

Dynamics II

Prof. Gerrit Lohmann & Paul Gierz

Course Information

Course Description

The focus of the course is to identify the underlying dynamics for the atmosphere-ocean system. This is done through theory, numerical models, and statistical data analysis. It has been recognized that the atmospheric and oceanic flow binds together the interactions between the biosphere, hydrosphere, lithosphere and atmosphere that control the planetary environment. The fundamental concepts of atmosphere-ocean flow, energetics, vorticity, wave motion are described. This includes atmospheric wave motion, extratropical synoptic scale systems, the oceanic wind driven and thermohaline circulation. These phenomena are described using the dynamical equations, observational and proxy data, as well basic physical and mathematical concepts. Practicals complement the lessons. Some specific aspects examined will be:

- Ocean Circulation
- Atmospheric dynamics and related teleconnection patterns
- Climate variability patterns
- Reconstruction of climate, instrumental, and proxy data
- Dynamical concepts for climate dynamics: Bifurcations, Feedback analysis
- Instabilities in the atmosphere-ocean system and the dynamics of waves
- Statistical approach of fluid dynamics
- Fundamental models

Lecture

Instructor	Professor Gerrit Lohmann
email	<code>gerrit.lohmann@awi.de</code>
Lecture	M. 14 ⁰⁰ – 16 ⁰⁰ NW1, Room S3121

Tutorial

TA	Paul Gierz
email	<code>paul.gierz@awi.de</code>
“Office” Hours	M. 10 ⁰⁰ – 12 ⁰⁰ Study Room next to Café Quark
Discussion & Tutorial	16 ⁰⁰ – 17 ⁰⁰ NW1, Room S3121

Exercises

There will be homework exercises throughout the semester:

May 5 Ex. 1

May 12 Ex. 2, Ex. 1 collected

May 19 Ex. 3, Ex. 2 collected, Ex. 1 discussed

May 26 Ex. 4, Ex. 3 collected, Ex. 2 discussed

June 2 Ex. 5, Ex. 4 collected, Ex. 3 discussed

June 16 Ex. 6, Ex. 5 collected, Ex. 4 discussed

June 23 Ex. 7, Ex. 6 collected, Ex. 5 discussed

June 30 Ex. 8, Ex. 7 collected, Ex. 6 discussed

July 7 Ex. 9, Ex. 8 collected, Ex. 7 discussed

July 14 Ex. 9 collected, Ex. 8 discussed

July 21 Ex. 9 discussed, General Questions and Exam Preparation

Practicals

There will be several practical computer exercises during the semester:

May 12 R Crash Course

May 26 PaLib

June 23 PaLib Continued, Climate-Box-Model, Waves

June 30 Brownian Motion

Exam

The exam is based on the problems from Ex. 1-9 as well as the lecture material. 20% of final grade based on Exercises, 80% on the exam.

Date (Tentative): July 29, 10⁰⁰ – 12⁰⁰

Resources

Course Website:

[http://www.paleodyn.net/
dynamics.html](http://www.paleodyn.net/dynamics.html)



Homework and Codes:

[https://github.com/
pgierz/Dynamics2](https://github.com/pgierz/Dynamics2)

