



# International Association of Geomorphologists

## 3<sup>rd</sup> IAG-DENUCHANGE-2023 Working Group Workshop

Haifa, Israel, 13–16 March 2023

### Report

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The DENUCHANGE Working Group of the International Association of Geomorphologists (IAG) celebrated its Third Workshop in Israel on March 13-16, 2023. Thanks to the generous IAG Grant I could attend both the Conference and Fieldwork as part of the Workshop activities. I am deeply grateful to Nurit Shtober-Zisu, Lea Wittenberg, and Hilit Kranenburg for all their effort in organizing such an amazing stay in Israel which included several social and academic activities, delicious Mediterranean food, and a fructiferous trip along the land of Israel.

### The Conference

Everything started on March 13<sup>th</sup> at the University of Haifa in northern Israel. The Conference integrated dynamic and diverse oral and poster presentations by colleagues from 11 countries in Europe, Asia, Africa, and the Americas. Particularly, the Conference promoted two Young Geomorphologists Sessions which I strongly enjoyed. A friendly atmosphere allowed an active discussion around the different topics presented such as soil erosion, badlands development, and transport of pollutants among others. The afternoon activities comprised a panoramic view of Haifa City from the tallest building of Mount Carmel and a celebration dinner.

We finished our Conference on March 14<sup>th</sup> at midday and started our 3-day fieldwork from northern Mediterranean Israel to the southern desert.

