

# 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 <sup>00</sup> – 16 <sup>00</sup> NW1, Room S3121

## Tutorial

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

## 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)

