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Rupture plane identification of intermediate depth earthquakes in the Hellenic arc by back projection of local seismic waveforms

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We apply the Source-Scanning Algorithm (SSA), an earthquake back projection approach, to identify the rupture plane and possible source time function asperities of intermediate depth earthquakes in the Hellenic arc. We use P-waveform envelopes from recordings on local broadband stations at epicentral distances as much as 200 km. At each grid point of a predefined source volume we sum the normalized observed amplitudes at the corresponding predicted arrival times for each station with an appropriate time correction. The produced composite brightness image in both space and time resembles the earthquake rupture plane, and the source asperities. Intermediate depth earthquakes are the ideal candidates for this type of analysis, since the P-wave train is well defined and separated from secondary phases. Moreover, the small number of aftershocks can not define with certainty the true rupture plane, that constrain the predominant stress field and the mechanisms that produces them. Initially, we apply the method to the Mw 6.2 Leonidio earthquake (2008) to identify the known low dipping rupture plane, imaging at least three different source asperities. The earthquake's maximum brightness in time, that resembles the centroid, is distinctively separated from the origin time. Consequently, the method is applied to two moderate (Mw 6.0-6.5) intermediate depth earthquakes at the southeastern end of the Hellenic arc that have not been studied before in order to image the spatiotemporal distribution of asperities and identify the fault planes. Finally, the application of this back projection approach to events recorded on a local network gives evidence on its spatial and temporal resolution.