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Hydrodyn-SEDSOFT

Sediment is considered to be the source of erosion and deposition in the ocean environment. It occurs due to the construction of ports, jetties, piles or by natural calamities.

Hydrodyn-SEDSOFT is an advanced software package, with a Graphical User Interface (GUI) consisting of pre-processor, multiple solvers and post processor that can simulate erosion, deposition and bed levels in oceans, rivers, seas and coastal waters of estuarial systems in a complex geometry with high precision using higher order numerical schemes. **SEDSOFT** provides rapid predictions of the sedimentation in any meteorological and hydrological conditions. It includes user friendly graphical interface for entering both wind and hydrological data.

Hydrodyn-SEDSOFT includes many specialized features of graphics and menu driven pre/post processor for setting up the input, running the calculation, and selecting and obtaining graphical output from the analysis, animation facilities etc. It allows fast, flexible creation and modification of computational models to reduce the possibility of errors in the input. It is available for Unix/Linux and Windows operating systems.

GRAPHICAL USER INTERFACE FEATURES

Hydrodyn-SEDSOFT provides interactive Graphical User Interface (GUI) which guides the user for defining topographical features, specifying boundary locations, defining meteorological data options and preparing data base for various types of ports, bridges and jetty constructions, selecting options for grid generation, specifying model parameters, selecting physical models, properties, boundary conditions and solvers, initializing the solver parameters, setting up solution controls, running the solvers, on-line animation facilities, hard copy utilities and extensive on-line help facilities.

Post Processor assists the user for display of solver output results graphically in various formats. GUI options are available for plotting of contour maps and color maps of model properties, simulation results such as water elevations, Sediment concentrations, flux variation at different locations, plotting of flow velocity vectors, computational grid, residual velocities, time history plots, animation facilities, setting background colors of pre and post processor screens etc. GUI's Hard copy utilities helps the user to save the image pictures in standard formats and to export software results to ASCII text files supported by virtually any 3D visualization software. Online Help facility is also available in the GUI. This guides the user to help out in various stages in the preparation of input data and setting up the software.

GEOMTERY AND MESH SYSTEM

Hydrodyn-SEDSOFT interface is built on Triangular grid generation module based on Advanced Front Technique which contains a logical menu interface that guides the user to generate the grid for complex domain shapes. The user can control the grid spacing in selected regions of the domain of study. Constant grid spacing, and spatially varying grid spacing options are also available while generating mesh.

SOLVER FEATURES

Hydrodyn-SEDSOFT uses Finite Element Method to solve the Navier- Stokes and scalar advective-diffusive equations on Triangular grid system for prediction of hydrodynamic and sediment transport variables. **SEDSOFT** has both explicit/implicit solvers for solving the basic governing equations of flow and sediments in a coupled way. Various modules including hydrodynamic, salinity and temperature models have been integrated into **SEDSOFT**.

Hydrodyn-SEDSOFT uses Lagrangian discrete parcel algorithm to solve the governing equations of sediment transport taking into consideration, various processes including advection, mechanical spreading, horizontal turbulent diffusion, erosion and deposition.

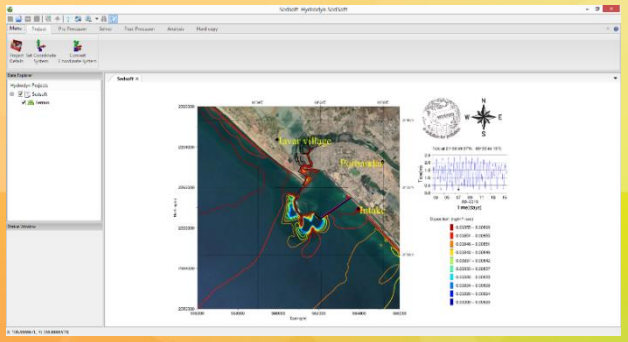
- Uses the Finite Element approach, which allows modeling in 1, 2 or 3 dimensions
- Solves equations for conservation of mass, momentum and energy for flow and sediment transportation
- Solves sediment distribution in open surface flows and includes models for density variation
- Uses 3D triangular (horizontally) and sigma-stretched (vertically) grid so that the simulation can be done for any arbitrary shaped topography of flow domains
- Has its own Grid Generator, which is based on Advanced Front Technique
- The user can select any type of boundary conditions at any location
- Pre-processor is integrated to the model to define the required model inputs graphically
- Various objects, i.e. bathymetric depth contours, islands, dykes, coastlines, ports, bridges, piles, jetties etc. are represented by different colors to identify the objects easily
- Interactive GIS data management system
- The solver has options to continue the sediment transport computations alone after converging the flow field or both flow and sediment simultaneously

