

Coastal Modeling System

Advanced Topics



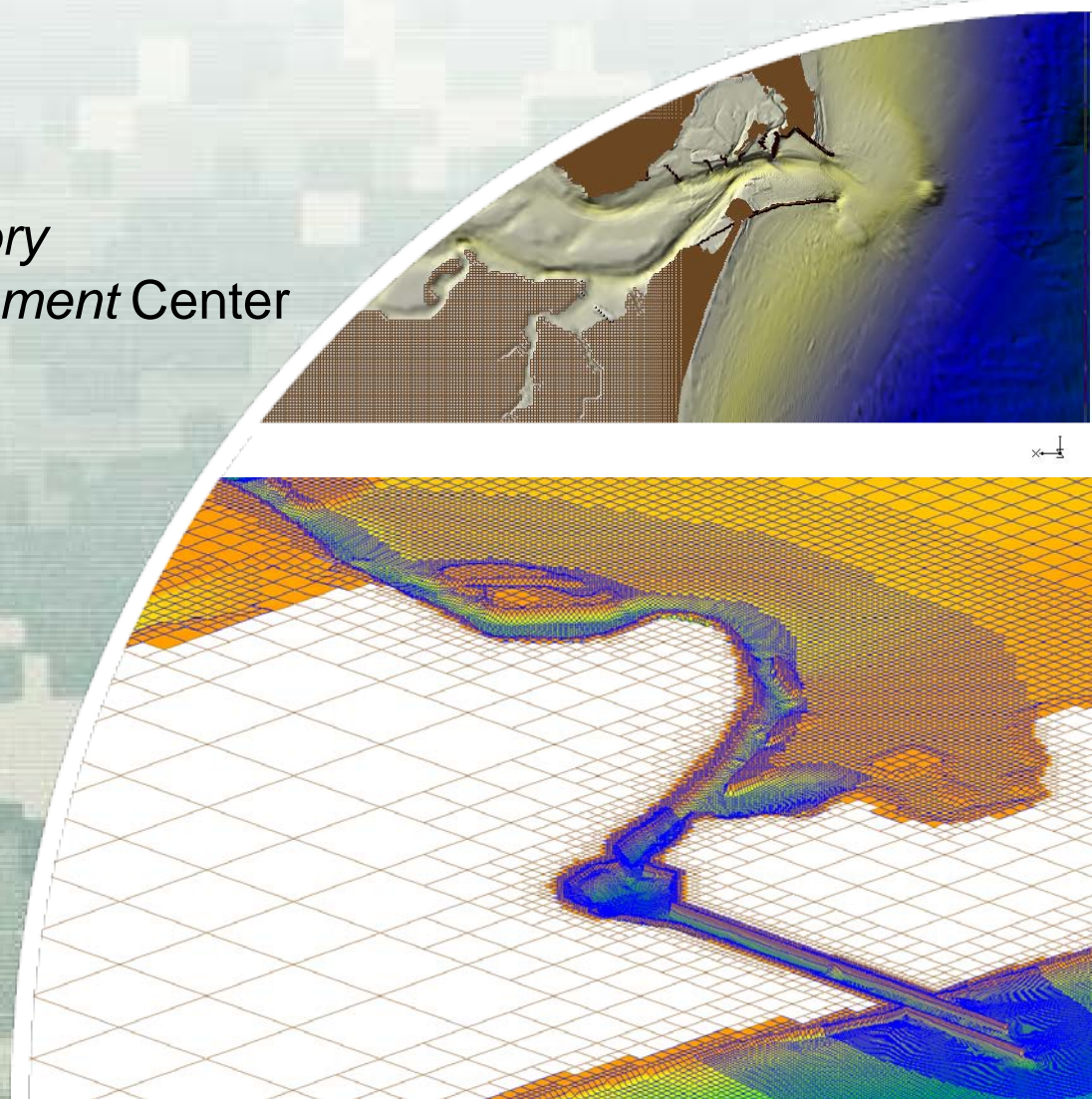
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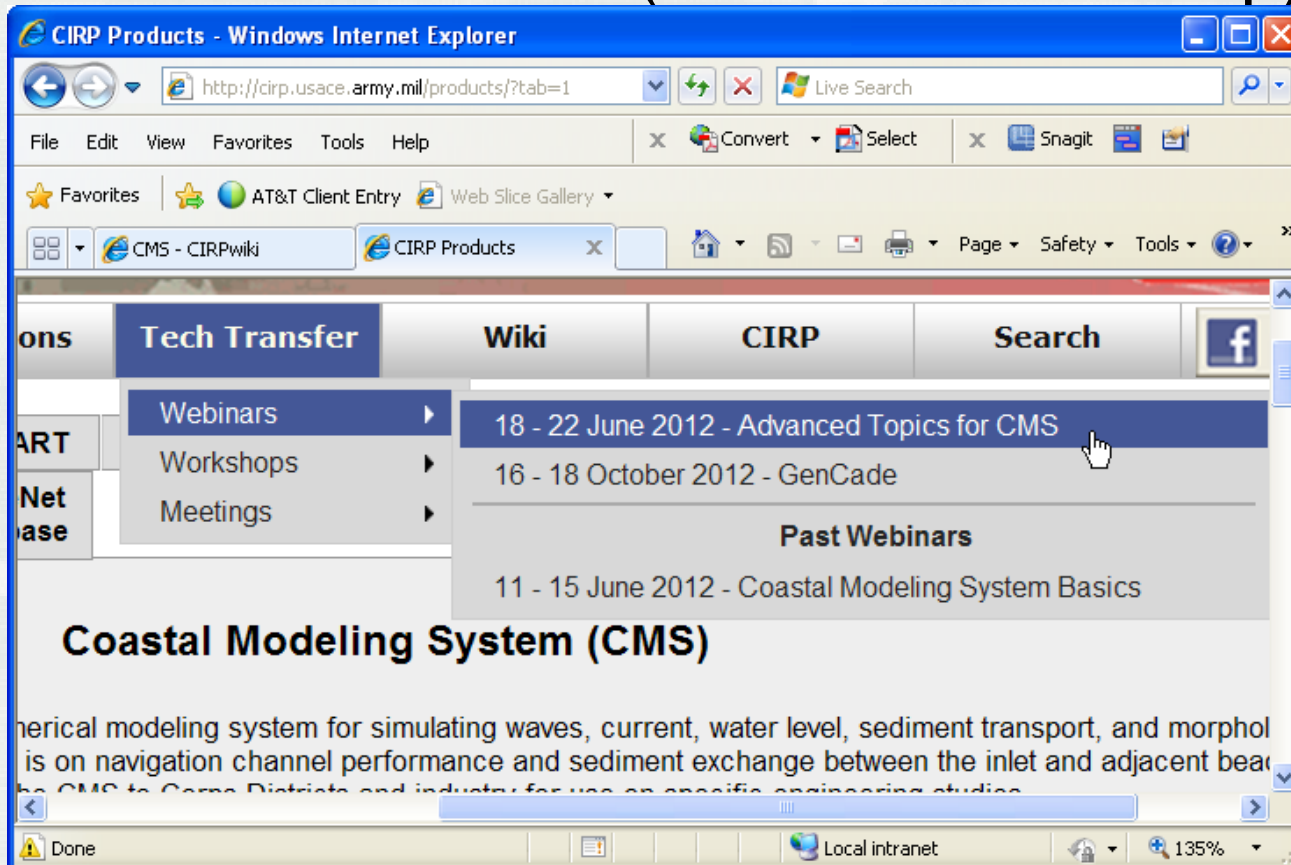
June 22, 2012



