



MARINE ENVIRONMENTAL NEWSLETTER

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SSFATE (SUSPENDED SEDIMENT FATE)

THE INSIDE STORY

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The dredging of harbors and other shallow water bodies is often necessary to create deeper channels for vessel traffic. Before such operations can proceed in the United States, a regulatory review of dredging operations is required to define "environmental windows," time periods during which the dredging operation will have the lowest impact on biological resources in the area. These environmental windows are intended to protect biological resources and their habitats.

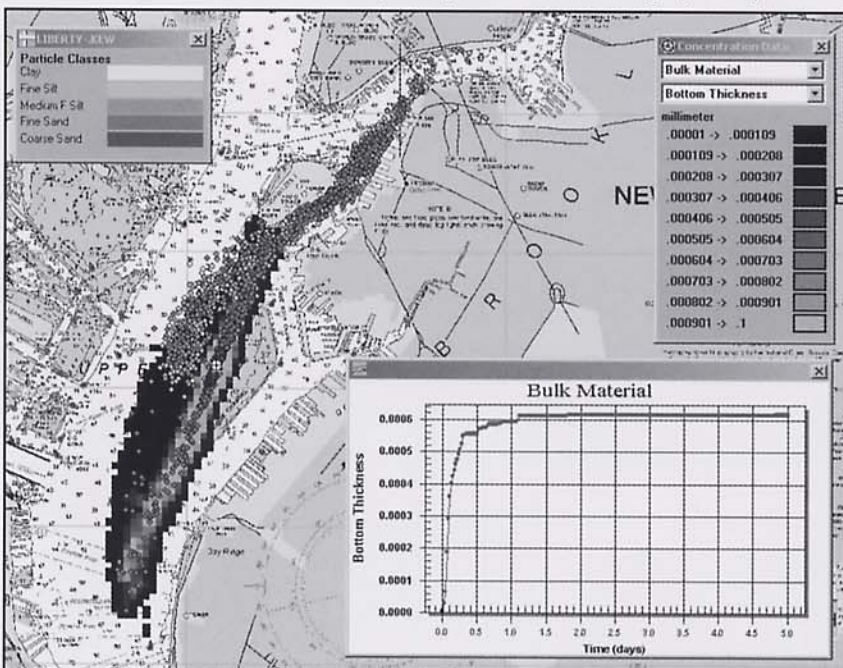
SSFATE is a system created by ASA and U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, Mississippi. SSFATE is an integrated system combining a Geographic Information System (GIS) with a computational model that predicts the transport, dispersion, and settling of suspended sediments released into the water column as a result of dredging operations. Suspended sediments are a primary concern for resource agencies, as elevated suspended sediment concentrations have a negative impact on aquatic organisms. Likewise, re-deposition of suspended sediments can be harmful to sensitive bottom-dwelling organisms (e.g., oysters or sea grasses) that are present in the vicinity of a dredging project. The effects on aquatic organisms are related to both the concentration and duration of the organisms' exposure to these concentrations.

The SSFATE system consists of a map-based user interface and Geographic Information System (GIS) similar to other ASA software, an underlying particle transport model, and animation and viewing tools. The user interface and GIS system allow the user to describe the physical environment for the model application, describe the location, timing and localized sediment distribution of dredging operations, simulate the advection of these sediments, and visualize the resultant in-water movement and on-bottom deposition of these sediments and the affected biology.

SSFATE was developed to provide ERDC with a modeling tool that can be easily customized to simulate a broad spectrum of dredging scenarios, accommodating essentially any hydrodynamic setting and most typical dredge plants. SSFATE is fully compatible with ASA's widely used oil spill model, OILMAP; water quality model, WQMAP; and mild slope equation wave model, WAVEMAP. ASA's globally re-locatable hydrodynamic model, HYDROMAP, generates reliable predictive current data quickly for any area that can easily be linked to SSFATE.

