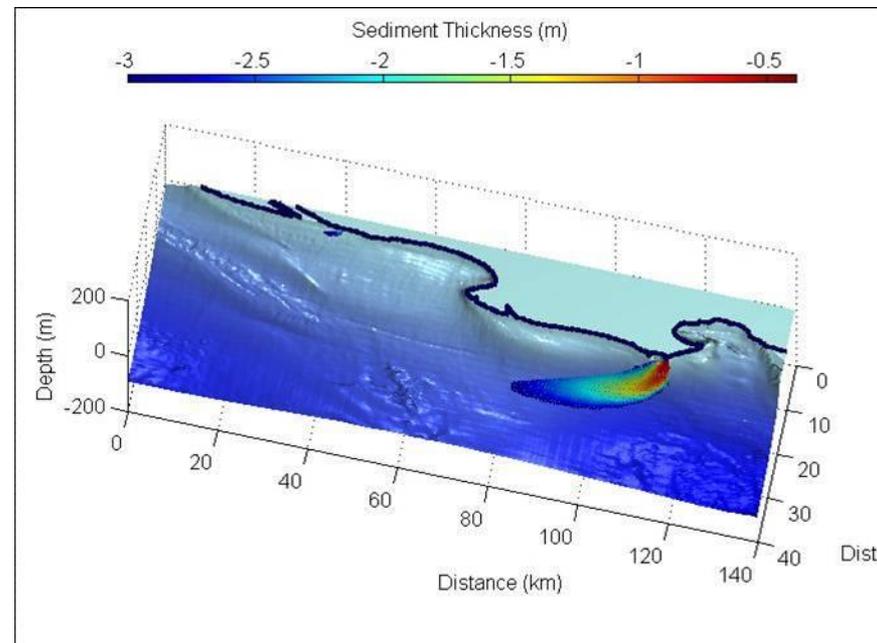


Modeling of delta processes: a web-based toolbox

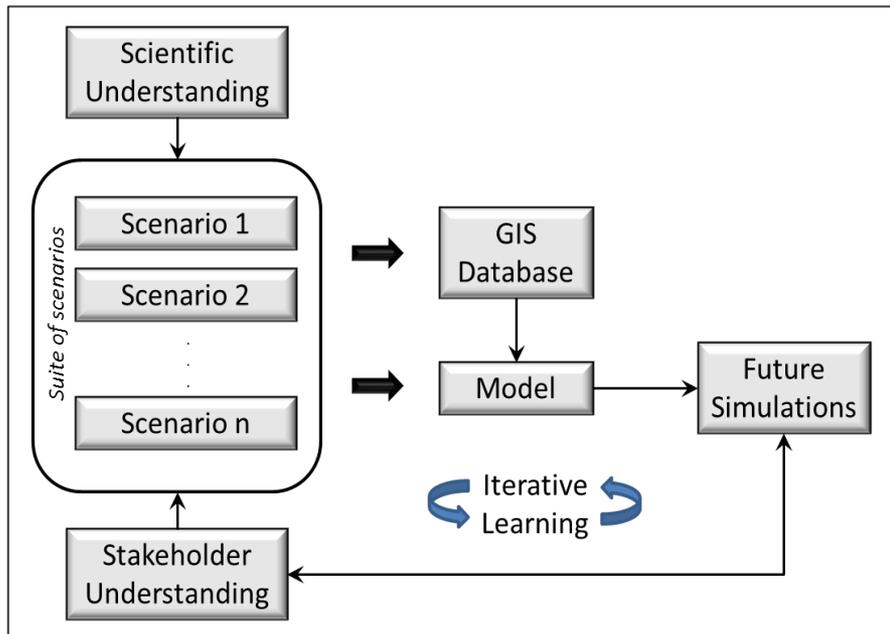


Irina Overeem

CSDMS, University of Colorado at Boulder, USA

Belmont Forum DELTAS Project

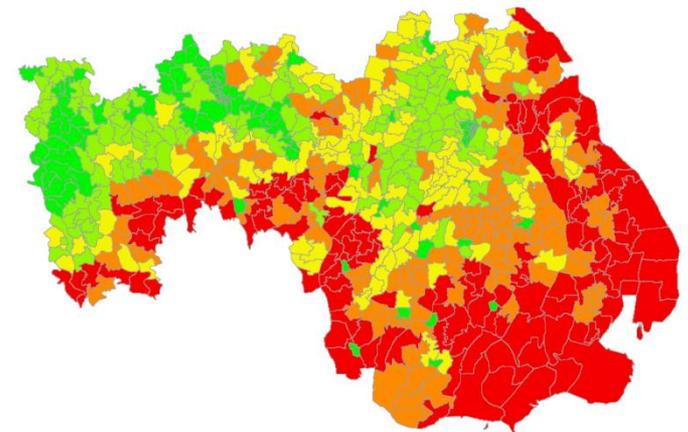
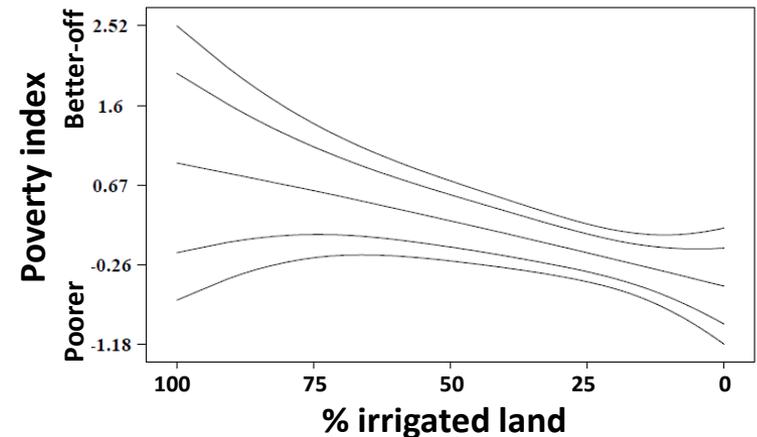
DELTAS initiative coordinates and enhances the development of a science-based framework for delta sustainability and risk assessment



← Conceptual model allows tight integration of data, models and feedback loops

GIS Modeling

- 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 Geospatial Semiparametric (BGS) logistic regression model



WMT web-based modeling tool

The CSDMS Web Modeling Tool

⚙️ Model (*Sedflux2D 1)



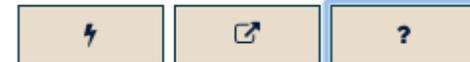
☰ Sedflux2D ▼

coastal_en... +

subaerial_... +

baselevel +

🔧 Parameters (Sedflux2D)



Sedflux2D v2.1 (10.1594/IEDA/100161)

Basin filling stratigraphic model. Sedflux2d simulates longterm marine sediment transport and accumulation into a 2D longitudinal basin over time scales of tens of thousands of years. It simulates the dynamics of strata formation of continental margins and includes turbidity currents and debris flows.

http://csdms.colorado.edu/wiki/Model_help:Sedflux

