



A High-level Overview of SCHISM

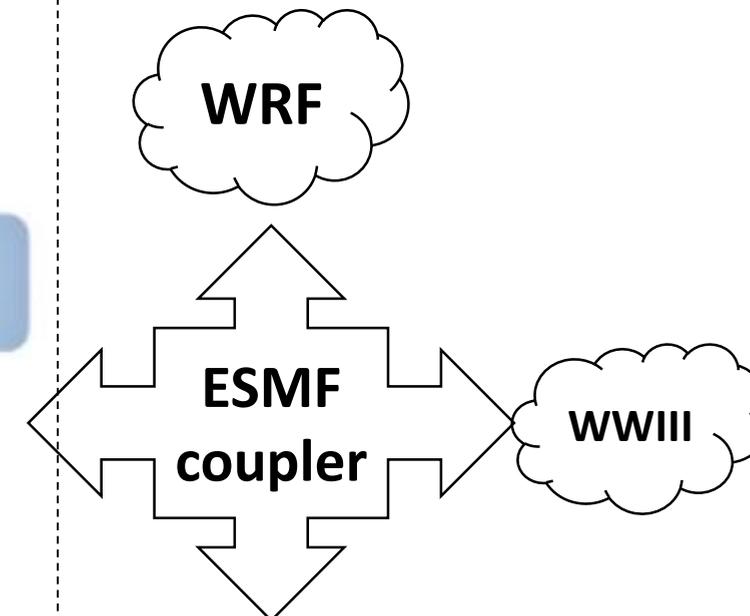
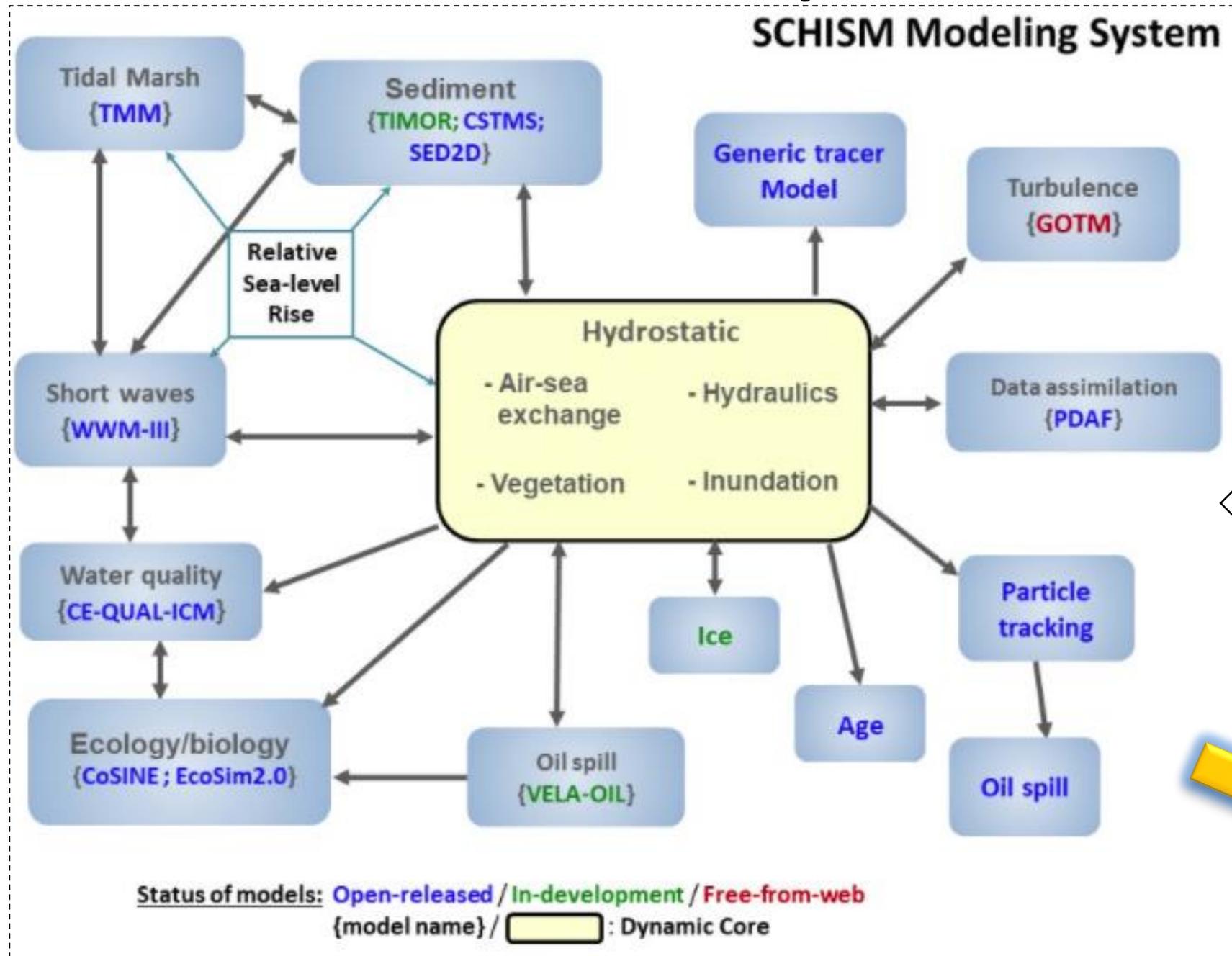
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Outline

