

**Workshop on Numerical Methods in Ocean Models
24-25 August 2007 – Bergen, Norway
Programme**

Thursday 23rd August: Basics

1/ Overview of equations and methods (08:00-09:30): Alistair Adcroft

08:00-08:30

Equations, Approximations and Methods in Ocean Modeling
Alistair Adcroft, Geophysical Fluid Dynamics Laboratory, Princeton, USA

08:30-09:00

Ocean Modeling, Remapping, and the ALE Method
John Dukowicz, Los Alamos National Laboratory, USA

09:00-09:30

The different flavors of Finite Element and Finite Volume discretization for oceanic flows
Mohamed Iskandarani, RSMAS/MPO, University of Miami, USA

09:30-10:00 – Break

2/ Vertical coordinates (10:00-12:00): Robert Hallberg

10:00-10:20

Overview - Inherent strengths and challenges of the various vertical coordinates used in ocean models
Robert Hallberg, Geophysical Fluid Dynamics Laboratory, Princeton, USA

10:20-10:40

Spurious diapycnal mixing in ocean models
Stephen Griffies, Geophysical Fluid Dynamics Laboratory, Princeton, USA

10:40-11:00

Issues arising from the nonlinear equation of state in isopycnal coordinate models
Robert Hallberg, Geophysical Fluid Dynamics Laboratory, Princeton, USA

11:00-11:20

Are there remaining issues precluding the use of terrain-following coordinates in global climate models?
Gokhan Danabasoglu, National Center for Atmospheric Research, Boulder, USA

11:20-11:40

Issues regarding the use of hybrid coordinates

Rainer Bleck, NASA Goddard Institute for Space Studies, Columbia University, New York, USA

-i.e., what modeling considerations give the best of the various coordinate options, and not the worst.

11:40-12:00 - Discussion

What can be done to promote a unified treatment of physical parameterizations across various vertical coordinates? -or- Further discussion of other issues from this session at the discretion of the Organizer.

12:00-13:00 - Lunch

3/ Non-rectangular structured meshes and unstructured meshes (13:00-15:00): Todd Ringler, Matthew Piggott, Eric Deleersnijder

13:00-13:30

Voronoi Tessellations for Ocean Modelling: Methods, Modes and Conservations
Todd Ringler, Los Alamos National Laboratory, USA

13:30-14:00 Unstructured meshes and adaptivity for 3D multi-scale ocean modelling
Matthew Piggott, Imperial College, London, UK

14:00-14:30 Finite element ocean modeling on unstructured 'prismatic' meshes
Laurent White, Université catholique de Louvain, Louvain-la-Neuve, Belgium

14:30-15:00 - Discussion

15:00-15:30 - Break

4/ Parameterization of physical process (15:30-18:00): Richard Greatbatch and Martin Schmidt

15:30-15:55

Diabatic effects associated with mesoscale eddies

Richard Greatbatch, Department of Oceanography, Dalhousie University, Halifax, Canada

15:55-16:20

Parameterizing eddies in ocean models: energetics, potential vorticity mixing and flow instability

David Marshall (1) and Alistair Adcroft (2)

(1) Department of Physics, University of Oxford, UK, (2) Geophysical Fluid Dynamics Laboratory Princeton, USA

16:20-16:45

Parameterizing Mesoscale Eddies with Residual and Eulerian Schemes
Geoffrey K. Vallis, Geophysical Fluid Dynamics Laboratory, Princeton, USA

16:45-17:10

The energetics of internal solitary waves and the need for parameterizations of their effects
Kevin Lamb, Department of Applied Mathematics, University of Waterloo, Canada

17:10-17:35

The vertical mixing role of surface waves in ocean circulation models
Fangli Qiao, First Institute of Oceanography, State Oceanic Administration, China

17:35-18:00

Should we really resolve eddies in the ocean component of coupled climate models?
Rüdiger Gerdes, Alfred-Wegener-Institute Bremerhaven, Germany

Friday 24th August: Applications

5/ Coastal/Regional modelling (08:00-10:30): Eric Blayo, Jarle Berntsen

08:00-08:30

Open boundary conditions
Eric Blayo, University of Grenoble, France

Coastal/regional models are partly driven by their open boundaries, and the conditions which are applied at these artificial interfaces have a strong influence on the solution:

- Mathematical point of view
- Practical aspects: which conditions? the role of external data
- Open issues

08:30-09:00

Two-way nesting
Laurent Debreu, Institut National de Recherche en Informatique et en Automatique, Saint Martin d'Herès, France

-Methods for ensuring transparent behaviour at boundaries, and conservation of mass and tracers: Technical and practical issues

Physical aspects (65mn talk + 25min discussion)

09:00-09:25

Internal physics

Jarle Berntsen (1), Alan M. Davies (2), and Jiuxing Xing (2)

(1) Universitetet i Bergen, Norway, (2) Proudman Oceanographic Laboratory, UK

The ocean physics in coastal/regional models can be somewhat different from the physics at a larger scale:

- Which particular physics has to be represented in coastal/regional models?
- Small-scale processes and their parameterization
- Interactions with topography
- Hydrostatic versus non-hydrostatic

09:25-09:45

Wetting and Drying

Leo Oey, Princeton University, USA

-The physical problem and its importance in coastal modelling; numerical methods and algorithms

09:45-10:15 - Break

10:15-10:40

Model validation

Lars Petter Roed, Norwegian Meteorological Institute, Oslo, Norway

-How shall we do it? Examples from recent exercises

10:40-11:00 - Discussion

6/ Basin and Global Models: Claus Böning, Anne Marie Treguier and Stephen Griffies

11:00-11:15

Southern Ocean Simulations with and without Eddies

Robert Hallberg, Geophysical Fluid Dynamics Laboratory, Princeton, USA

11:15-12:00

Global Eddy Simulations: what is done and what should be done

Stephen Griffies, Geophysical Fluid Dynamics Laboratory, Princeton, USA

12:00-13:00

Surface Forcing of Ocean Models Claus Böning (1) and Rüdiger Gerdes (2)

(1) IFM-GEOMAR, Universitaet Kiel, Germany (2) Alfred-Wegener-Institute Bremerhaven, Germany

13:00-14:00 - Lunch

14:00-14:15

Quantitative model-data comparisons using altimeter data: Dependency of the model skill on resolution

Thierry Penduff, Laboratoire des Ecoulements Géophysiques et Industriels, Grenoble, France

14:15-15:00

Resolving Mesoscale Eddy Spectrum: What is Needed?

Anne Marie Treguier, Laboratoire de Physique des Océans, IFREMER, Brest, France

15:00-15:30 - Break

7/ Ocean processes and inverse methods (1530-1700): Detlef Stammer

15:30-16:00

Using Ocean Data Assimilation to Estimate Transports and Processes

Detlef Stammer, Inst. fuer Meereskunde, Universitaet Hamburg, Germany

16:00-16:30

Impact of Ocean Initialization on Seasonal Forecast Skills

Magdalena Balmaseda, ECMWF, Reading, UK

16:30-17:00

Data Assimilation with HYCOM

Ashwanth Srinivasan, COAPS, Florida State Univeristy, Miami, USA

8/ Recommendations to WGOMD and LOM (1700-1730): Stephen Griffies