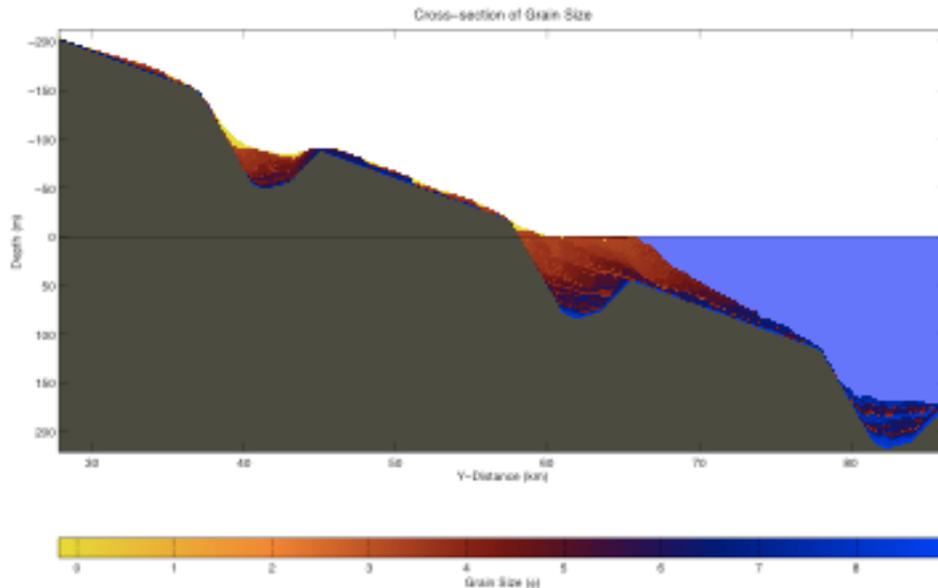


# SedFlux Modeling in CSDMS Component Modeling Tool

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Objectives:

- Learn how to use SedFlux in the CMT; to run a model simulation on the supercomputer 'Beach'.
- Learn working with tabbed dialogues and the associated Component Help.
- Learn how to use the 'Job Info' features to monitor progress of your simulations.
- Learn how to transfer files from the remote server to your own machine.
- Learn how to visualize output files with VisIT.

## 1 Set up the CSDMS Modeling Tool & VisIT

### Step 0 Become a member and get an Beach account

To make use of the CSDMS supercomputer you will have to become a member and request an account for access to the machine. This is a bit of a tedious process, but once completed you'll have access to a great resource!

How to become a member and get an account is explained here:

[http://csdms.colorado.edu/wiki/Portal\\_getting\\_started\\_with\\_CMT](http://csdms.colorado.edu/wiki/Portal_getting_started_with_CMT)

### **Step 1          Activate your Secure Connection**

You will now have setup a VPN (Virtual Private Network) to have a secure encrypted tunnel from your computer to the University of Colorado's network. Please install VPN-Network Connect Software on your own system. Find this software for your OS on the CSDMS memory stick.

To then log in to the CU network, you will need to know your CU user name, and your password. Connect to the University of Colorado.

### **Step 2          Download and Install the latest CMT tool**

Download the CMT tool from the CSDMS website here:

[http://csdms.colorado.edu/wiki/CMT\\_download](http://csdms.colorado.edu/wiki/CMT_download)

### **Step 3          Download and Install VisIT**

Download VisIT from its home site, more instructions are posted on the CSDMS site. VisIT is the visualization software with the CMT.

[http://csdms.colorado.edu/wiki/CMT\\_visualization](http://csdms.colorado.edu/wiki/CMT_visualization)

### **Step 4          Start CMT and Log In to Beach**

Once installed, double-click on the CMT icon.

You will be requested to log in to the CSDMS High Performance Computing Cluster (the HPCC is called 'Beach'). You have to request an account for this and received login information from us. For this step you will need again your CU user name, and password.

## **2          Running a CMT component: SedFlux**

### **2.1      Introduction**

SedFlux is a process-response model that delivers multigrained-size sediment load across a continental margin (Hutton & Syvitski, 2008).

