component seismic stations with the spacing of 500 m and three tripartite mini-arrays at the military test-site Turecký vrch, Slovakia. 38 subsurface explosions with the size of 75 g – 2000 g TNT were performed to simulate post-explosion aftershocks during both windy and quiet days. Seismic motions caused by the explosion were recorded and analyzed. While the tripartite mini-array was capable to detect the smallest explosion at the distance as large as 2.5 km, a single 3-component station detected the smallest explosion at the distance not larger than 1 km.

We also discuss determination of magnitudes of such small events. Possible future OSI field experiments are anticipated and discussed.