

Hydrodyn - AIRSOFT

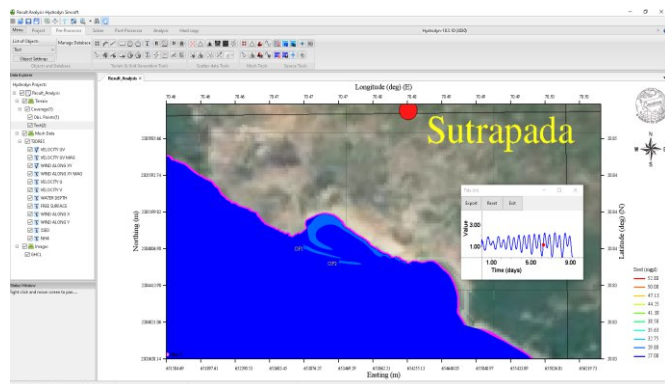


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AD 2000+ Technology towards BC 2000 Nature

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Hydrodyn-AIRSOFT is an advanced computer program used to simulate dispersion of pollutants emitted to the atmosphere under various meteorological conditions and complex topographical features. The software uses user defined or automatically generated computational grids for solving the basic governing equations of atmospheric flows and pollutants. It solves the conservation equations for mass, momentum and energy for atmospheric flows and pollutants. A chemistry module is integrated to study chemically active primary as well as secondary pollutants. It uses a 3D BFC grid to map the physical domain features to be modeled exactly and with generalized flow boundaries.



Hydrodyn-AIRSOFT is capable of predicting the formation and impact of gas clouds or particle matter. A dispersion can be continuous in nature, such as emission from the stacks and cooling towers in the industrial area and vehicular exhausts on roads, or accidents in nature, such as industrial accidents and heavy gas spill from trucks, railway cars or boats. It is capable of taking into consideration heavy as well as light pollutants, on a large or small scale. It can also predict wind velocity and temperature distribution over a three dimensional complex terrain topography. It is capable of doing exact modeling of terrain topography (e.g. level curves, soil nature, lakes, rivers, forests, buildings, hills, valleys, roads, tunnels, chemical units etc.) by generating a nested mesh.

GRAPHICAL USER INTERFACE FEATURES

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

Post Processor assists the user for display of solver output results graphically. GUI options are available for plotting of contour maps and color maps of model properties, simulation results such as water elevations, pollutant concentrations, flux variation at different locations, plotting of flow velocity vectors, computational grid, residual velocities, time history plots, spill trajectory 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. Online Help facility is also available in the GUI. This guides the user to help out in various stages in the

GEOMETRY AND MESH SYSTEM

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

Hydrodyn-AIRSOFT uses Lagrangian discrete parcel algorithm to solve the governing equations of water quality transport.

- ◆ Uses a finite volume approach, which allows modeling in 2 or 3 dimensions.
- ◆ Solves equations for conservation of mass, N-S momentum and energy for atmospheric flow and pollutant
- ◆ Solves the basic fluid mechanics equations (i.e continuity, momentum, energy, k-e & K-diffusion turbulence)n and photolytic set of chemical equations
- ◆ Solves for the pollutant dispersions in open atmosphere and includes models for density and temperature variation.
- ◆ Modeling of chemically reactive pollutants.
- ◆ Can do simulation of dispersion of a plume containing multiple pollutants.
- ◆ Uses 3D BFC grid, so that the simulation can be done for any arbitrary shaped topography of computational domains.
- ◆ Has its own Grid Generator, which is based on BFC methodology.
- ◆ Uses sigma-coordinate system vertically, so that irregular bottom topography of the river can be studied exactly.
- ◆ The user can select the boundary conditions at any location and select the any type of boundary conditions i.e. steady or transient.
- ◆ A graphical interface i.e. pre-processor is integrated to the model to define the required model input graphically.
- ◆ Various objects, i.e. bathymetric depth contours, islands, dykes and coastlines are represented by different colors to identify the objects easily.
- ◆ Dynamic post-processing facilities for output results.
- ◆ The solver has options to continue the pollutant calculations alone, after converging the flow field or both at a time.
- ◆ The monitor points can be selected at any location in the computational domain to monitor the output results and show the results graphically.

