Tsunami hazard in the Persian Gulf and Red Sea

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ICG/IOTWMS Task Team on
"Scientific Tsunami Hazard Assessment of the Makran Subduction Zone"
Provisional Agenda
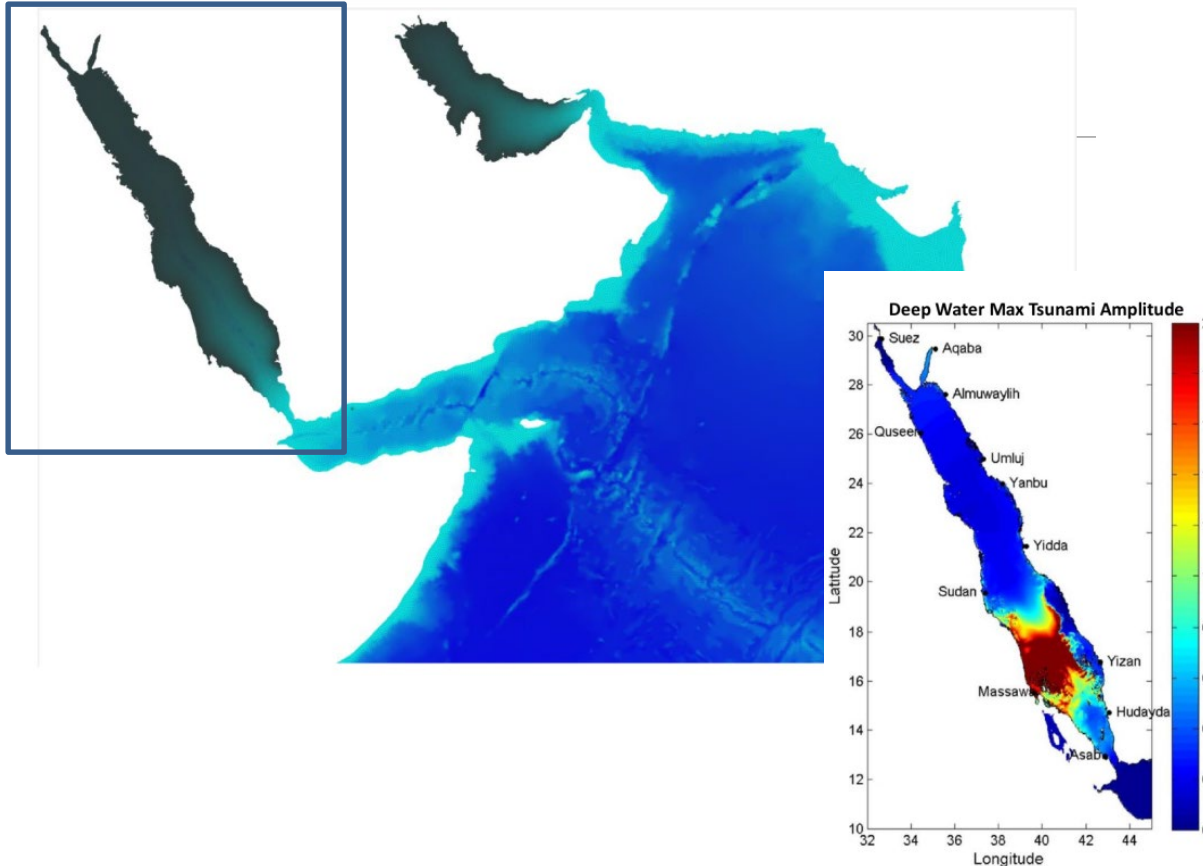**Intersessional Online Meeting – 9 November 2021**

