RUNNING COUPLED MODEL
River – Delta Plain to Longshore Transport

Run & Couple Surface Dynamics Models

Outline

OBJECTIVE

- Learn How to Run Coupled Components in the CMT
- Discuss science & technology challenges associated with coupling.

EDUCATIONAL EXAMPLE : HYDROTREND-Avulsion-CEM

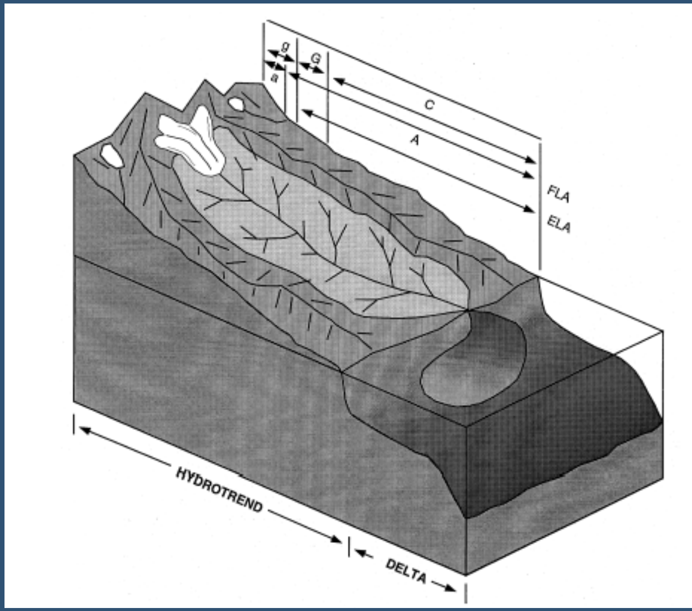
- River Changes affecting Coastline Evolution Processes
- Simple Scenario and Changes to Input Parameters

HANDS-ON

• Set up a coupled run for two distributary channels feeding ‘wave-dominated’ deltas.

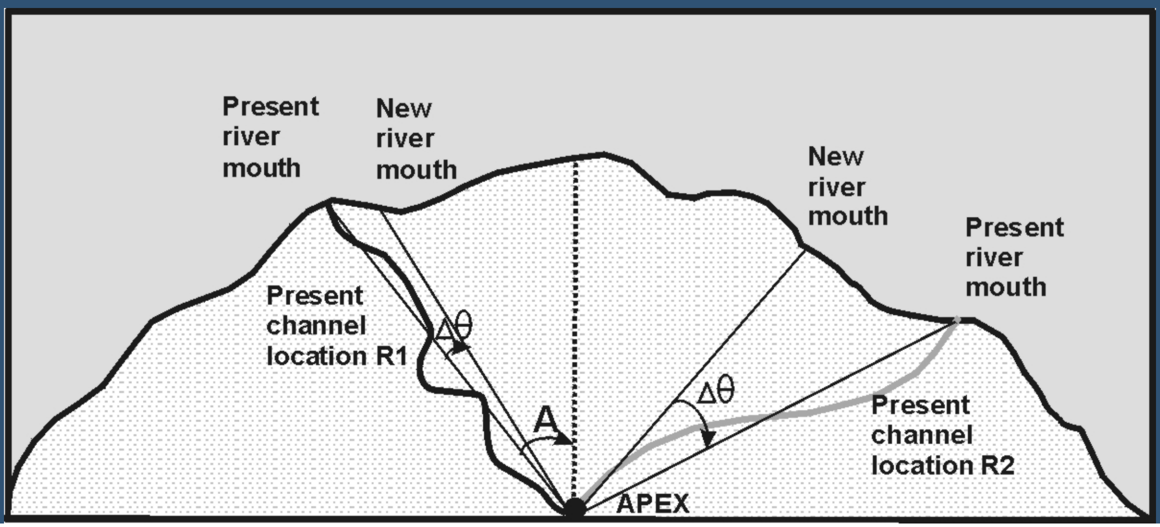
HYDROTREND Component

- Task: to deliver water, sediment load from an entire drainage basin to a delta apex.
- Needs: climate and basin characteristics
- Provides: Q, Qs, Qb at delta apex



