HIGH RESOLUTION TSUNAMI MODELING AT THE MEDITERRANEAN COAST OF ISRAEL, TOWARDS AN EARLY WARNING TSUNAMI SCENARIOS DATA BANK

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BACKGROUND

In November 2005 the Intergovernmental Coordination Group setup by the IOC/UNESCO General Assembly decided to establish the Tsunami Early Warning and Mitigation System in the North-eastern Atlantic, the Mediterranean and Connected Seas (ICG/NEAMTWS).

Based on ICG/NEAMTWS recommendations for member states, IOLR initiated the computation of high resolution tsunami scenarios, to be used for the preparation of a tsunami scenarios data bank for the Israeli coast, which will enable early tsunami warning using tsunami alerts to be sent by the ICG/NEAMTWS regional alert centers presently under development.

IMPLEMENTATION METHOD

The investigation of the various scenarios has been carried out using the open-source software named GeoClaw (an extension of the CLAWPACK package) available at **http://www.amath.washington.edu/~claw**

The tsunami model (GeoClaw) used simulated tsunami wave generation, propagation and inundation at the Mediterranean coast of Israel.

Additional tsunami generation model tools have been developed by the first author, particularly on tsunami generation and post processing results visualization and analyses.

The tsunami model and additional tools were used to simulate several worst case tsunami scenarios, resulting from both earthquakes at the Helenic arc and from offshore submarine landslides induced by earthquakes at the Dead Sea Transform.

Two kinds of tsunamis according to the generation mechanisms were investigated, namely: a Earthquakes, b Submarine landslides.

a

North

Strike direction

θ

fault block

Earthquakes

b

Width

Height (h)

Lenght

θ

Submarine landslides

$h(t) = h_{max} (1 - e^{-c(t-t_0)^2})$
h_{max}-the final height of the landslide
c- the rate of exponential growth
t_0- the initial time of the process

The location of the sources in the Mediterranean sea is shown below, for earthquakes in the left figure and for landslides in the right figure.