From Previous meeting …

GEBCO 30 arc second (900 m) for Arabian Sea and 15 arc second (450 m) for Persian Gulf (PG), Gulf of Suez (GS), Gulf of Aqaba (GAq) and Red Sea (RS)
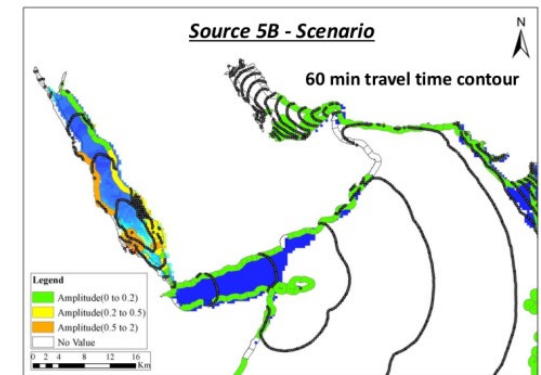
Total Number Nodes: **773660**   Total Number of Elements: **392885**
Minimum Length near coast : **500 m** (in Gulf areas) Minimum Length near coast : **1000 m**
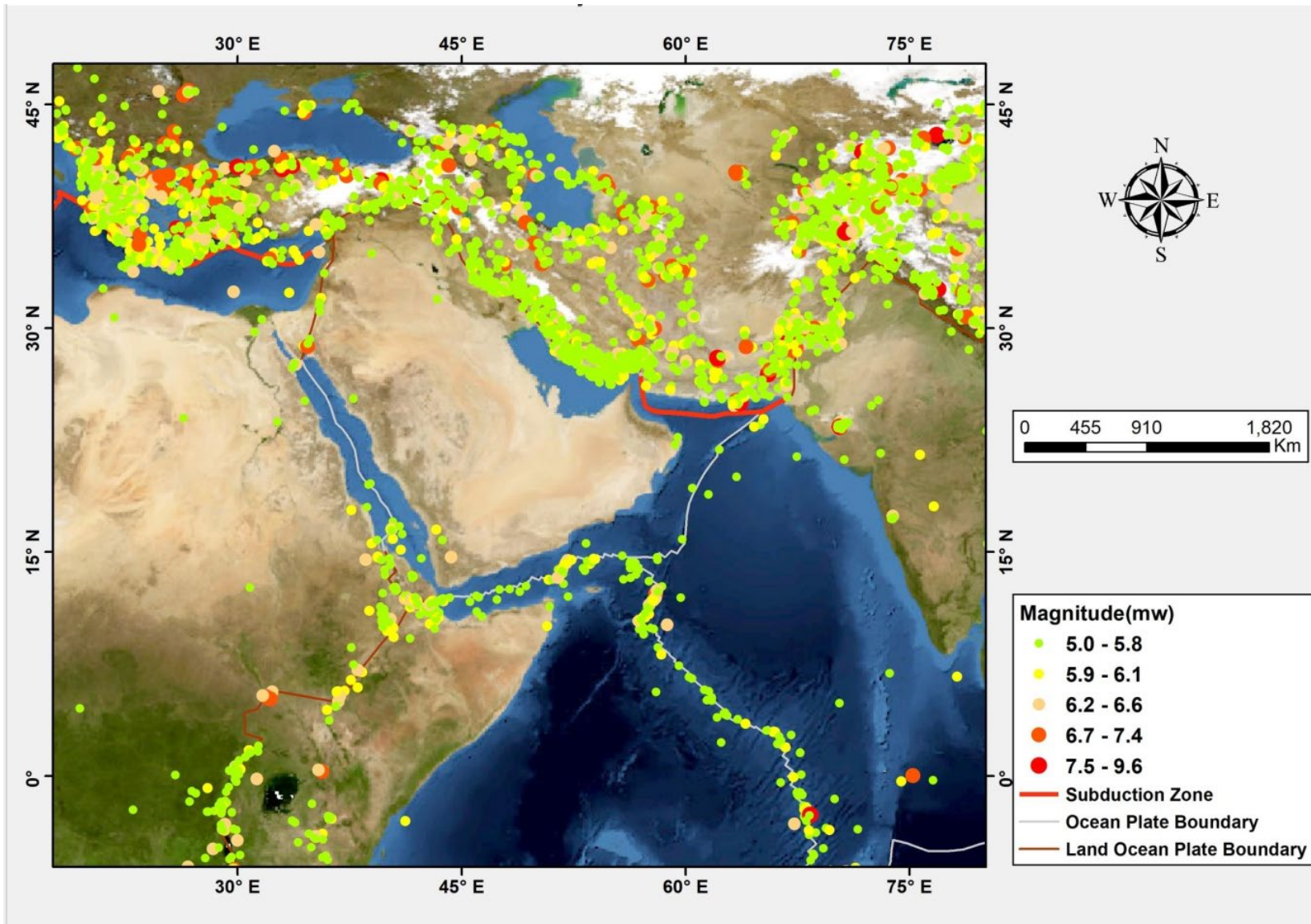Maximum Length in Deep Ocean: **5 KM**