Hydrodyn-SEDSOFT

- The observation points can be selected at any location in the computational domain to monitor the output results and show the results graphically
- It can display the erosion, deposition & bed levels at any time during the computation
- It is capable of handling various type of sediment particles in the prediction of sedimentation in open waters
- Comprehensive sediment characteristic database
- Specify sediment occurrence scenarios
- Input winds time series
- Enter and edit sediment particle types in the sediment library
- Display GIS resources affected by the sedimentation
- The GIS utility is highly interactive and allows the user to enter, or import from external GIS sources
- It has animation facility for output results of various file formats i.e. Bitmap, JPG, PNG
- Dispersant effectiveness and over-flight update tools

SOFTWARE CAPABILITIES

- This software is flexible and can be used for any geographical locations in the world
- It can be used to simulate sedimentation in tidal and non-tidal flow domains
- It uses a 3D triangular grid for performing calculations
- The model can be used for either continuous or instantaneous sediment spills for predicting advection, mechanical spreading, horizontal turbulent diffusion, and shoreline deposition
- It includes many specialized features of graphics and menu driven pre/postprocessor for setting up the input, running the calculation, and selecting and obtaining graphical output from the analysis
- It allows fast, flexible creation and modification of computational models, while greatly reducing the possibility of errors in the input



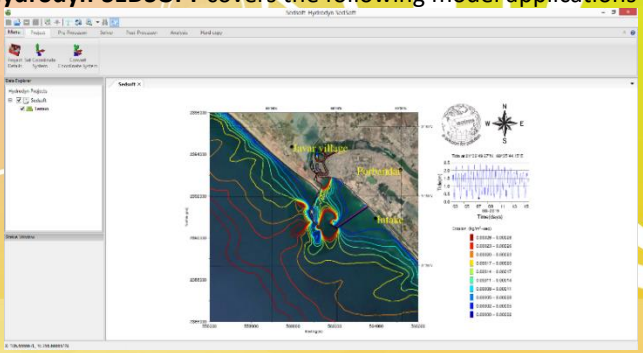
- It can be used either as a real-time basis to predict the sedimentation or as a scenario model to analyse the possible impact of sediments due to constructions of piles, jetties and ports

Some of the core features are mentioned below

- Digitization of the raster images using .dxf files and .xyz files
- Drawing the coastal boundaries, triangular mesh generation with mesh refinement in selective region
- Applying the bathy using scatter points
- Saving the domain in binary format which reduces the size of memory compared to ascii format files
- Defining the boundary conditions and applying the tides and wind for boundary condition
- Defining the sediment spill locations and particle properties
- Finite Element Method solving technics which involves fast computation and produces more accurate results
- Displays the contours, vectors while simulation goes on
- Saving flow and sediment result in binary format
- Loading of huge result files takes less time compared to loading of ASCII files
- Plotting, extracting and saving of Time dependent results at selected observation points
- Capable of producing results in PNG format and saving
- Plotting of Erosion, Deposition, and Bed levels
- Producing animation of velocity contours, vectors and trajectories

SOFTWARE APPLICATIONS

Hydrodyn-SEDSOFT covers the following model applications



- As a real-time basis to predict the sedimentation and to analyse the possible impact of sediment dumping
- It generates multiple stochastic simulations for various locations using statistical or historical wind time series
- It can be run to determine most likely on a monthly, seasonal, or annual basis
- Output includes maps showing erosion, deposition, bed level & shoreline changes
- The software output results can be used to determine the impact on the shoreline
- Predict the probability of key areas being affected a given site (stochastic)
- Allow over-flight update predictions
- Provide first order guidelines in the use of dispersant and help develop dispersion strategies around coastline