Earthquakes
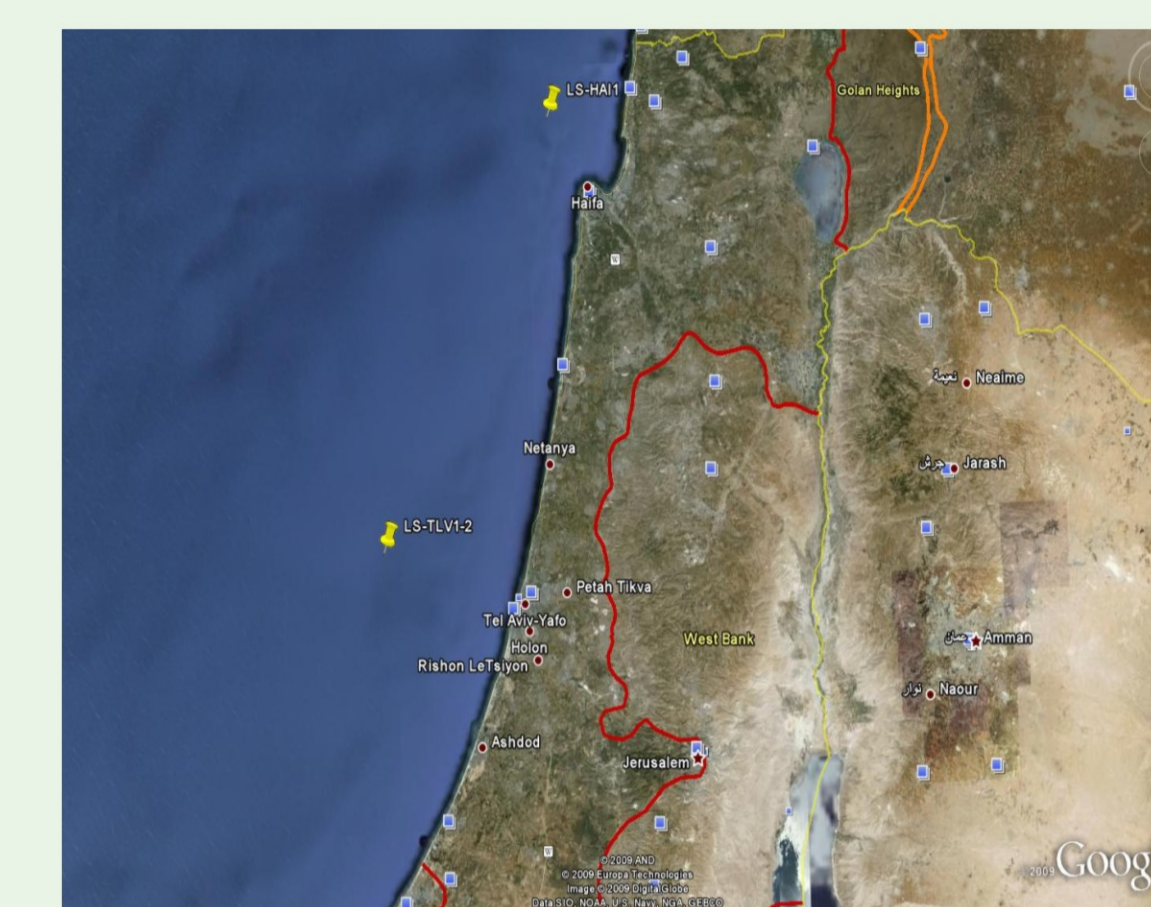
Submarine landslides

The computations were based on the SRTM bathymetric data in the Mediterranean and on high resolution digital bathymetric and topographic data at the near-shore (> - 500m) and dry coast (grid cell size 5x5m).

The sources, earthquakes and submarine landslides, were modeled to describe the time profile change of the bathymetry. This information served as initial conditions for the computational package GeoClaw.

In this presentation we consider the situation where only the first tsunami wave hits the Israeli Mediterranean coast.
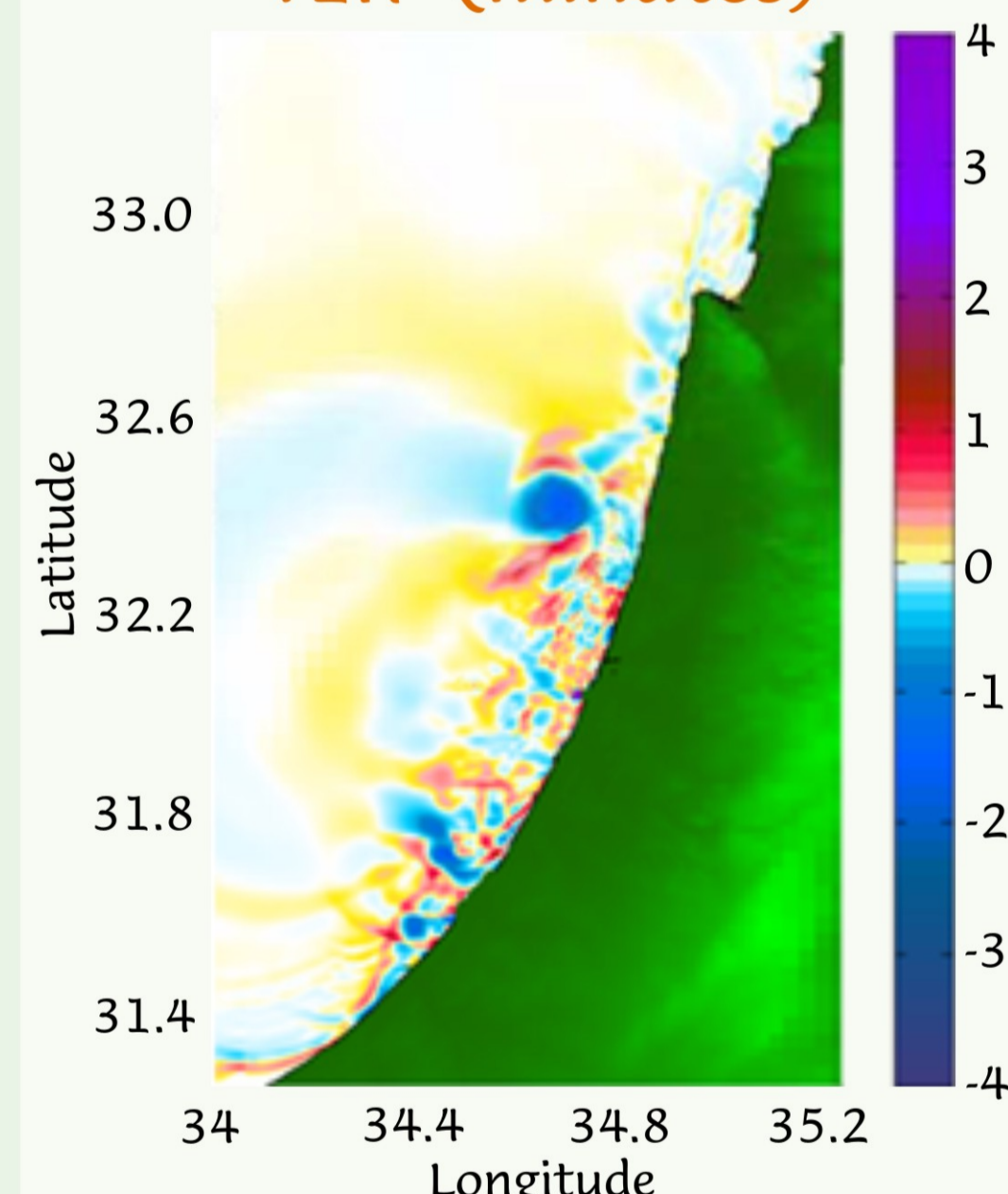
RESULTS