Model developer: Eric Hutton

✕ Close

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

irina.overeem@colorado.edu

Sign Out

Model (*CEM 2)

📁 📄 ▶ More ▾

☰ CEM ▾

☰ Avulsion ▾

- Show parameters
- Get information
- Delete

☰ Waves ▾

Parameters (Avulsion)

⚡ 🔗 ?

Run Parameters

Name of the simulation	Avulsion
Number of rows in the computational grid	500
Number of columns in the computational grid	500
Grid resolution in cross-shore (row) direction (m)	100.0
Grid resolution in along-shore (column) direction (m)	100.0
Grid row containing point of inflow (-)	250
Grid column containing point of inflow (-)	0
Minimum river angle (deg)	45.0
Maximum river angle (deg)	135.0
Variance of avulsion angle changes (deg)	10.0
Exponent used to divide sediment among branches (-)	1.67
Exponent used to divide water among branches (-)	1.0
Number of rivers (-)	1
File format for output files	netcdf

Integration between WMT and wiki

The CSDMS Web Modeling Tool

⚙️ Model (*Plume 1)



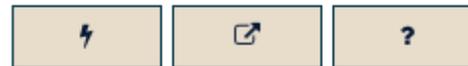
☰ Plume ▾

- 🔧 Show parameters +
- ? Get information +
- ✕ Delete +

Click here



🔧 Parameters (Plume)



Plume (10.1594/IEDA/100152)

Plume simulates the sediment transport and deposition of several grainsize 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