Deep Water Max Tsunami Amplitude

Simulation Point
Latitude: 16.52 N , Longitude: 40.34 E

Source 5B - Scenario

60 min travel time contour

Legend
Amplitude(0 to 0.2)
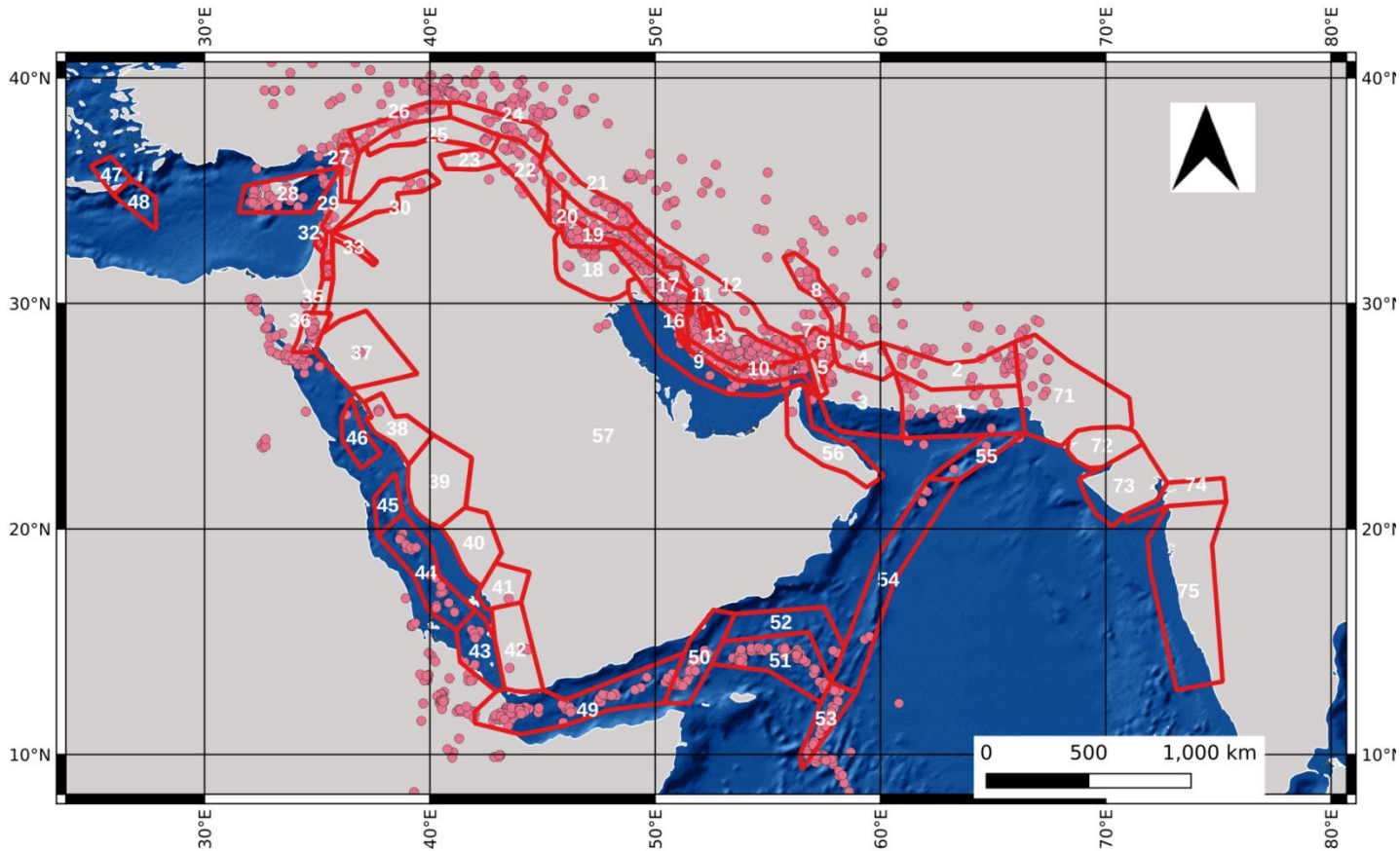Amplitude(0.2 to 0.5)
Amplitude(0.5 to 2)
No Value

