

A Hitchhikers Guide to the Black Arts of Earth System Modelling

(‘or why you should not want to know what is in a sausage’)

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Date & Time:	February 13 & 14, 2017	9 am – 5 pm
Location:	E - 4025	
Language:	English	
POLMAR credit points:	2	
Registration:	info.polmar@awi.de	

Course content:

This 2-day introductory course provides an introduction to, and practical hands-on learning in, Earth system modelling. It will provide a chance to explore the dynamics of the Earth’s climate system as well as of global carbon and biogeochemical cycles. The course will foster a critical appreciation of the nature and limitations of climate and Earth system models in trying to understand and predict (both past and future) global change. But you will also see how numerical models can be utilized to address scientific questions, test hypotheses, and quantify past and future relationship between global carbon cycling and climate (and associated feedbacks). In particular, you will experiment with and explore: climate ice-albedo feedbacks and ‘tipping points’, ocean circulation and heat transport, impacts of fossil fuel CO₂ emissions and ocean acidification, and the primary controls on ocean carbon cycling and hence atmospheric *p*CO₂. You will also learn new computer skills and gain experience with data analysis and visualization. The cumulating objectives of the course are to develop a deeper understanding of the role and nature of feedbacks in the Earth system, provide context to the impacts of current human activities, and importantly, foster a critical appreciation of the nature and limitations of climate and Earth system modelling in understanding and predicting global change.

Day 1 – Earth system modelling for ‘newbies’*

1. Presentation – Introduction to (Earth system) modelling and cGENIE

Introduction to numerical and Earth system modelling.
Brief overview of the cGENIE model structure and use.

2. Session I – Getting started

Accessing the computing cluster; installing and compiling cGENIE; directory structure (‘where everything is’).

Command-line operation; how to submit jobs to a cluster queue. Use of ‘restart’ experiments and modelling methodologies.

Visualization of model output: time-series and time-slice (2D and 3D) output.

3. Session II – A ‘real’(!) experiment

Setting up experiments: configuration files and setting parameter values.
Exploring Earth system dynamics: ‘Snowball Earth’ and climate feedback.

4. Session III – ‘Poking the climate beast’

Applying perturbations and tracing ocean circulation.
Exploring the stability of the Atlantic meridional overturning circulation (‘AMOC’).

Day 2 – Getting your hands dirty with carbon

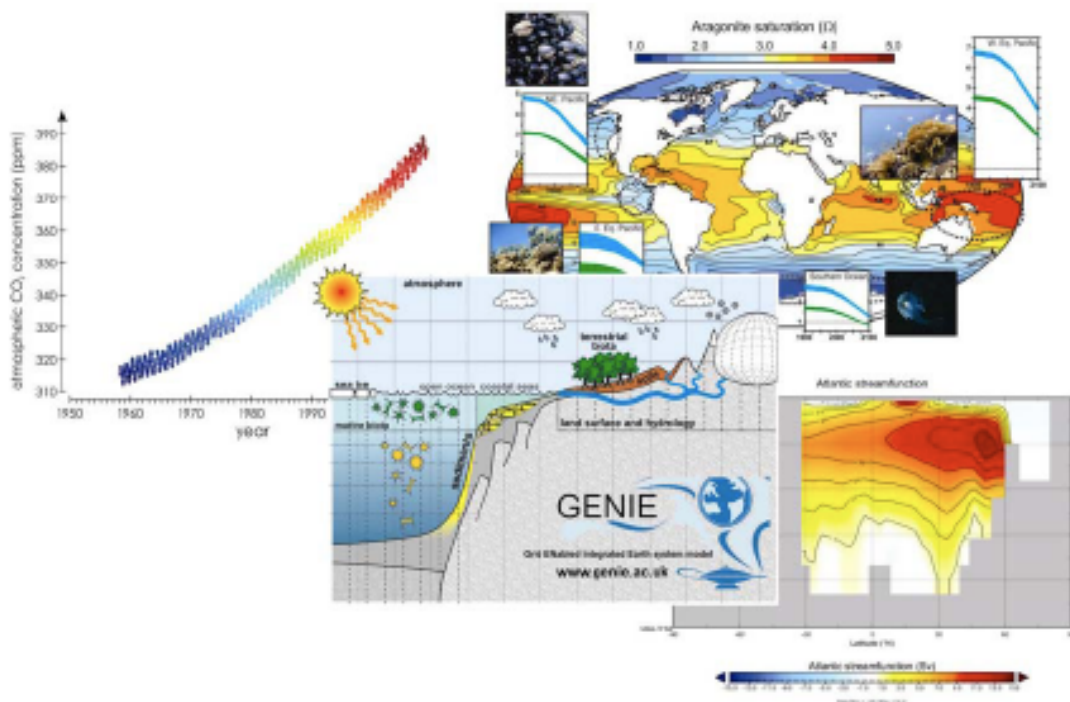
1. Presentation – Carbonate chemistry and ocean acidification

2. Session IV – Poking the carbon cycle

CO₂ emissions and the spatial patterns of ocean acidification.

3. Session V – Engineering the carbon cycle

Sensitivity of atmospheric $p\text{CO}_2$ and ocean acidification to changes in the oceans' biological pump and ‘weathering’.



Target group:

Anybody interested in the topic!

More information: andy@seao2.org

<http://www.seao2.info/index.html>

Our courses are generally free of charge for all participants. However, they do have a price and can cost POLMAR as much as 150 € per day per student. Please take this into account when cancelling your place at the last minute.