The results were presented by outcomes as shown in the figures below as:
- Time snapshots for a given period
- Animations
- Maximal inundation and set down maps
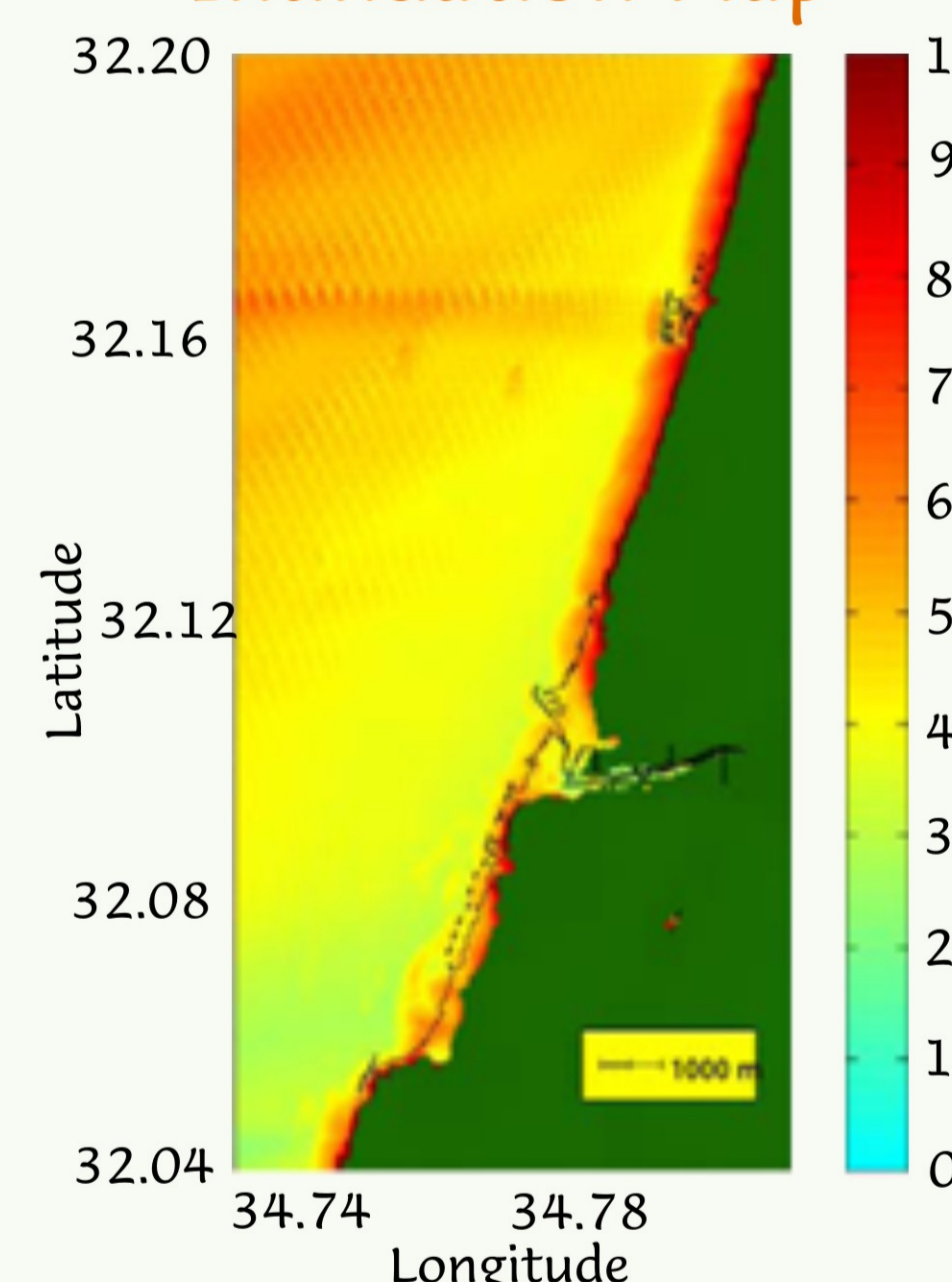- Maximum inundation level at the coast line