An extension of SSFATE to account for biological responses to sediments in the water column and deposited on the bottom is now under testing. A calibration effort will be undertaken this fall in the Providence River, in concert with federal and local environmental agencies.

Sample output from SSFATE using HydroMap currents.



ASA at ECM7

The 7th International Conference on Estuarine and Coastal Modeling (ECM7) was held 5-7 November 2001 at the Tradewinds Sirata Beach Resort Hotel, St. Pete Beach, Florida. The focus of the conference was on the application of numerical models to solve engineering and environmental assessment problems. A total of 107 papers were presented in 28 breakout sessions during the conference. The presentation topics covered the development, testing, application, calibration, and verification of hydrodynamic, sediment transport, water quality, and wave models and forecast/nowcast systems for estuarine and coastal waters.

The ECM7 Conference had an attendance of 151, including 50 participants from 12 foreign countries, and ASA was well represented.

★ **Malcolm Spaulding** continued to serve as conference co-chair, as he has since its inception in 1989. He also was session moderator for the Innovative Computational Techniques session and presented *An Integrated System for Real-Time Observation, Modeling and Data Distribution for Shelf, Coastal Sea and Estuarine Waters*, co-authored by Thomas Opishinski, University of Rhode Island.

★ **Craig Swanson** was session moderator for the Hydrodynamic Modeling of the Coastal Ocean session and presented *Linking Landside Nutrient Loading and Water Quality Models: Application to Nantucket Waters*.

★ **Daniel Mendelsohn** was session moderator for the Water Quality Modeling of Estuaries session and presented two papers: *Development of a Water Quality Model for Northeast Estuarine Systems: Calibration and Verification using an Experimental Eutrophication Study*, co-authored by **Deborah French**, **Tatsusaburo Isaji** and **Aimee Keller** (University of Rhode Island), and *A Simplified Model for Marsh Inundation Modeling in Hydrodynamic and Water Quality Models with Application to Savannah River Estuary (GA) and Cooper River Estuary (SC)*, co-authored by **Eduardo Yassuda** (ASATM Brazil) and **Steve Peene** (TetraTech).

★ **Matthew Ward** was moderator for the Water Quality of Modeling of Estuaries session and presented *A Nowcast/Forecast System of Circulation Dynamics for Narragansett Bay*, co-authored by **Malcolm Spaulding**.

★ **Tatsusaburo Isaji** presented *A Stepwise-Continuous-Variable-Rectangular Grid*, co-authored by **Eric Anderson**, **Eoin Howlett** and **Colleen Dalton**.

★ **Hyun-Sook Kim** presented *A Model Application to Double Flood Phenomena in Shallower Waters*, co-authored by **Craig Swanson**.

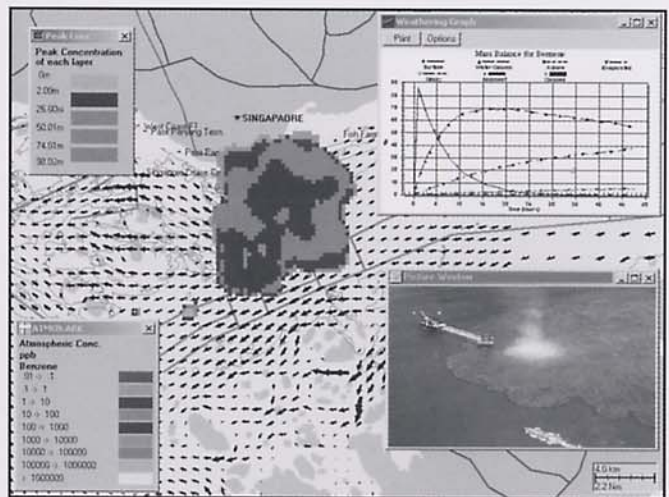
★ **S. Sankaranarayanan** presented *Effect of Grid Non-Orthogonality on the Solutions of Shallow Water Equations using Boundary-Fitted Grids*.