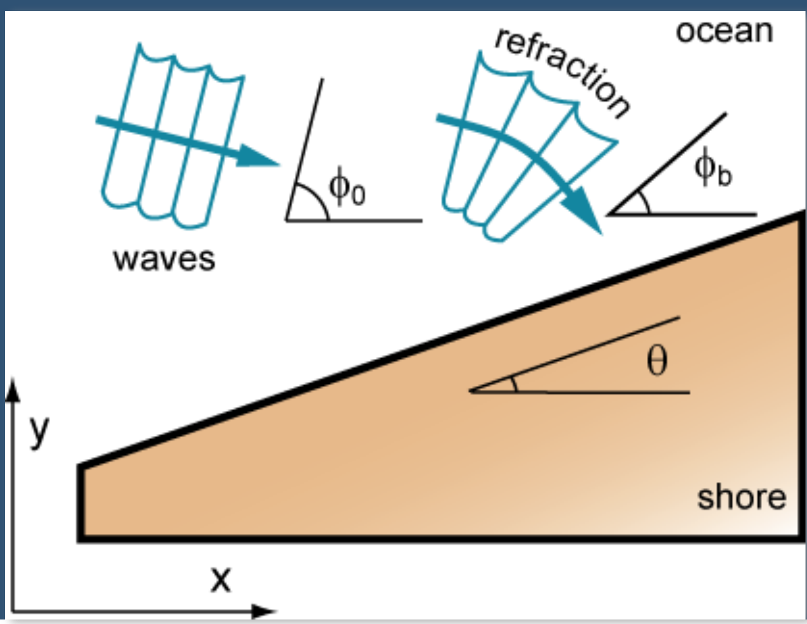
Avulsion Component

- Task: to route the distributary channel(s) from the delta apex to the coastline
- Needs: incoming water and sediment flux, number of dist. channels and specifications for switching frequency
- Provides: flux for 1 – 5 river mouths at coastline



Coastline Evolution Model

- Task: to evolve a shoreline due to gradients in breaking-wave-driven alongshore sediment transport.
- Needs: incoming sediment flux at coast, wave regime
- Provides: offshore deposition and erosion (elevation)



River-CEM Hands-On

- Activate your VPN for secure connection
- Launch the CMT tool (from the CSDMS website)
- Log in to beach.colorado.edu

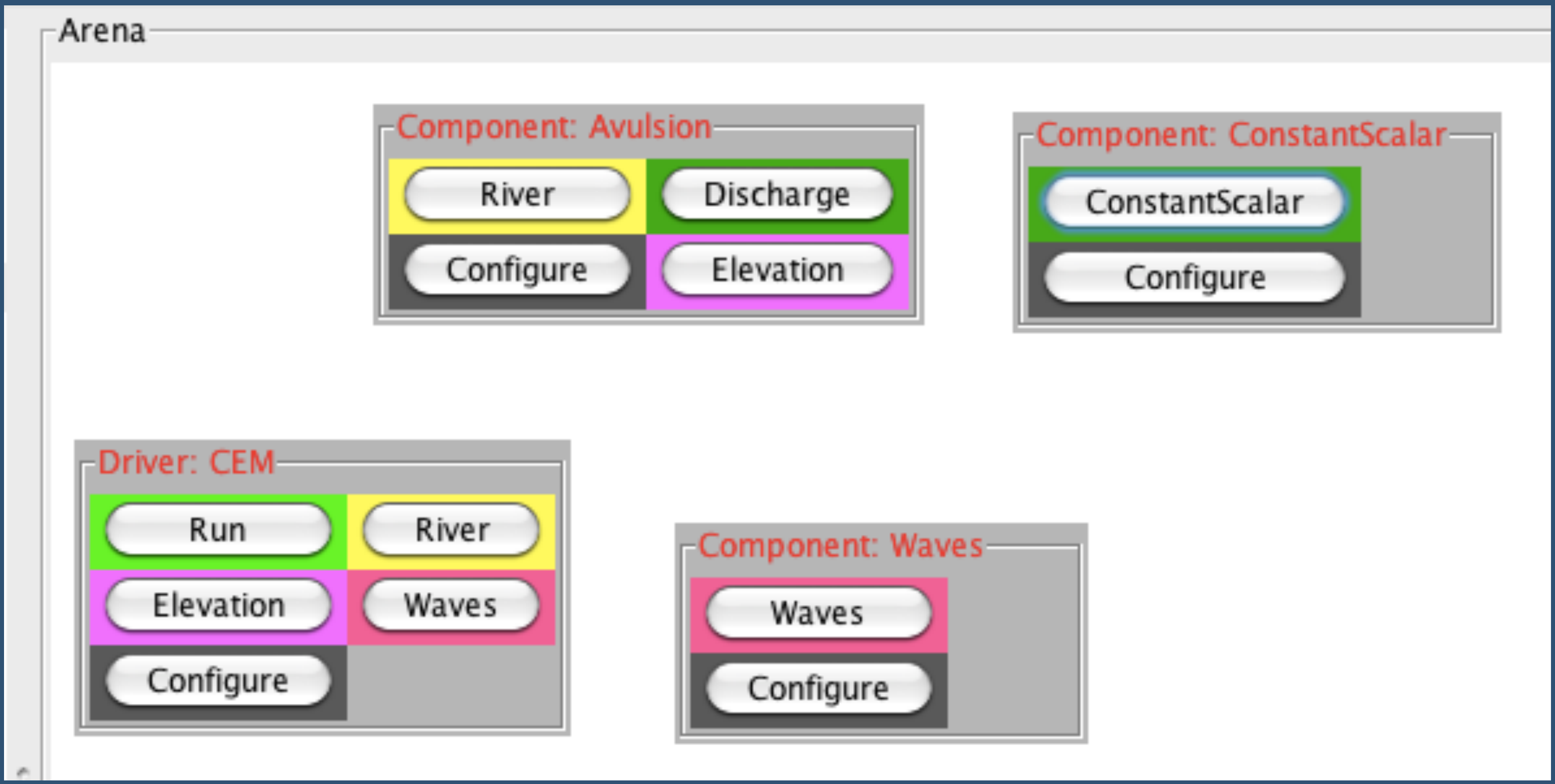
- Open Group: Coastal
- Open Project: Hydrotrend + Avulsion +CEM