- A bird's-eye view of SCHISM
- New capabilities in SCHISM
- ICOGS

A bird's-eye view of SCHISM



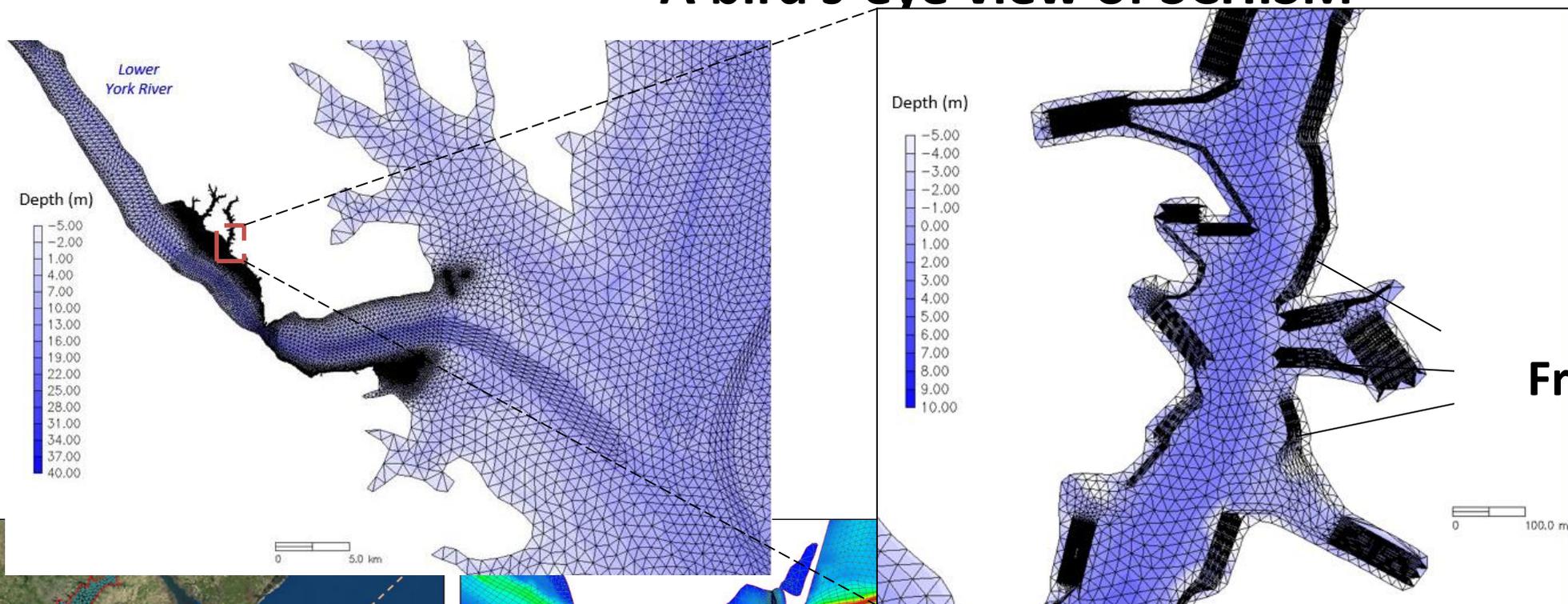
**ELCIRC-sub
(street-level
inundation)**