SOFTWARE CAPABILITIES

- ◆ This software is flexible and can be used for any geographical locations in the world.
- ◆ It can be used to simulate effluent dispersion in tidal and non-tidal flow domains.
- ◆ It uses a 3D triangular grid to model with generalized flow boundary conditions.
- ◆ The model can be used for either continuous or instantaneous effluent discharges and the model takes into consideration various processes including advection, mechanical spreading, horizontal turbulent diffusion.
- ◆ It includes many specialized features pre/postprocessor for setting up the inputs.
- ◆ It performs fast computations, while greatly reducing the possibility of errors in the input.
- ◆ It can be used to predict the pollutant spread to analyse the impact of pollutants into water.

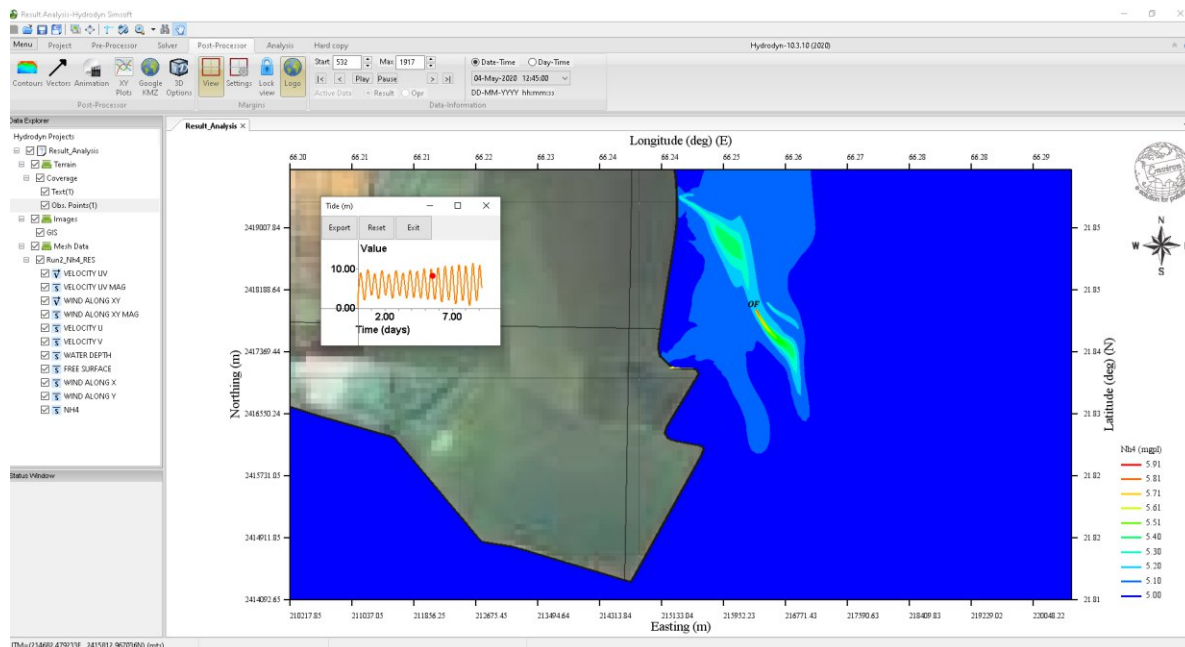
Some of the core features are mentioned below

- ◆ 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
- ◆ Finite Element Method solving technics which involves fast computation and produces more accurate results
- ◆ Displays the contours, vectors while simulation goes on, saving the flow and water quality result
- ◆ 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 water quality parameter dispersion
- ◆ Producing animation of velocity contours and vectors