- Drag CEM Component to be the Driver

- Link the River Component, the Discharge Component, and the Waves Component

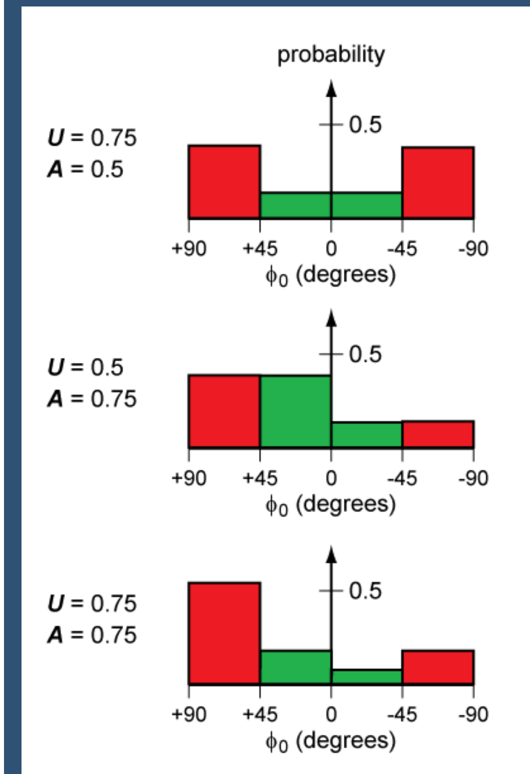
- Set up a run by making changes in the configuration menus

