ESC2016-140, 2016
35th General Assembly of the European Seismological Commission

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4–10 September 2016
Trieste

Spatiotemporal variation of body-wave velocities in Corinth Gulf (Greece)

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The Gulf of Corinth has been identified as one of the faster expanding (1 to 1.5 cm/year of north–south extension) and most seismically active continental rifts around the world, characterized by normal faulting in an approximate E-W direction. The most active normal faults of the Gulf are dipping north, resulting a long term subsidence of the northern coast and an upward displacement of the main footwalls, giving the impression of an asymmetrical rift structure.
A preliminary hypocenter location has been performed for the seismicity of the broader area and the 2012-2016 time period, using the HYPOINVERSE code and an initial regional 1D velocity model in order to obtain a reliable local one, using the mean travel-time residuals and location uncertainties (RMS, ERH, ERZ) minimization.
The total dataset was divided to five subsets, in order to ensure the similarity of the results in close time periods, making the tomographic time series more continuous. The recorded seismicity is mostly concentrated at the Western termination of the Corinth Gulf (Aigion-Helike), while some additional spatiotemporal clusters are also observed, along dominant tectonic features, such as the Andravida Fault Zone (AFZ), Patra-Rion Fault System (PRFS), Kato Achaia and Demestika Faults to the south and Antirrion-Nafpaktos, Trizonia and Itea faults to the north of the graben.
This study highlights the temporal changes in 3-D body-wave velocity structure within and around the broader region of Western Corinth Gulf selecting more than 3,000 seismic events recorded by the local seismic stations of the Hellenic Unified Seismological Network (HUSN) and the Corinth Rift Laboratory Network (CRLN). The main scope of this study is to highlight the areas with changes in fluid circulation and impact on local geological setting. The obtained results show several distinct structures, namely areas of high and low Vp/Vs ratio correlating the hypocenter distribution with changes in lithology and fluid concentration. In the area of Patraikos Gulf, an ascending velocity volume was traced in the study-period that could possibly be connected to salt tectonics in the alpine basement which is quite important not only for the local seismotectonics but also for the oil and gas exploration.