A bird's-eye view of SCHISM

- Major differentiators
 - **No bathymetry smoothing or manipulation necessary**: faithful representation of bathymetry is key in nearshore regime (Ye et al. 2018, OM)
 - **Implicit** Finite-element solver → superior stability → very **tolerant** of bad-quality meshes (in non-eddying regime)
 - **Accurate & efficient**: implicit + low inherent numerical dissipation
 - Flexible gridding system: **polymorphism**
- **Uncompromised**
 - Seamless cross-scale capability: need for grid nesting is minimized

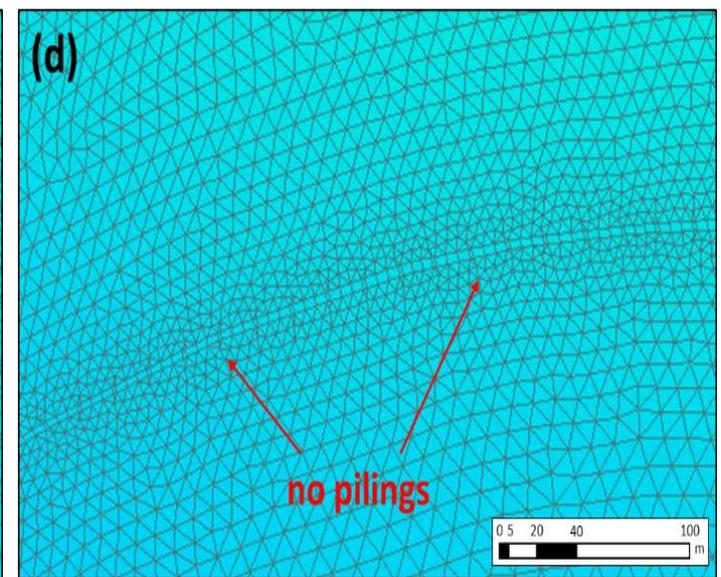
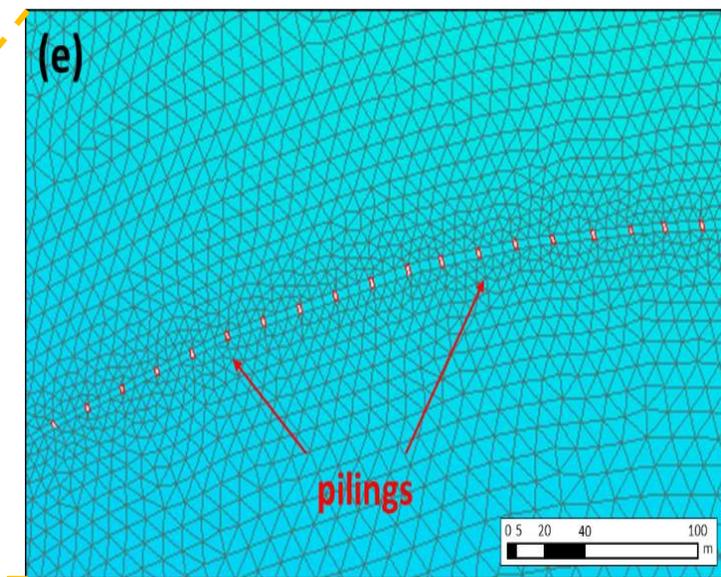
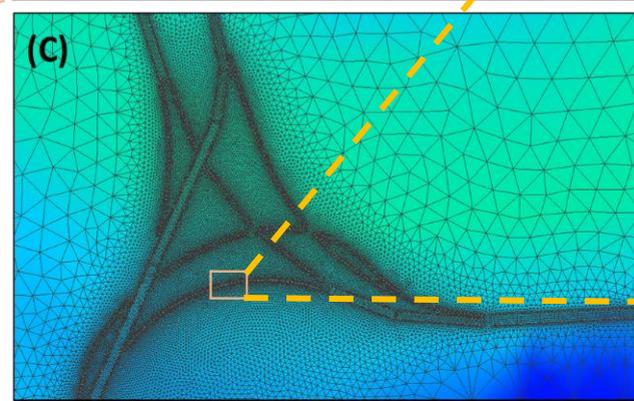
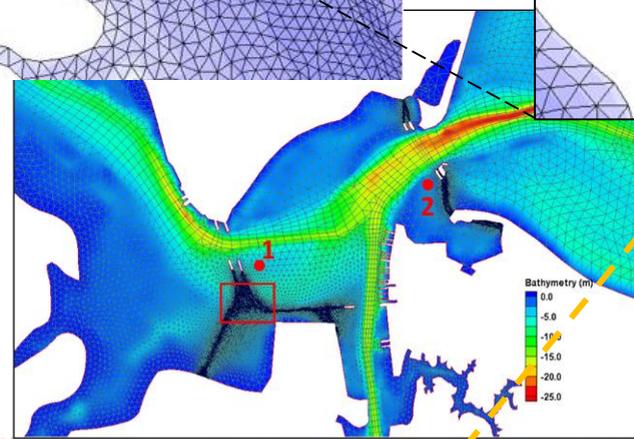
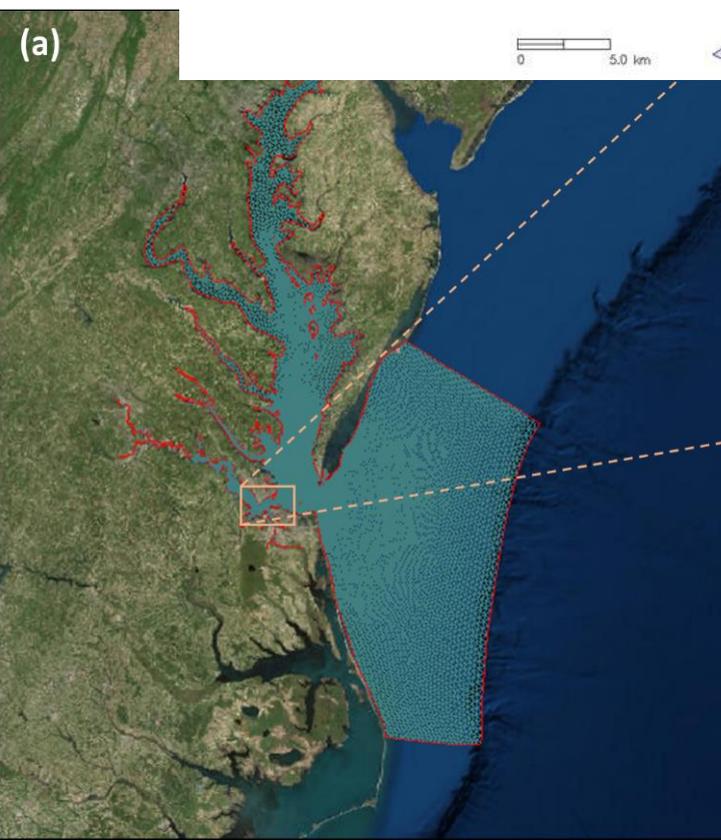
In short, SCHISM is a very different type of beast!

