The Intriguing Tsunami of 19 March 2017 in the Persian Gulf

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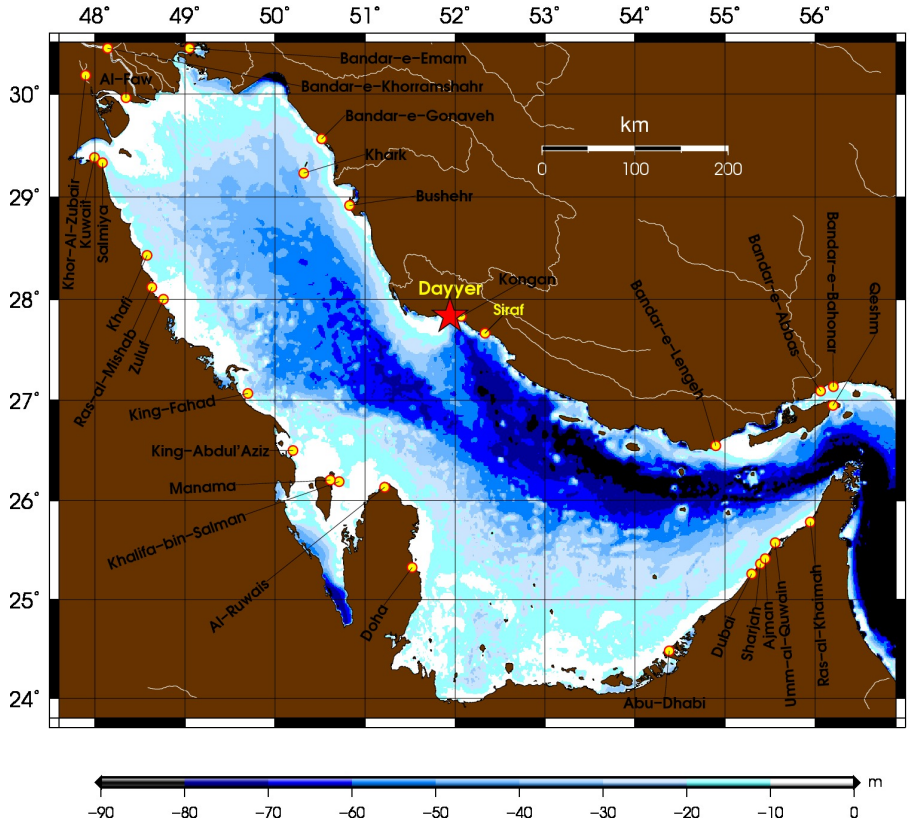
Introduction

- **What:** Following a few stormy days, a series of waves killed 1, and 5 people went missing; $10 million of damage
- **Where**: reportedly, at the Port of Dayyer in Iran
- **When:** Between ~8:00 AM and ~8:20 AM on March 19, 2017
- **How:** reportedly, inundated 1 km inland, reaching ~1 m height

