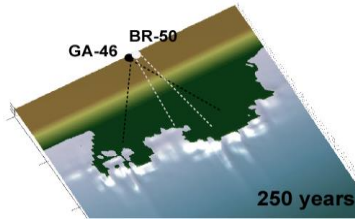
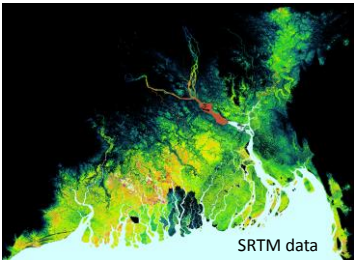


# Challenges and Opportunities in Data Collection and Delta Modeling

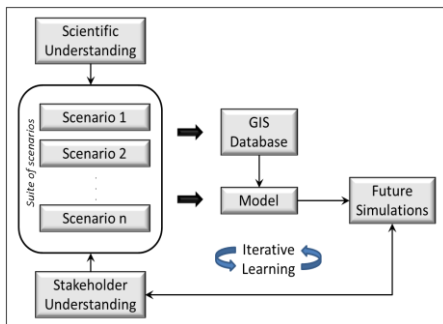
Irina Overeem<sup>1</sup>, Zachary Tessler<sup>2</sup>, Charles Vorosmarthy<sup>2</sup>

<sup>1</sup>CSDMS, University of Colorado at Boulder, USA

<sup>2</sup>CUNY Environmental CrossRoads Initiative, CUNY, USA

## Belmont Forum DELTAS Project

DELTA 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

## Data Challenges

Data is needed, but not collected, or cannot be collected.....

Data can be collected, but there is no baseline to look for change or trends.....

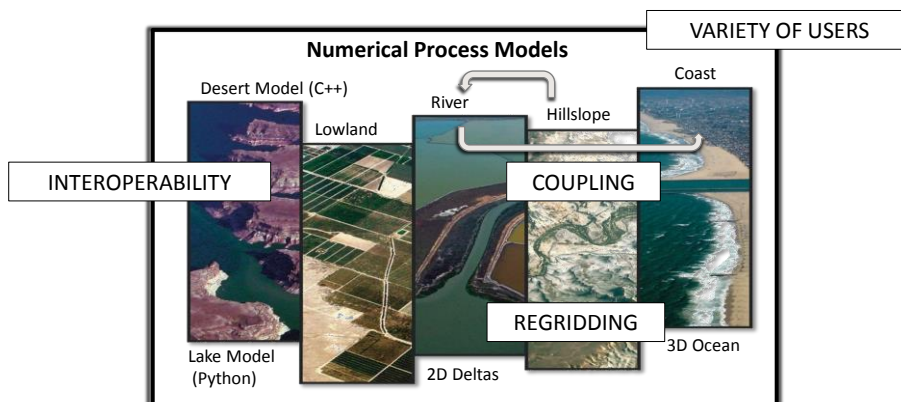
Data is not quality controlled or documented....

Deltas are a complex system, we need data from a large variety of disciplines: Bio-physical, ecological, socio-economical, policy data.....

Deltas are intimately connected to their river basins, need data far upstream.....

Data may be politically sensitive between different countries with different needs for resources.....

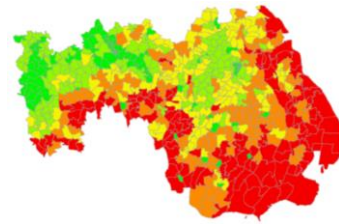
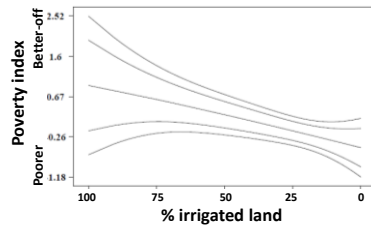
## Modeling Challenges



Technical or software challenges, but social and design decisions form a challenge as well  
(From: Overeem et al., 2012)

# 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 Geosadditive Semiparametric (BGS) logistic regression model



From: Lazar et al, 2014, CSDMS meeting presentation

# BF-DELTA modeling infrastructure

## The CSDMS Web Modeling Tool

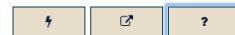
### Model (\*Sedflux2D 1)



### Sedflux2D

- coasta\_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](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

Model (\*CEM 2)

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)

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

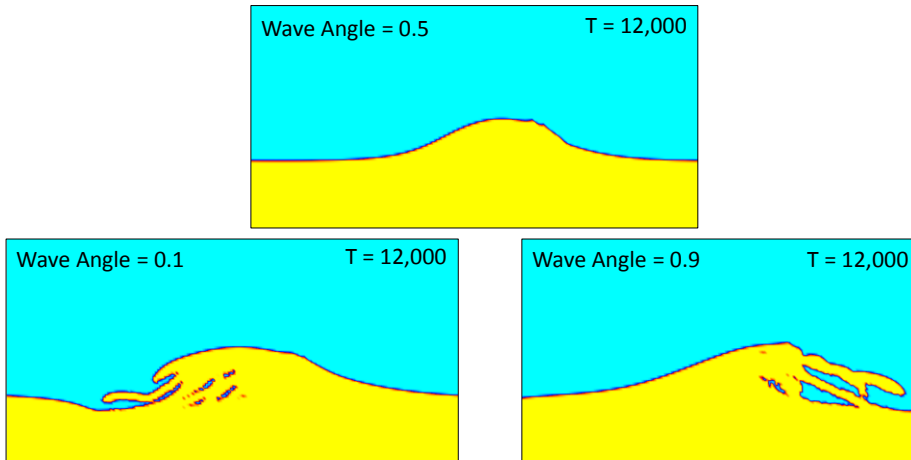
<http://csdms.colorado.edu/wiki/Model:Plume>

Model developer: Eric Hutton

Click here

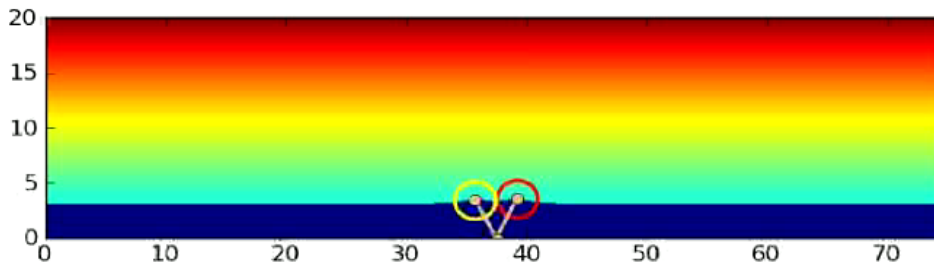
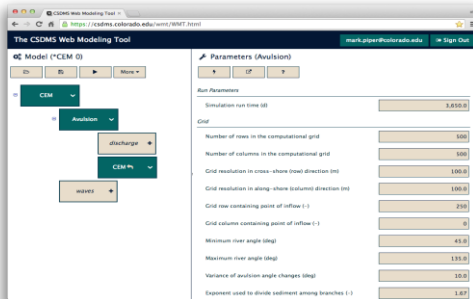
Close

## Example of Wave-dominated Delta Simulations



Simulation set 2 allows process-response relationships to be explored.

Learning Objective: Describe-Predict certain responses based on specific process parameters



Ashton et al., 2013, Computers & Geosciences 53: 21-29

## Data & Model Opportunities

- Identify Data & Models that are critically needed to inform policy for a variety of users and disciplines
- 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 & Models need to be shared in a user-friendly, flexible modeling infrastructure

## Opportunities for Education

- Model and data integration creates awareness of gaps in understanding
- 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)