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An upper crust shear-wave splitting study for the period 2013-2014 in the Western Gulf of Corinth (Greece)

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Seismic anisotropy is investigated by performing an upper crust shear-wave splitting study in the Western Gulf of Corinth (WGoC). The study area, which is a tectonic rift located in Central Greece, is one of the most seismically active regions in Europe, characterized by a 10 to 15 mm/year extension rate in a NNW-SSE direction and E-W normal faulting. Intense seismic activity has been recorded in the WGoC during 2013-2014, including the 2013 Helike swarm, at the southern coast, and the offshore 2014 seismic sequence between Nafpaktos and Psathopyrgos, including an Mw 4.9 event on 21 September 2014. The largest event of the study period was an Mw 5.0 earthquake that occurred in November 2014, offshore Aigion, followed by an aftershock sequence. Seismicity was relocated using the double-difference method, including waveform cross-correlation differential travel-time data, yielding a high-resolution earthquake catalogue of approximately 9000 local events. This dataset was utilized in order to determine the shear-wave splitting parameters in seven stations installed at the WGoC, using a fully automatic technique based on the eigenvalue method and cluster analysis. A smaller subset was analyzed with the visual inspection method (polarigrams and hodograms) for verification of the automatic measurements. All selected station-event pairs were within the shear-wave window and had adequately high signal-to-noise ratio. The orientation of the seismometers of all stations used in the present study has been measured and verified in order to ensure the validity of the obtained fast shear-wave polarization directions and to apply corrections for borehole instruments. Mean anisotropy directions are in general agreement with the horizontal component of the dominant stress field, with some deviations, likely related to mapped faults and local stress anomalies. Temporal variations of time-delays between the two split shear-waves are examined in order to investigate their connection to possible stress field variations, related either to the occurrence of moderate to strong events or to fluid migration.

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