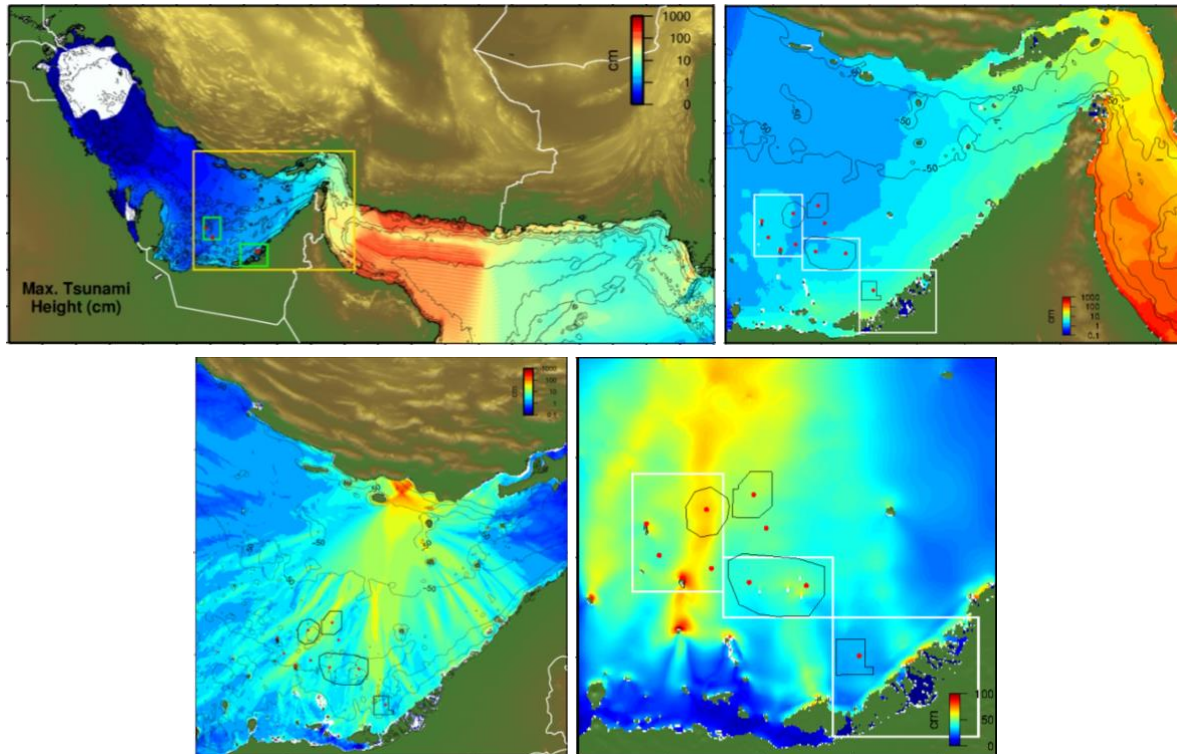


# TSUNAMIS AFFECTING OFFSHORE OIL AND GAS FACILITIES

ABU DHABI, UNITED ARAB EMIRATES



**(top left)** Maximum computed tsunami amplitudes from a Mw 8.9 earthquake on the Makran Subduction Zone. **(right)** Amplitudes are heavily attenuated through the Straits of Hormuz. **(bottom left)** Maximum computed tsunami amplitudes from a hypothetical landslide tsunami source. **(right)** Model results in the vicinity of the offshore facilities.

## PROJECT INFORMATION:

**Location:** Abu Dhabi, United Arab Emirates

**Client:** Arup Consultants

**Project Date:** 2016

## SCOPE OF WORK:

- Review of historical tsunami events
- Tsunami source characterization
- High resolution numerical modelling of tsunami inundation and currents

## PROJECT DESCRIPTION:

ORAS Director Dr. Jose Borrero conducted a tsunami hazard analysis for the offshore oil and gas fields located inside the Persian Gulf and operated by the Abu Dhabi Marine Operating Company. To quantitatively assess the tsunami effects at the offshore marine facilities, we used a numerical modelling approach to simulate tsunami generated by a variety of possible tsunami sources. As a first step, the models were tested against the effects of the 2004 Indian Ocean tsunami with a generally good agreement between the model and measured data, particularly at Salalah, Oman. The validation for the tsunami effects at Dubai were less accurate, however the measured tsunami signal used for comparison was very weak and noisy making a robust comparison difficult. However, there was a good agreement between the model and measured arrival times for the small tsunami surges at Dubai.

For this study we considered tsunamis generated both inside and outside the Persian Gulf. For sources inside the gulf, we assumed tsunamigenesis from earthquakes along steeply dipping reverse on southern coast of Iran with earthquake magnitudes of 6.9 as a 'typical' event and 7.6 as an extreme event based on historical earthquake data from the region. We also considered the possibility of a large submarine landslide occurring in this region as well.

Tsunamis from outside the Persian Gulf were assumed to be generated by large scale earthquakes along the Makran Subduction Zone (MSZ). Again we simulated two events, a 'typical' subduction zone earthquake with a magnitude of 8.6 and a 'large' event with magnitude of 8.9. Both sources were positioned at the westernmost extent of the MSZ.

Due to the generally shallow water depths in the Persian Gulf, the tsunami waves are heavily attenuated, particularly for the tsunami sources located on the MSZ. Overall the model results confirm the relatively low vulnerability of the ADMA-OPCO facilities to tsunami effects. Only an extreme earthquake ideally positioned is able to produce tsunami heights or current speeds that would be potentially damaging or disruptive to maritime activities.