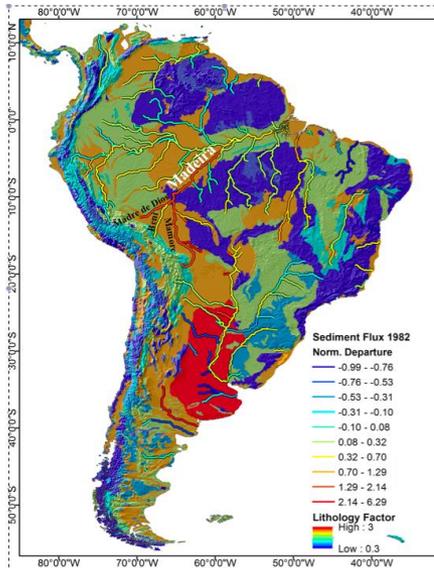
<http://csdms.colorado.edu/wiki/Model:Plume>

Model developer: Eric Hutton

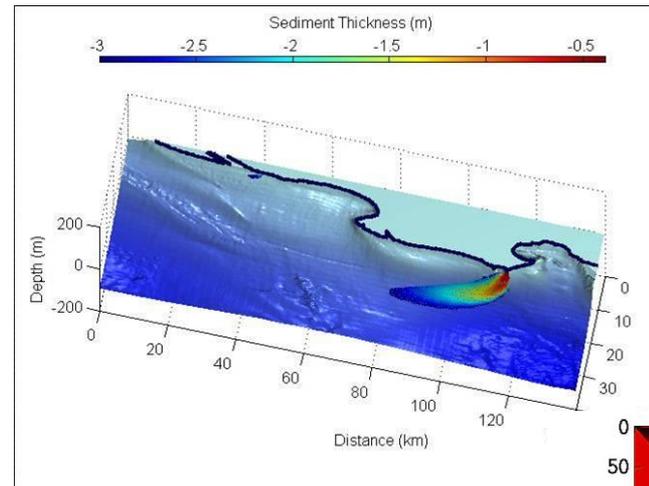
✕ Close

A couple of relevant models

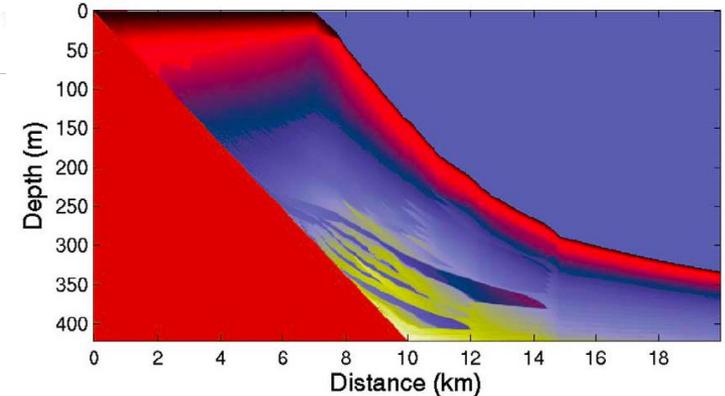
River-basin sediment



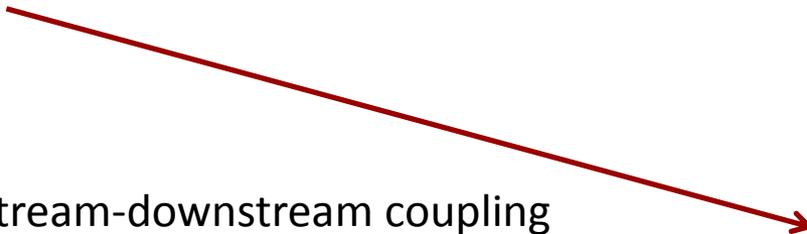
River-marine Plumes



Sediment Failures



Upstream-downstream coupling



HydroTrend in WMT

The CSDMS Web Modeling Tool

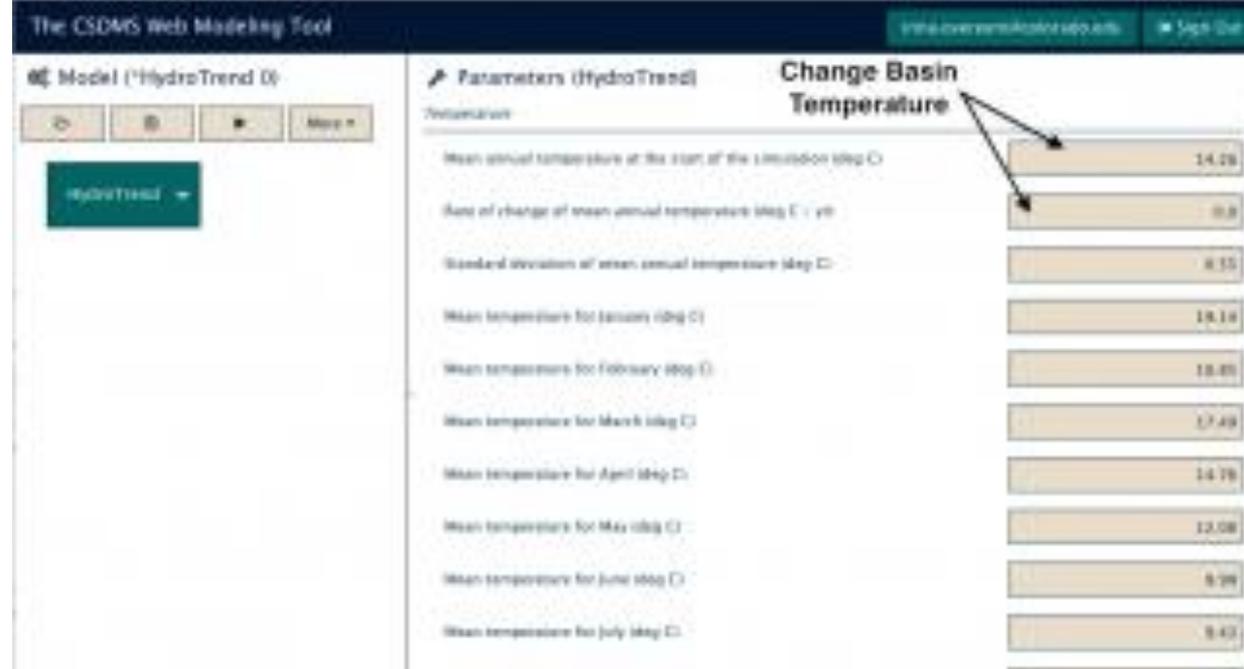
Model



driver +

- Avulsion
- base_level
- CEM
- CHILD
- coastal_environment
- HydroTrend
- Plume
- Sedflux2D
- Sedflux3D
- Waves