US Army Corps of Engineers
BUILDING STRONG

- **18 June 2012 - Day 1**
 - Introduction to CMS (slides)
 - Overview of Documentation and Workshop Material – Read it!
 - Tips for preparing bathymetry and other scattersets
 - Tips for setting up and running
 - Hydrodynamics
- **19 June 2012 - Day 2**
 - Wind and Atmospheric Pressure
 - Initial and Boundary Conditions
- **20 June 2012 – Day 3**
 - Surface roller
 - Salinity Transport
 - Sediment Transport
- **21 June 2012 - Day 4**
 - Multiple-sized sed. transp.
 - Numerical Methods
 - Advanced Output
- **22 June 2012 - Day 5**
 - Scripting
 - Problem Solving
 - Model Calibration
 - Post-processing
 - Upcoming features

- CMS-Flow data folder (same as workshop)



The screenshot shows a Windows Internet Explorer browser window titled "CIRP Products - Windows Internet Explorer". The address bar shows the URL "http://cirp.usace.army.mil/products/?tab=1". The browser's menu bar includes "File", "Edit", "View", "Favorites", "Tools", and "Help". The address bar contains "http://cirp.usace.army.mil/products/?tab=1". The browser's menu bar includes "File", "Edit", "View", "Favorites", "Tools", and "Help". The address bar contains "http://cirp.usace.army.mil/products/?tab=1". The browser's menu bar includes "File", "Edit", "View", "Favorites", "Tools", and "Help".

The main content area displays a navigation menu with the following items:

- ons
- Tech Transfer**
 - Webinars
 - 18 - 22 June 2012 - Advanced Topics for CMS
 - 16 - 18 October 2012 - GenCade
 - Workshops
 - Meetings
- Wiki
- CIRP
- Search

