

Considerations for Coupling M2D with ADCIRC & STWAVE

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Introductory Concept



- Rectilinear M2D can serve as a convenient local model for representing coastal processes on the same scale as the wave model.
- M2D can then be driven by the regional oceanographic model ADCIRC, together with local forcing of wind and tributary discharge.
- Considerations for coupling M2D with ADCIRC & STWAVE are presented.

Topics



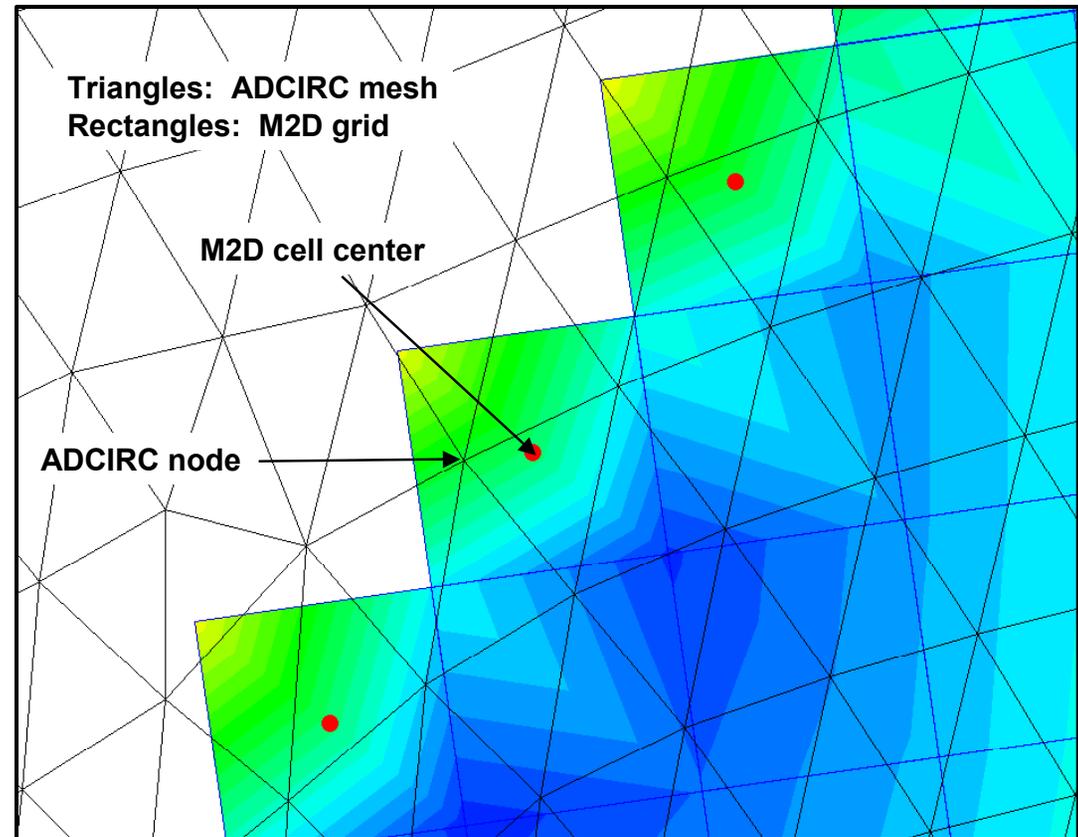
- M2D & ADCIRC
 - ADCIRC mesh resolution near M2D boundary
 - ADCIRC output frequency
- M2D & STWAVE
 - M2D vs. STWAVE grid conventions
 - Grid resolution
 - Coupling interval
- General considerations