Conference papers are currently in peer review and a conference proceeding will be distributed to the participants in late Spring 2002. The proceedings will also be available for purchase from the American Society of Civil Engineers. Planning is currently in progress for ECM8, which will be held in October or November 2003.

CHEMMAP Atmospheric Model

In the event of a chemical release, what are the possible impacts on human beings? This is the first question that teams responding to a chemical spill ask themselves. ASA's three-dimensional chemical discharge model, CHEMMAP, can help responders answer this question. CHEMMAP predicts the trajectory, fate and biological effects for a wide variety of chemical substances, including floating, sinking, soluble and insoluble chemicals and product mixtures. CHEMMAP's atmospheric dispersion model calculates the concentration of chemical in the atmosphere with time at various heights. It also calculates average exposure concentrations for the affected region that can be compared to human health criteria to determine any potential risk to humans. CHEMMAP's atmospheric model can be used in conjunction with the 3-D trajectory and fates model for water, or on its own for both water and land releases.

CHEMMAP contains ASA's embedded Geographic Information System (GIS) and a spill model that predicts the movement of chemicals on the water surface and the distribution of chemicals in the surrounding environment. The spill model relies on environmental data such as wind and currents, physical data such as the proximity of shorelines, and chemical data. The extensive chemical database contained within CHEMMAP provides physical, chemical, toxicity and human health data for over 900 chemicals. Recently CHEMMAP has also incorporated data from ChemWatch, which provides the CHEMMAP user with access to ChemWatch's large database of Material Safety Data Sheets (MSDS) for more than 40,000 pure substances and 75,000 common mixtures.



Atmospheric concentrations for benzene predicted by CHEMMAP.



Personnel

Craig Swanson represented ASA, one of the founding corporate partners, at the Kickoff Meeting for the Rhode Island Corporate Wetlands Restoration Partnership held in Providence on 22 October. This partnership among public and private sector organizations is dedicated to the restoration of degraded wetlands around the state. ASA will contribute staff resources to help in the analysis of alternatives to increase circulation and flushing in these ecologically important areas.



On 6-8 November, **Deborah French McCay**, assisted by **Eduardo Yassuda**, provided technical training on ASA's oil spill impact model SIMAP to Petrobras scientists in Rio de Janeiro. Petrobras, assisted by ASA, will develop databases covering Guanabara Bay for input to the model and enable Petrobras scientists to evaluate impacts of real and hypothetical spills. The photo above shows (left to right) Maria de Fatima Guadalupe Meniconi, Talita de Azevedo Aguiaro Pereira, **Deborah French McCay**, Cristina Bentz, and Eduardo Yassuda unwinding after the course.



Colleen Dalton and **Roddy Thomas** delivered and provided training on the latest version of OILMAP to the Isle of Man Coast Guard, 28-29 November. Working closely with the UK mainland, the Isle of Man Coast Guard is responsible for oil spills in their waters. They use OILMAP and its British Admiralty Raster Charts viewing capabilities for their response and contingency planning.

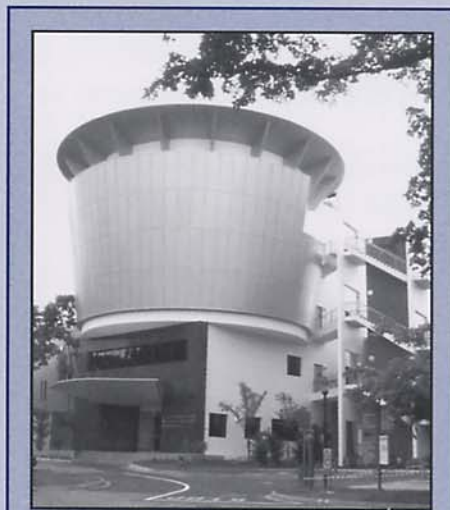


The week of October 22, **Deborah French McCay**, **Chris Galagan** and **Nicole Whittier** provided Minerals Management Service (New Orleans and Headquarters) staff with training on ASA's two spill models: SIMAP for oil and CHEMMAP of chemicals. MMS worked with oil and chemical fates and effects models in hindcast and probabilistic mode. Database tools, including importing GIS data, were also described during the training. Thus, it was a busy week for all involved!