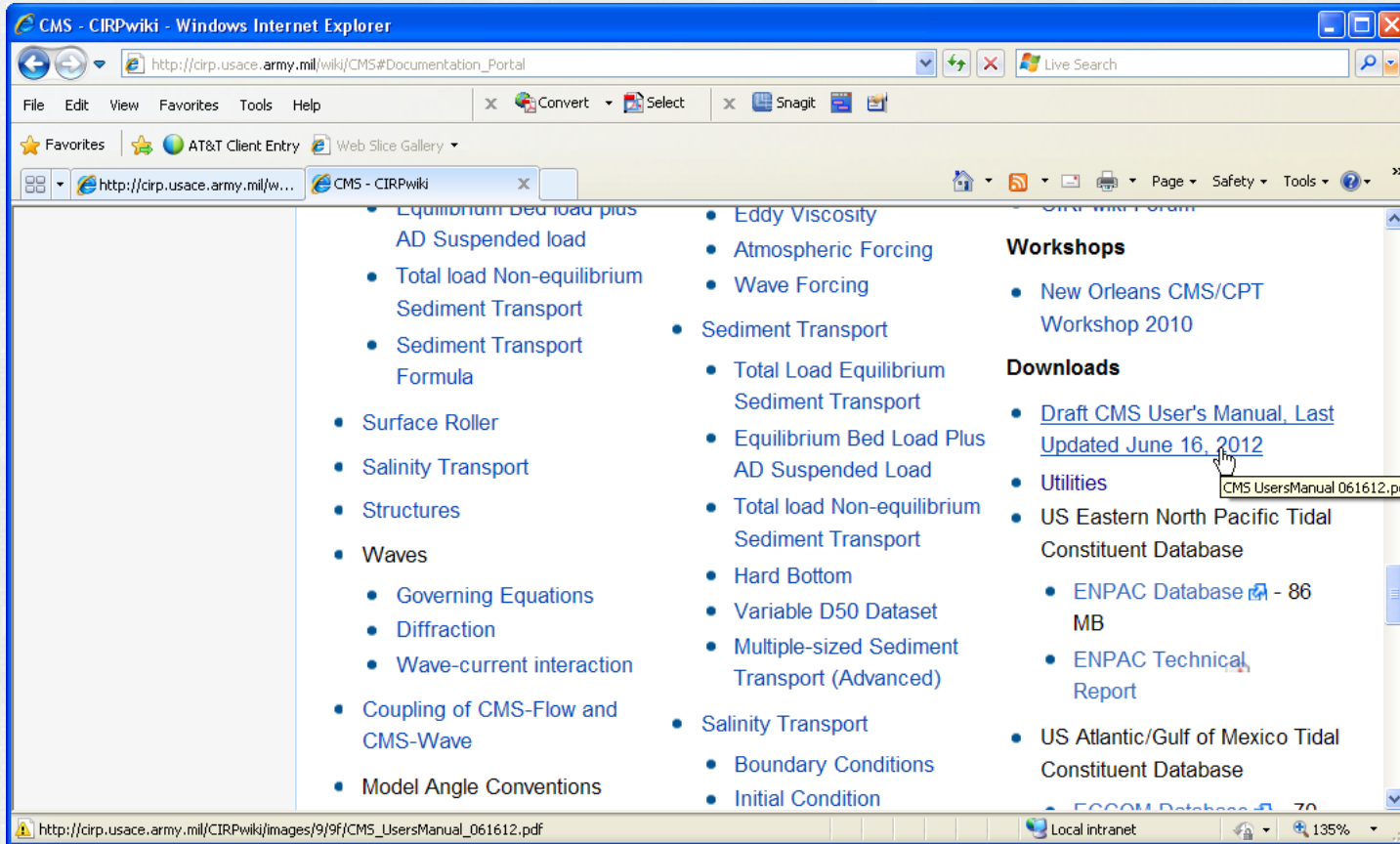
Below the navigation menu, there is a section titled "Past Webinars" with the following entry:

- 11 - 15 June 2012 - Coastal Modeling System Basics

The main heading for the content is "Coastal Modeling System (CMS)". Below this heading, there is a paragraph of text describing the system:

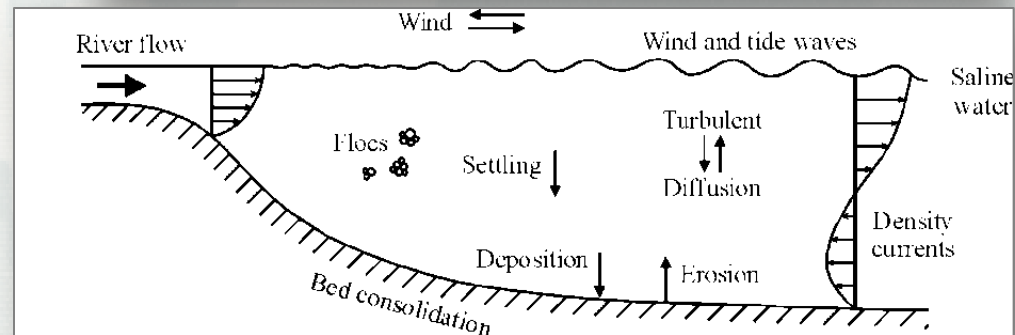
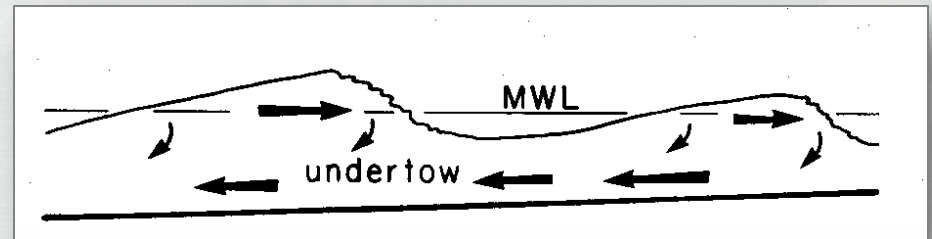
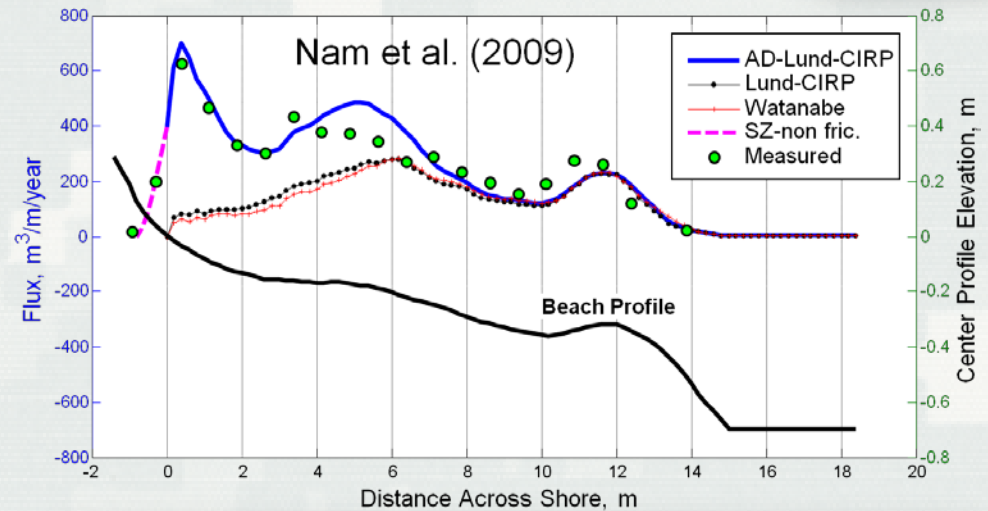
nerical modeling system for simulating waves, current, water level, sediment transport, and morphol
is on navigation channel performance and sediment exchange between the inlet and adjacent bea
he CMS to Corps Districts and industry for use on specific engineering studies

Draft CMS User Manual



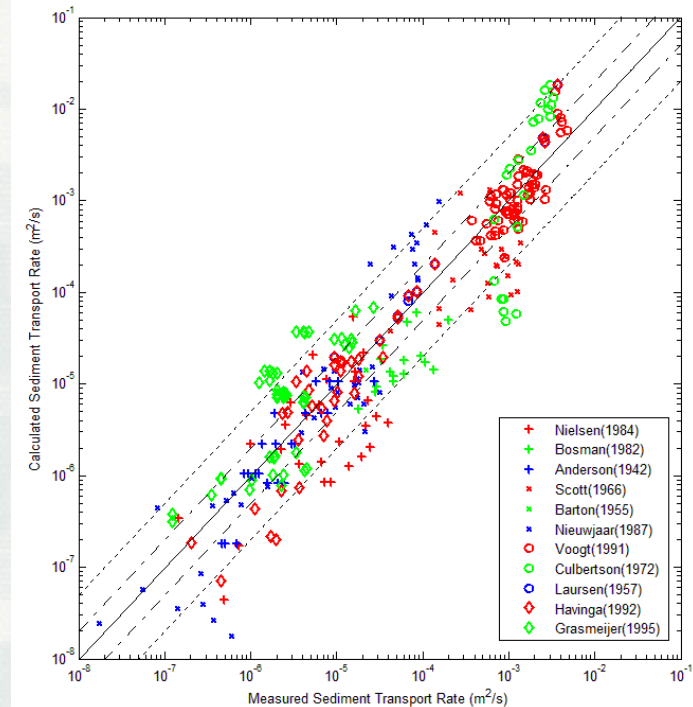
<http://cirpwiki.info/wiki/CMS>

- Swash-zone
- Cross-shore sediment transport
- Mixed sediments
 - Mix-Sed (SEDZLJ)
 - CMS-Sed
- Linking to tidal databases
 - (TPXO, ADCIRC, LeProvost)
- Boundary condition extraction tool
- Parallelization for HPC