M2D & ADCIRC

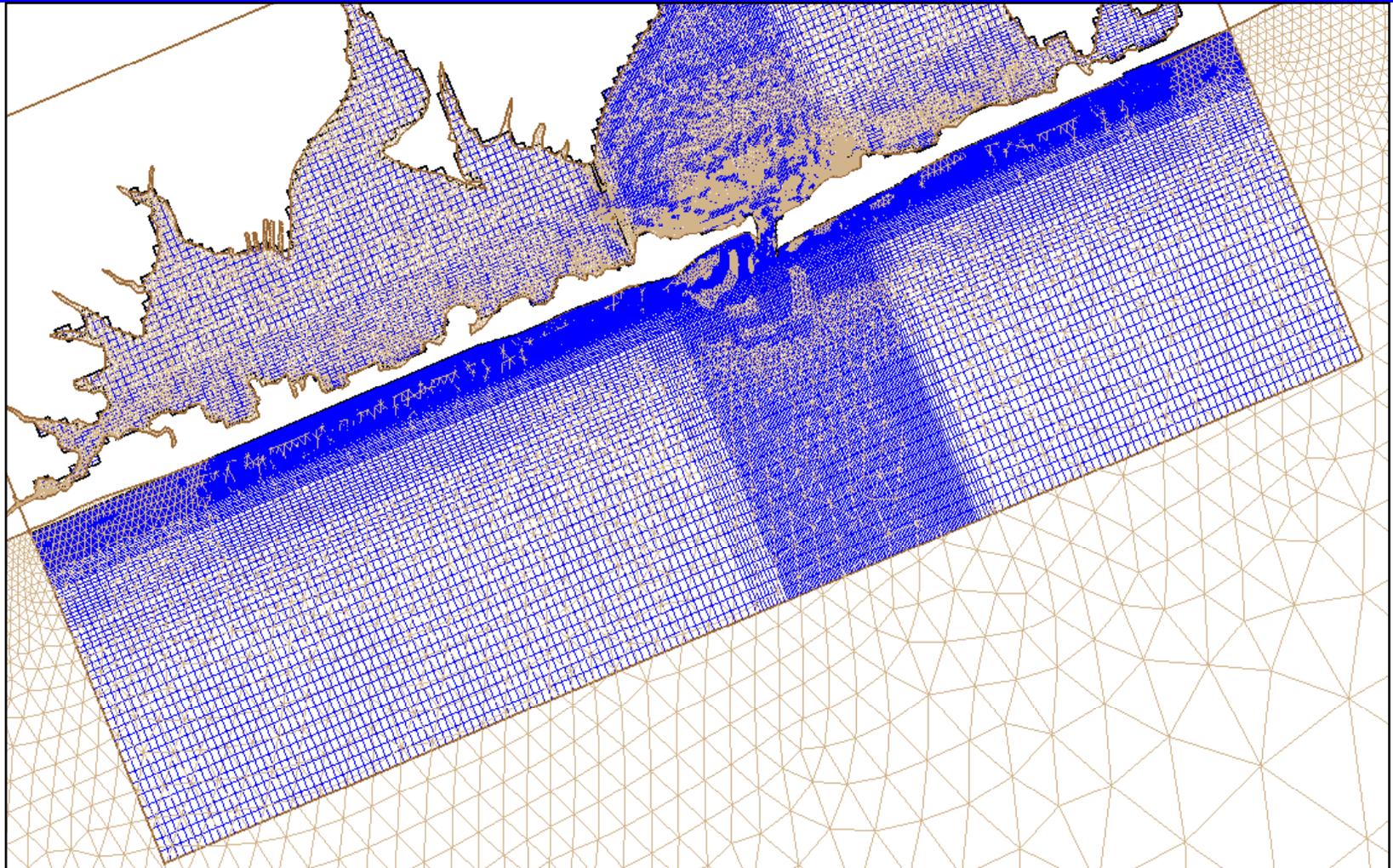
Mesh Resolution Near M2D Boundary



- ADCIRC node spacing similar to M2D cell dimension
 - Near M2D boundary
 - Accuracy in interpolation to M2D cell centers
- Preserves water-level distribution
 - Wind setup/down
 - Tidal phase



