Boğaziçi University
Kandilli Observatory and Earthquake Research Institute

KOERI Scenario

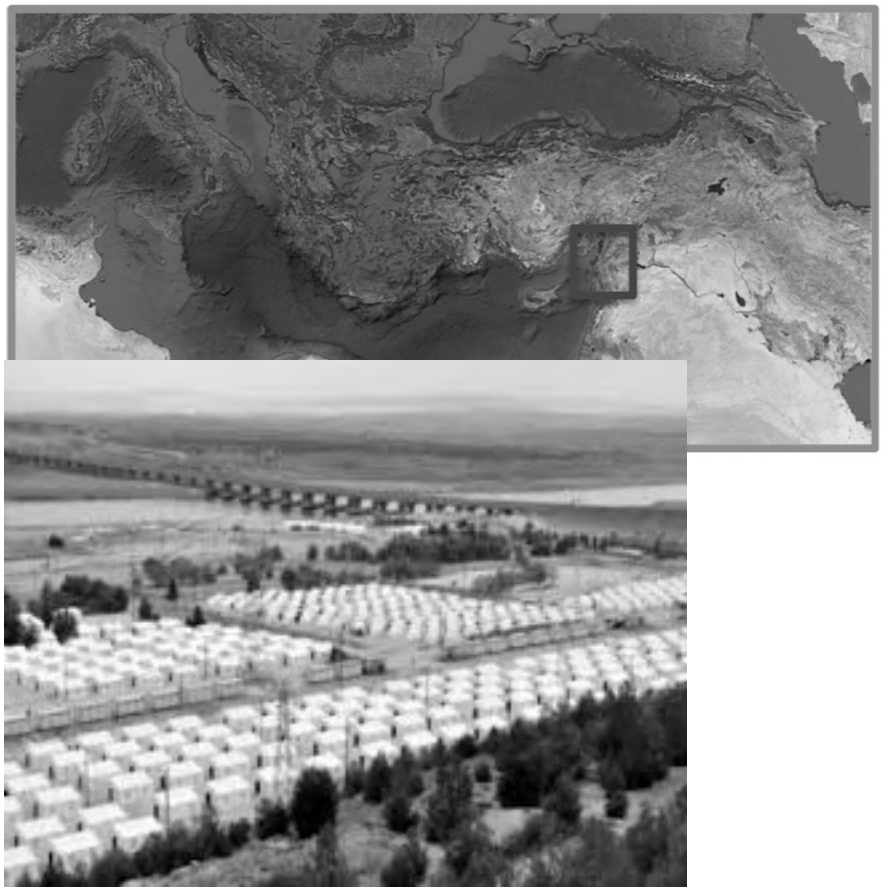
Öcal Necmioğlu, Ceren Özer Sözdinler, Ufuk Hancılar,
Mehmet Yılmazer, Fatih Turhan, Yavuz Güneş, Ali Pınar, Kıvanç Kekovalı

Bogaziçi University
Kandilli Observatory and Earthquake Research Institute
Istanbul-Turkey

Overview

Mw 7.4 inland earthquake in Hatay Province of Turkey, that would trigger a submarine landslide generating a tsunami which would mainly impact Iskenderun Bay, but also leading to tsunami impact in Latakia, Syria and observations in southern Turkey, Levantine coast and Cyprus.

The main aim of this scenario is to simulate a multi-hazard natural disaster in a region where there is an on-going humanitarian crisis.



