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Multi-segment reactivation of Cephalonia Transform Fault, Aegean Arc

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Multi-event seismic sequences are observed in different regions and scales, but their understanding has not been easy because of the available limitation in data and modelling. The 2003 Leucas earthquake (Mw 6.2), which occurred 50 years after a devastating triple earthquake sequence of 1953 (M=7.2), is the most recent event along the Cephalonia Transform Fault (NW edge of the Aegean Arc), and permits to shed some light to a multi-event sequence through independent inversion of seismological and GPS data. Modelling of the latter has been a challenge, because conventional inversion techniques led to sub-optimal solutions.
In our study we analysed co-seismic displacements of 10 GPS stations using the new Topological Inversion (TOPINV) algorithm for two faults, an essentially deterministic simultaneous inversion for all 18 variables defining a two segment fault in an Okada-type model.
The results of the topological inversion were constraint to a wide range of possible values of each unknown variable around the corresponding seismological estimates, were very much consistent with the seismological data and revealed reactivation of two en echelon essentially strike-slip main faults. Fault rupture stopped along the first segment and resumed along the second segment, with a lateral and longitudinal offset of 8.7 and 17.1km, respectively.