Simulation Wiring



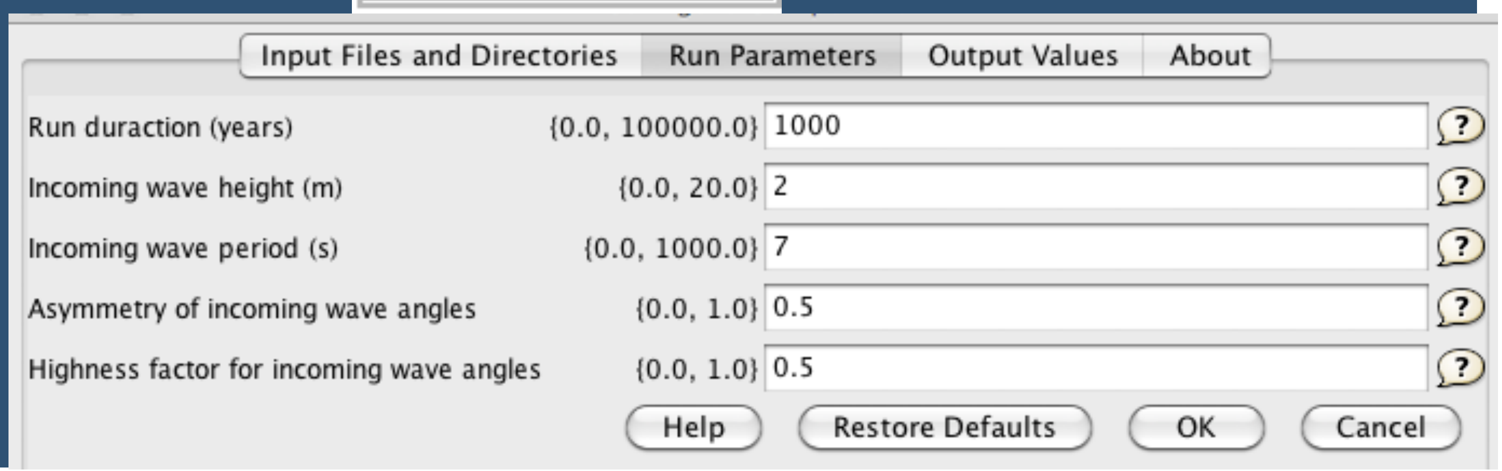
CEM needs AVULSION to set a switching delta channel transporting bedload for sediment delivery to the coast, it needs WAVES to drive longshore tranport, the avulsion component needs incoming river discharge (CONSTANT).

Coastline Response to Wave Dynamics?



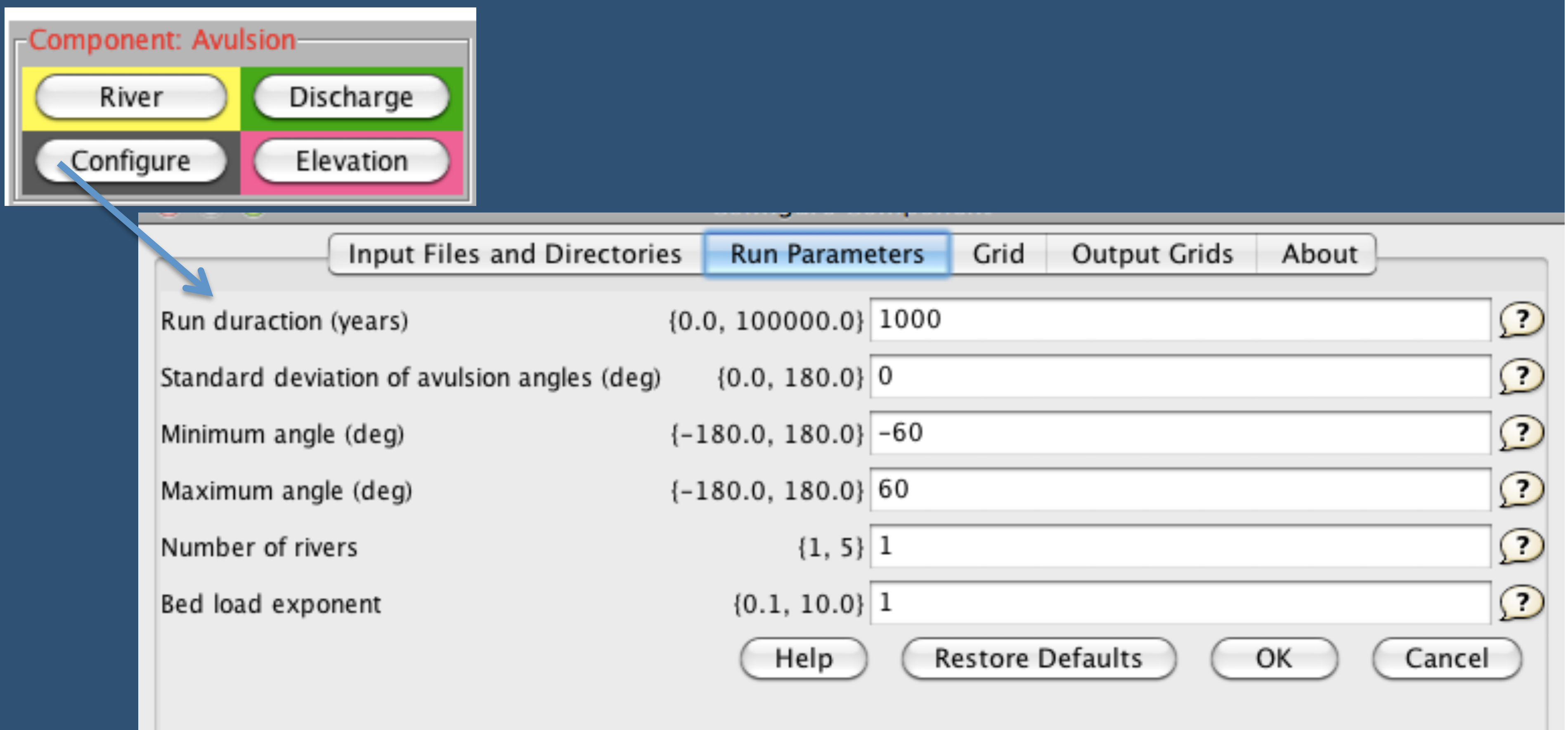
(from Ashton et al.)