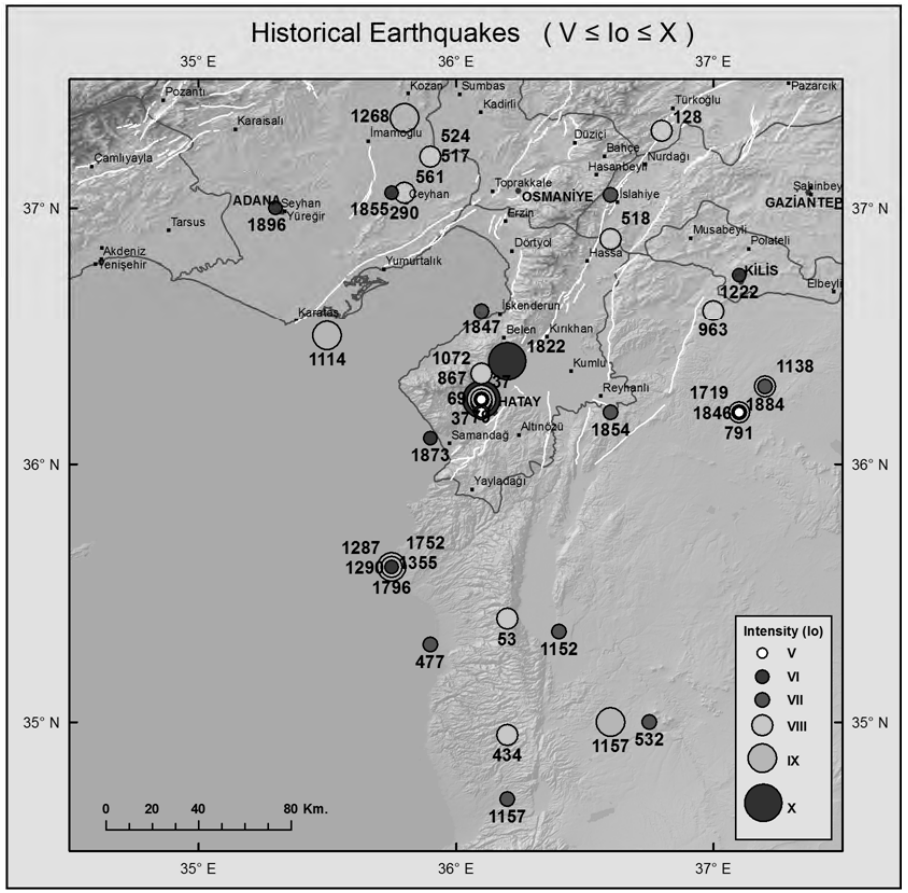
Historical earthquakes and tsunamis in the region

Hatay Province had experienced large earthquakes in history, such as in 860, 1822 and 1872.

January 860…… Ms 7.4 on the coast of Antiochia to Akko; heavy damage to the coastal towns of Latakia and Jeble that were almost totally destroyed. Damage extended to north in Antakya where 1500 houses collapsed.

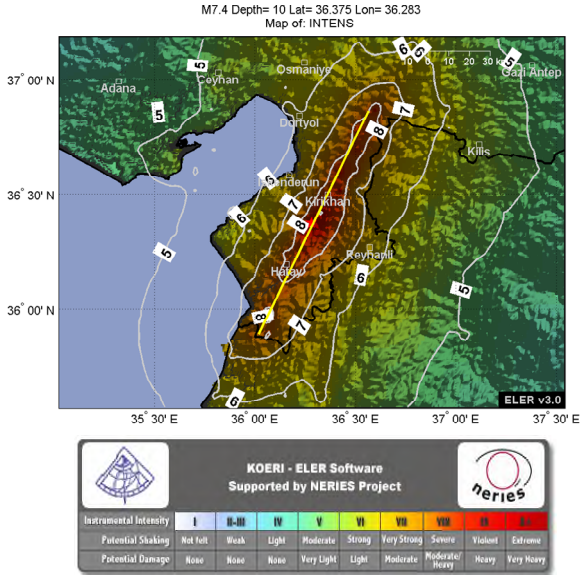
13 August 1822…… Ms 7.0; two thirds of the towns were destroyed and thousands of the inhabitants were killed. Tsunami was observed in Beirut, Iskenderun and on the Island of Cyprus (Soloviev, 2000 and Altınok et al., 2011, based on Karnik, 1971).

3 April 1872…… Ms 7.2; the shocks almost totally ruined Antakya (Antiochia). Ambraseys (2009) report that out of 3000 houses were destroyed and damaged in Antakya, 1960 were totally destroyed; 500-1600 casualties and 400-800 injured.