click here

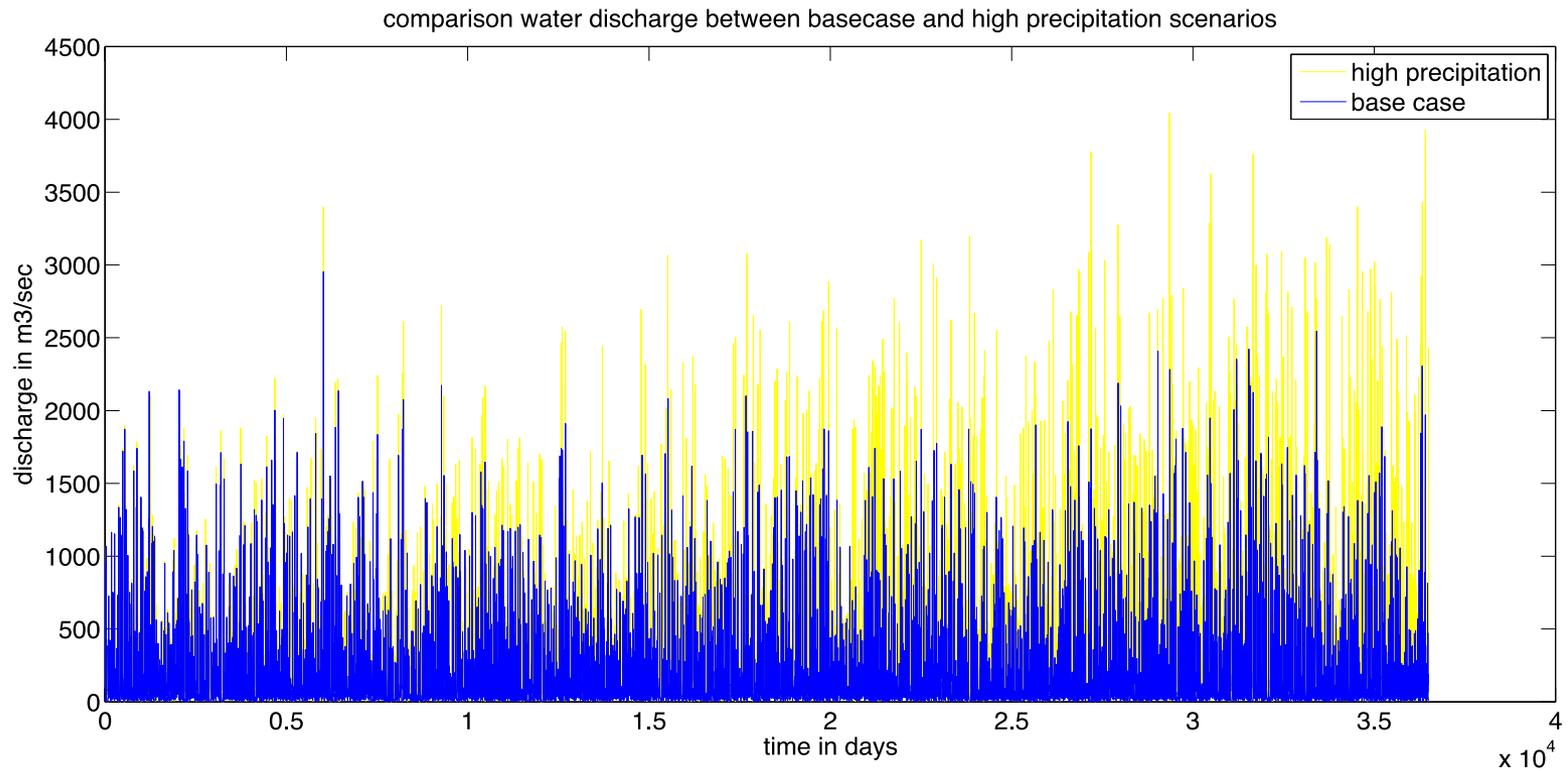


The screenshot shows the 'Parameters (HydroTrend)' section of the tool. A sub-section titled 'Change Basin Temperature' is highlighted with an arrow. It contains a list of temperature parameters, each with a corresponding input field.

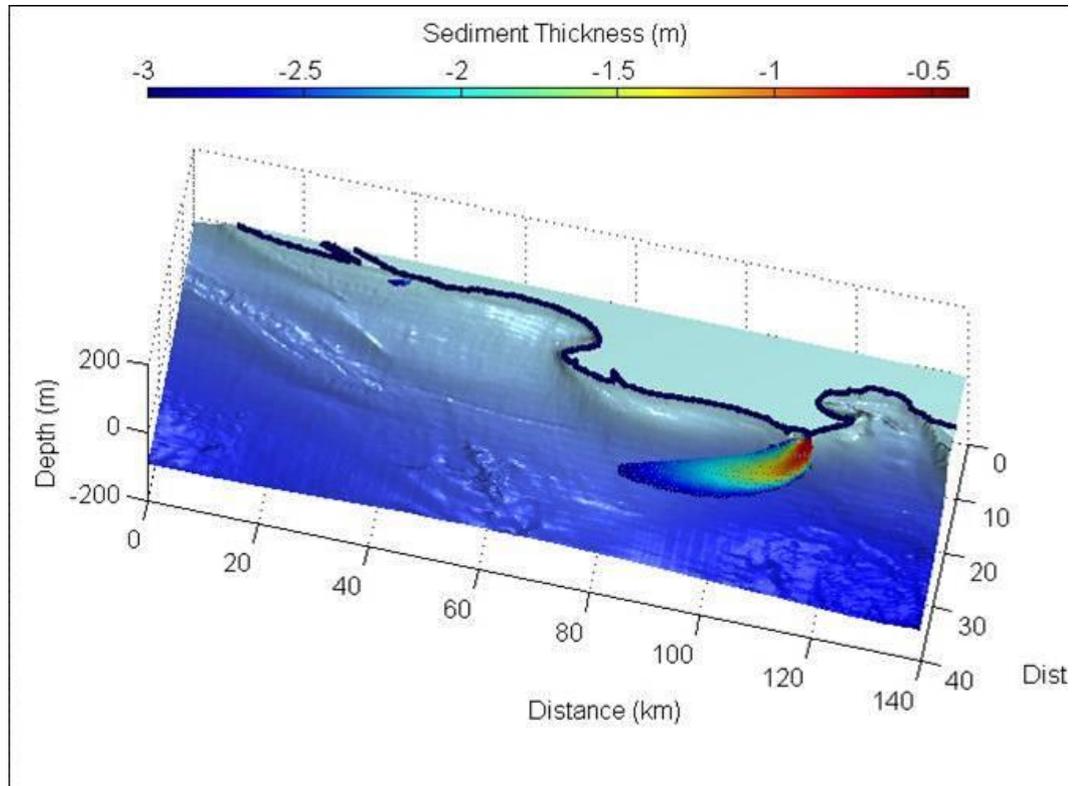
Parameter	Value
Mean annual temperature at the start of the simulation (deg C)	14.28
Rate of change of mean annual temperature (deg C / yr)	0.8
Standard deviation of mean annual temperature (deg C)	8.55
Mean temperature for January (deg C)	18.18
Mean temperature for February (deg C)	18.41
Mean temperature for March (deg C)	17.49
Mean temperature for April (deg C)	14.78
Mean temperature for May (deg C)	12.08
Mean temperature for June (deg C)	9.38
Mean temperature for July (deg C)	8.43