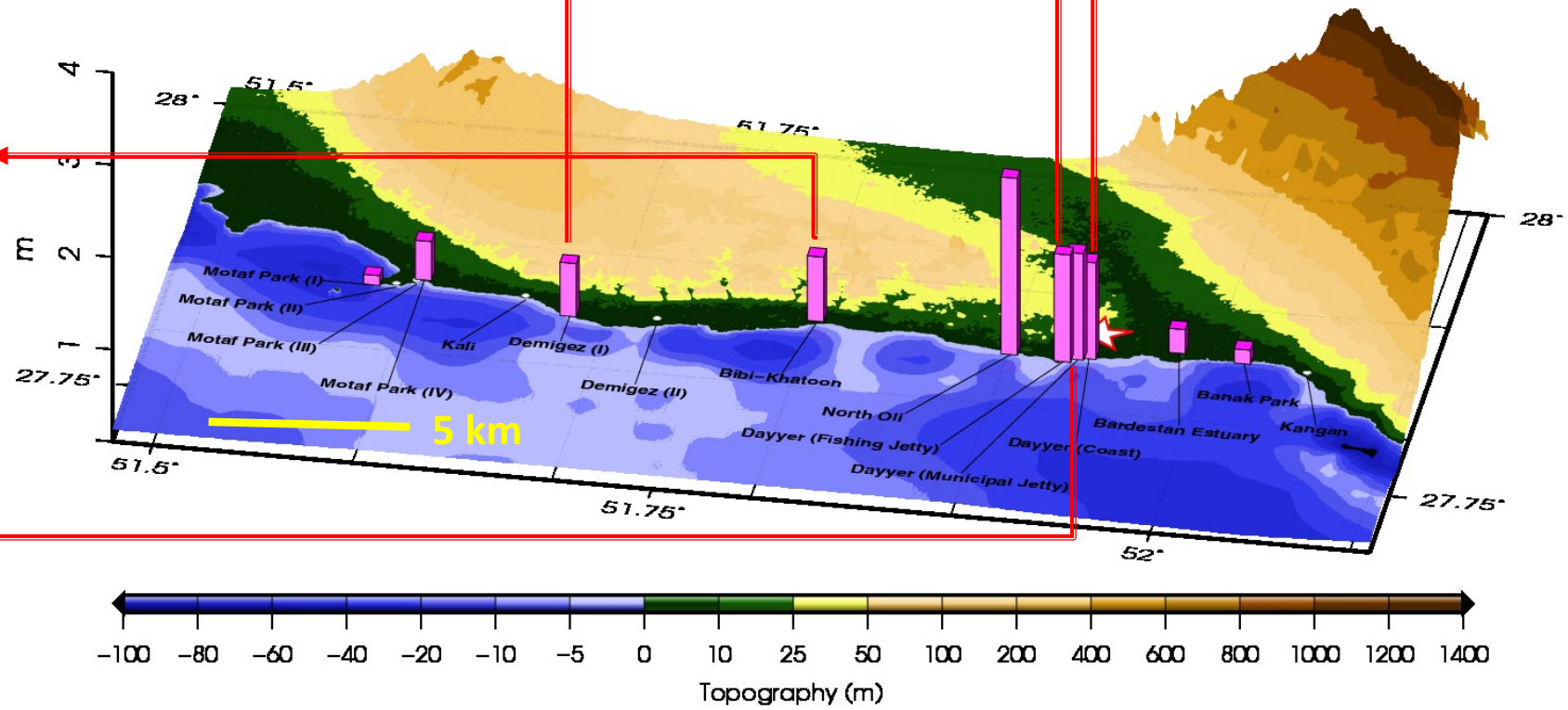
(Mehr News)



