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The dynamic and timing of mass wasting processes along the eastern Mediterranean continental slope, off the Israeli shores

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Submarine mass wasting events (e.g. landslides, debris flows, turbidity currents) are part of the morpho-dynamic evolution of continental slopes. These events pose a significant geo-hazard in cases where they directly hit communication or energy related infrastructure, or if they induce tsunami. There is ample evidence of Quaternary landslides along the eastern Mediterranean continental-slope. Furthermore, historical reports suggest that submarine landslide-induced tsunamis are not uncommon. We recently mapped 447 submarine landslides (area range: 0.0024 - 91 sq-km) along the south-central Israeli continental slope, which appear as up to 50 m deep depressions in the current sea-floor and cover over 20% of the studied continental slope. Their pronounced relief suggests that these landslides are young and might pose a current offshore geo-hazard; however, their age is only vaguely determined.

Here we explore the dynamic and the temporal setting of these submarine landslides using 3 - 4 m long gravity-cores sampled offshore southern Israel in 2002, at about 900 m water depth. At first we CT-scanned these cores to create an X-ray based 3D tomography. Next we sliced the cores lengthwise, described their stratigraphy, and sub-sampled along their axis. We utilized oxygen isotopes and foraminiferal taxonomy along the cores to locate the transition to the Holocene (dated ca. 12 kyr). High TOC values (>2.5%) define the last S1 sapropel event (dated ca. 10 - 7 kyr). Adding to the above temporal proxies, a profile of radiocarbon ages (on G. ruber shells) was used to better constrain the event ages.

Based on their heterogeneous deformational structures, at least 3 suspected intervals of potential instability events were detected along core AM113 (sampled in a mapped landslide scar). Events predate S1 (located $\sim$1 m down core) and are contemporaneous or closely-predating the transition to the Holocene. The largest event, 0.5 m thick, showed mixing of glacial and interglacial foraminiferal species, in contrast to the under and overlaying hemipelagic sequences that host either cold or warm water planktonic foraminifera species. Radiocarbon-age along AM113 increases with depth and indicates an average sedimentation rate of 14 cm/kyr. However, within the instability intervals (dated: 22.1, 18.7, 14.5-12.8 kyr) ages do not increase with depth, but are rather mixed or constant. Suspected instability events were also detected in two cores sampled further north, out of a mapped landslide scar (AM015, AM137). Similarly to AM113, events predate S1 and are contemporaneous or closely-predating the transition to the Holocene. This is supported by radiocarbon ages of 16 and >30 kyr in AM015 and >22 kyr in AM137. In contrary, core AM149, sampled near AM113, reveals heterogeneous interglacial sediment all along its entire 3 meters, thus representing a Holocene landslide deposit.

The above novel results might suggest that mass wasting activity along the studied continental slope is declining since the transition to the Holocene, with AM149 being the single exception. Results also reveal that thin mud-flows are widespread along the studied slope, and are found in or beyond landslides scars area.