

Experimental S-wave Data Acquisition and Processing Above a Tunnel

S-waves are characterized by lower velocity than the P-waves therefore they provide more detailed images of the subsurface. The geologic and man-made structures can be detected more precisely on the S-wave sections than on the P-wave ones. However, the attenuation for the S-waves is higher than for the P-waves resulting in lower signal-to-noise ratio. That is why the S-wave data acquisition and processing is more challenging than the P-wave procedures. S-wave data collection was performed in the Bakony Mountains near Veszprém city in Hungary. The profile crossed over a railway tunnel and it was implemented along a straight and flat road. The depth of the tunnel arch was 14 m. ELVIS-III type horizontal vibrator was utilized as a seismic source and horizontal geophones were deployed to observe the S-wave arrivals. During the reflection data processing we aimed to get the highest possible signal-to-noise ratio and resolution on the final migrated section; while refraction tomography provided an independent S-wave velocity model. On both sections, slide-like structures were detected; in addition, the tunnel can be recognized as a disturbed zone on the reflection section. The explanation is that the diameter of the tunnel is on the limit of horizontal resolution (7 m).

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