New Multiple-sized Sediment Transport Formula

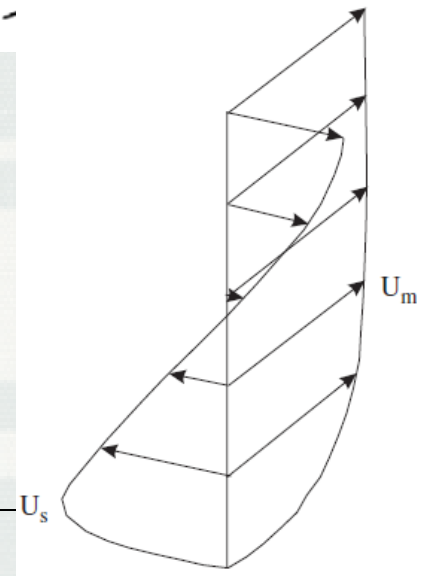
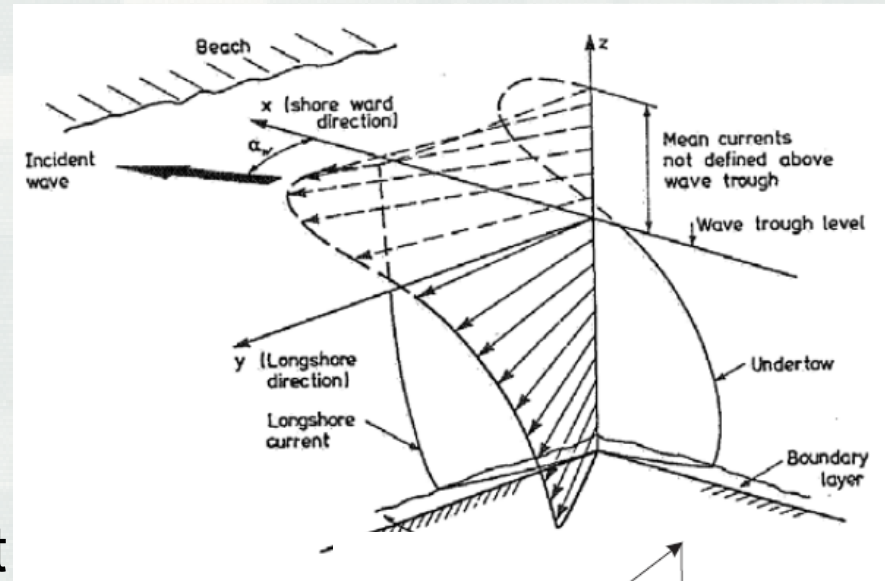
- Largest source of error in modeling
- Existing formula designed for
 - Graded sediments under currents only (e.g. Wu et al. 2000) or
 - Sorted sediments under waves and currents (e.g. Lund-CIRP)
- Database being compiled
- Lab experiments
- Work will benefit whole lab



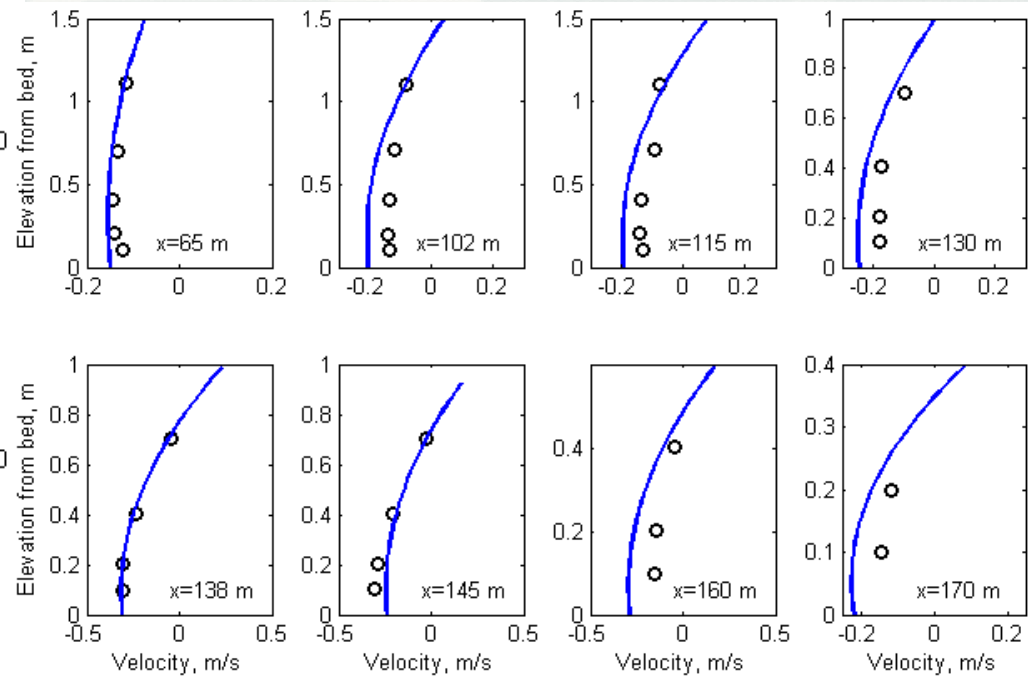
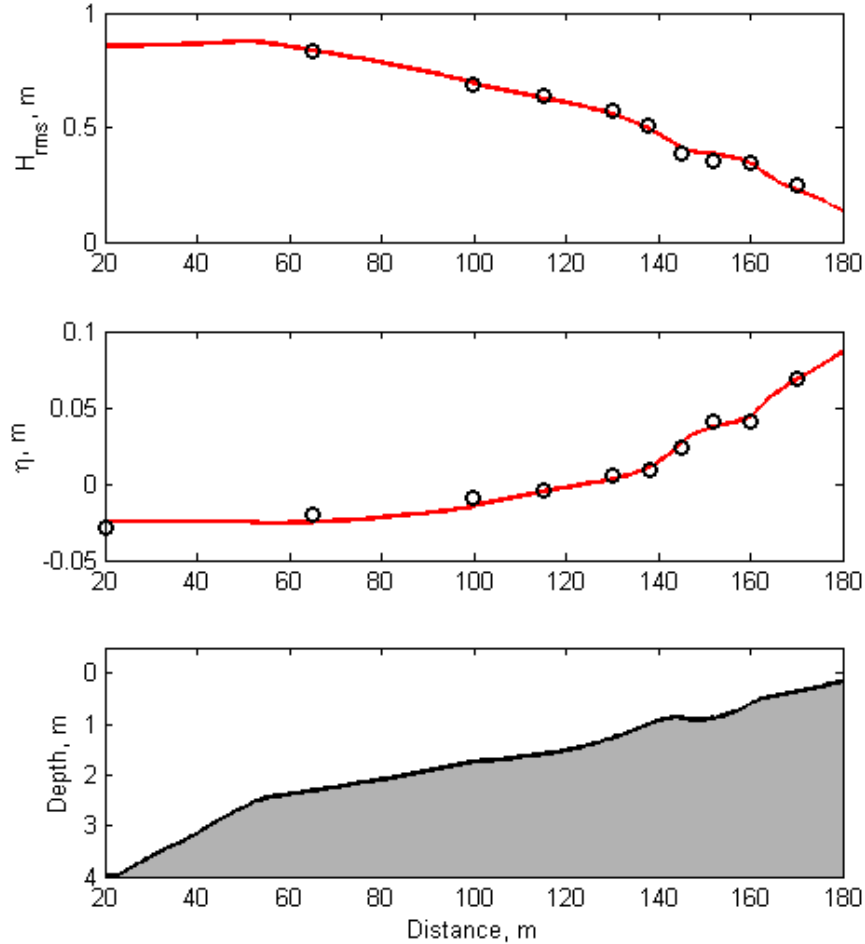
Bed load Transport Formula	% within factor of	
	2	5
Bailard and Inman (1981)	47	70
Dibajnia and Watanabe (1992)	41	72
Ribberink (1998)	32	52
Lund-CIRP (2007)	46	74
Wu et al. (2011)	55	86