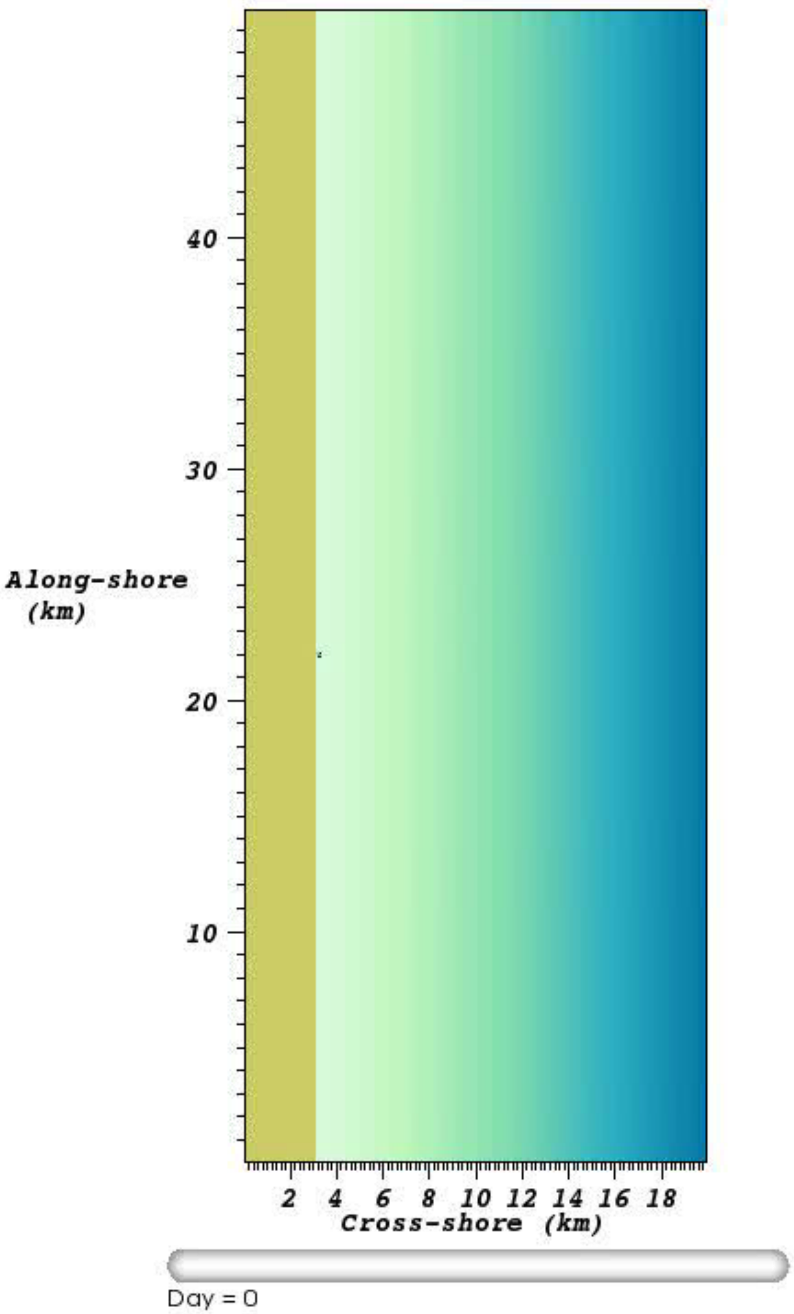
Set up wave angle regimes which systematically change the asymmetry of the incoming wave field (A), and the proportion of high angle waves (U)

