Geophysical Research Abstracts
Vol. 17, EGU2015-6492, 2015
EGU General Assembly 2015
© Author(s) 2015. CC Attribution 3.0 License.

Minimum 1D P- and S- Velocity Models for Montenegro and Vicinity

Ljiljana Vucic (1), Edi Kissling (2), Wim Spakman (3), and Branislav Glavatovic (1)

(1) Montenegro Seismological Observatory, Podgorica, Montenegro , (2) ETH Zurich, Department of Earth Sciences, Institute of Geophysics , (3) Department of Earth Sciences, Utrecht University and Centre of Earth Evolution and Dynamics (CEED), University of Oslo

The territory of Montenegro and its vicinity are characterized by high-seismicity rate and very complex tectonics. Namely, southern Adria microplate subducts beneath Eurasia, forming the Dinarides fold-and-thrust belt which spreads through whole Montenegro and the western Balkans. Present-day lithosphere structure of the Adria-Dinarides collision zone in general is not constrained very well and, consequently, there is a lack of three-dimensional (3D) velocity models in this region. For these reasons, high resolution 3D tomography modeling of this area is considered to be of great importance.

As part of preparatory phase for conducting a 3D local earthquake tomography study, a substantial amount of waveform data was collected, from all surroundings national seismic networks including 130 seismic stations from 11 countries. The data set comprises waveforms from 1452 earthquakes in the region recorded during time period 1990 - 2014. The collected data were obtained in different formats and the data base was harmonized by converting and integrating all data to miniseed format.

The potential resolution of collected data for seismic tomography purpose was analyzed by ray density testing, using specially developed software for this specific purpose. The result is expressed as the number of rays between selected group of earthquake hypocenters and seismic stations, penetrating through the 3D model of the Earth crust and it documents the great potential of the data set for 3D seismic tomography.

As a prerequisite to 3D tomography and for consistent high-precision earthquake locations, a minimum 1D velocity model has been calculated. The data set of around 400 earthquakes was selected from the main database and consistent wave onsets picking was performed, including seismic phase interpretation and its quality assessment. This highly consistent travel time data set is used for calculation of 1D velocity models for the region under study. The minimum 1D models were derived through the iterative inversion procedure using VELEST software.

Comparison of the results between previous routinely processed seismic data at the studied area and the earthquake relocation results by applying the new 1D models, shows a significant improvement in quality of hypocenter parameters of all earthquakes used in the experiment. Since a minimum 1D model represents a solution to the coupled hypocenter-velocity problem, the resulting velocity information will be used as a suitable velocity model for further routine earthquake location in the region, and also as the appropriate initial reference model for 3D tomography modeling, applying the full seismic database.

Keywords: minimum 1D model, seismic tomography, Velest, Montenegro