Suspended load Transport Formula	% within factor of	
	2	5
Bijker (1968)	23	52
Bailard (1968)	30	65
van Rijn (1989)	32	52
Lund-CIRP (2007)	33	65
Wu et al. (2011)	48	83

- Simulates vertical variation of horizontal velocities due to:
 - Wave and wind surface stress, bottom stress, helical flow, and Coriolis (geostrophic acceleration).
- Semi-analytical solution to vertical velocity profiles so that the dispersion and wave-current interaction terms can be calculated analytically without numerical integration - Very efficient

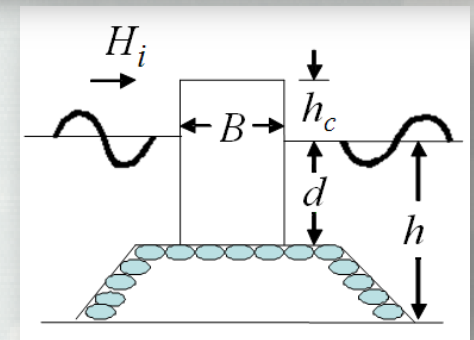
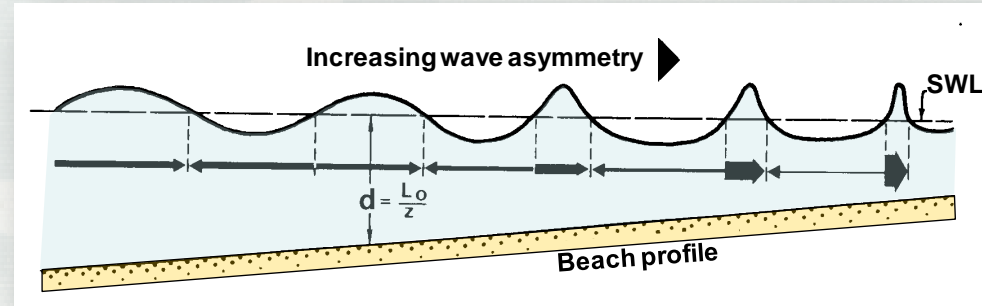