Example M2D & ADCIRC Resolution

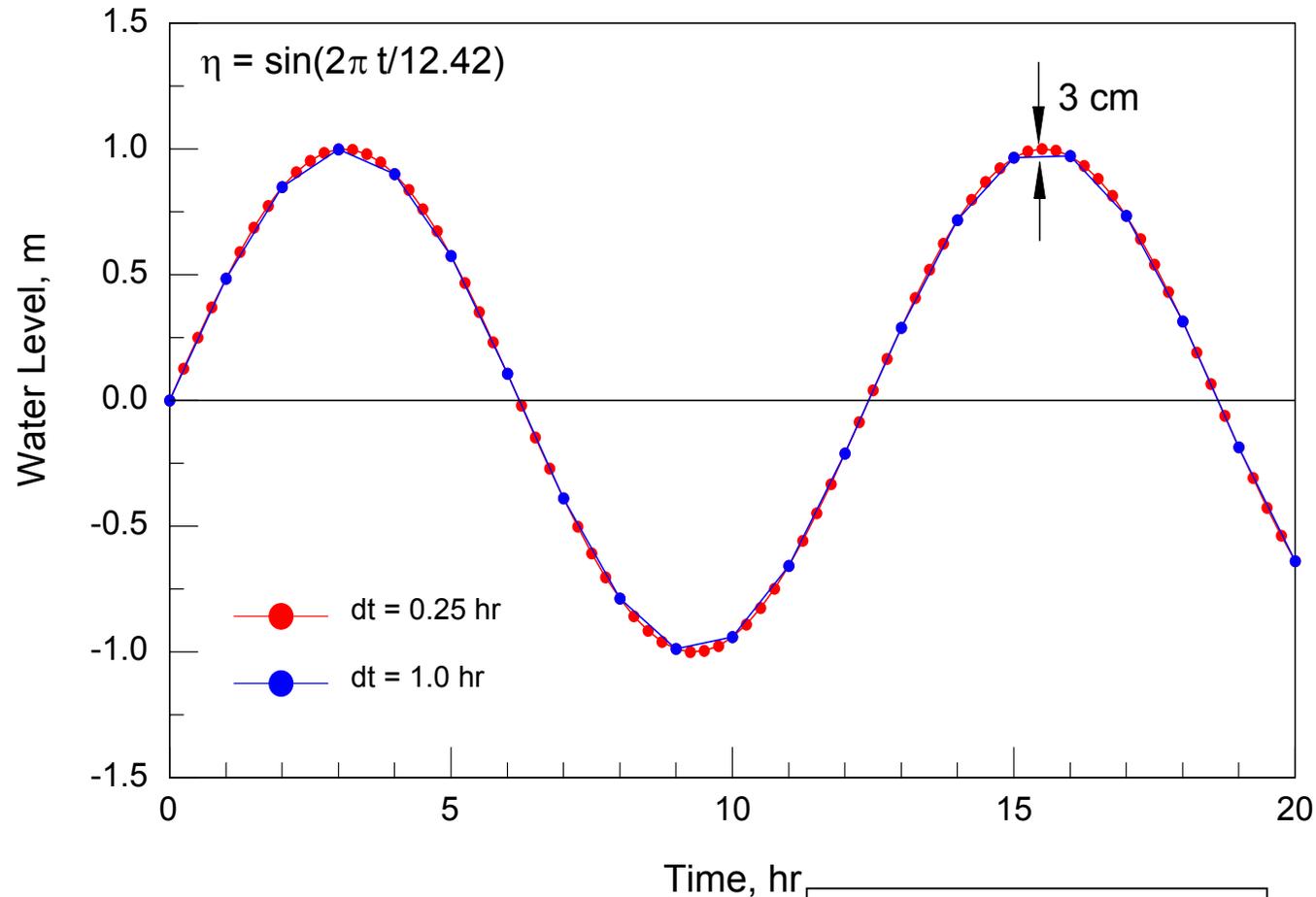


M2D & ADCIRC

ADCIRC Output Frequency



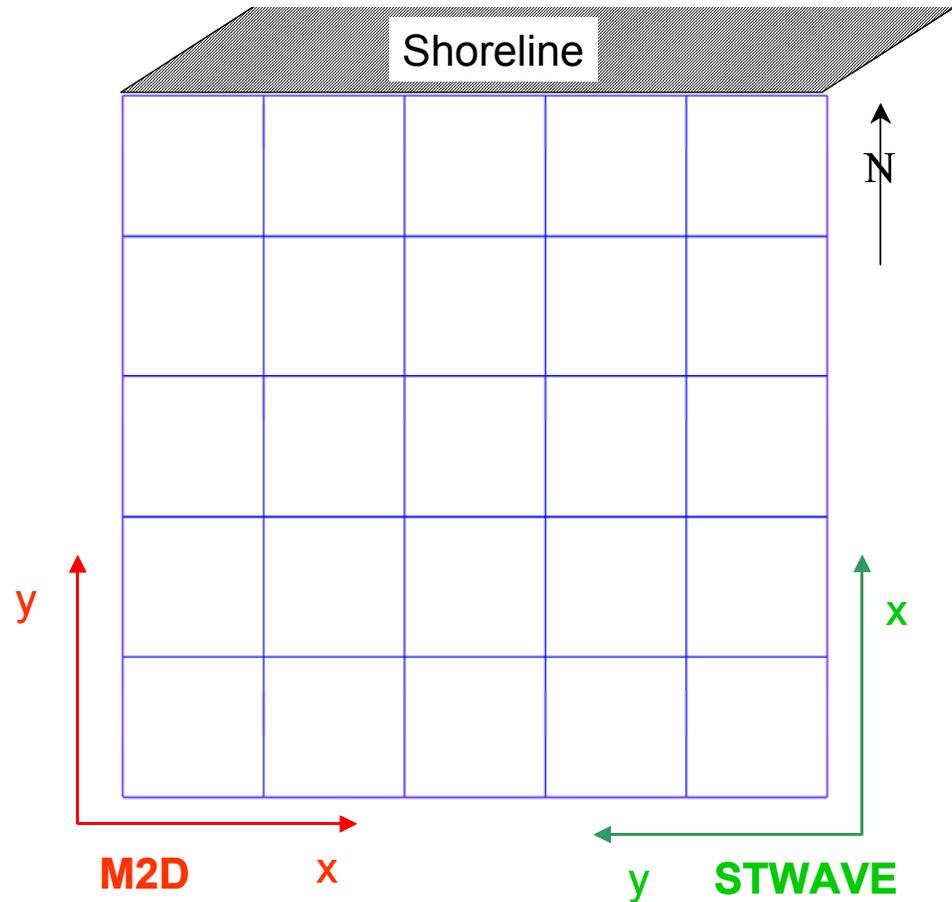
- ADCIRC output to drive M2D
- Output frequency
 - Scales of processes being modeled
 - Tide: $dt = 15$ min or less