HydroTrend models basin-wide water and sediment flux, under changing temperature, precipitation, dams, land-use.....

HydroTrend Climate Scenario

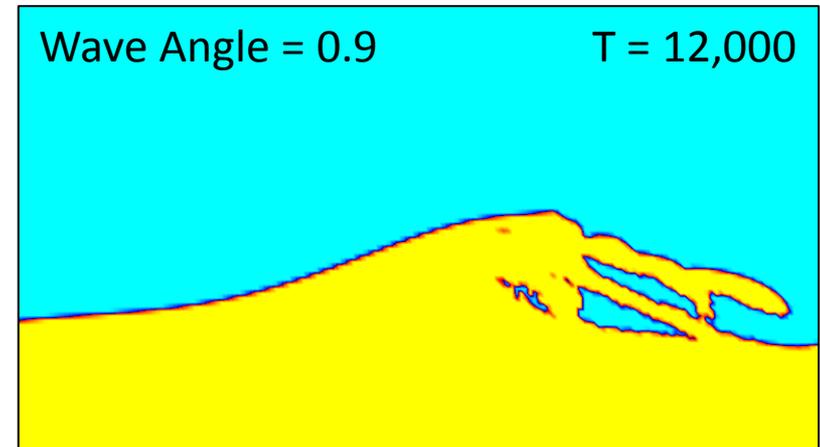
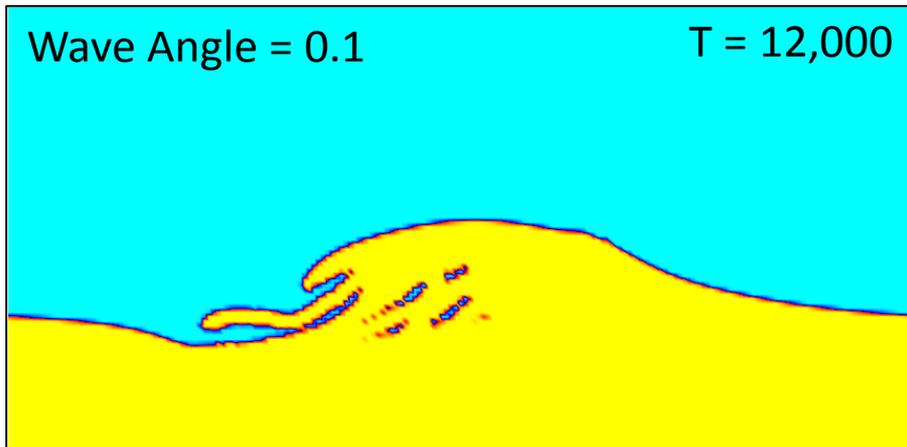
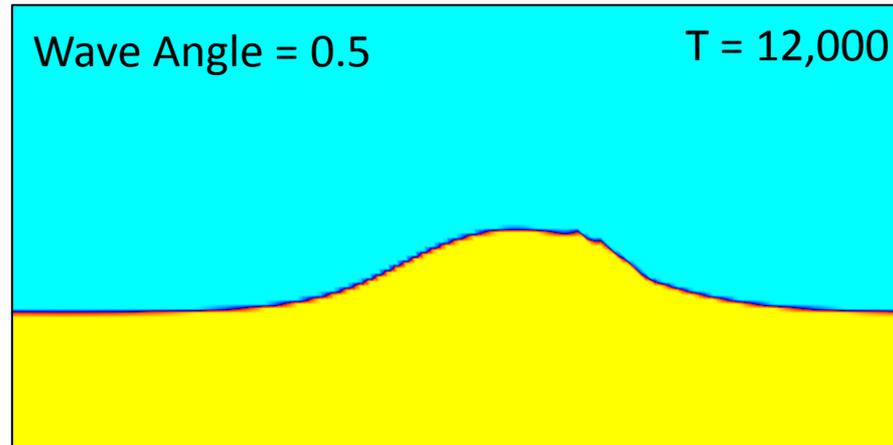