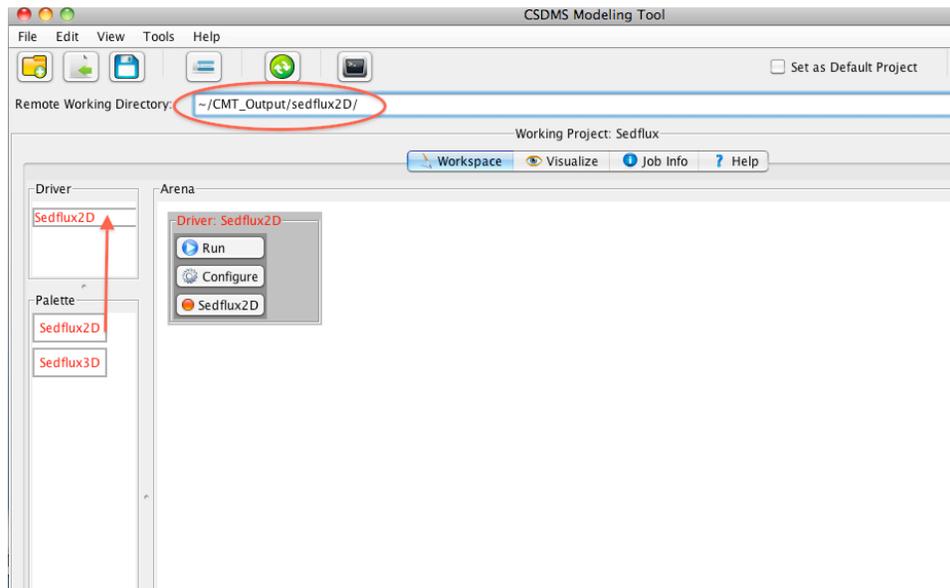
We are using a very simple SedFlux run, parameters are shown by default in the CSDMS Modeling Tool for Sedflux in its tabbed dialogues.

## Exercise 1: Explore a base-case stratigraphic simulation

1.1 Run a “base-case” SedFlux simulation for 5000 years.

>> *Open Project: go to Group Marine, Select SedFlux project.*

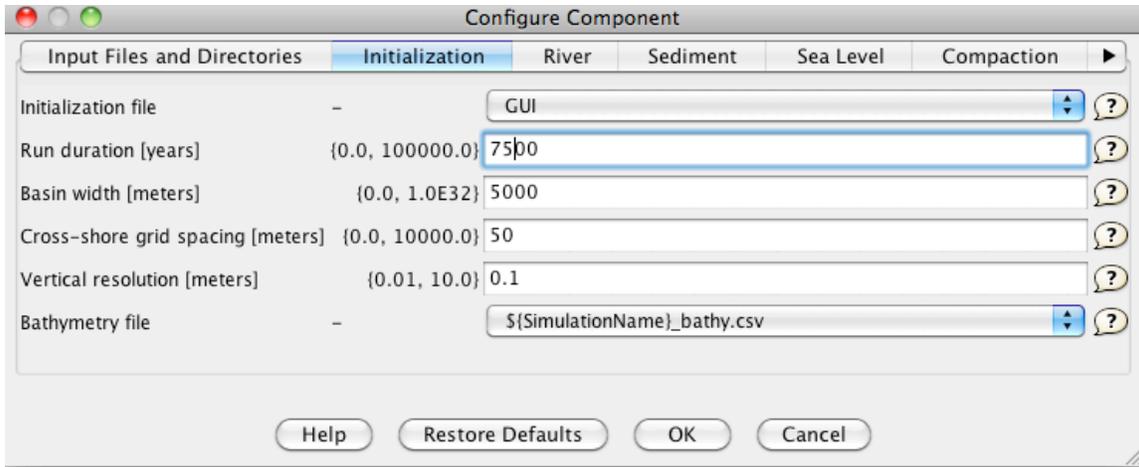
>> *Set a unique remote working directory for your experiments.*



>> *For this specific exercise we will be running SedFlux2D in stand-alone mode. This means that you drag the SedFlux Component from the Component Palette into the Driver Palette.*