Max_Beach : >0.5 m to <2m
Wave Arrivals: 01 to 03 hrs (with in gulf)
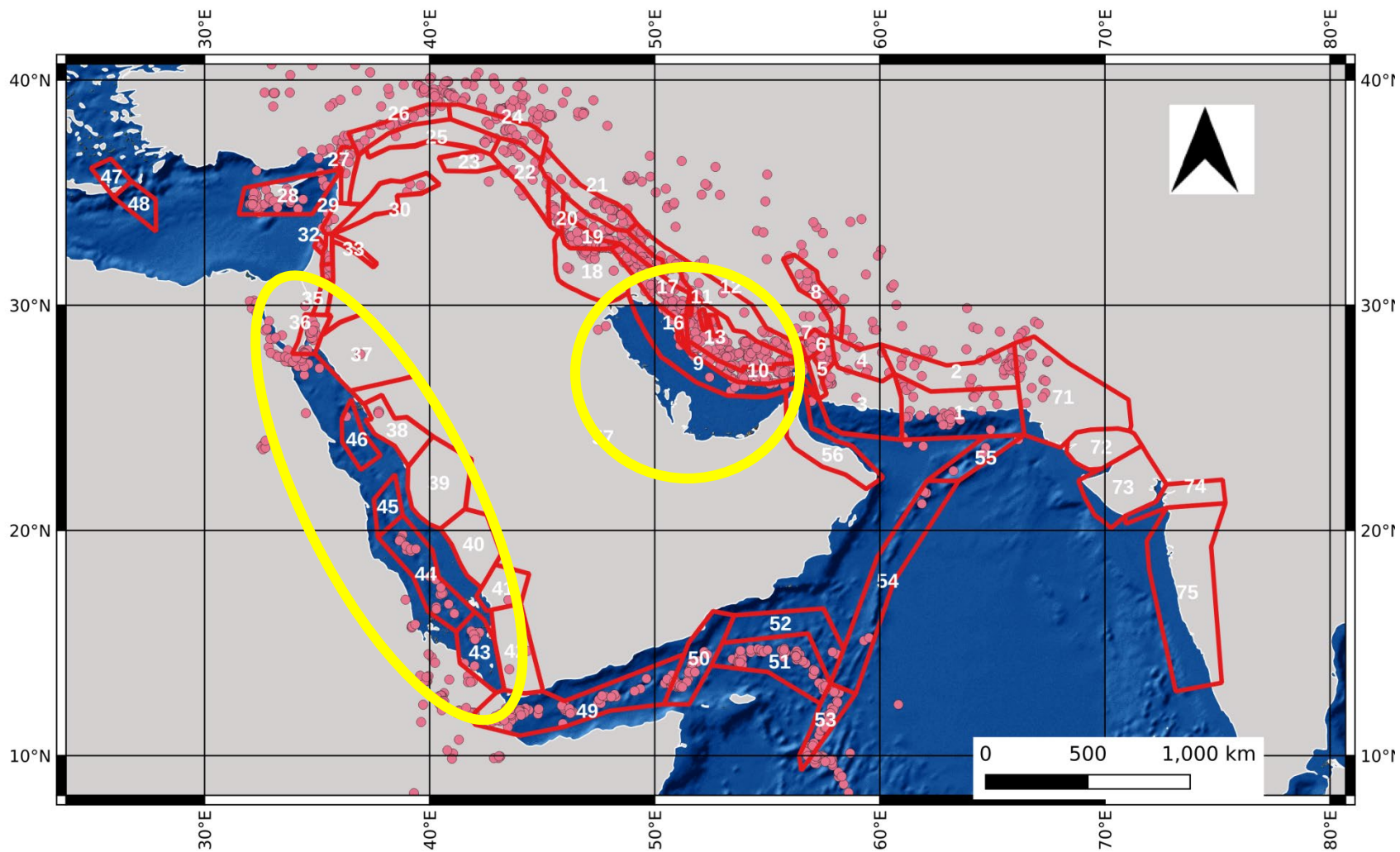
Historical Seismicity

Source Zones

1. Source zones of Persian Gulf and Red Sea considered

2. Full set up source parameter combinations needs to be finalised for generating scenarios

Source Zones

Tsunami Model - ADCIRC

ADVANCED **CIRC**ULATION MODEL FOR OCEANIC,COASTAL AND ESTUARINE WATERS (ADCIRC) developed by UNIVERSITY OF NORTH CAROLINA AT CHAPEL HILL for solving the equations of motion for a moving fluid on a rotating earth. These equations have been formulated using the traditional hydrostatic pressure and Boussinesq approximations and have been discretized in space using the finite element (FE) method and in time using the finite difference (FD) method