SOFTWARE APPLICATIONS

Hydrodyn-AIRSOFT covers the following model applications

- ◆ Either as a real-time basis to predict the effluent dispersion or as a scenario model to analyse the possible impact on marines
- ◆ 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 effluent dispersion
- ◆ 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 etc
- ◆ Resource management
- ◆ Environmental impact assessments
- ◆ Protection and prevention strategies
- ◆ Environmental Audits
- ◆ Training courses
- ◆ 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 flow

STMSOFT : Simulation of Solute transport, Biodegradation, chemical Reaction processes in Ground Water flow system

NSPSOFT : Simulation of Noise Pollution

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

SEDOSOFT : Simulation of Cohesive and non- Cohesive Sediment Transport

AHDSOFT : Analysis of Hydrographic Data For Tidal Management Practice

LIBSOFT : Library Management System

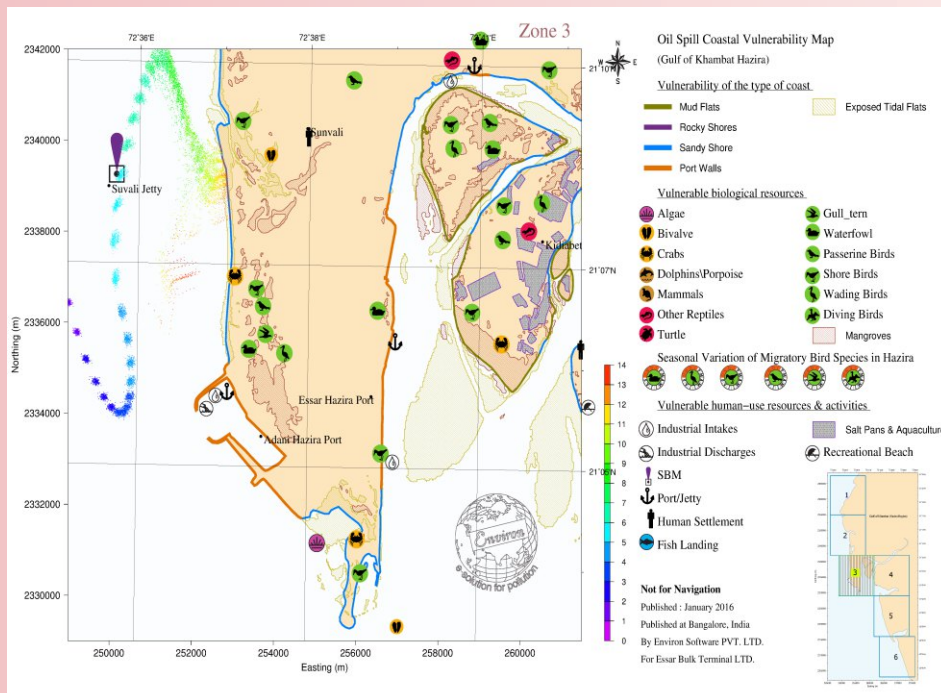
e-Institute : institutional Management System Software

e-Breeze : Office Automation Software

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- ❖ Adani Port Limited, Hazira
- ❖ Bharat Petroleum Corporation Limited, Mumbai.
- ❖ British Gas Mumbai
- ❖ Cairn India Limited, Noida
- ❖ Cairn Lanka Pvt Ltd (CLPL), Sri Lanka
- ❖ Chennai Petroleum Corporation Ltd., Chennai
- ❖ Coastal Energen Pvt Ltd (Energen), Chennai
- ❖ Department of Ocean Development (DOD), Chennai
- ❖ Dhabol Power Corporation, Dhabol
- ❖ DMCC Oil Terminals (Navalakh) limited, Gujarat
- ❖ Dubai port, Mina, Jabal Ali, United Arab Emirates
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- ❖ IOCL, Port Blair, Andaman, Kolkata
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- ❖ IPSHEM, Oil and Natural Gas Commission(ONGC), GOA
- ❖ Indian Oil Corporation Limited, Pipelines Division, NOIDA
- ❖ Jindal Shipyard Limited, Mumbai
- ❖ Lift and Shift Private Limited, Mumbai
- ❖ Reliance Industries Limited, Mumbai
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