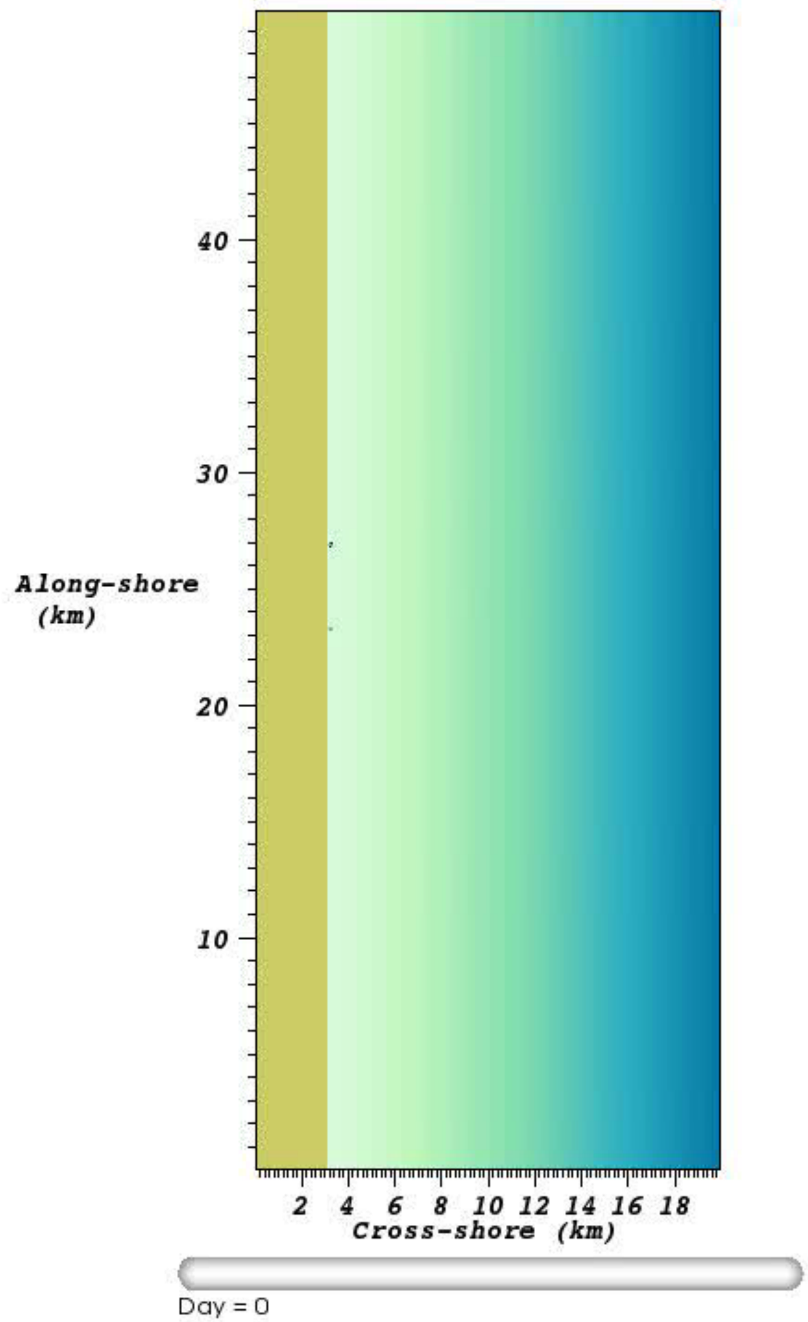


Multiple Distributary Channels

Set the number of rivers to two distributary channels.
If you can adjust the bedload exponent, the channel with the shortest route to the coast will receive a higher proportion bedload.




