



Surface wave tomography in Northern Apennines (Italy) derived from RETREAT records

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A sets of group-velocity distributions for the period range 10 s to 45 s, both for Rayleigh and Love waves, are obtained for the region of Northern Apennines using the records from temporary seismic network RETREAT.

The Apennines represent one of the most complex zones of continental subduction. The area is characterized by syn-convergent extension processes that could not be fully explained how the retrograde motion of the subducting plate causes horizontal extension in the overlying zone of crustal convergence. A passive seismological experiment in the frame of the project RETREAT started in the end of 2003. Temporary broadband seismic network (progressively extended) is installed in the area of Northern Apennines with specific objectives to understand the deep structure beneath Northern Apennines, with particular attention on crustal and lithospheric thicknesses and patterns of mantle flows.

The records of the local and regional earthquakes from the broadband stations of the RETREAT network are collected and analyzed. The analyzed events have body-wave magnitude greater than 4.5 and occurred in the Mediterranean region in the period November 2003 - December 2005.

The collected records are with sampling rate from 20 to 50 sample/s as the most suitable for the range of the station-epicenter distances (between 100 km and 4000 km).

Applying frequency-time analysis FTAN (Levshin, 1973) for each record the group velocities of Rayleigh (on the vertical components) and Love (on the transverse component) waves are measured. The method FTAN represents the waveform as a two-dimensional function of the frequency and the time using a set of Gaussian filters.

Using floating filtering technique, the method extracts the surface-wave part of the analyzed signal with high level of signal/noise ratio.

The measured periods by FTAN are within the range 6 s to 50 s where group velocities vary from 1.5 km/s to 4.4 km/s.

A 2D tomography method is applied to estimate lateral variations of group velocities at different periods. The method is an extension of the Backus-Gilbert formalism (Yanovskaya and Ditmar, 1990) and permits the inversion of the group and phase velocity dispersion data for 2D inhomogeneous media. Analysis of 2D distributions for some period range of the surface waves gives the general view for the 3D velocity structure of the studied region.

The main pattern of the distributions at all periods is the contrast between low-velocity north-eastern part and high-velocity south-western part of the studied region. The comparison with other regional tomography studies shows very well coincidence of the obtained values for the group velocities although different tomography methods and different data sets are used. The density of data from the temporary network RETREAT allows detections of more details in the crustal velocity structure in Northern Apennines.

References

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