Scenario earthquake parameters

Mw	Lat	Lon	Depth	Fault Length	Fault Width	Average Slip	Strike	Dip	Rake
7.4	36.375° N	36.283° E	10 km	77 km	20 km	3.2 m	30°	80°	320°



Earthquake Intensity map obtained from the Earthquake Loss Estimation Routine (ELER) developed by KOERI within NERIES project.

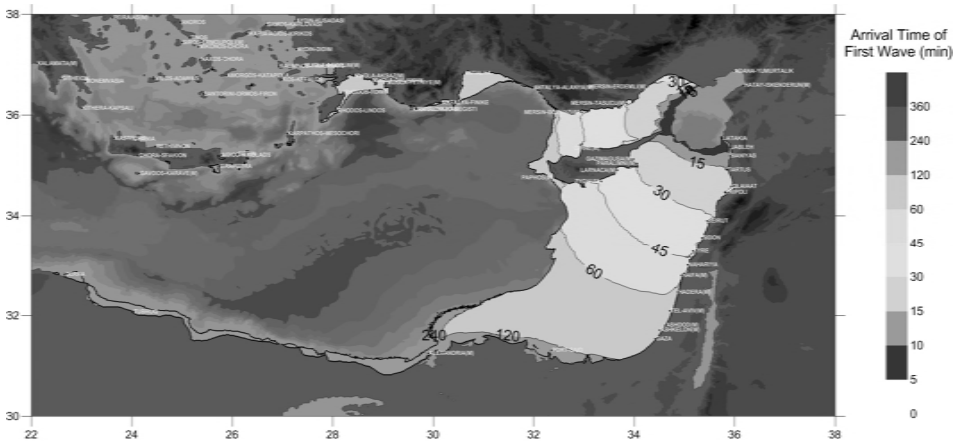
Intensity based damage and casualty assessment with ELER indicated the number of buildings damaged from “slight” to “very heavy” levels and being destructed due to this scenario.

The number of fatalities is estimated around 1500 with more than 6000 people being seriously injured.

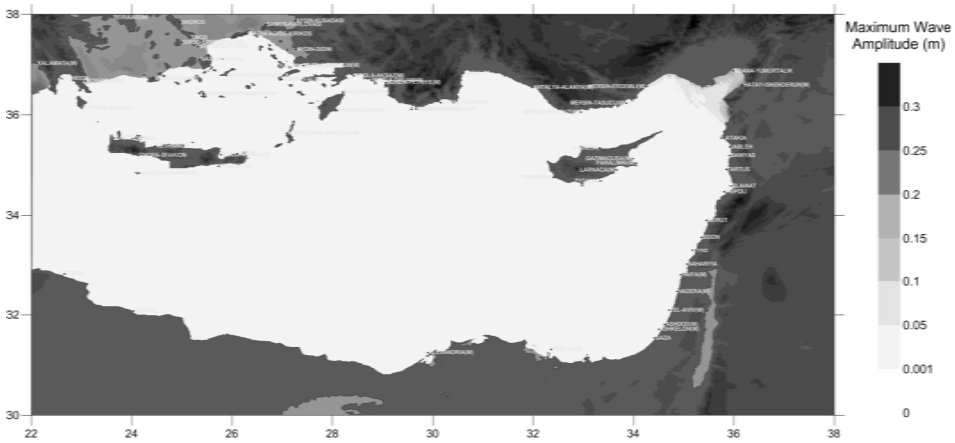
A recent study by University of Arkansas indicated that the number of the fatalities could increase by 20% taking into account the displaced population due to the humanitarian crisis in Syria.

Tsunami modeling

Tsunami numerical modeling has been done with numerical model NAMIDANCE (NAMIDANCE, 2011).



arrival time of first wave



distribution of maximum water surface elevation

According to the numerical modelling results, the initial water surface elevation of tsunami source generated by the scenario earthquake is 0.29m and maximum calculated tsunami wave height is 0.44m after 3 hours simulation.