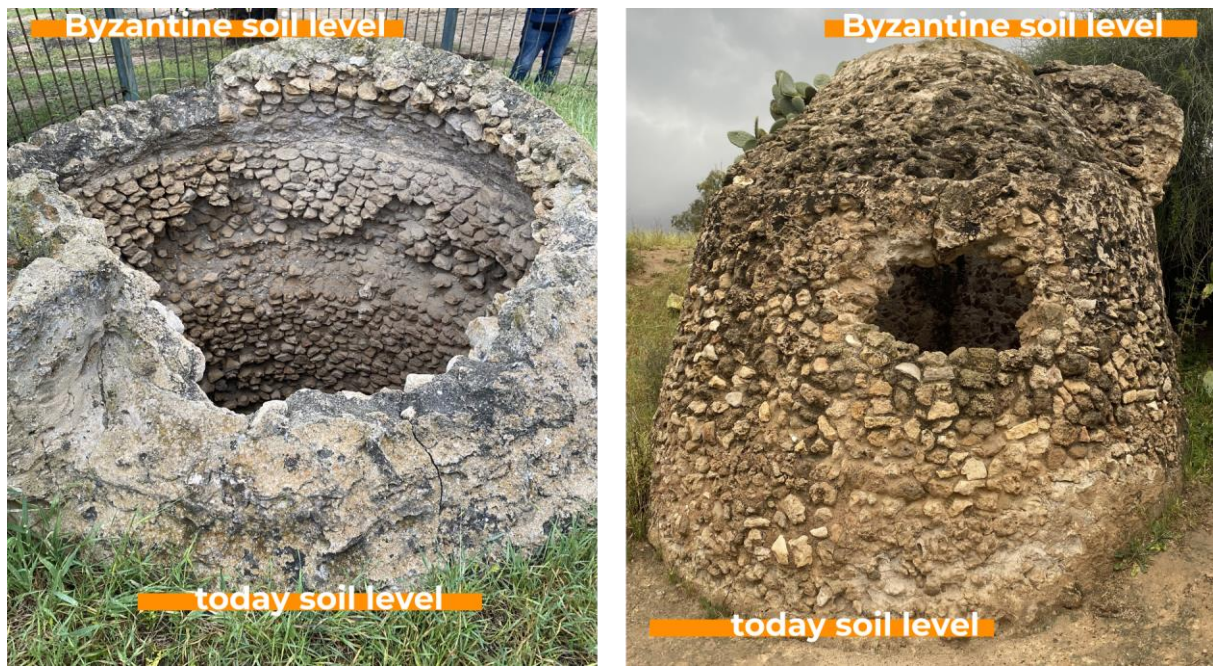
### The Fieldtrip

During the first day, we explored the Quaternary loess-paleosols sequences of northern Negev highlands: impressive landscapes that record the environmental history of the desert since the Pleistocene, between soil forming conditions and aeolian sediments deposition (**Figure 1**). Right after, we visited Horvat Mador where several examples of Byzantine water cisterns constructed underground are preserved. It means that the top of the cisterns represents the Byzantine period (around the 5th century) soil level in a geoarchaeological approach. In this way, it is possible to determine the soil erosion/accumulation rates in the area, considering uncovered

**Figure 1.** Quaternary loess-paleosols sequence in northern Negev highlands.



and still-covered cisterns as proxies (**Figure 2**). At the night, we learned about the role of the Negev Desert and Zuckerman brothers in the construction of the State of Israel in the last century.



**Figure 2.** Byzantine cisterns constructed underground. The uncovered part of the cisterns can be understood as result of soil erosion. On the right, the cistern is shown completely uncovered.



The second day began at the Bet Guvrion-Maresha National Park where we described the Cretaceous marine carbonates of Judean Hills a region in the lowlands with several caves which have served as scenarios for human development as well. One of the most particular archaeological expressions of these caves is the *Columbariums*, an installation to raise doves with over 2,000 niches constructed during the Hellenistic period (**Figure 3**). Later, we travelled to the northern part of the Dead Sea near Jericho. Over there, we talked about the Miocene pull-apart basin responsible for the Dead Sea formation between the Jericho fault to the west and the Arava fault to the east. Additionally, we discussed the water level change of the Dead Sea, which is sinking approximately one meter per year today.

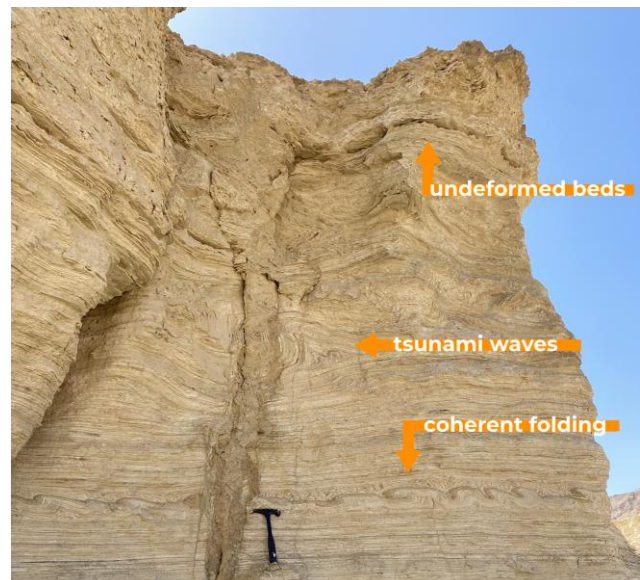
**Figure 3.** Hellenistic *Columbariums* built underground in thick homogeneous chalk strata.



For the third day we overnighted on the nice shores of the Dead Sea and early in the morning we talked about the human-induced surrounding sinkholes because of the Dead Sea shrinkage. Particularly, the eastward retreat of underground brine replaced by fresh groundwater, which in turn dissolved a subsurface salt layer, is generating cavities and collapsing sinkholes (**Figure 4**). On the way, we visited the UNESCO Masada Mountain, and we followed both the ancient haloclines of the Last Glacial Maximum and several earthquake-induced fluidizations of lake sediments associated with syndepositional faults (**Figure 5**). We ended our fieldtrip with a relaxing bath in the saline waters of the Dead Sea.



**Figure 4.** Sinkholes affecting old highway.



**Figure 5.** Left – the salt mirror at Mount Sedom. Right – earthquake-induced fluidizations in the Zeelim formation.





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### Extra photos