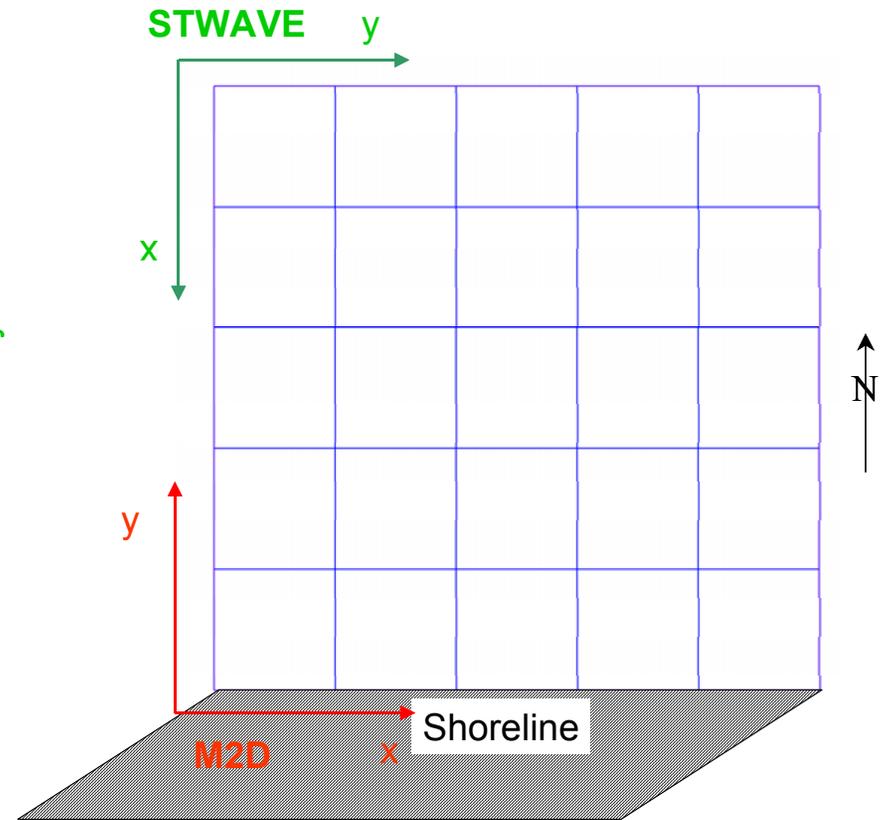
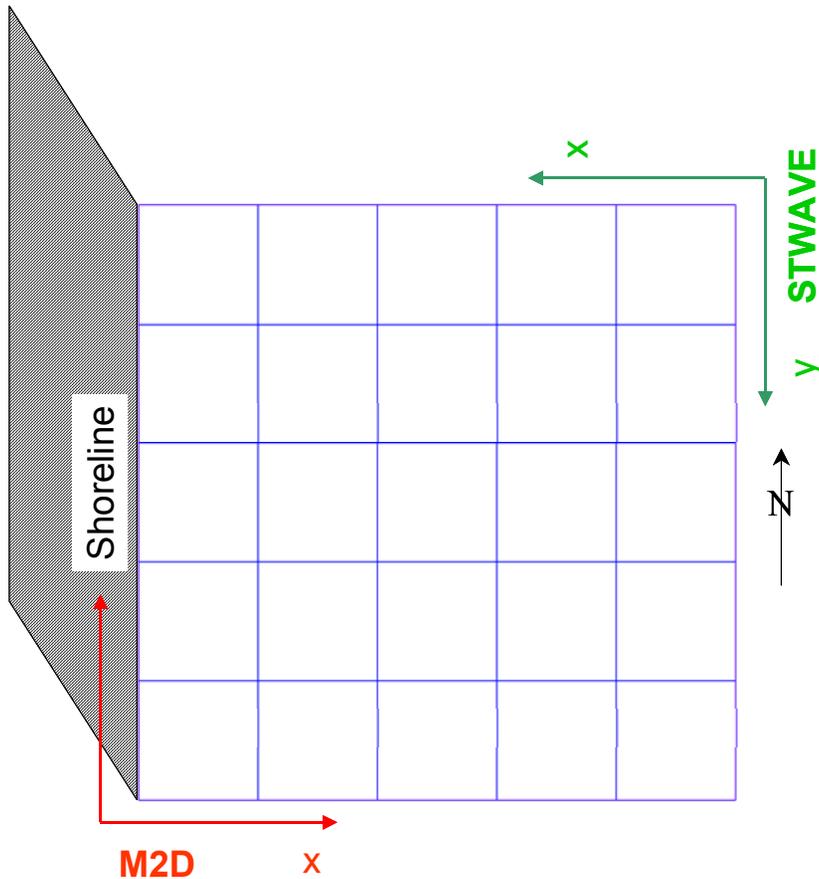
M2D & STWAVE Grid Conventions



