

Marine Environmental Technology

Oceanography

-a new contribution to our activity



The oceanography activity of SINTEF has become a part of the Marine Environmental Technology from 1 October 2004. The activity was earlier organised within SINTEF Fisheries and Aquaculture. Addressing almost the same market area, it was decided that the Marine Environmental Technology would be a better arena for the oceanography activity. It is therefore a pleasure for us to offer our customers measurements, analyses, modelling and reputable expertise also within physical oceanography.

State-of-the-art instrumentation is used for oceanographic data collection, including:

- Acoustic Doppler Current Profilers (ADCP)
- Aquadopps
- RCM-7, 8 and 9
- Directional wave buoys
- Waveriders
- Wave and Tide recorders
- High precision CTD profilers
- Weather stations

Oceanographic data acquisition and analysis

Data acquisition programmes are carried out to establish physical environment data bases for regulatory applications, short and long-term predictions of the ocean climate, risk assessments and for the design and operation of ships and offshore installations. Over the last two decades SINTEF's oceanographers have observed the ocean climate worldwide, ranging from tropical to arctic waters.

Ocean Mapping and Analyses

An array of custom-made time series analysis packages, statistical analysis packages and related programs are available:

- Extreme value analysis
- Duration analysis
- Harmonic analysis
- Wave analysis

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SINTEF performing ocean current measurements offshore Nigeria



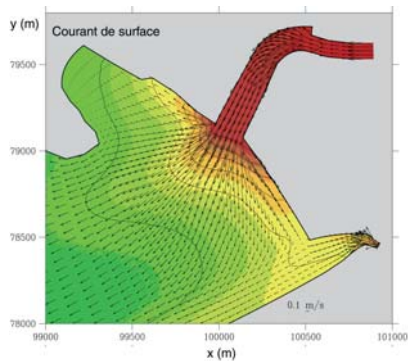
- Oceanography:**
- Current
 - Waves
 - Tides
 - Sea level
 - Wind
 - Salinity
 - Temperature

Oceanography, a new contribution to our activity

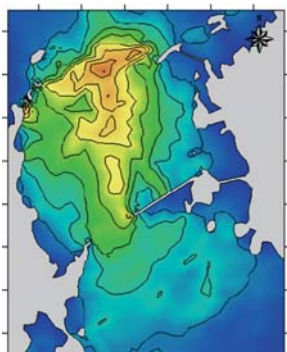
Numerical models

We possess numerical models to cover most needs within ocean and coastal engineering, including shallow water wave transformation models, 3-D baroclinic current models and 3-D (turbulent) wind models. The models are expanded with modules that cover engineering applications such as spreading and dilution of effluent discharge, wave agitation, dredging and reclamation, erosion and sediment transport.

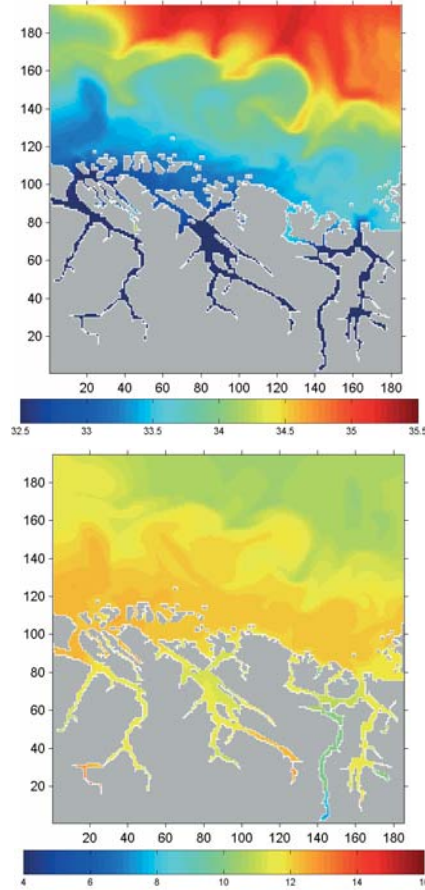
GeoSim is a complete 3 D baroclinic current model developed to study ocean currents and transport of matter in the coastal area. *GeoSim* is based on finite elements well suited for complex topography as the Norwegian coast and fjords. *GeoSim* includes all driving forces for ocean currents as wind, tides and pressure gradients. The model also includes all steering agents as topography, stratification, friction and the earth's rotation.



Modelling river discharge and estuarine circulation (*GeoSim*)



Left: Modelling the flow through a sound, and the impact of jetties, with the finite element model *GeoSim*



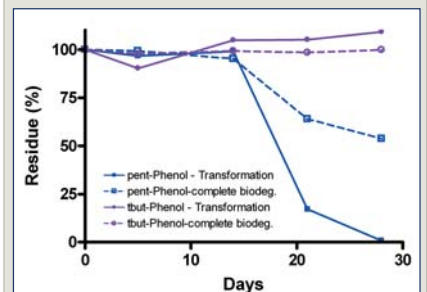
Modelling sea surface salinity (above) and temperature (below) off the west coast of Norway (*SinMod*)

Another SINTEF-developed 3-D current model is the hydrostatic pressure, finite difference model *SinMod*. It solves the Reynolds averaged Navier-Stokes equations and transport equations for salt and temperature. The turbulence closure is algebraic, with stratification effects on the vertical dispersion. *SinMod* is well suited for more global simulations of the ocean circulation.

