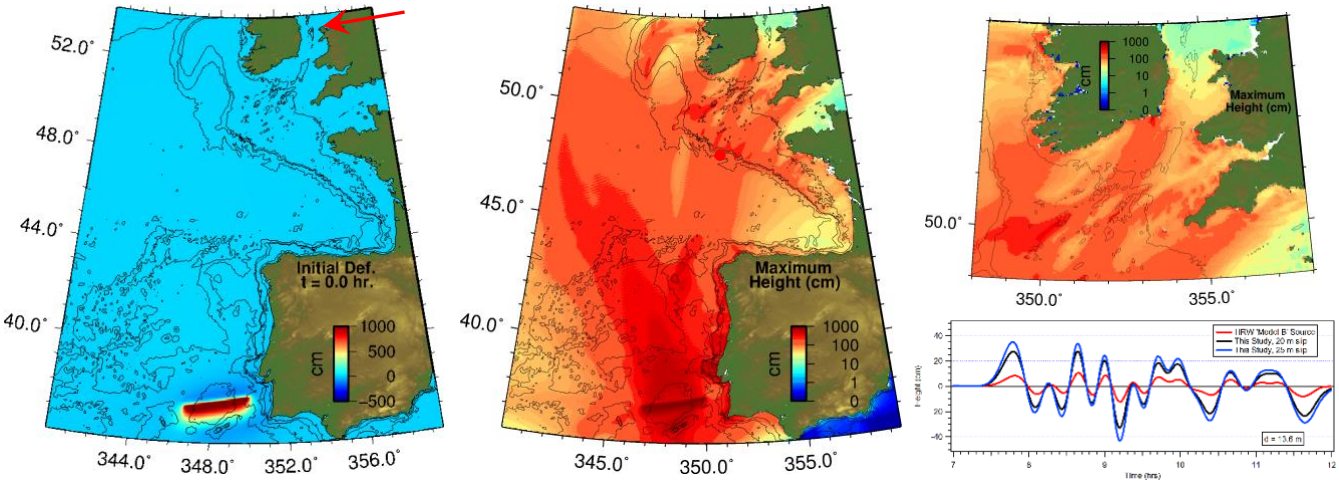
TSUNAMI HAZARD MODELLING FOR THE WYLFA NUCLEAR POWER PLANT

WYLFA, WALES



(left) Initial seafloor deformation from a M_W 9.06 earthquake on the Gorringe Bank offshore Portugal. The location of Wylfa is indicated with the red arrow. **(middle and top right)** Maximum computed tsunami amplitudes **(lower right)** Modelled time series of tsunami water levels at the study site.

PROJECT INFORMATION:

Location: Wylfa, Wales

Client: Arup Consultants

Project Date: 2013-2014

SCOPE OF WORK:

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

PROJECT DESCRIPTION:

As part of a consent review process for the Horizon Nuclear Power Plant (NPP) at Wylfa, Wales, ORCAS Director Jose Borrero was commissioned to examine the tsunami hazard at the site. The study considered three very large tsunami sources positioned off the SW coast of Portugal in the region of the Gorringe Bank: a M_W 8.7 event with 13.6 m slip over a 200x100 km fault plane and M_W 9.0 and 9.06 events with 20 and 25 m slip over 300x100 km fault planes. The 20-25 m slip amounts are typical of Mw 9 earthquakes along subduction zone plate boundaries. However, this slip amount is even more conservative in this context owing to the steep (41º) dip angle of the fault plane. The steeper angle results in much more vertical uplift relative to subduction zones with shallower (generally 5º – 15º) dip angles.

The first source was modelled in an effort to replicate and show consistency with results from previous modelling studies. And indeed, the model output agreed quantitatively with the previous work lending credibility to our methodology with both models predicting maximum tsunami amplitudes of ±10 cm (zero to peak) at the study site.

Applying the larger 20 m slip source yields maximum wave heights that are approximately 3 times larger: ±30 cm (zero to peak) and applying the 25 m slip source increases the modelled wave heights to approximately ±40 to 45 cm.

Although much larger than the results from the previous study, these wave heights are small given the size of the earthquake being considered and the tide range that is normally experienced at the site, not to mention the implausibility of the causative tsunami source. As a result, we conclude that the tsunami hazard at the Wylfa site is relatively low.