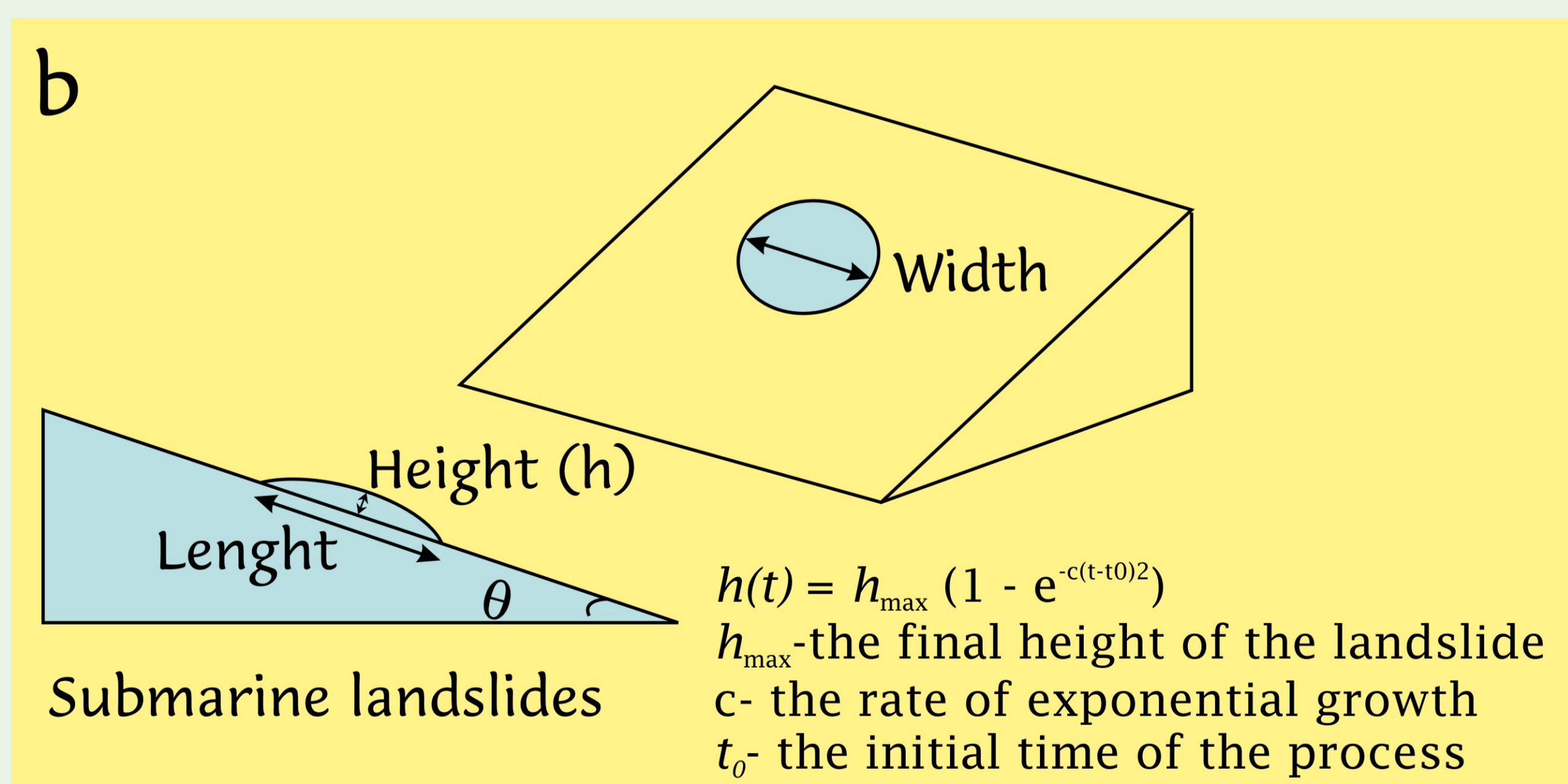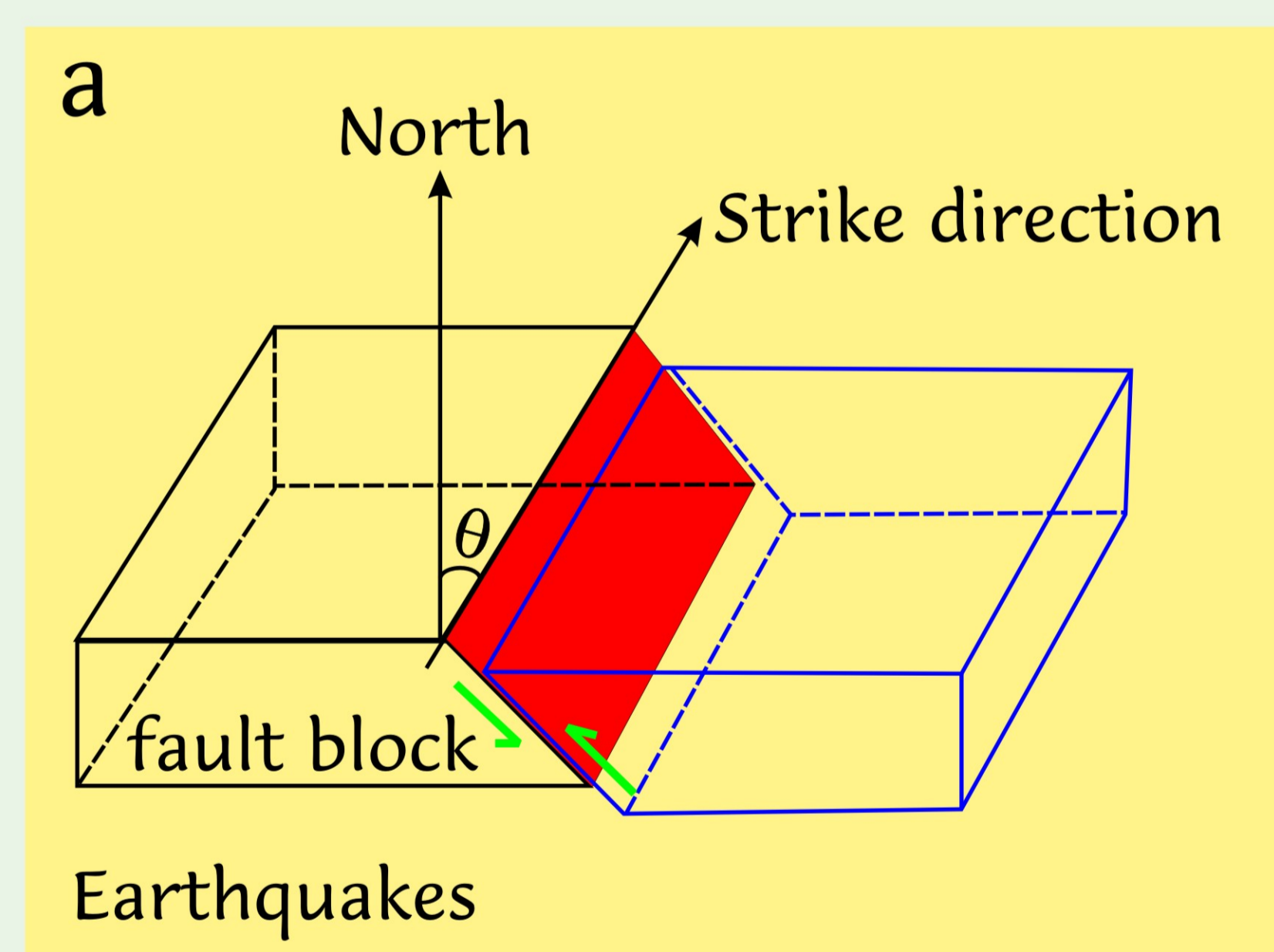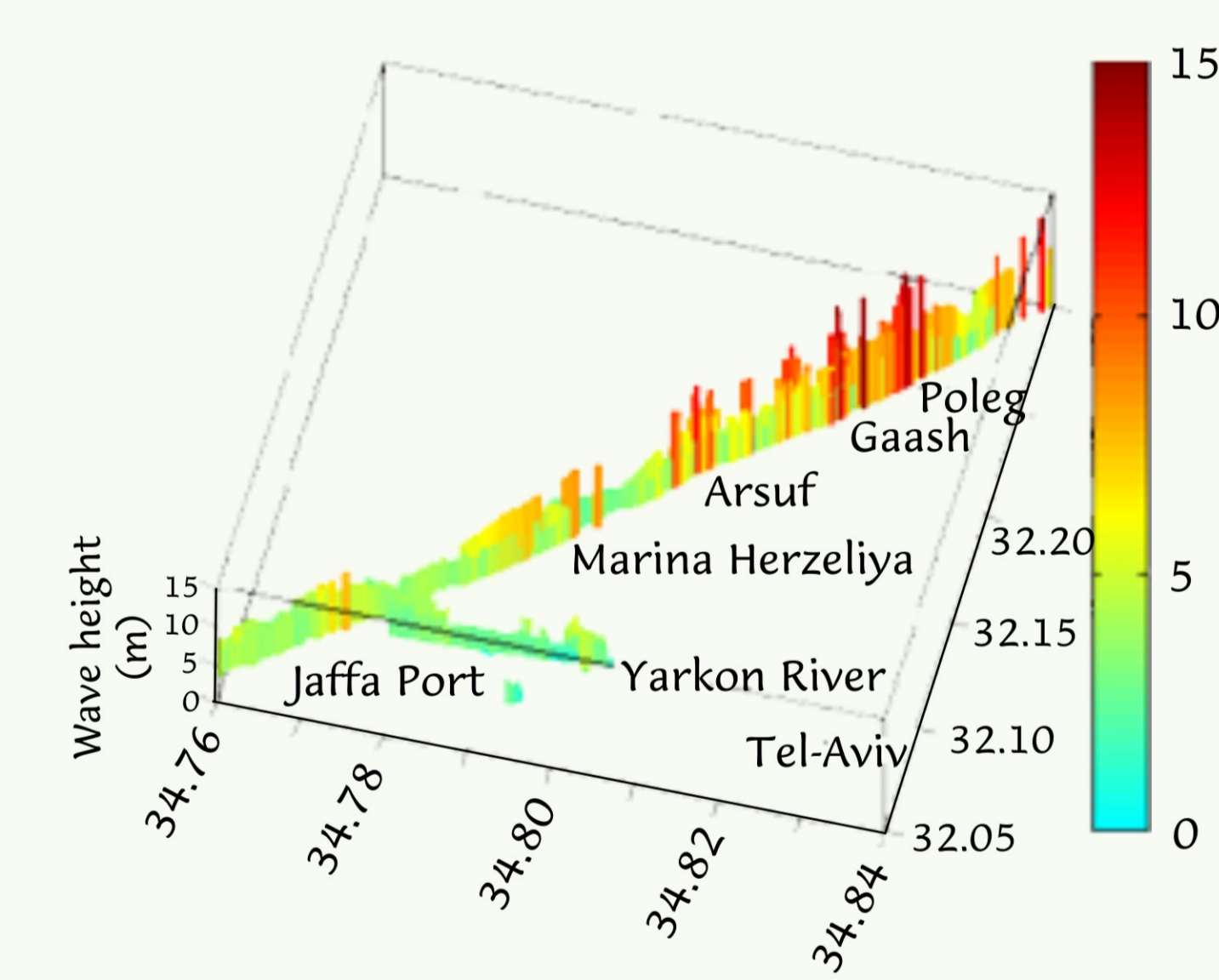

