EGU21-8623
https://doi.org/10.5194/egusphere-egu21-8623
EGU General Assembly 2021

Slow-slip, earthquake-swarms and fault-interactions at the western-end of the Hellenic Subduction System precede the Mw 6.9 Zakynthos Earthquake, Greece

Vasiliki Mouslopoulou[1], Gian Maria Bocchini[2], Simone Cesca[3], Vasso Saltogianni[3], Jonathan Bedford[3], Gesa Petersen[3], Michael Gianniou[4,5], and Onno Oncken[3]

[1]National Observatory of Athens, Institute of Geodynamics, Athens, Greece (vasiliki.mouslopoulou@noa.gr)
[2]Ruhr University of Bochum, Institute of Geology, Mineralogy and Geophysics, Germany
[3]GFZ Helmholtz Centre Potsdam, German Research Centre for Geosciences, Telegrafenberg 14473 Potsdam, Germany
[4]University of West Attica, Athens, 12243, Greece
[5]Hellenic Cadastre, Athens, 15562, Greece

The month-to-year-long deformation of the Earth's crust where active subduction zones terminate is poorly explored. Here we report on a multidisciplinary dataset that captures the synergy of slow-slip events, earthquake swarms and fault-interactions during the ~5 years leading up to the 2018 M_w 6.9 Zakynthos Earthquake at the western termination of the Hellenic Subduction System (HSS). It appears that this long-lasting preparatory phase initiated due to a slow-slip event that lasted ~4 months and released strain equivalent to a ~M_w 6.3 earthquake. We propose that the slow-slip event, which is the first to be reported in the HSS, tectonically destabilised the upper 20-40 km of the crust, producing alternating phases of seismic and aseismic deformation, including intense microseismicity (M<4) on neighbouring faults, earthquake swarms in the epicentral area of the M_w 6.9 earthquake ~1.5 years before the main event, another episode of slow-slip immediately preceding the mainshock and, eventually, the large (M_w 6.9) Zakynthos Earthquake. Tectonic instability in the area is evidenced by a prolonged (~4 years) period of overall suppressed b-values (<1) and strong earthquake interactions on discrete strike-slip, thrust and normal faults. We propose that composite faulting patterns accompanied by alternating (seismic/aseismic) deformation styles may characterise multi-fault subduction-termination zones and may operate over a range of timescales (from individual earthquakes to millions of years).