Plume Model in WMT



- 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

The CSDMS Web Modeling Tool

mark.piper@colorado.edu Sign Out

Model (*CEM 0)

- CEM
 - Avulsion
 - discharge +
 - CEM ↶
 - waves +

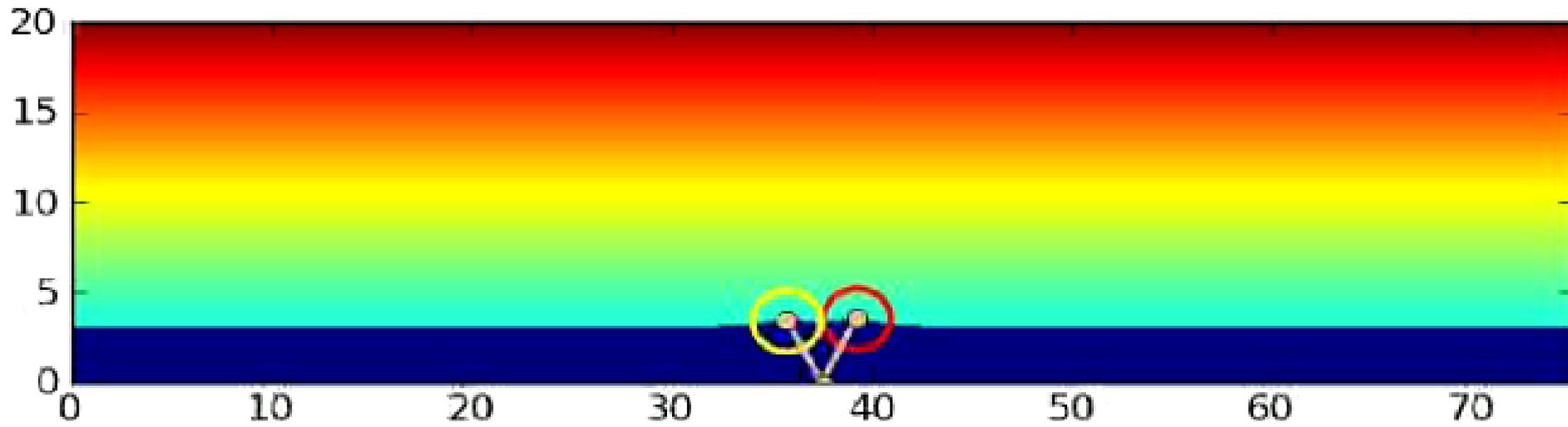
Parameters (Avulsion)

Run Parameters

Simulation run time (d) 3,650.0

Grid

Number of rows in the computational grid	500
Number of columns in the computational grid	500
Grid resolution in cross-shore (row) direction (m)	100.0
Grid resolution in along-shore (column) direction (m)	100.0
Grid row containing point of inflow (-)	250
Grid column containing point of inflow (-)	0
Minimum river angle (deg)	45.0
Maximum river angle (deg)	135.0
Variance of avulsion angle changes (deg)	10.0
Exponent used to divide sediment among branches (-)	1.67



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

Discussion

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?

Find out more!

- 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_River_Sediment_Supply)
- [http://csdms.colorado.edu/wiki/Labs WMT Ganges Sediment Supply](http://csdms.colorado.edu/wiki/Labs_WMT_Ganges_Sediment_Supply)