Biodegradation of alkylphenols in seawater

Alkylphenols (AP) discharged to marine recipients have been associated with various impacts in marine organisms, like induction of ovotestis in male fish, and laboratory studies have shown AP bioconcentration factors of 100-200 in Atlantic cod.

We have previously studied marine biodegradation potentials of phenol and C₁-C₄ phenols (with alkyl chains of 1-4 carbons) in laboratory experiments. In a recent study sponsored by the Norwegian Oil Industry Association (OLF) biodegradation of 30 alkylphenols (C₁-C₉) in oils and produced waters were investigated. When phenols occurring naturally in the oil were analysed biotransformation rates generally decreased with increasing degree of alkylation, showing half-lives ranging from less than 1 week up to several weeks. A study with pure alkylphenols showed that phenols with linear alkylation were biodegraded more rapidly than phenols with a branched alkylation



Biotransformation and complete biodegradation (biological oxygen consumption) of linear pentyl phenol and branched tert-butyl (tbut) phenol in seawater.

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IMEMS 2004

7th International Marine Environmental Modelling Seminar

Washington D.C. 19-21 October, 2004

Environmental Modelling for Management of Coastal Waters Impact Assessment, Resource Management, and Mitigation

SINTEF initiated the first IMEMS in Trondheim, Norway in 1994, with more recent meetings being held in Lillehammer, Athens, New Orleans, and again in Trondheim in 2002. IMEMS 2004 was held at the Washington Plaza Hotel in downtown Washington D.C. The U.S. Minerals Management Service (MMS) contributed significant support in terms of economics, planning and execution. Dr. James Price of MMS co-chaired the meeting with Mark Reed of SINTEF. Additional support came from Total E&P Norge AS, and SINTEF Materials and Chemistry, Division of Marine Environmental Technology.

The primary purpose of IMEMS is to bring together marine environmental scientists and managers from academic, research, industry, and government organizations to share information and concepts across national as well as disciplinary and technical boundaries. Bringing model developers and users together helps to achieve a common understanding of present and future capabilities, needs, and limitations. The meeting is a forum for presentation of analysis tools and concepts, exchange of ideas, and technology transfer, and has proven to be of interest to environmental managers, researchers, students, and consultants.

A second goal of IMEMS is the wider dissemination of information presented at the meetings. Proceedings have been published in dedicated volumes of *Spill Science and Technology Bulletin*, *Marine Pollution Bulletin*, *Environmental Modelling and Software*, and the *Journal of Marine Systems*.

IMEMS 2004 focused on concepts and tools to support better environmental management in coastal waters, with emphasis on North America.

For a brief pictorial report on the previous meetings, see <http://www.sintef.no/units/chem/environment/kalender.htm>

The meeting started with the traditional reception on the evening of the 18th, with a technical session in plenum on Coupled Model Systems starting the following morning. On Wednesday there were three parallel sessions, followed by the seminar banquet. This event took place on a ship cruising on the Potomac Estuary. Parallel sessions continued Thursday morning, with closure of the seminar in the early afternoon.

IMEMS 2004 was the largest seminar in the series so far, with 110 registered participants. Funding from MMS allowed support for invited speakers, who contributed excellent presentations. Dr. Eileen Hoffman of Old Dominion University presented her work on modeling of larval transport in the Antarctic. Dr. Hans Dahling, Technical Director of EuroGOOS, talked about the status and future of operational marine environmental modelling. Dr. Antonio Baptista from the Oregon Health and Science University described a state-of-the-art coastal-margin observation and prediction system. One of the most popular talks was given in absentia by Don MacKay, Professor Emeritus at Trent University: "Fathoming Impacts on the Marine Environment, The Crucial Contribution of Modelling".

SINTEF would like to thank all of the speakers, as well as the meeting sponsors, for making this another successful event.

IMEMS 2005 is destined for Helsinki in August, where the Finnish Environment Institute (SYKE) will serve as host. For more information, contact the organizer, Mark.Reed@sintef.no, or the conference secretary, May.Ditlevsen@sintef.no.

This year's sponsors:
MMS and TOTAL

Hosted by MMS



TOTAL

Initiated by:



SINTEF

We wish you all a
Merry Christmas and a Happy New Year



Mobile phones at SINTEF Materials and Chemistry

From January 1st, 2005 mobile phones will be the only way of phone communications in SINTEF Materials and Chemistry.

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