Analysis of static stress transfer in the 2013 Valencia Gulf (NE Spain) seismic sequence

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The role of static stress transfer as an earthquake triggering mechanism is evaluated in the seismic sequence that took place in Spain's Valencia Gulf during September and October 2013. Earthquakes occurred in spatiotemporal correlation with injection activities conducted at the Castor Underground Gas Storage.

Coulomb Stress Changes (CSC) are quantified using the Coulomb Failure Function, which considers positive values as those promoting failure on the objective fault plane. Focal Mechanism (FM) solutions for the 8 strongest events in the sequence (M_L 3.5 - 4.3) are computed from full waveform inversion, and are then used to place the earthquake sources. A geometrical model containing both the FM-derived faults and the previously mapped structures in the area is built; CSC are then quantified along the sequence on all those faults.

We first assess whether the earthquakes can be explained based on static stress transfer on its own, and which of the previously mapped structures in the area is most likely to have slipped. The shortening on the Main Fault's characteristic earthquake cycle as a result of the experienced seismicity is also evaluated.

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