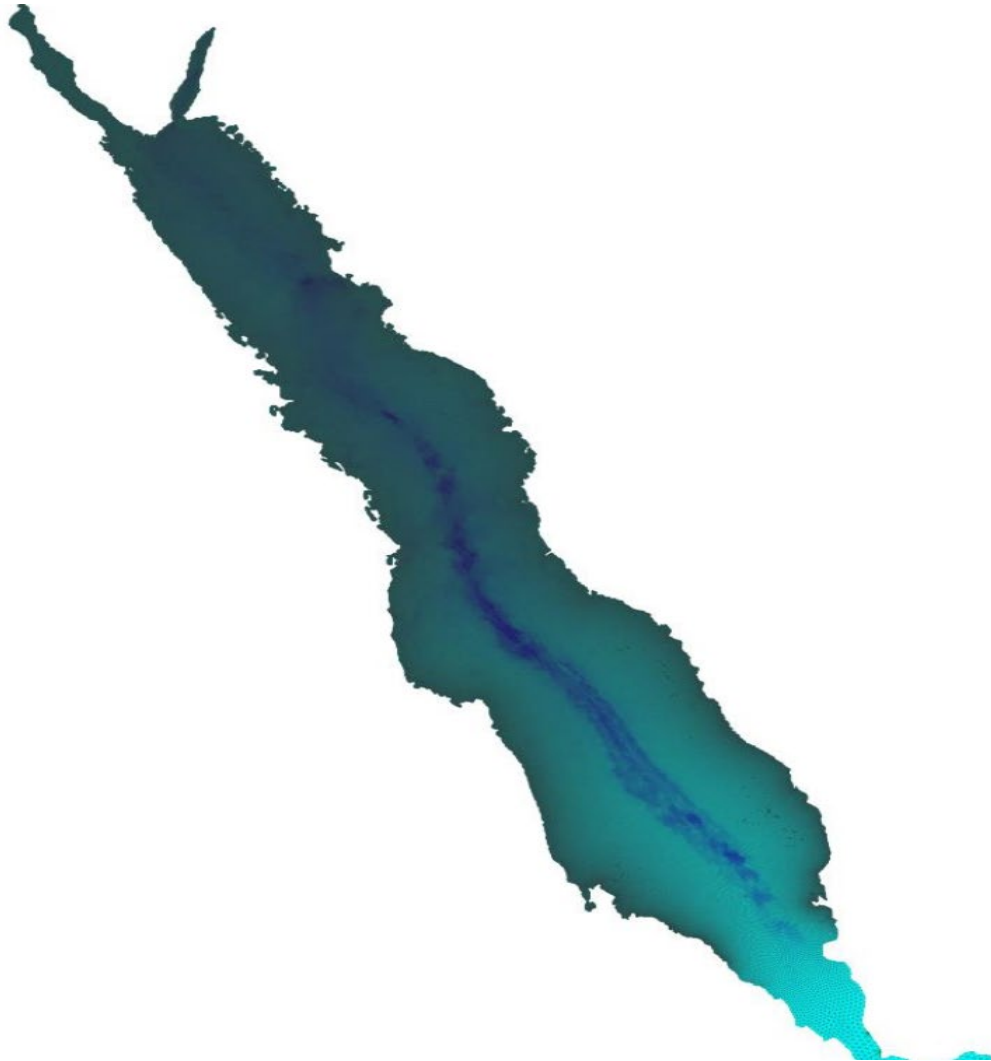The governing equations consist of the primitive continuity equation

$$\frac{\partial \zeta}{\partial t} + \frac{\partial UH}{\partial x} + \frac{\partial VH}{\partial y} = 0 \tag{1}$$

and the primitive momentum equations (in nonconservative form)