- M2D: relative to geographic
 - Aligned w/ geographic
 - **x**: E-W parallel
 - **y**: N-S parallel
 - Rotated +/- 45 deg w/ respect to geographic
- STWAVE: relative to shoreline
 - **x**: shore normal
 - **y**: shore parallel



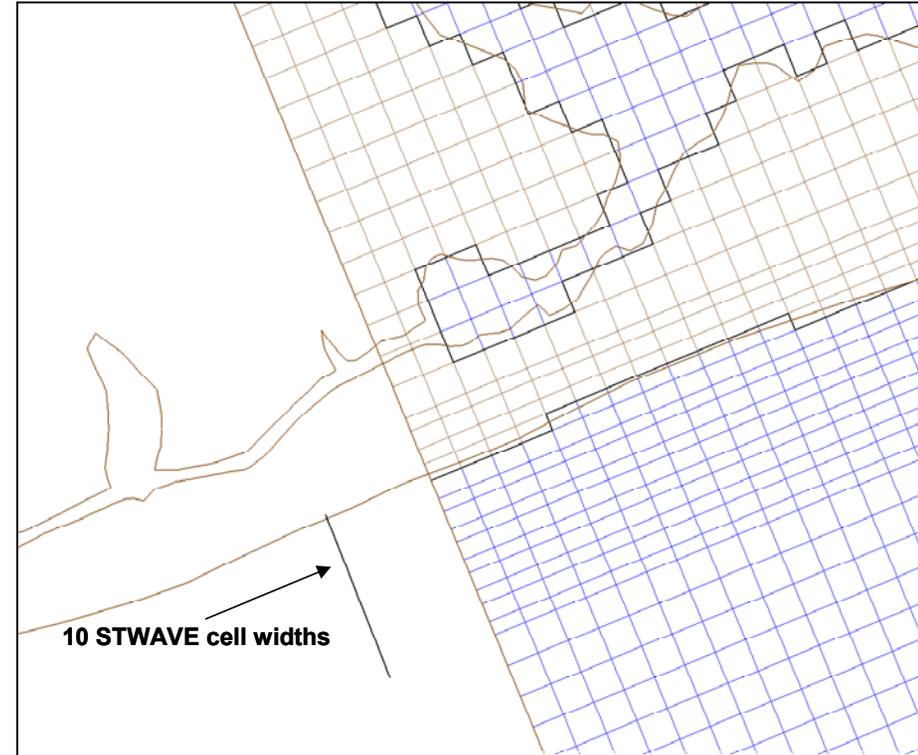
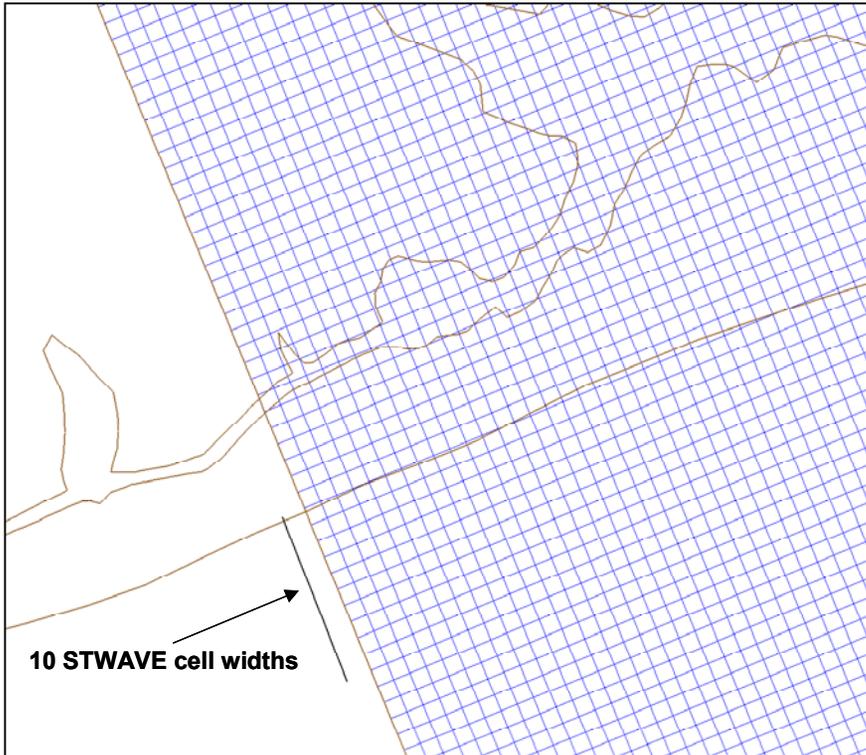
M2D & STWAVE Example Grid Orientations