Along-shore (km)
40
30
20
10
2 4 6 8 10 12 14 16 18
Cross-shore (km)
Day = 0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2 4 6 8 10 12 14 16 18
Cross-shore (km)
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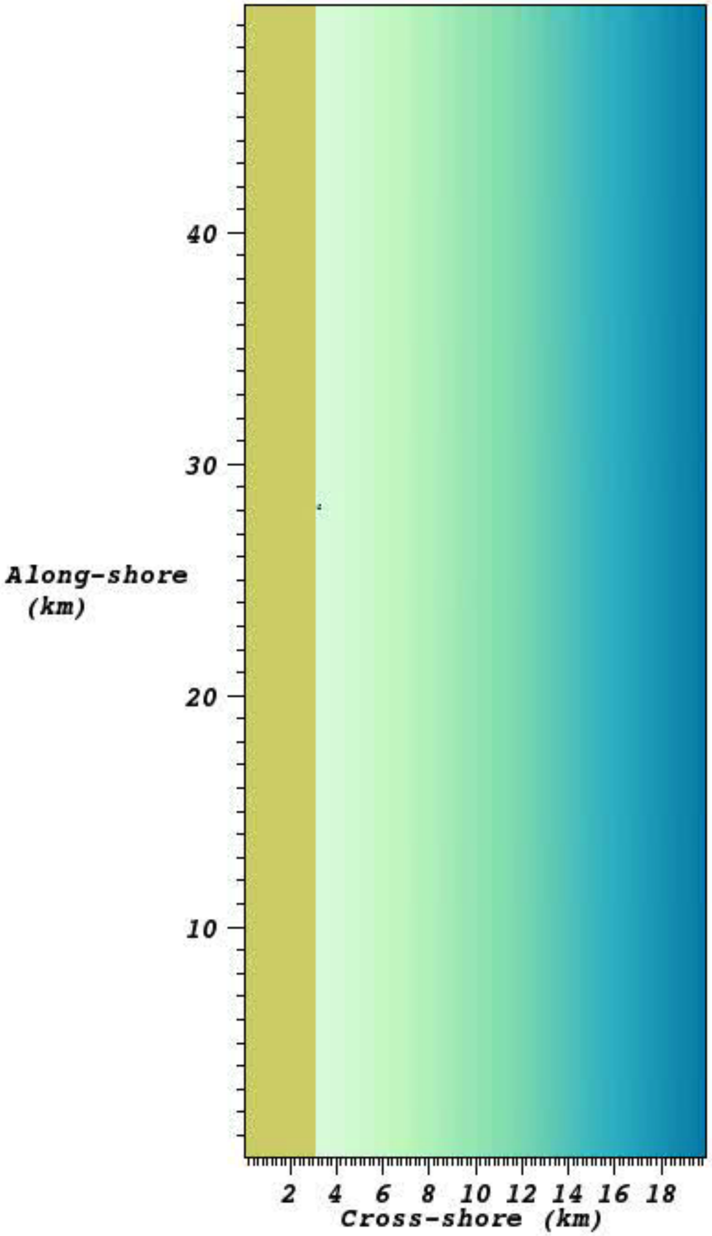
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Along-shore (km)
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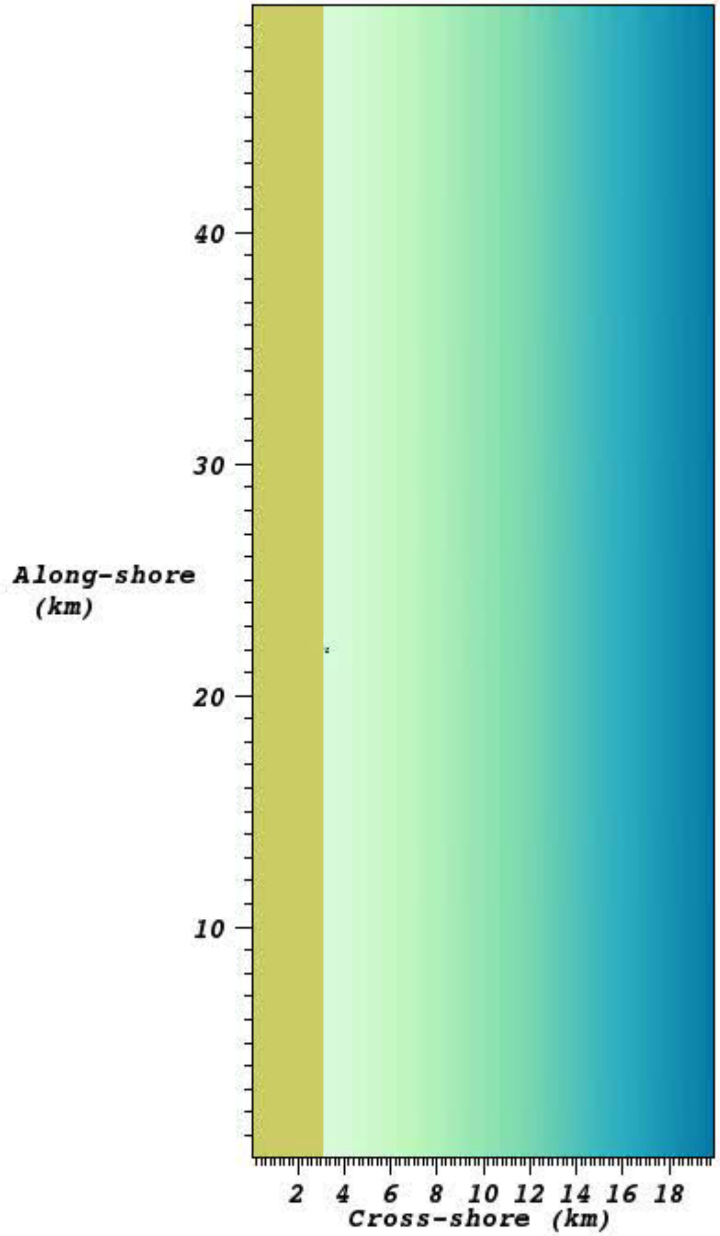
2 4 6 8 10 12 14 16 18
Cross-shore (km)