>> *The Sedflux2D Component will now be active as driver in the CMT Arena. The SedFlux Configure Menu is used to set the parameters for the simulations. You can set the parameters by going through the different tabs under the configure menu and subsequently run your simulation by hitting the blue run button.*

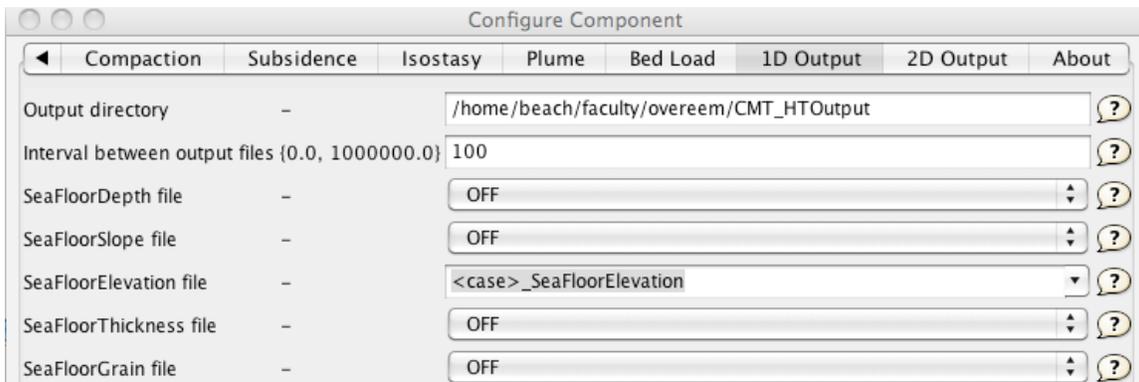
>> *Make sure you have the input files and directories tab of the ‘Configure Menu’ set to GUI. This means that the input to the model is being received from the GUI. Here you can specify your simulation name. Any output files are then automatically tagged with these identifiers.*

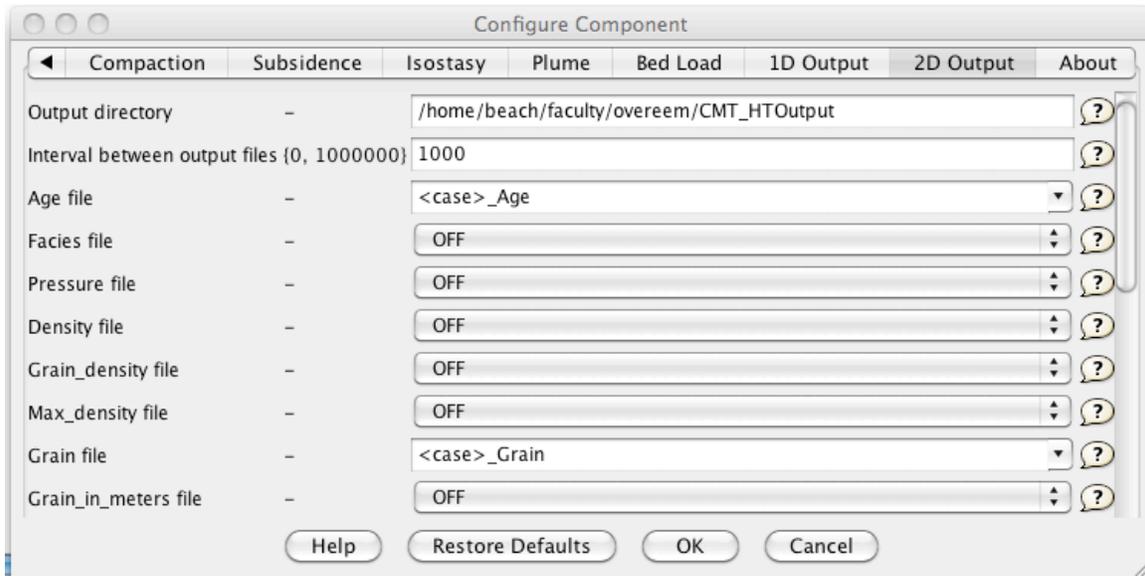


>> Set the run to 7500 years duration in the second tab. To generate a nice stratigraphic section, we'll use a narrow basin-width of 5000m.