Note: Very Shallow Depth off Dayyer; max = 60 m

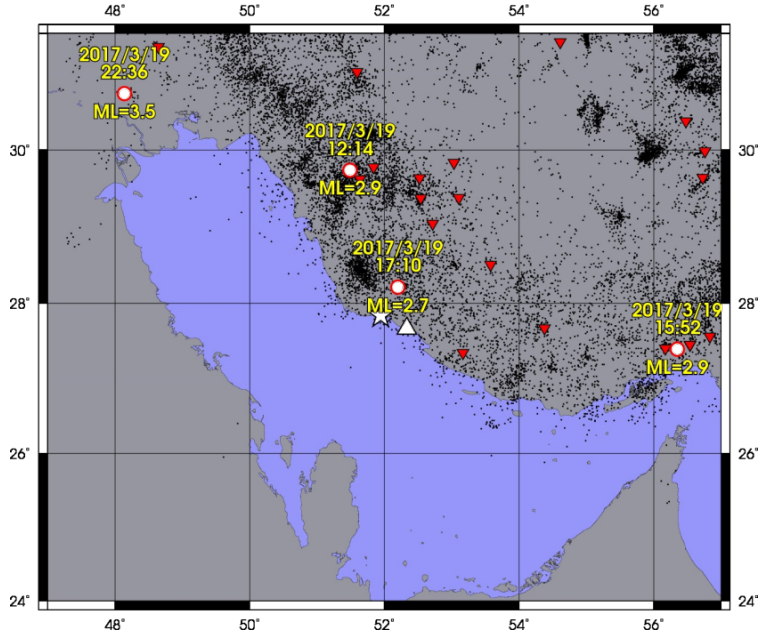
Field Survey

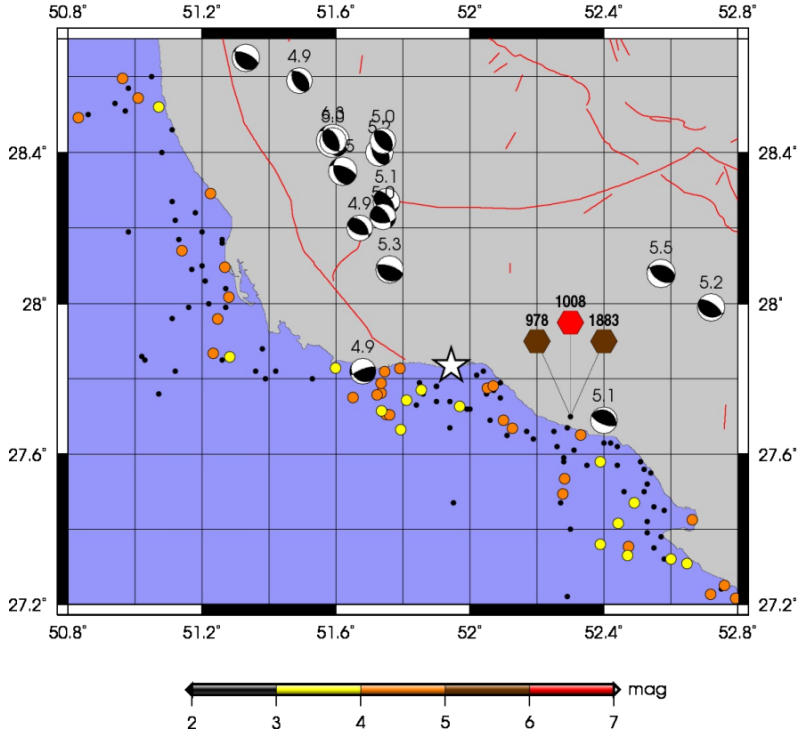
- Started from the **Motaf Park** and ended in **Kangan**.



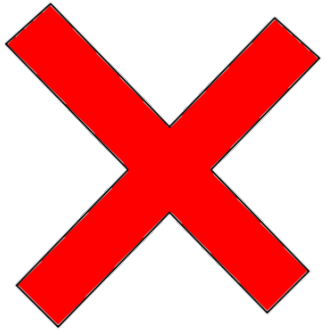
Topography data (GEBCO, SRTM)

Seismic Source?