Day = 0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Along-shore (km)
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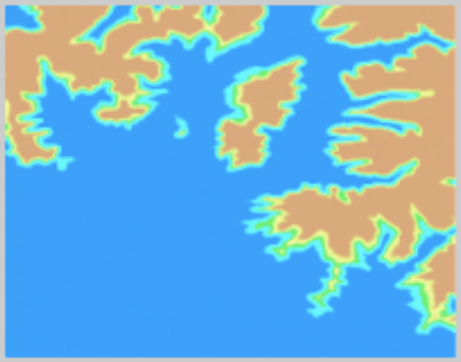
2 4 6 8 10 12 14 16 18
Cross-shore (km)

Day = 0

Educational Material in CSDMS wiki

Lectures



[Surface Dynamics Modeling with CMT tool]()

Irina Overeem & Scott Peckham

These presentations are part of the course on "Surface Dynamics Modeling with the CMT Tool". This course is currently taught and will be completed by December 2010.

This lab will be taught during the current semester and made available online by Nov 5th, 2010

http://csdms.colorado.edu/wiki/Labs_portal

http://csdms.colorado.edu/wiki/Lectures_portal

Want to Contribute?

"New Tools and Information for Model Contributors"

Scott Peckham

4.30-6pm, tomorrow

References

- Ashton A., Murray B.A. Arnault O. *Formation of Coastline Features by Large-Scale Instabilities Induced by High-Angle Waves.* Nature Magazine. Volume 414. 15 November 2001.

- Ashton A.D., Murray A.B. *High-Angle Wave Instability and Emergent Shoreline Shapes: 1. Wave Climate Analysis and Comparisons to Nature.* Journal of Geophysical Research. Volume 111. 15 December 2006.

- Ashton A.D., Murray A.B. *High-Angle Wave Instability and Emergent Shoreline Shapes: 2. Wave Climate Analysis and Comparisons to Nature.* Journal of Geophysical Research. Volume 111. 15 December 2006.

- Overeem, I., Syvitski, J.P.M., Hutton, E.W.H., (2005). Three-dimensional numerical modeling of deltas. SEPM Spec. Issue, 83. 'River Deltas: concepts, models and examples'. p.13-30.

- Hutton, E.W.H, Syvitski, J.P.M., 2008. *Sedflux 2.0*: An advanced process-response model that generates three-dimensional stratigraphy . Computer & Geosciences, 34-10, 1319-1337.