>> For the base case scenario we will leave all other process parameters as default values.

>> But we do need to specify what output files will be generated, and at what time interval. You can monitor values as 1D lines, or 2D profiles. As you can see 2 output files are requested; age of the deposits and grainsize of the deposits are selected. 2D output consists of NetCDF files that store profiles at selected time intervals. Such files require a lot of memory, so be aware, we recommend every 1000 year output.





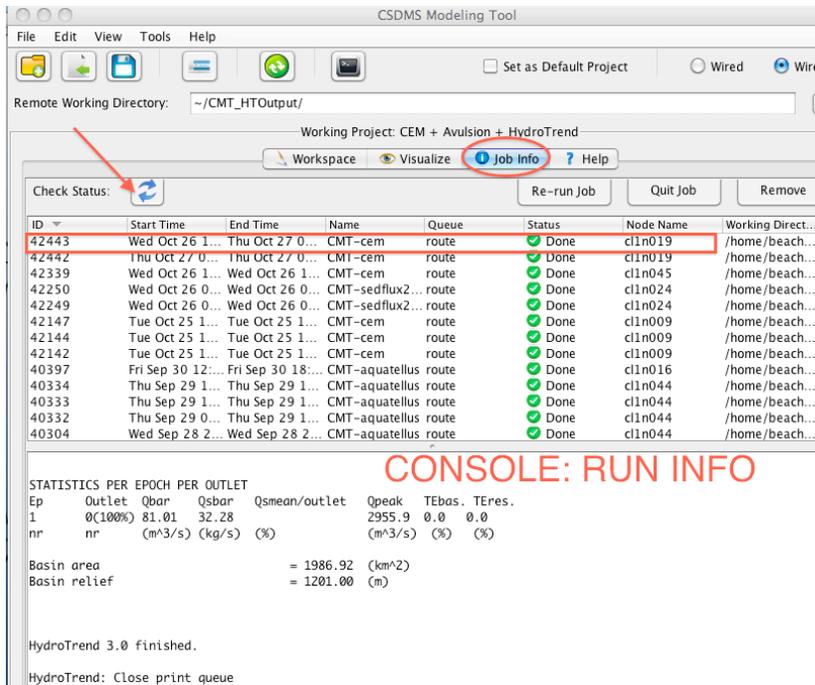
>> Note that each tab of the configure menu has a help button (lower left), it redirects to the CMT SedFlux Help System on the CSDMS Wiki. There are governing equations, literature references and model parameter descriptions posted there. Model Help should be detailed so that models never become 'black boxes'.

[http://csdms.colorado.edu/wiki/Model\\_help:Sedflux](http://csdms.colorado.edu/wiki/Model_help:Sedflux)

## 1.2 Which process modules are active based on the GUI input?

>> HIT RUN.

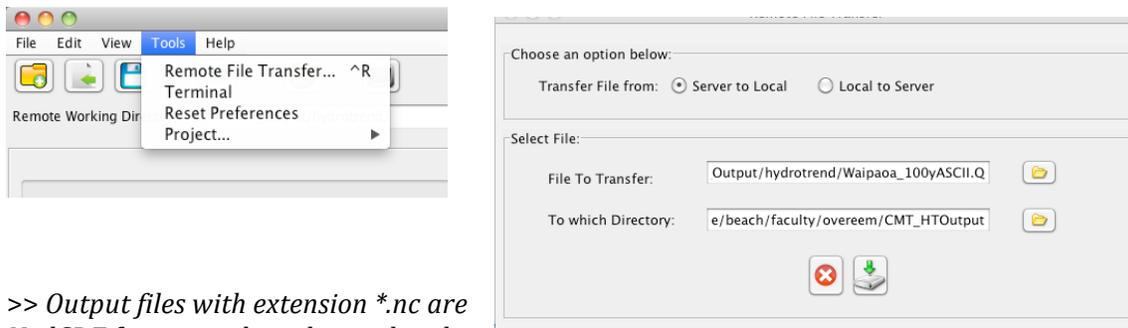
>> The Job Info menu allows you to check the status of your run, once you click on the submitted job the console shows current information. You may have to 'Check Status' a couple of times before the simulation is finished.