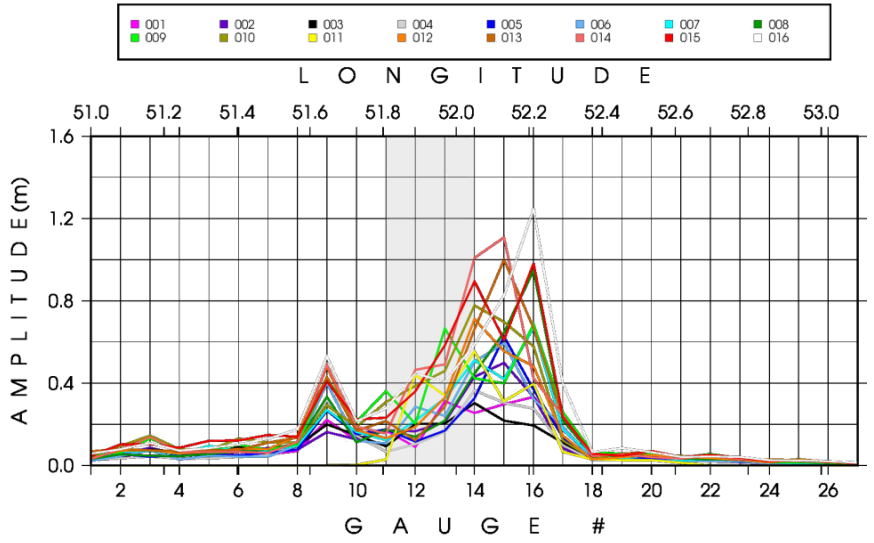


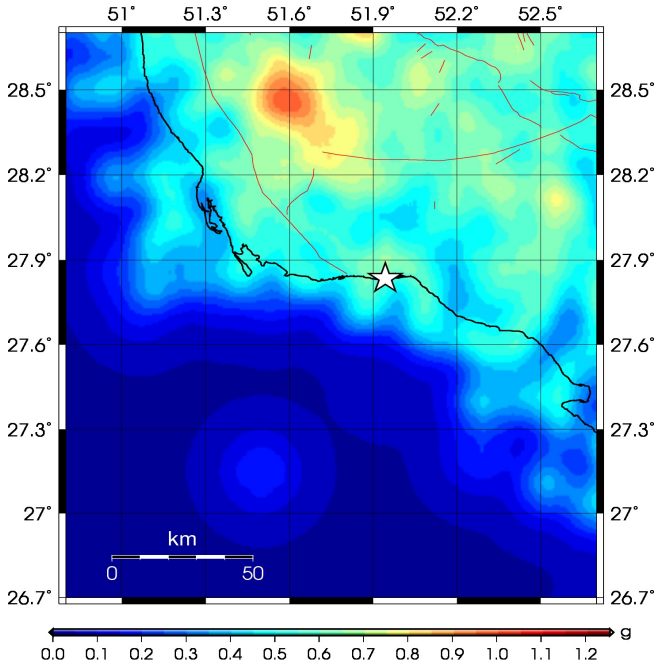
- Iran is a seismic country.
- Tsunami & Seismic history of southern Iran.
- No earthquakes were felt/recorded in the Persian Gulf on March 19.
- The event was only felt at the Port of Dayyer (?)

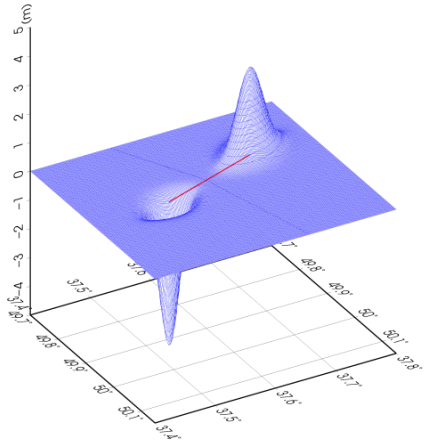


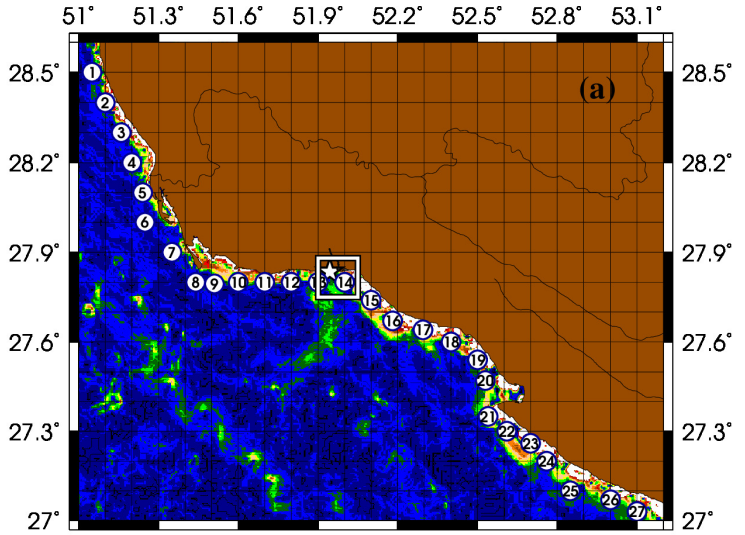