Quasi-3D Results: LIP 11D Test-1B

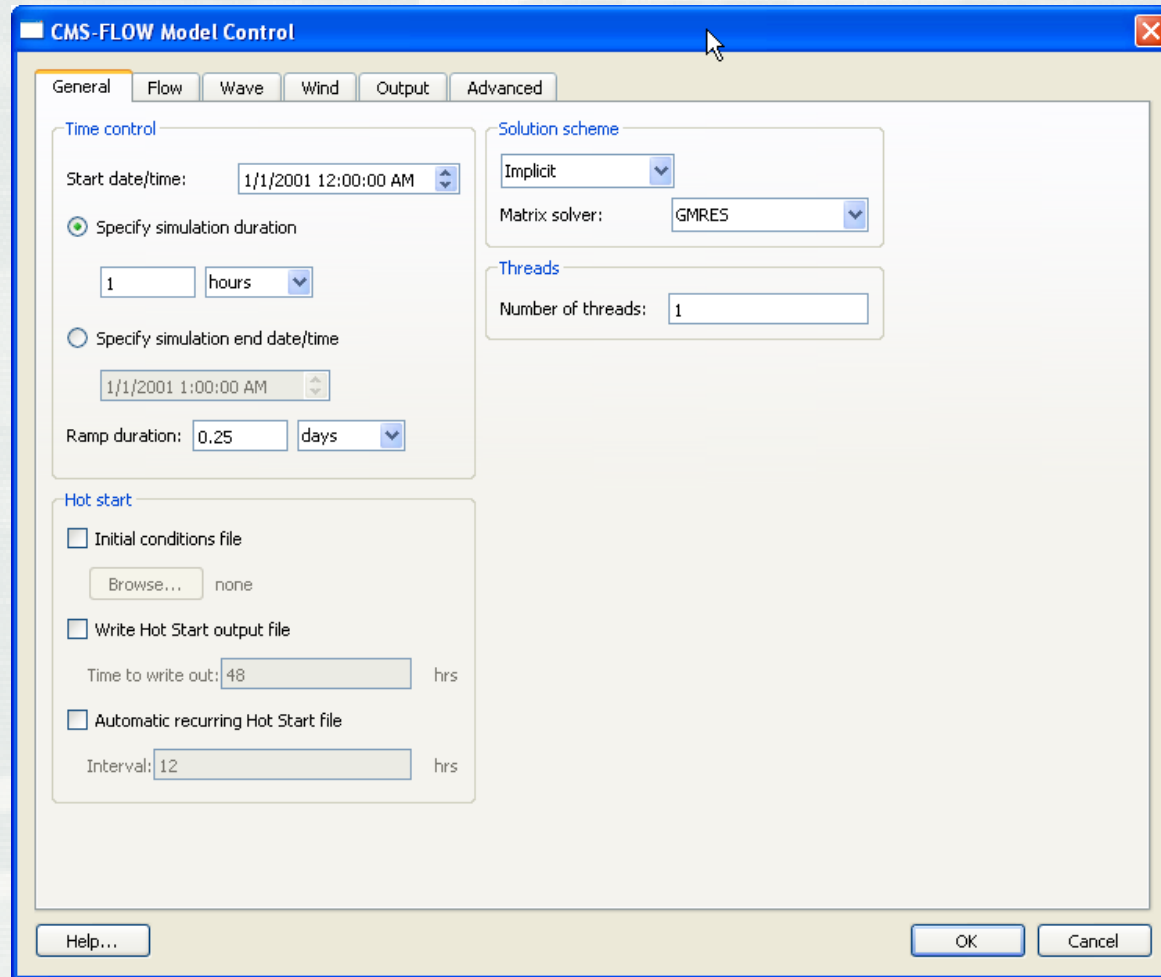


CMS-Wave

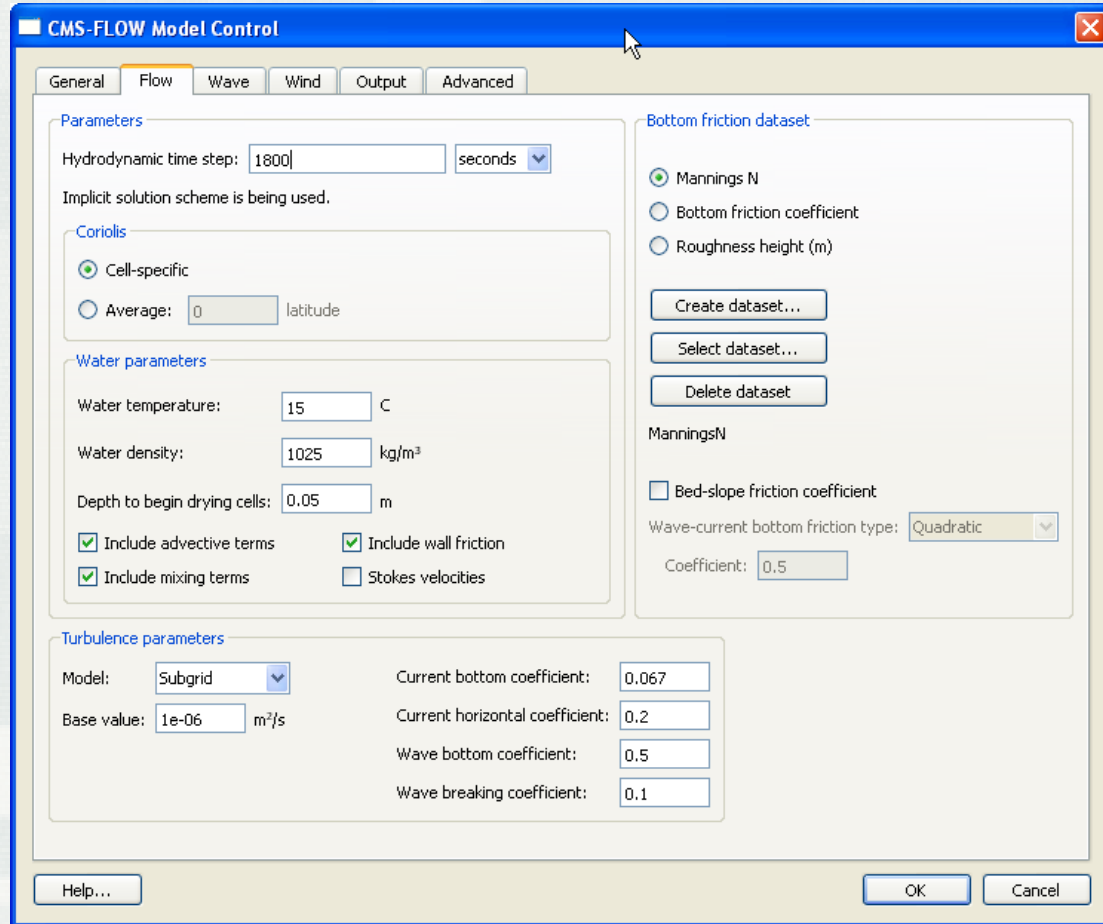
- Waves in swash zone
- Wave calculations at complex structures
- Coupling with Navy & NOAA operational models and buoys
- Modeling jetty stone breaching/blowout



- Grid smoothing for telescoping grids
- Improved time control
- Matrix solver
- Harmonic BC



- Wave flux velocity
 - Stokes velocity
 - Surface roller
- Turbulence options
 - Models and coefficients
- Bottom friction
 - Wave-current BBL
 - Bed-slope coefficient



CMS-FLOW Model Control

General | **Flow** | Wave | Wind | Output | Advanced

Parameters

Hydrodynamic time step: 1800 seconds

Implicit solution scheme is being used.

Coriolis

Cell-specific

Average: 0 latitude

Water parameters

Water temperature: 15 C

Water density: 1025 kg/m³

Depth to begin drying cells: 0.05 m

Include advective terms Include wall friction

Include mixing terms Stokes velocities

Turbulence parameters

Model: Subgrid

Base value: 1e-06 m²/s

Current bottom coefficient: 0.067

Current horizontal coefficient: 0.2

Wave bottom coefficient: 0.5

Wave breaking coefficient: 0.1

Bottom friction dataset

Mannings N

Bottom friction coefficient

Roughness height (m)

Create dataset...
Select dataset...
Delete dataset

ManningsN

Bed-slope friction coefficient

Wave-current bottom friction type: Quadratic

Coefficient: 0.5

Help... OK Cancel

- Spatially variable winds
- Meteorological stations

CMS-FLOW Model Control