On 13 November, **Deborah French McCay** presented a paper entitled: "Probabilistic Modeling to Evaluate Ecological Consequences of Chemical Spills in the Gulf of Mexico" at the 22nd Annual Meeting of the Society of Toxicology and Chemistry (SETAC). This analysis was performed with ASA's chemical spill model CHEMMAP.



Nicole Whittier and **Colleen Dalton** attended the EPA Chemical Emergency Preparedness and Prevention Conference held in Baltimore on 10 - 12 December. They demonstrated CHEMMAP as a response and contingency planning tool for both marine and land-based chemical releases.

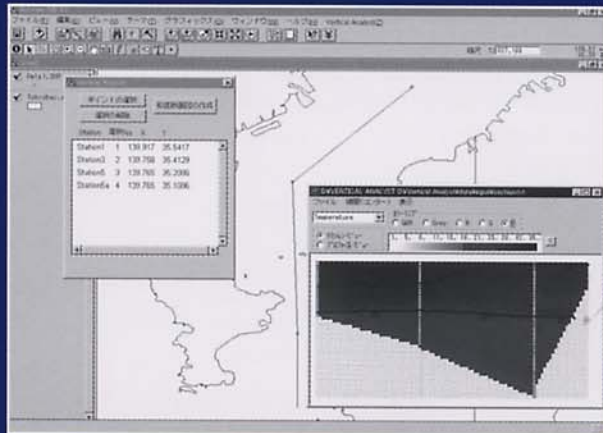


MPA's new Integrated Simulation Centre (ISC) in Singapore, home of ASA's Crisis Management Simulator software.

Vertical Analyst

Vertical Analyst is a new extension for Arcview developed by ASA and Science and Technology of Japan. This visualization tool allows users to examine the 3-D nature of various water bodies (rivers, lakes and oceans) within seconds for anywhere in the world. The user imports measured profiled data such as temperature, density, and salinity as a function of depth and then selects sites of interest using the mouse. An interpolation routine creates a cross section of the selected sites. Vertical Analyst is available in both English and Japanese.

Japanese version of the Vertical Analyst shows a vertical temperature profile.



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New Faces

ASA is pleased to welcome several new faces to our offices in Rhode Island and Brasil.

Jill Jennings joined ASA as a Scientist in December 2001. Originally from Michigan, Jill received her Masters of Science in Marine Biology from the University of Charleston in Charleston, South Carolina in November 2001, and her Bachelor of Arts from DePauw University in



Greencastle, Indiana in May 1996. Her Master's thesis was on the abundance, biomass and diversity of fishes on the continental shelf and upper slope of the southeastern Atlantic coast of the U.S., and included analyzing thirty years of fishery-independent data using GIS and statistics. She will primarily be working with Debbie French McCay on the biological aspects of SIMAP, and has begun reviewing bird restoration/scaling procedures to be applied to San Francisco Bay.



Holly Palaia is ASA's new office manager. Holly comes to us from Otis Elevator Co. of Providence, Rhode Island. She has recently relocated from Bristol, CT to the village of Wickford, RI, fulfilling a long-time dream of living by the ocean.



In addition to Eduardo Yassuda, the ASATM Brasil Team has five new members (2 Ph.D.'s, 1 Ph.D. Candidate, and 2 M.Sc.'s, all in the field of Oceanography and Coastal & Oceanographic Engineering). From left to right in the photo above: José Edson Pereira, Leandro Calado, Marco Antonio Correa, Hemerson Tonin, and Eduardo. Not shown is Andrea Gallo Xavier, who is working in Rio de Janeiro, where she is also finishing her Ph.D. at the COPPE/UFRJ University.



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Dredging photo on page 1 courtesy US Army Corps of Engineers

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