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Influence of fluctuations of historic water bodies on fault stability and earthquake recurrence interval: The Dead Sea Rift as a case study

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Despite the global, social and scientific impact of earthquakes, their triggering mechanisms remain often poorly defined. We suggest that dynamic changes in the levels of the historic water bodies occupying tectonic depressions at the Dead Sea Rift cause significant variations in the shallow crustal stress field and affect local fault systems in a way that may promote or suppress earthquakes. This mechanism and its spatial and temporal scales differ from those in tectonically-driven deformations. We use analytical and numerical poroelastic models to simulate immediate and delayed seismic responses resulting from the observed historic water level changes. The role of variability in the poroelastic and the elastic properties of the rocks composing the upper crust in inducing or retarding deformations under a strike-slip faulting regime is studied. The solution allows estimating a possible reduction in a seismic recurrence interval. Considering the historic water level fluctuation, our preliminary simulations show a promising agreement with paleo-seismic rates identified in the field.