Landslide Source?

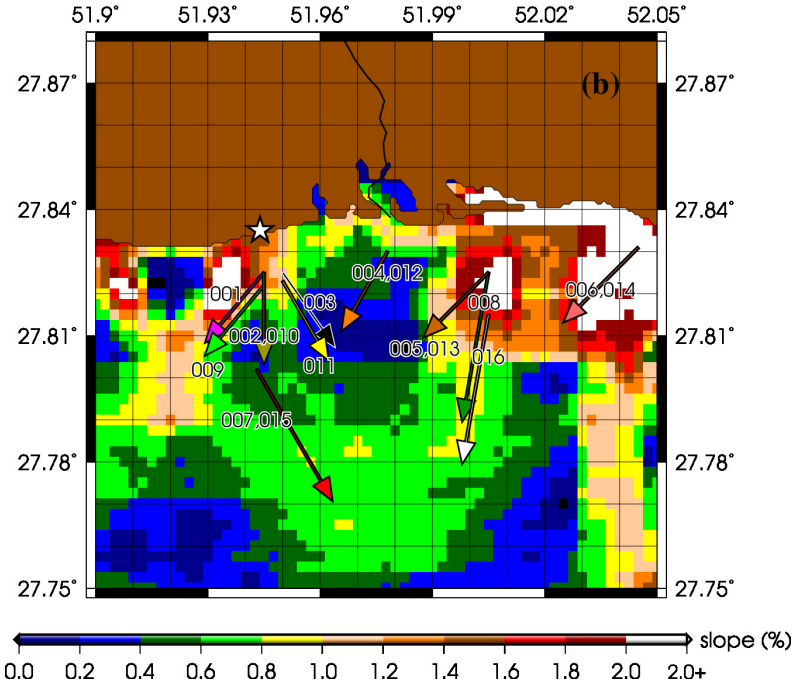
- Attenuation equations predict large enough PGA in the sea, close to Dayyer
- Subtle slopes on the Iranian side of the Persian Gulf
- Designed landslide dipoles (Synolakis et al, 2002)
- Used the MOST algorithm (Titov & Synolakis, 1995) to simulate the tsunami









