Full-waveform tomography in the Vrancea region - Romania

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The Vrancea region, located in the eastern part of the Carpathian arc bend, represents one of the seismically most active zones in Europe. It is characterized by quite sustained moderate-magnitude ($Mw<=5.6$) shallow to intermediate-depth activity combined with the occurrence of strong events ($Mw>=6.9$) at the intermediate depth level clustered in a rather tight area of about $40x80km^2$, , This seismic activity has often caused large damages in and beyond the region in the past, notably in Bucharest. Therefore the Vrancea region is a relevant area for many complementary geological and geophysical studies.

The international tomographic experiment CALIXTO (Carpathian Arc Lithospheric X-Tomography), conducted in 1999 in southern Romania, provides six months of registrations from a temporal seismic network composed of 90 short-period and 30 broadband sensors. Seismic travel times, retrieved from these data, have been used in connection with gravity data to produce a three-dimensional velocity and density models down to 200 km. This model puts in evidence a high Vp/Vs volume associated with the seismogenic zone, and a southeastward increase of the Moho depth. The nature and origin of this subducting slab is still under discussion.

Recent developments in theoretical and computational seismology have made it possible to use addional information contained in the whole waveforms of recorded seismograms in order to retrieve more detailed and reliable descriptions of the Earth's structure. With the aim to improve the tomographic model of the Vrancea region, we are implementing such a full-waveform inversion techniques to the broadband registrations of the CALIXTO database. Constraining better the structural features is critical for a better understanding and should yield further insight into the underlying lithospheric dynamic processes. We show results of initial tests, and assessments of quality of the existing dataset in terms of imaging capability.