$$\frac{\partial U}{\partial t} + U\frac{\partial U}{\partial x} + V\frac{\partial U}{\partial y} - fV = -\frac{\partial}{\partial x}\left[\frac{p_s}{\rho_0} + g\zeta - g(\eta + \Upsilon)\right] + \frac{\tau_{sx}}{\rho_0 H} - \frac{\tau_{bx}}{\rho_0 H} + D_x - B_x \tag{2}$$
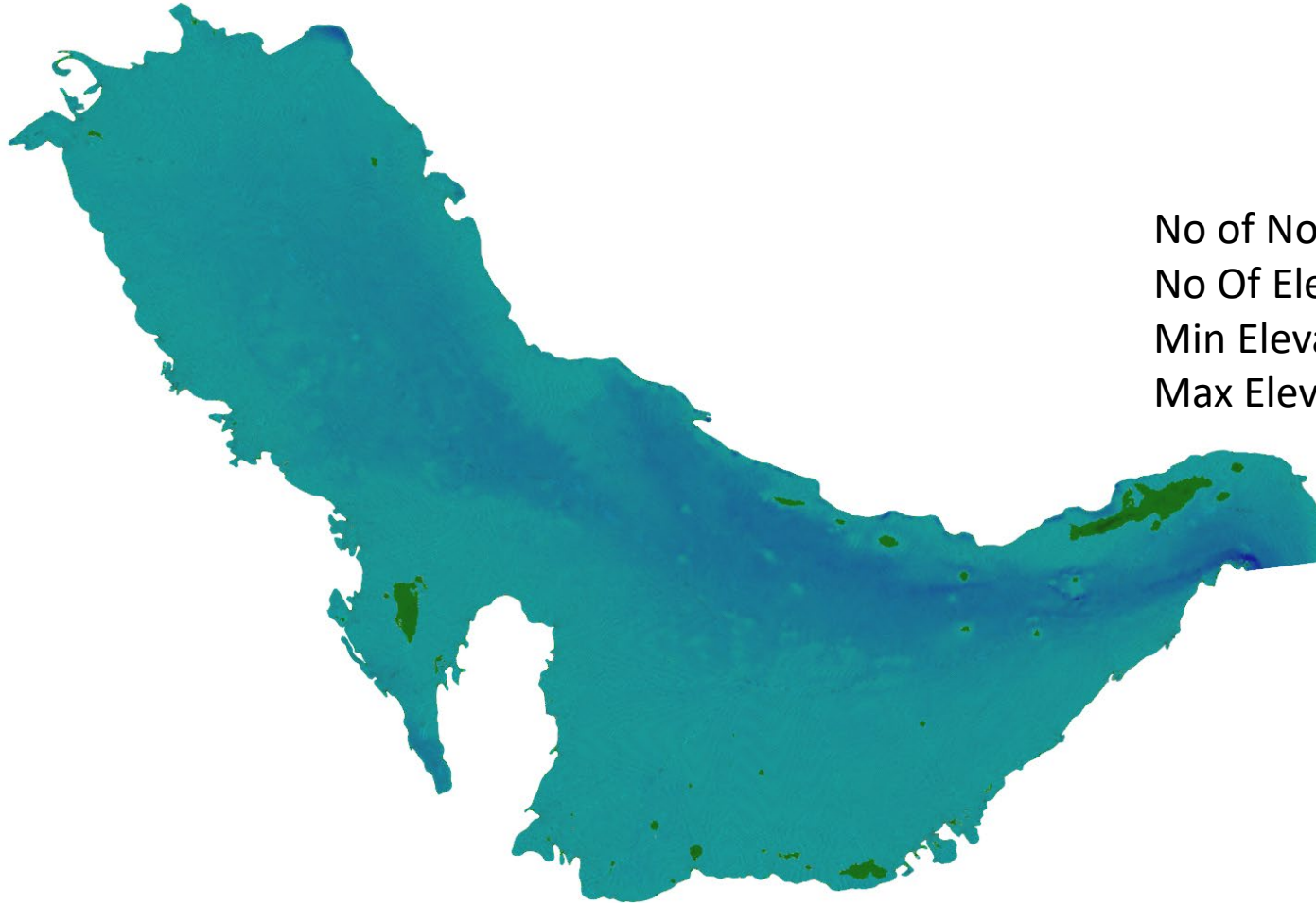
$$\frac{\partial V}{\partial t} + U\frac{\partial V}{\partial x} + V\frac{\partial V}{\partial y} + fU = -\frac{\partial}{\partial y}\left[\frac{p_s}{\rho_0} + g\zeta - g(\eta + \Upsilon)\right] + \frac{\tau_{sy}}{\rho_0 H} - \frac{\tau_{by}}{\rho_0 H} + D_y - B_y \tag{3}$$

Finite Element Mesh - Red Sea

No of Nodes   : 762592
No Of Elements: 1517276
Min Elevation   : -2811.5 m
Max Elevation   : 405.3 m

Finite Element Mesh -Persian Gulf

No of Nodes   : 408106
No Of Elements: 810988
Min Elevation   : -222.7 m
Max Elevation   : 237.5 m

3 . Technical setup of ADCRIC Models made ready along with Finite Element Mesh (with SRTM30+ datasets) and POIS (at the coast) , but some fine tune is required for blowups

4. Sample scenarios can be run as POC for computational times and storage and Full set of Scenarios can be simulated down the time line once the source parameters combination finalized.