Scenario Master Schedule of Events List

T[min]

T0: EQ Origin Time
T3: Initial EQ Parameters (Mw 6.9, lat, lon, depth, origin time)
T8: Dissemination of the 1st message
T11: Revised EQ Parameters (Mw 7.4, lat, lon, depth, origin time)
T13: Eyewitness tsunami observations from ADANA-YUMURTALIK reported
T13: 2.20 m sea-level measurement at ISKENDERUN tide-gauge station
T15: Dissemination of the 2nd message (REVISED MAGNITUDE)
T38: 1.50 m sea-level measurement at GAZIMAGUSA (FAMAGUSTA) tide-gauge station
T45: 1.00 m sea-level measurement at MERSIN-ERDEMLI tide-gauge station
T50: Dissemination of the 3rd message (ONGOING)
T54: 0.70 m sea-level measurement at MERSIN-TASUCU tide-gauge station
T55: 0.60 m sea-level measurement at GIRNE (KYRENIA) tide-gauge station
T60: 0.44 m sea-level measurement at MERSIN-BOZYAZI tide-gauge station
T70: 0.34 m sea-level measurement at PAPHOS tide-gauge station
T75: Dissemination of the 4th message (ONGOING)
T80: 0.32 m sea-level measurement at ANTALYA-ALANYA tide-gauge station
T85: 0.56 m sea-level measurement at HADERA tide-gauge station
T95: 0.44 m sea-level measurement at ASHKELON tide-gauge station
T115: 0.16 m sea-level measurement at MUGLA-FETHIYE tide-gauge station
T120: Dissemination of the 5th message (ONGOING)
T140: 0.06 m sea-level measurement at ALEXANDRIA tide-gauge station
T160: No significant sea-level measurement at MUGLA-BODRUM tide-gauge station
T175: No significant sea-level measurement at KASTELI tide-gauge station
T180: Dissemination of the 6th message (END)

Table 2 - The flow chart of message dissemination during NEAMWave17

MESSAGE#1	MESSAGE#2	MESSAGE#3	MESSAGE#4	MESSAGE#5	MESSAGE#6
WATCH/ADVISORY/ INFORMATION @8th min	WATCH/ADVISORY @15th min	ONGOING @50th min	ONGOING @75th min	ONGOING @120th min	END @180th min

Exercise Message Number #1 – Mw: 6.9

```
... TSUNAMI WATCH ...
THIS ALERT APPLIES TO TURKEY

... TSUNAMI ADVISORY ...
THIS ALERT APPLIES TO CYPRUS...ISRAEL...LEBANON...SYRIA

... TSUNAMI INFORMATION ...
THIS ALERT APPLIES TOALBANIA...CROATIA...EGYPT...GREECE...ITALY...LIBYA.
..MALTA...MONTENEGRO...PALESTINIAN AUTHORITY...TUNISIA
```

Exercise Message Number #2 – Mw: 7.4

```
... TSUNAMI WATCH ...
THIS ALERT APPLIES TO CYPRUS...ISRAEL...LEBANON...SYRIA...TURKEY

... TSUNAMI ADVISORY ...
THIS ALERT APPLIES TO ALBANIA...CROATIA...EGYPT...GREECE...ITALY...LIBYA
...MALTA...MONTENEGRO...PALESTINIAN AUTHORITY...TUNISIA
```

Participation in Phase B by AFAD

Participation in Phase B by AFAD

As of March 2017, more than 35.000 Syrian refugees are sheltered by the Turkish CPA AFAD in Hatay Province only. KOERI scenario is expected to allow AFAD to exercise their post-disaster recovery and management activities in a broader context.

KOERI's Participation in NEAMWave17

As TSP.....

- KOERI will act as Message Provider for a scenario in the Eastern Mediterranean.
- KOERI aims to simulate a multi-hazard natural disaster in a region where there is an on-going humanitarian crisis. The scenario could be further extended to cover other disasters, i.e. fire in a natural gas plant, etc.

As NTWC…

- Turkish national messages will be disseminated to AFAD (Turkish CPA) during the exercise according the MSEL.

Exercise date: 1 November 2017 09:00-12:00 UTC

Participations in KOERI NEAMWave17 scenario are welcome ☺