General Flow Wave **Wind** Output Advanced

Type: Meteorological stations

Meteorological stations

	Name	X (m)	Y (m)	Height (m)
1	Station 1	12312	46751	10
2	Station 2	78654	712961	10
3				

Parameters

Direction (deg.)

Wind from:
 North = 0 deg. South = 180 deg.
 East = 90 deg. West = 270 deg.

Curve undefined

Import From File...

Anemometer height: 10 m

Velocity (m/s)

Curve undefined

Help... OK Cancel

- Switches for individual variables in in groups
- Output groups split into separate files
- Statistics
- Compression
- ASCII files

CMS-FLOW Model Control

General | Flow | Wave | Wind | **Output** | Advanced

Output times lists

- List 1
- List 2
- List 3
- List 4

Output times:

Start time (hrs)	Increment (hrs)	End time
0	0.5	1000

Delete

Statistical output

Group	Start time (hrs)	End time
<input checked="" type="checkbox"/> Hydrodynamics	0	24
<input checked="" type="checkbox"/> Sediment Transport	0	24
<input type="checkbox"/> Salinity	0	720

Output datasets

- 123 Water Surface Elevation (List 1)
- Velocity (List 1)
- Morphology (List 1)
 - 123 Depth (through time)
 - 123 Morphology Change
- Transport (List 1)
 - 123 Sediment Total-Load Concentration
 - 123 Sediment Total-Load Capacity
 - 123 Fraction Suspended
 - Total Sediment Transport
 - 123 Salinity Concentration
- Waves (List 1)
- Wind (List 1)
- 123 Eddy Viscosity (List 1)

Output options

- Tecplot snap shot (*.dat) and history files (*.his)
- SMS Super ASCII files (*.sup, *.xy, *.dat)
- XMDf file compression

Simulation label:

Help... | OK | Cancel