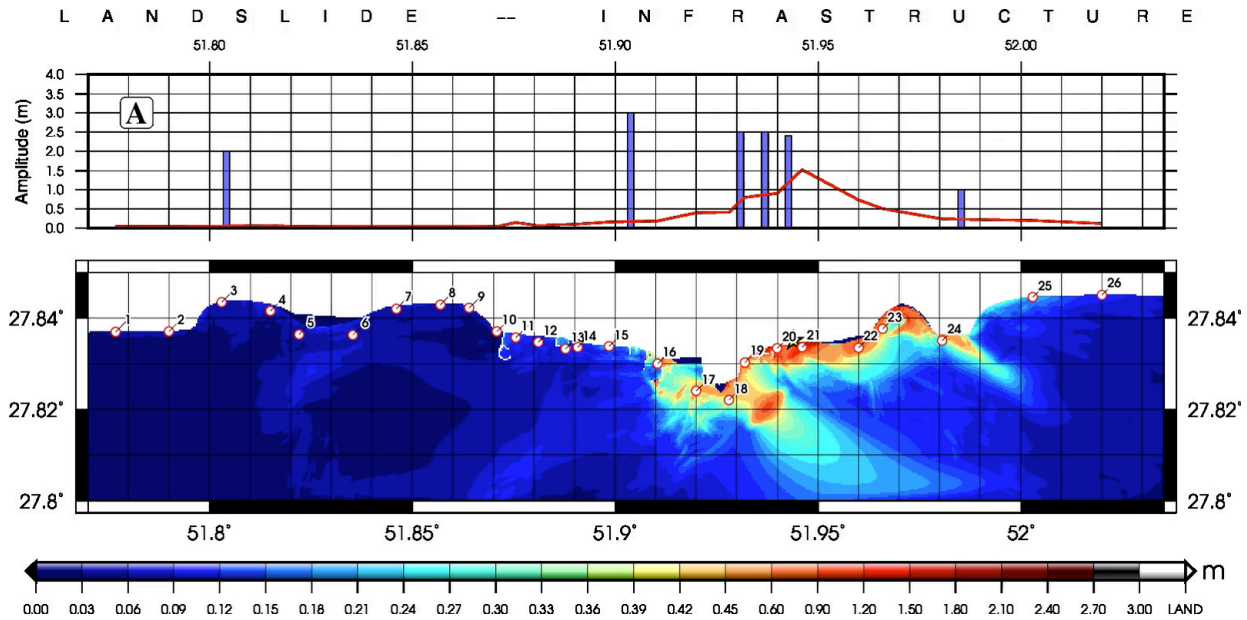


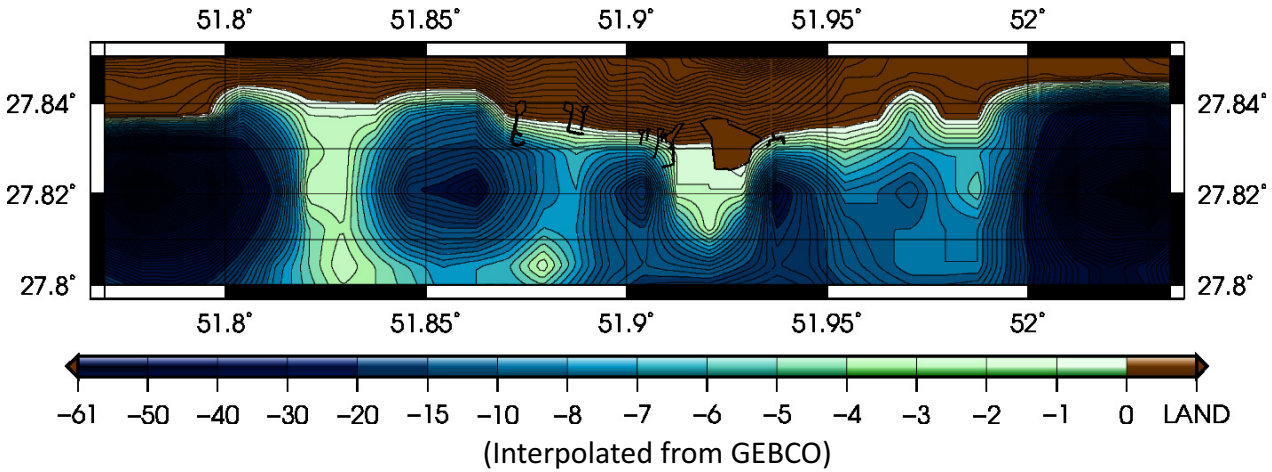
Salaree & Okal (2014)

Landslide Source?

(Considering Infrastructure)

- Superimposed the infrastructure as ”dry” points.
- Used the MOST algorithm (Titov & Synolakis, 1995) to simulate the tsunami
- Simulations miss the distribution of the documented maximum run-ups.