surface elevation at time 41.7 (minutes)

A time snapshot due to a landslide near Tel-Aviv
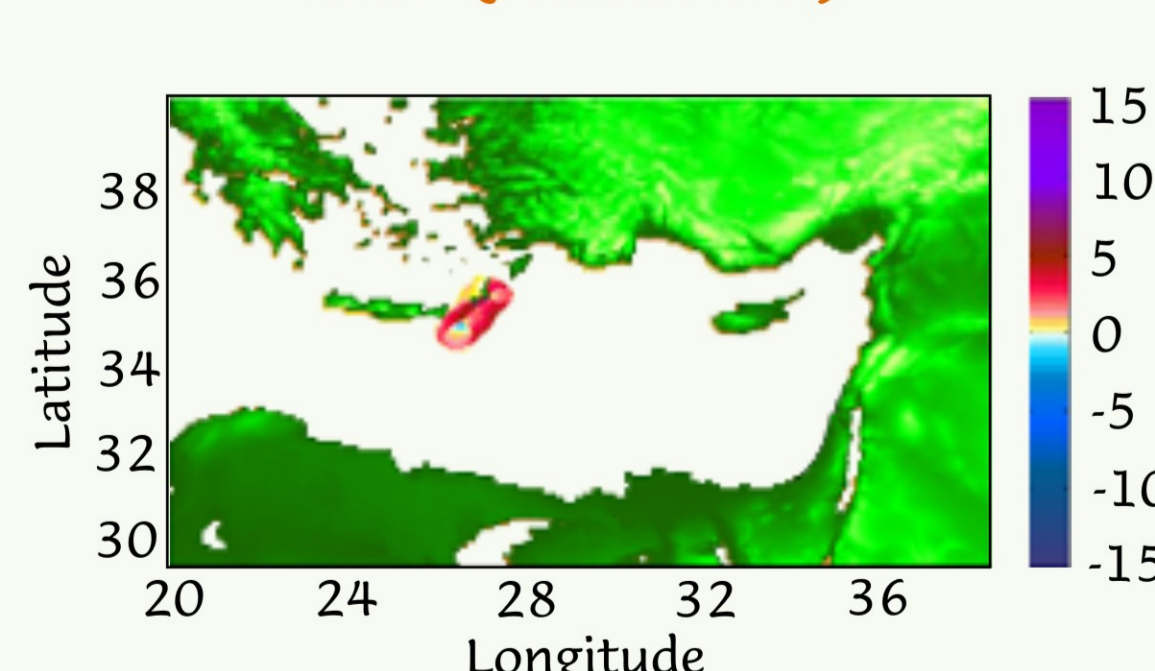