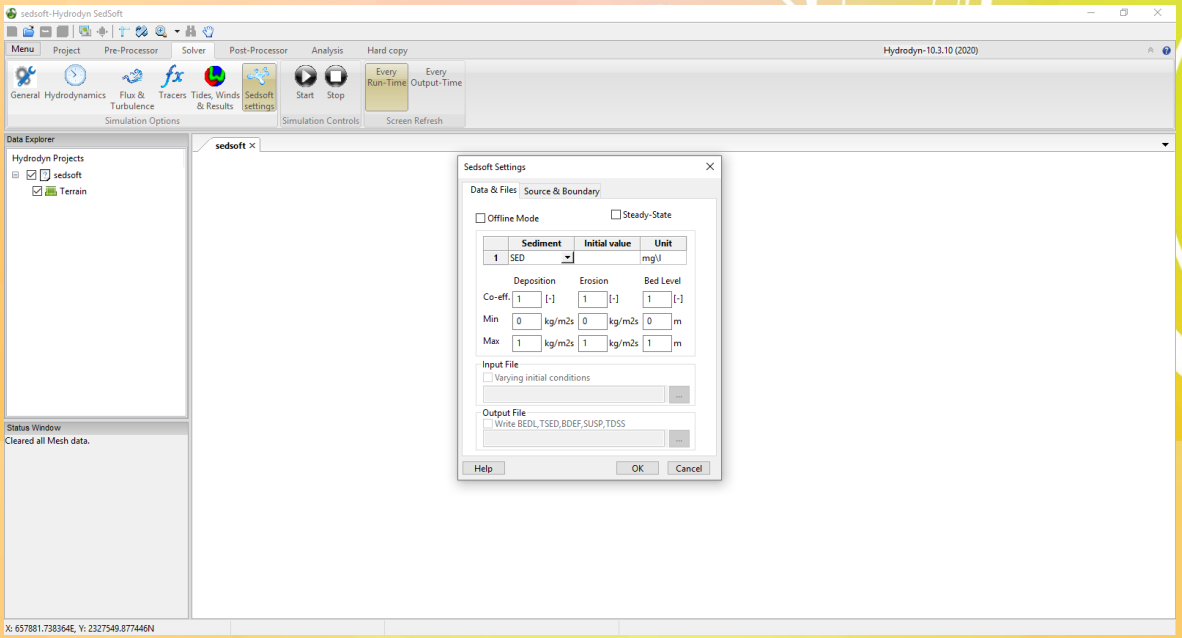
- Perform risk assessments for important resources e.g. beaches, fisheries, marine life, protected coastlines etc
- Resource management, Environmental impact assessments
- Protection and prevention strategies, Environmental Audits, Training courses

Hydrodyn-SEDSOFT

- Equipment review and recommendations, Equipment commissioning, Exercise delivery
- Optional capability to customize a resource and cost management system

OUR SCIENTIFIC SOFTWARE PRODUCTS

Airsoft : Simulation of pollutants spread in atmosphere.
Flosoft : Simulation of Hydrodynamic flow
Stmsoft : Simulation of Solute transport, Biodegradation, Transport chemical Reaction processes in Ground Water flow system
Nspsoft : Simulation of Noise Pollution Management Practice
Oilsoft : Simulation of fate and trajectory of oil spills
Polsoft : Simulation of Conservative and Non- Conservative Pollutant Transport
Surgsoft : Simulation of surges due to cyclones
Sedsoft : Simulation of Cohesive and non- Cohesive Sediment
Ahdsoft : Analysis of Hydrographic Data For Tidal
Libsoft : Library Management System
Wavesoft : Simulation of water elevation due to wave
e-Institute : institutional Management System Software
e-Breeze : Office Automation Software



SOME OF OUR CLIENTS

- Adani Power Dahej Limited, Gujarat
- EGS Survey Pvt. Limited, Mumbai
- En-Vision Enviro Technologies Pvt. Ltd., Surat
- Global Marine Engineering Consultancy (GMEC), Ahmedabad, Gujarat
- Multimedia consultants P Limited, Ahmedabad
- Mundra Port & Special Economic Zone Limited, Mundra
- CSIR-National Institute of Oceanography (NIO), Mumbai
- Reliance Industries Ltd., Mumbai
- Vimta Labs, Hyderabad