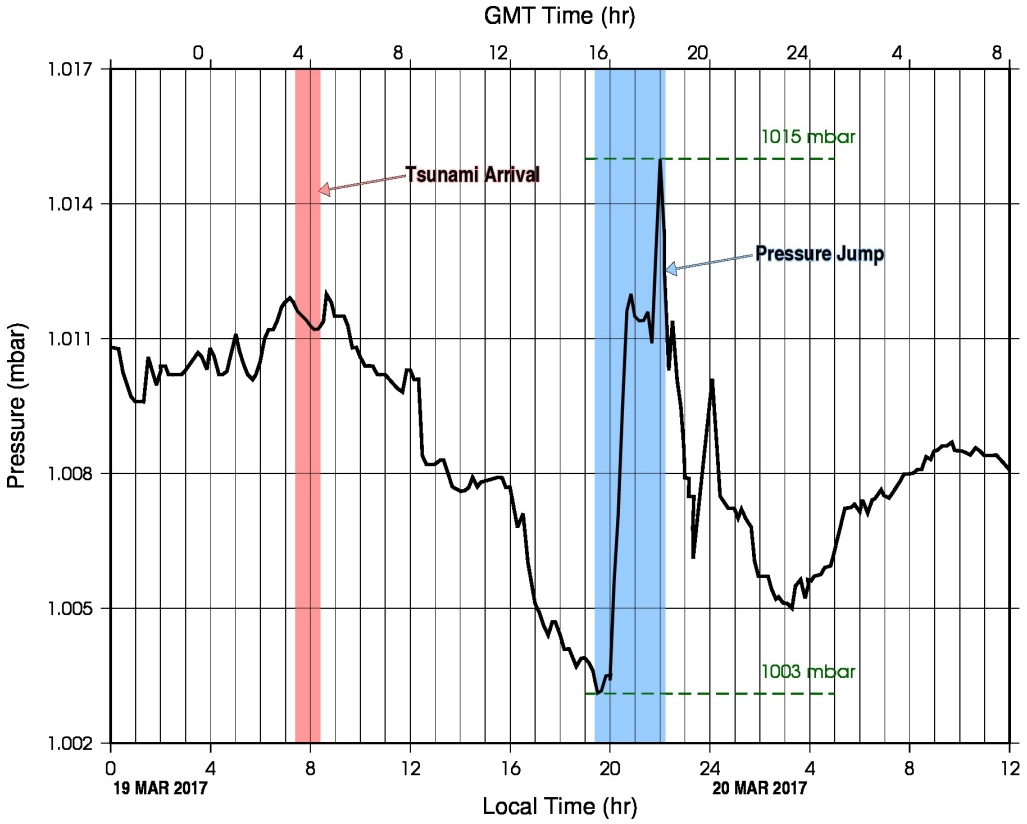




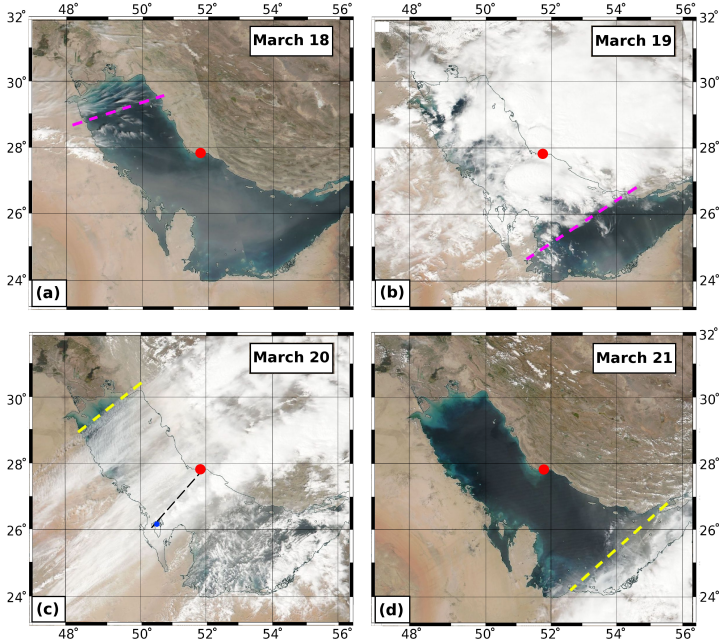
(Interpolated from GEBCO)

Meteotsunami

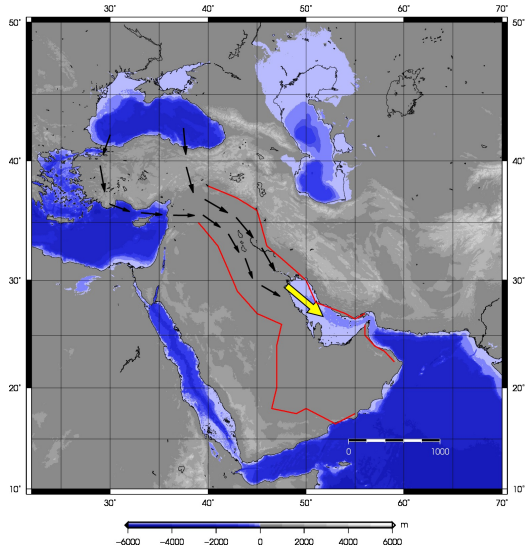
- The 18-21 March 2017 storm system.
- Shamal wind system in the Persian Gulf
- Discrepancy between the tsunami arrival and pressure signals



Barometric Data from
Hamad Bin Khalifa University



NASA Worldview (2017)

