

Notes from Feb 2009 CSDMS Marine Working Group Meeting, held jointly with the Coastal Working Group

MWG Attendees:

Courtney Harris, Carl Friedrichs, Chris Sherwood, Wen Long, Patricia Wiberg, Michael Steckler (by phone), Erik Hutton (from HQ)

Joint discussion of CSDMS progress and suggestions for new efforts

Suggestions:

1. Develop repositories for models, data and tools.
2. Develop a common framework for obtaining gridded land/sea surface elevation and for attaching soil properties to this grid. *More detail below.*
3. Develop a method for generating gridded and/or time series input data needed to run the models in CSDMS. *More detail below.*
4. Separate listings of models that are (or will be) CSDMS compliant and those that are available for downloading but are not CSDMS compliant.
5. Provide information for CSDMS modules regarding necessary inputs and where/how to find/get them.
6. Develop guidelines for the best/most useful way to develop code to make it as useful as possible within CSDMS and for CSDMS users.
7. Identify high priority models and make it a priority to make them CSDMS compliant. *More detail below.*

MWG priorities for new CDDMS capabilities:

- It is essential for marine modeling to have circulation and wave models available in CSDMS. Our priorities are for ROMS (hydrodynamics) and SWAN (waves) to be made CSDMS compliant. The main problem with ROMS in its current configuration is that it is not modular. A major contribution would be to modularize ROMS so that, e.g., a variety of sediment transport algorithms could be used with the ROMS hydrodynamics.
- Common grid (#2 above): To facilitate communication among CSDMS models, we recommend that a method be developed by which a user can identify a rectangle on a global map of topography/bathymetry and extract surface elevations at the required resolution. This grid should then be able to be augmented with properties associated with each cell (e.g., grain size, vegetation). The grid should also be able to be augmented with deeper cells that can carry information about sediment properties below the sediment surface for stratigraphic and morphologic modeling. SedFlux is built on a grid like this. Perhaps that could be the starting point for a more general gridding tool.
- Initialization and forcing data (#3 above): To facilitate running models within the CSDMS framework (and motivate the contribution of new models), we recommend that an interface be developed by which a user can identify an area or period of time for which boundary and forcing conditions are desired and available boundary and forcing data are identified. Desired data can then be selected and directly used as input to a CSDMS modeling project. Specific data identified as being useful for marine modeling include:
 - Sea-surface temperature

- Winds (speed, direction, wind stress)
- Tides
- Waves
- River mouth discharge
- Sediment characteristics of seafloor

CSDMS staff have data sets containing some of these parameters. Some others are available from other sites (e.g., NOAA). The goal would be to build an interface that can extract the needed data into a format easily accessed by CSDMS models (maybe net-cdf?). Other options for specifying model inputs would include user-specified inputs or using output from another model.

In our discussions, we thought by implementing the above suggestions, the value added by working within the CSDMS framework would be sufficient to attract a larger number of users/contributors.

Marine Working Group discussions of proof-of-concept projects

Characteristics of ideal projects:

- 2-way coupling (feedbacks)
- Link marine with coastal, estuarine and/or terrestrial processes
- Elements that can be tested against data
- Better done within CSDMS than by an individual/group working outside this framework
- Model elements are in CSDMS or exist in forms that can relatively easily be brought into CSDMS. Ideal if modular enough that as new models are added, they could replace or add to others being used in the project.
- Inputs and outputs identified in such a way as to make it easy to plug things in and out.

Suggestions for proof-of-concept projects

- Terrestrial watershed flood – marine storm coherence
- Coastal hazards in light of climate change, e.g., adding fire to runoff
- Tidal flat morphology, e.g., linking braided river and tidal flat models
- Terrestrial/marine sources of viruses and bacteria on beaches
- Eutrophication of coastal bays
- Feedback of sea-level rise on Bay of Fundy
- Feedbacks between delta morphology, sediment dispersal and wave climate
- Subsidence associated with degradation of organic matter

Considerations and suggestions:

- For any given project, are there already models that address the problem? What/where could CSDMS improve?
- Linking HydroTrend and ROMS would be useful, but the coupling is one-way.
- General interest in the suggestion of investigating feedbacks between delta morphology, sediment dispersal and wave climate in muddy settings. [The coastal working group is considering a similar proof-of-concept project focusing on sandy settings.]
 - Good data for Waiapaoa. Mississippi probably too complicated to start with.
 - Could explore a range of systems (e.g., wave dominated, tide dominated ...)

- What time scale? If long, how to handle glacial cycles, sea-level rise? Or focus on time since stabilization of sea level (e.g. last 5K yrs).
- Would we have to worry about lobe switching? Could it be handled in a generic way?
- Should gravity and dispersive transport modes be considered for each time step or separate time steps for the two transport modes? Morphology works on longer time scales. Delft3D has a method for doing this.
- Need plume model to disperse flood sediment.
- What about cross-shelf flows?

Discussion of hydrodynamic modeling framework for CSDMS

- ROMS vs FVCOM – it is likely to come down to the quality of the community using and supporting each model. Both have some biogeochemistry.
- There are alternatives to SWAN for waves that may be good for some applications, e.g., FunWave which has been coupled with other models to look at morphologic evolution.
- Rectangular vs unstructured grids
- Is anyone running a global ocean circulation model?

General items of interest to WG members

USGS Coastal and Marine Geology (CMG) hosts a repository of useful Matlab routines.

Notes from Executive Committee meeting (March 2009) of potential interest to WG

- It would be good if people put funds into research budgets for travel to CSDMS Working Group meetings.
- There is a possibility to get funds from CSDMS for a WG member to attend a meeting related to marine modeling in order to have a CSDMS presence at the meeting (at which point CSDMS would become a meeting sponsor).
- Eric Hutton is the CSDMS staff member assigned to work with the Coastal and Marine Working Groups.
- All members should get an account on CSDMD web site. Enables users to participate in wiki discussions, get RSS feeds, etc.
- People writing proposals to NSF with a modeling component can consider incorporation of the model into CSDMS as a Broader Impact.
- Metadata for models should include sample input, output, references and where it has been used.
- There will be a 2-day short course at the RCEM meeting on S2S/CSDMS modeling
- Coding camps vs webinars. Which would WG members find most useful?