LS-TLV1: Maximum Inundation Map

Maximum inundation map (Tel Aviv region) due to a landslide off Tel-Aviv

Poleg
Gaash
Arsuf
Marina Herzeliya
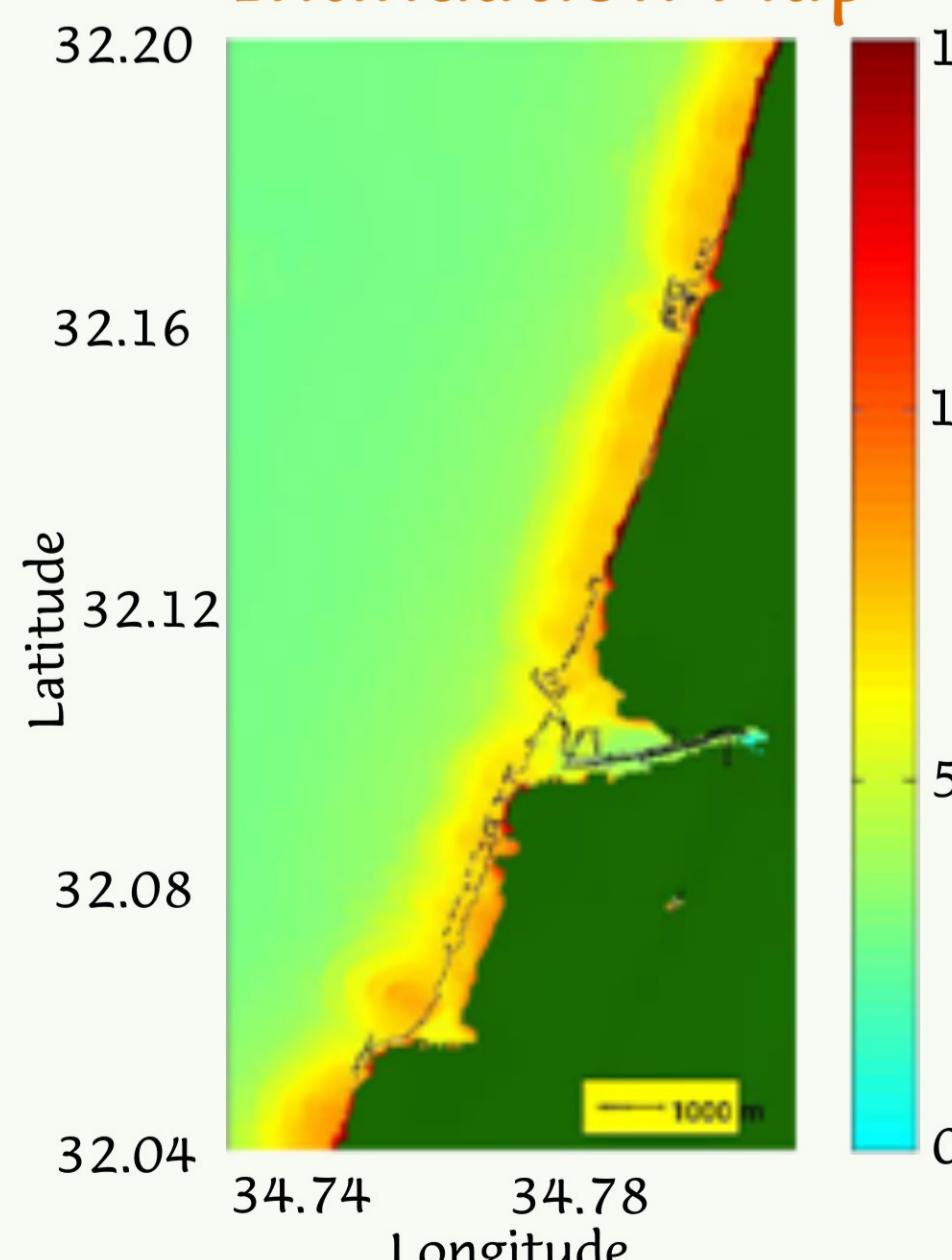Jaffa Port
Yarkon River
Tel-Aviv