A bird's-eye view of SCHISM



Nunez et al. (2020)

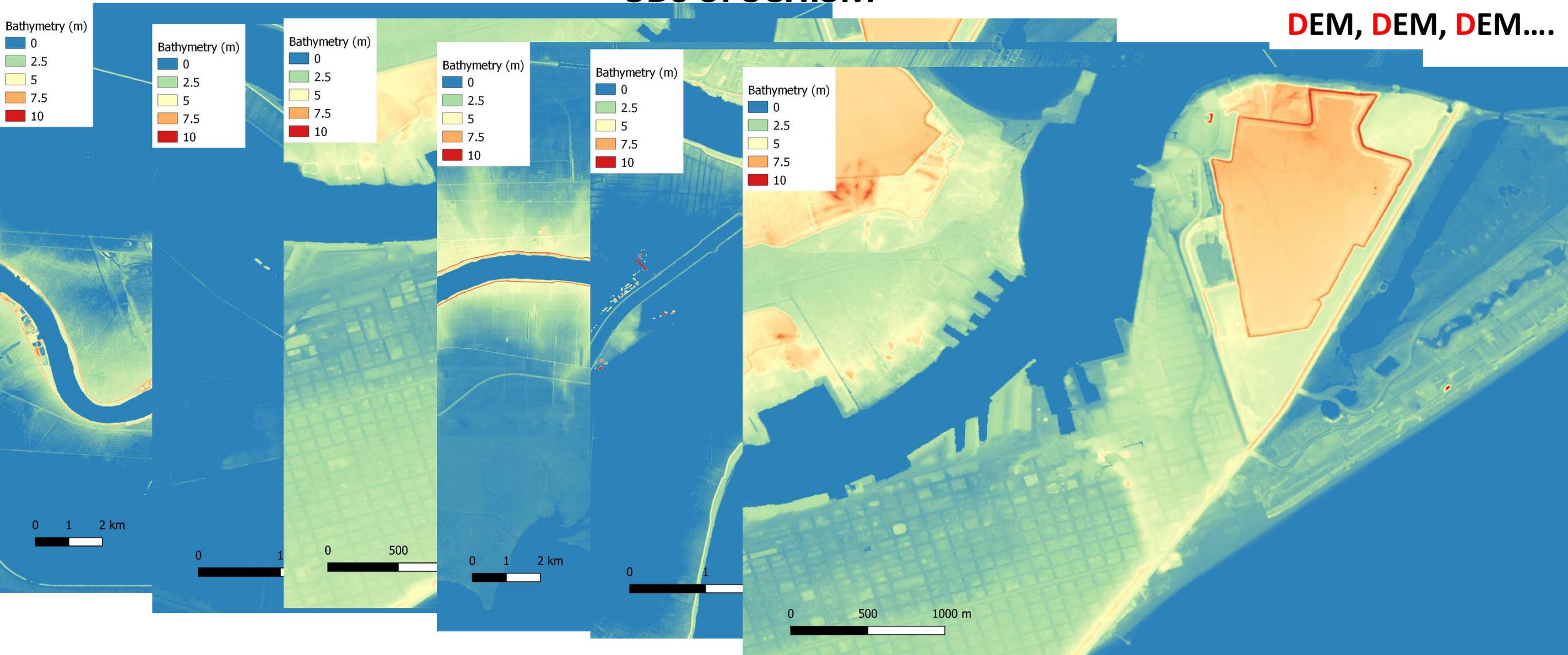
(a)



Liu et al. (2018)

3Ds of SCHISM

DEM, DEM, DEM....



- High-resolution DEMs (e.g. from OCS' NBS) are indispensable for good simulation with SCHISM
- Yes, we can utilize very fine DEMs (1m) e.g. LiDAR
- Particularly lacking are high-resolution bathymetric data in shallows

New capabilities

- Offline transport: save hydro results and use them to drive long-term, many-component biogeochemistry models efficiently
- Hybrid ELM transport
 - Useful for watershed where the accuracy of tracer transport is not as critical (and yet the mesh resolution is very high and mesh quality may be bad)
- Partially dry open boundary now allowed (c/o Dr. Jens Wyrwa, BfG)
 - If you do not impose velocity b.c., the entire segment can be dry
 - If you impose velocity b.c., the entire segment must not be dry
- 3D vortex formalism of Bennis and Arduin (c/o LRU)
- Revamped sediment transport
 - Supports quads, LSC²
 - Wave asymmetry and acceleration skewness (LRU)
- Analysis module: add your own code for deep analysis using native SCHISM variables
- ESMF and NUOPC components ('caps') (c/o Carsten Lemmen, HZG)
 - Coupler to other earth system models
 - HZG folks are the main developer and practitioner
 - PDAF data assimilation (c/o Dr. Lars Nerger, AWI)
- Discrete variance decay (DVD) of Klingbeil
 - For diagnosis of numerical diffusion
 - Only good in 'relative' terms, i.e. do not compare the numbers with physical diffusivity; good to identify diffusion hot spots

ICOGS 2D

- SCHISM 2D plus NWM, since Nov 5, 2020
- Launched daily at 07:15 ET, once per day, on 288 cores (Sciclone/cyclops)
- Complete within 25 min for the parallel forecast
 - Pre-processing took 10 min
 - Post-processing took 1 hour
- We are setting up ICOGS 3D on Frontera
 - Projects aimed to streamline/improve the pre- and post-proc efficiency

