Modeling of delta processes: a web-based toolbox

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BELMONT FORUM DELTAS PROJECT

DELTAS initiative coordinates and enhances the development of a science-based framework for delta sustainability and risk assessment.

Conceptual model allows tight integration of data, models and feedback loops.
Searching for **associative relationships** amongst:
- land use/land cover,
- environmental quality and
- Poverty (based on Census data)

- considers spatial dependence and spatial heterogeneity

- uses a variety of techniques:
  - Spatial autocorrelation techniques
  - Multivariate logistic regression models
  - Bayesian Geoadditive Semiparametric (BGS) logistic regression model

*From: Lazar et al, 2014, CSDMS meeting presentation*
Data sharing through Irods, combined with CSDMS Web-based Modeling Tool
This example shows a stand-alone model.
## Data and Model Coupling

### The CSDMS Web Modeling Tool

### Model (*CEM 2*)

- CEM
- Avulsion
- Waves

### Parameters (Avulsion)

#### Run Parameters

<table>
<thead>
<tr>
<th>Parameter Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the simulation</td>
<td>Avalsion</td>
</tr>
<tr>
<td>Number of rows in the computational grid</td>
<td>500</td>
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<tr>
<td>Number of columns in the computational grid</td>
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<tr>
<td>Grid resolution in cross-shore (row) direction (m)</td>
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<tr>
<td>Grid resolution in along-shore (column) direction (m)</td>
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<tr>
<td>Grid row containing point of inflow (-)</td>
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<td>Grid column containing point of inflow (-)</td>
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</tr>
<tr>
<td>Minimum river angle (deg)</td>
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<tr>
<td>Maximum river angle (deg)</td>
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<tr>
<td>Variance of avulsion angle changes (deg)</td>
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<tr>
<td>Exponent used to divide sediment among branches (-)</td>
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<tr>
<td>Exponent used to divide water among branches (-)</td>
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<tr>
<td>Number of rivers (-)</td>
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<tr>
<td>File format for output files</td>
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</tr>
</tbody>
</table>
Integration between WMT and wiki

The CSDMS Web Modeling Tool

Model (*Plume 1)

Parameters (Plume)

Plume (10.1594/IEDA/100152)

Plume simulates the sediment transport and deposition of several grain-size classes from a river mouth entering into a marine basin by creating a turbulent jet. The model forms a hypopycnal plume. The model allows for plume deflection due to systematic currents or Coriolis force.

http://csdms.colorado.edu/wiki/Model:Plume

Model developer: Eric Hutton

Click here
A couple of relevant models

River-basin sediment

River-marine Plumes

Sediment Failures

Upstream-downstream coupling
HydroTrend models basin-wide water and sediment flux, under changing temperature, precipitation, dams, land-use.....
HydroTrend Climate Scenario

Comparison of water discharge between base case and high precipitation scenarios.
Flood-Plume Deposits of the Rhone Delta, France, 90 days weather data.

Compared with oceanography studies of Drexler, Nittrouer, Ogston et al., 2008.
Wave-dominated Delta Model in WMT

Simulation set 2 allows process-response relationships to be explored.
Learning Objective: Describe-Predict certain responses based on specific process parameters
What cyberinfrastructure is in-place?

- **Open-source**: Data & Models need to be made available to researchers and public worldwide.

- **Metadata**: Data & Models need to be documented labeled with strict standard names to ensure inter-operability.

- **Cyberinfrastructure**: Data and Models are shared in a user-friendly, flexible modeling infrastructure.
For audience discussion:

- Identify Data & Models that are critically needed to inform policy for a variety of users and disciplines
- How do data and models need to be integrated?
- Would models be used to look at implications of change (scenario modeling). What are the most pressing trends to be modeled in your particular delta?
Technological base for web-sharing and interaction is now much more accessible to all users

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

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