## Exercise 2: Plot Simulation Results

### 1.1 Plot Q-data.

>> Output files are generated in your specified output directory on 'Beach'. You can grab the files and use either your own favorite data analysis software or VisIT. An easy way of doing this is to go to Tools → Remote File Transfer. This opens a menu to bring files from the remote server beach to a directory on your local machine.



>> Output files with extension \*.nc are NedCDF format and can be read with VisIT. Transfer the elevation file to your local machine. For now, we will leave the larger 2D profile files.

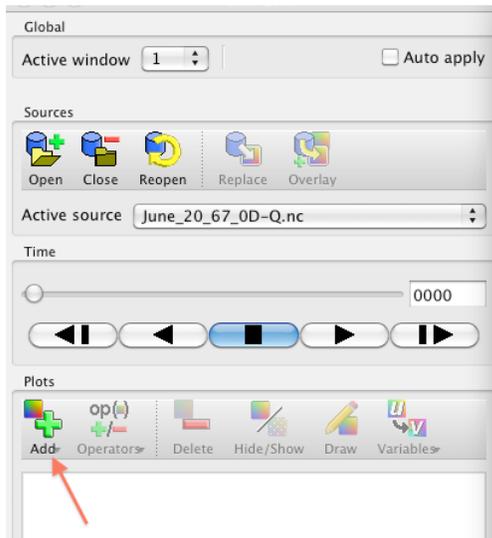
>> launch VisIT on your own machine

>> Under VisIT, choose 'Open File' and open '\*elevation.nc'

>> This file will then show up as the Active Source.

>> You can use the Add button to add these variables to your plotting datasets.

>> Once you have added Q, you can use the 'Draw button' to plot a time series.



2.1 What do you see? Roughly how much sedimentation occurred in the deltafront?

>> to plot the profile data is more complicated, we will demonstrate this in the class. Recommended is to follow the VisIT clinic :)

## Exercise 2: Modeling Fjord Stratigraphy

For this case we will run a simulation with more variable input. It represents a deglacial infill of a fjord. The fjord is deglaciaded 17kBP and sediment starts filling in a fjord. Rapid isostatic rebound is posed upon the grid by using a subsidence file. Please load the \*.bld file from the sedflux/fjord17k directory.

2.1 Run your simulation and plot up the elevation profile. What do you see?

## Exercise 3: Model Coupling Discussion

3.1 What process models can be coupled to a stratigraphic model like SedFlux? Think of an example of climatic processes, or drainage basin processes (i.e. upstream) as well as marine processes (i.e. downstream).

4.2 Please go browse in the CSDMS Model repository whether you can find an example of a model that could potentially be coupled. Why would this coupling would be useful?

4.3 Use the CSDMS voting system to vote for components that you think are essential to bring into the CMT to be coupled to others.

The CSDMS Model repository is browsable here: <http://csdms.colorado.edu/wiki/Models>

## **Background Papers**

- *Syvitski, J. P. M. and Hutton, E. W. H., 2001. 2D SEDFLUX 1.0C: an advanced process-response numerical model for the fill of marine sedimentary basins. Computer & Geosciences, 27, 731~753*
- *Hutton E.W.H, and Syvitski, J.P.M., 2008.Sedflux 2.0: and advanced process-response model that generates three-dimensional stratigraphy. Computers & Geosciences, 34(10), 1319-1337.*
- *Overeem, I., Syvitski, J.P.M., Hutton, E.W.H., Kettner, A.J., (2005). Stratigraphic variability due to uncertainty in model boundary conditions: a case-study of the New Jersey Shelf over the last 40,000 years. Marine Geology, 224, 23-41.*
- **More at <http://csdms.colorado.edu/wiki/Model:Sedflux>**