M2D & STWAVE Grid Resolution



- Similar resolution nearshore (surf zone)

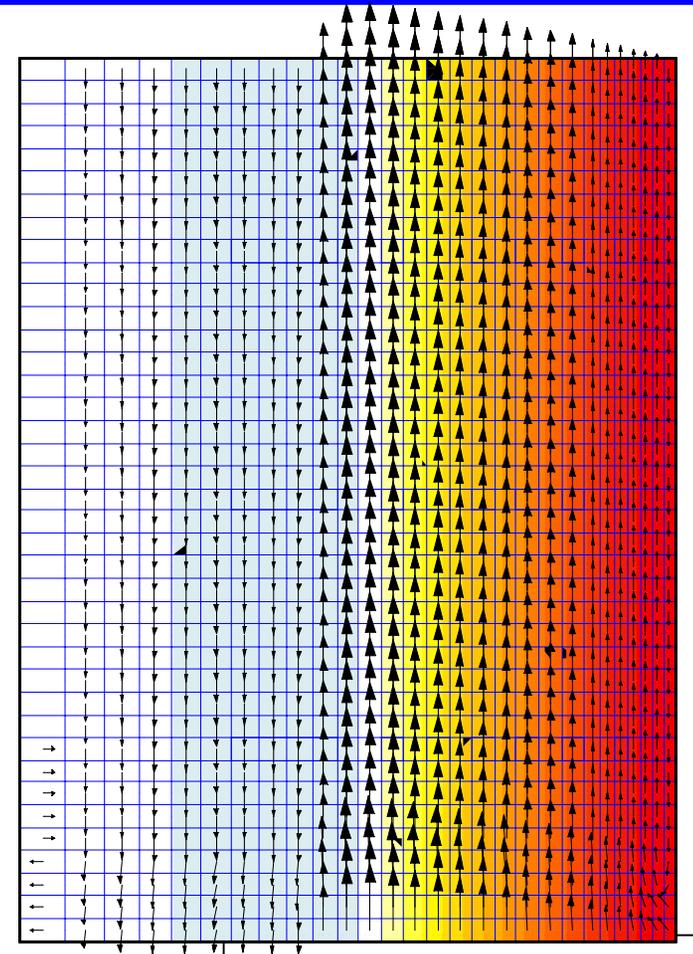
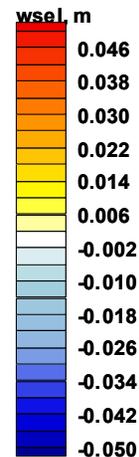


M2D & STWAVE Coupling Interval



- Time scales of processes being calculated
 - Changes in water level, waves, wind
- Model run time
 - Greater frequency of coupling increases run time
- Strength of interactions
 - Greater frequency if interactions strongly dependent on time-varying conditions
 - Current & water level in an inlet modify wave propagation

Idealized Beach



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General Considerations



- Each application will require judgment calls on aspects of the model configuration & couplings
- Model response is dependent on:
 - Physical & forcing properties (bathymetry, tide range, wave properties, etc.)
 - Grid properties (size, resolution, boundary conditions)
 - Coupling settings (frequency of coupling, 1- or 2-way interaction)