1-D VERSUS 3-D STRUCTURAL MODEL IN SEISMIC SOURCE STUDIES

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The mountain region of Malé Karpaty, especially the zone around Dobrá Voda, suffers from moderate seismicity with earthquakes up to M~3.5. We study the mechanisms of the events in the complete moment tensor description, which are a useful tool for the identification of the active fault systems and for the determination of the tectonic stress. The moment tensors are sensitive to a mislocation of the hypocenters and especially to a quality of structural model applied. Following the standard approach from regional data inversions in the first approximation, we use a 1-D velocity model for calculating the response of the medium. However, such model is too simple to simulate observed polarization of the P waves with required accuracy. In consequence, it prevents us from including the horizontal components of the P waves into the inversion. For the same reason, the incorporation of the S-wave polarizations is disputable, too. Thus for the moment tensor inversion we can only use the vertical component of the P waves, which results in a considerable reduction of the input data. Nevertheless, the double-couple component determined following this approach appears to be sufficiently accurate to identify the fault plane orientation. On the contrary, the non-double-couple components are more sensitive to the accuracy of the structural modelling and can be spurious.

Next step towards a more sophisticated approach is to apply a 3-D velocity model. The 3-D laterally inhomogeneous model of the medium in the hypocenter area was created in 80-ies, and incorporated the basic geological units in the area, especially the sedimentary basin. The model was compiled with the aim to locate the microearthquakes therefore it is satisfactory from a kinematic point of view, but it may fail to predict the amplitudes with the required accuracy. Compared with the 1-D approach, the application of the 3-D velocity model improved the fit of the observed and expected polarizations essentially. Then, we can use the input data with the complete polarization vectors, which guarantees more reliable moment tensors determination including the non-double-couple components.