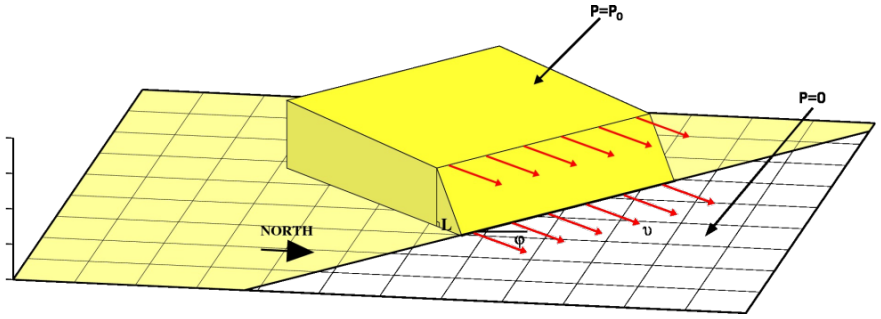


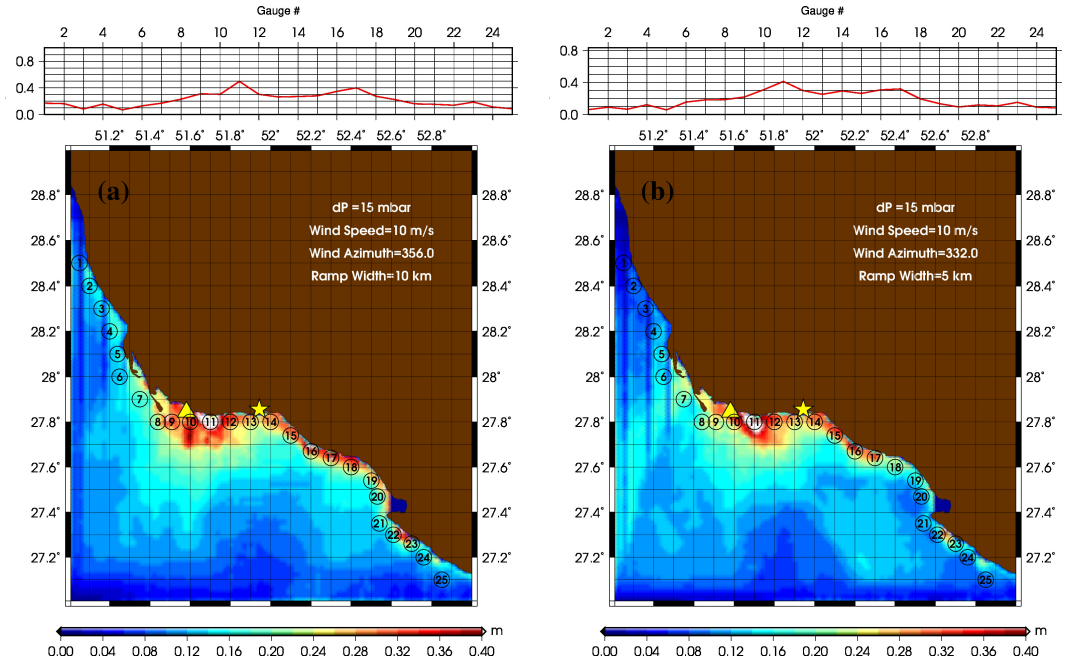
Modified from Perrone (1979)

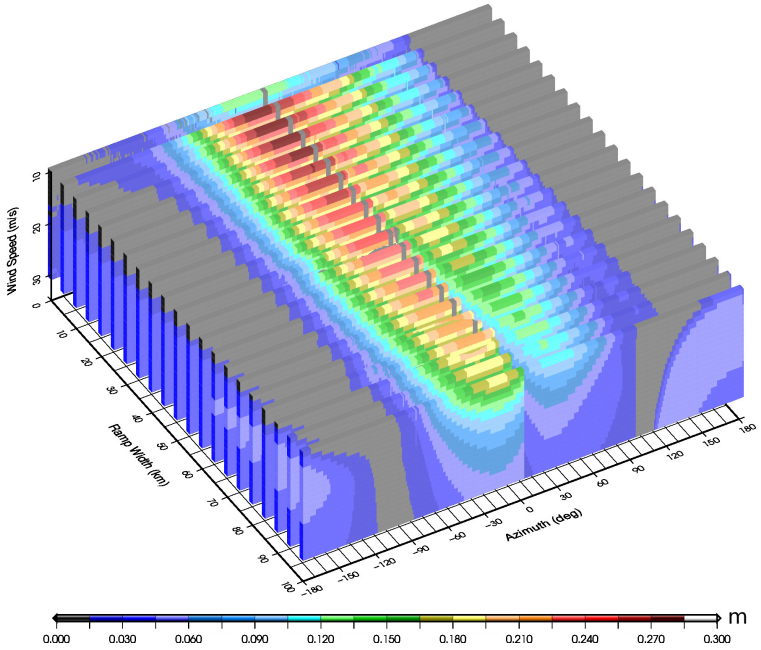
Meteotsunami

- Simulated the tsunami using the method by Platzman (1958).
- An interpolated *local* GEBCO grid (Δt=30 s).
- Recorded amplitudes at 25 virtual gauges over 10-hr windows.
- 158,760 simulations by varying *L* (0-100 km), *v* (10-30), and φ (0-359).
- The maximum amplitudes at Dayyer occurred at (L, v, φ):

  (10^{km}, $10^{m/s}$, 356˚) & (5^{km}, $10^{m/s}$, 332˚)







Conclusion

- **Field Survey:** The 19 March 2017 tsunami in the Persian Gulf, inundated a 40-km stretch of Iranian coastlines, with the highest run-up values concentrated in a narrower (8 km) segment around the Port of Dayyer.

- **Earthquake Scenario:** No earthquake with the potential of generating a tsunami of this size was recorded in the region.

- **Landslide Scenario:** These models fail to correctly predict the distribution of maximum amplitudes along the coastline.

- **Meteotsunami:** Atmospheric models for the tsunami source provide more reliable results.

- **Verdict:** The shortcoming of local source models in reproducing the amplitude distribution is perhaps due to the low-resolution bathymetry used in hydrodynamic simulations.