Maximum inundation level along the coast (Tel-Aviv region) due to landslide off Tel-Aviv
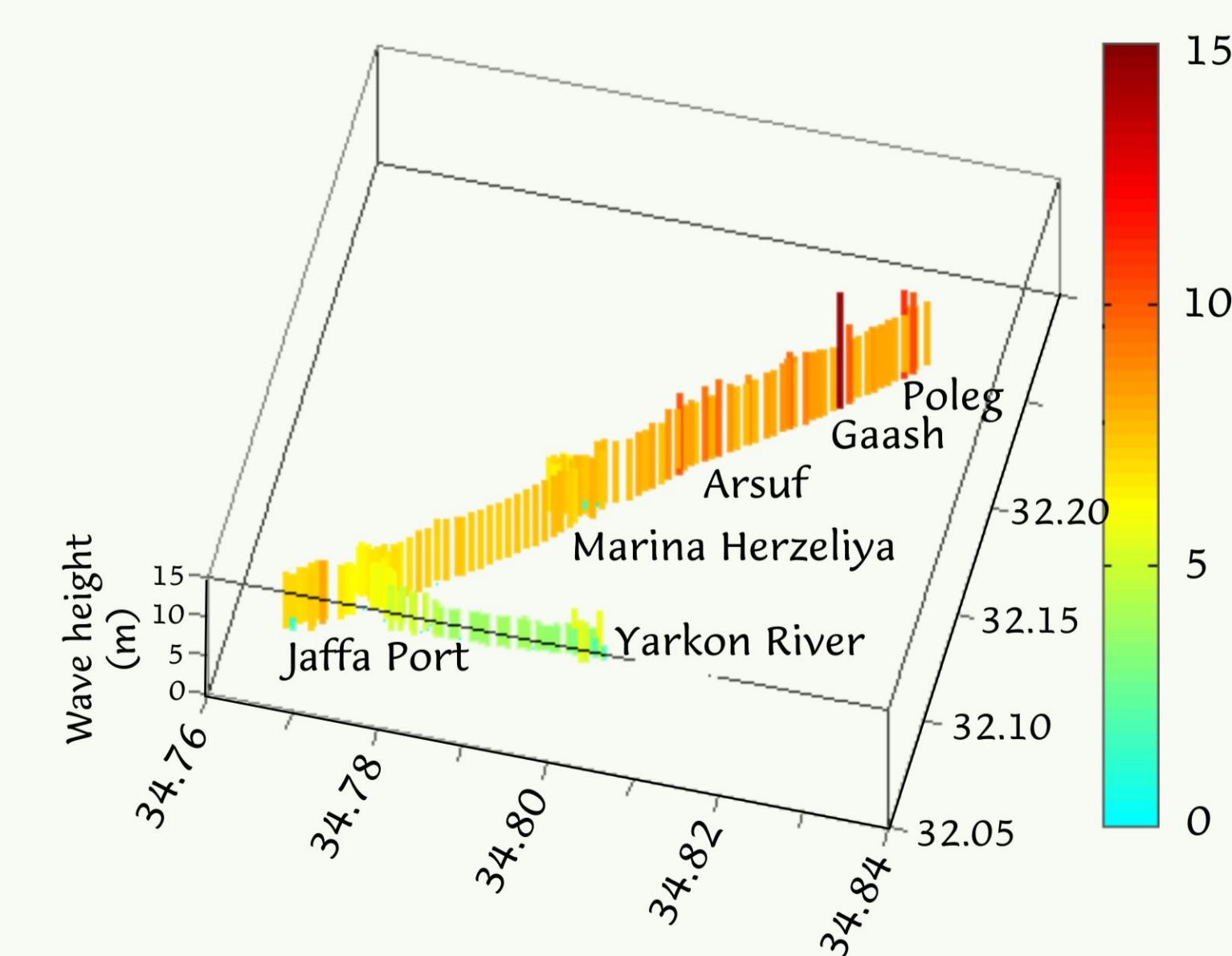

surface elevation at time 3.3 (minutes)

A time snapshot due to an earthquake near Crete

EQ-Crete 1: Maximum Inundation Map

Maximum inundation map (Tel Aviv region) due to an earthquake near Crete

Poleg
Gaash
Arsuf
Marina Herzeliya
Jaffa Port
Yarkon River

Maximum inundation level along the coast (Tel-Aviv region) due to an earthquake near Crete