Early Career Researcher Support Programme

MARUM / GLOMAR Specific Knowledge Course

Advanced Ocean Modelling

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TRR 181 "Energy Transfers in Atmosphere and Ocean"

27 – 28 June 2018

Objectives

This course will give an overview over the principles of mathematical and numerical modelling of geophysical flows. We will discuss the underlying system of differential equations, classical approximation, and models from first analytical models of the North Atlantic gyre to general circulation models and the corresponding solution methods. The focus will be on ocean models.

Topics

- Stommel gyre model
- Navier-Stokes Equations in a rotating frame of reference
- material time derivative and Eulerian/Lagrangian coordinate systems
- classical approximations (hydrostatic, Boussinesq, thin-shell, quasi-geostrophic)
- Reynolds Averaging, simple models of turbulence
- General Circulation Models with "physics" packages
- Large scale waves and their solution in GCMs: Rossby waves, Kelvin waves, Poincaré waves
- solution methods (only as an overview), discretization in space and time

Methods

Mainly lecturing, if time permits we may build our own shallow water model in MATLAB or Python

Prerequisites

- Basic calculus: partial differential equations, differential operators (e.g., gradient, divergence in R^3) ,integrals
- Fundamental conservation laws of physics (momentum, energy, angular momentum, etc.)
- Prior knowledge in fluid dynamics would be helpful

Software used in the course

MATLAB
Python (latest version 3.6.5; can be downloaded from https://www.anaconda.com/download/)

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Please note:
*Participants who would like to **bring their own laptops** may do so but are responsible to make sure that the software is running properly by the beginning if the course. Thus, the software needs to be installed before the course.*
***During the course**, support can only be given for laptops provided by us.*

Location and Time

MARUM, University of Bremen, Leobener Str. 8, 28359 Bremen, Germany
MARUM I (main) building, room 2060

09.00 – 17.00 hrs.

Registration

To register for this course, please visit the course webpage.

Please note that your registration will be binding.

The registration deadline for this course is **19 June 2018**.

Any enquiries regarding the course should be addressed to early-career@marum.de.