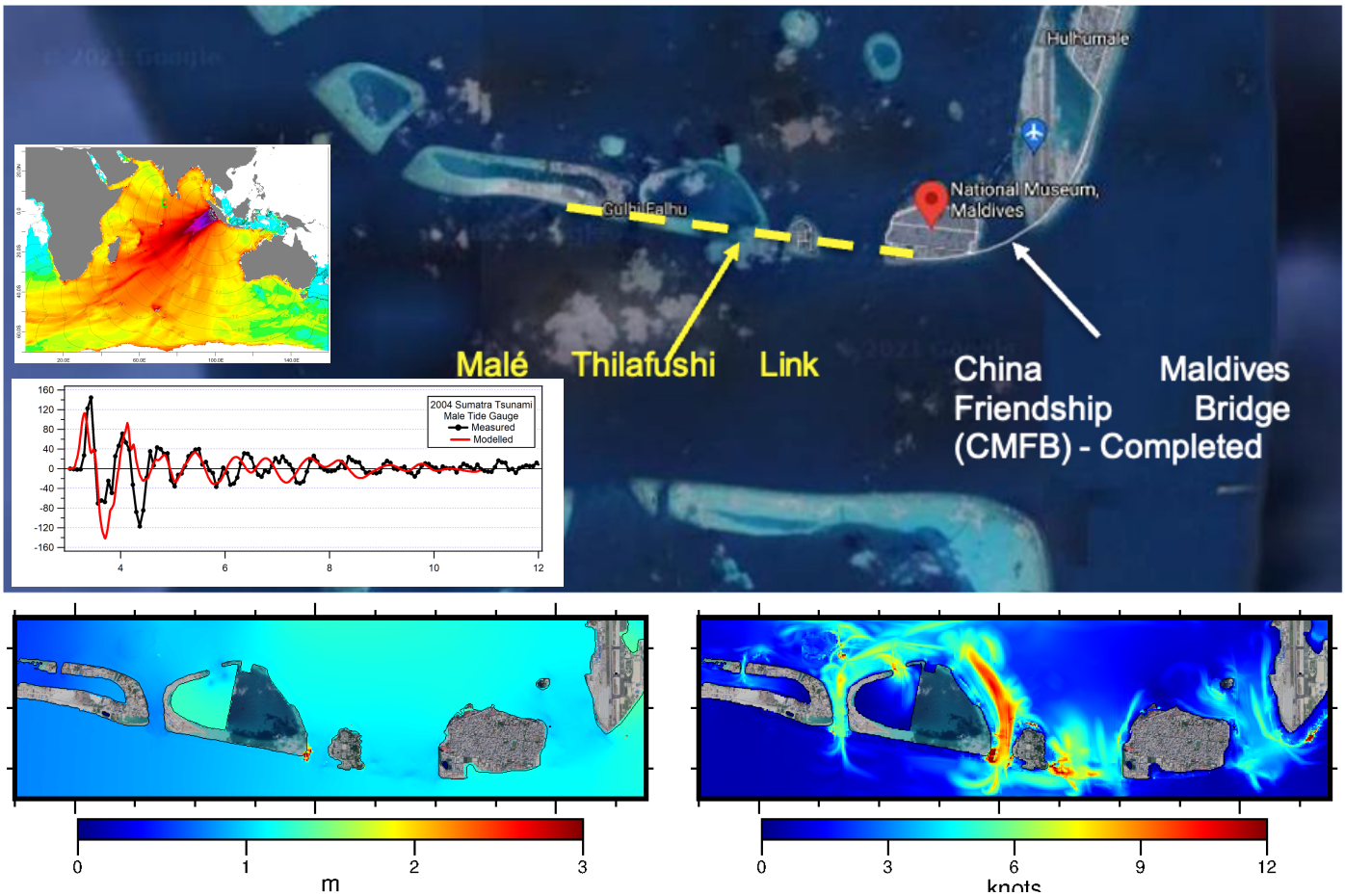
MODELLING OF TSUNAMI EFFECTS ON THE MALE-THILAFUSHI LINK BRIDGE

MALDIVES



(top) The proposed alignment of the Malé-Thilafushi link bridge. Inset shows a plot of maximum modelled tsunami amplitudes across the Indian Ocean from the 2004 Sumatra tsunami and a model to measured comparison of tsunami water levels at Malé (bottom) Hydrodynamic model output for tsunami height and current speed.

PROJECT INFORMATION:

Location: Malé, Maldives

Client: Arup Consultants

Project Date: 2021

SCOPE OF WORK:

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

PROJECT DESCRIPTION:

We conducted a hydrodynamic modelling study of tsunami effects for on the alignment for the proposed Male-Thilafushi Link (MTL) Bridge. Tsunami sources were based on historical and hypothetical events including the 2004 Boxing Day tsunami (M_W = 9.4), the Sumatra earthquake of 1833 (M_W = 9.1), a hypothetical large magnitude rupture of the entire Sumatra Subduction Zone (M_W = 9.3) and a large magnitude earthquake on the Makran Subduction Zone (M_W = 9.2) located in the north-western Indian Ocean along the southern coast of Iran and Pakistan. The results suggest that the 2004 event can be considered as a 'worst case' scenario for the Maldives due to the location of the high-slip region off the northern coast of Sumatra which projects the greatest amount of tsunami energy westward directly towards the Maldives. Sources further south on the Sumatra subduction zone tend to project tsunami energy to the southwest into the southern Indian Ocean and away from the Maldives. The Makran source also does not efficiently project energy towards Male making that area a lower hazard than Northern Sumatra. Because of the exceptionally large magnitude of the 2004 event and the large amount of co-seismic slip released, we would not expect a repeat of that event for hundreds, if not thousands of years. However, seismological studies suggest that a large magnitude vent on the southern portion of the subduction zone could reasonably be expected to occur in the coming century.