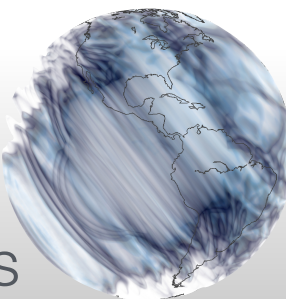
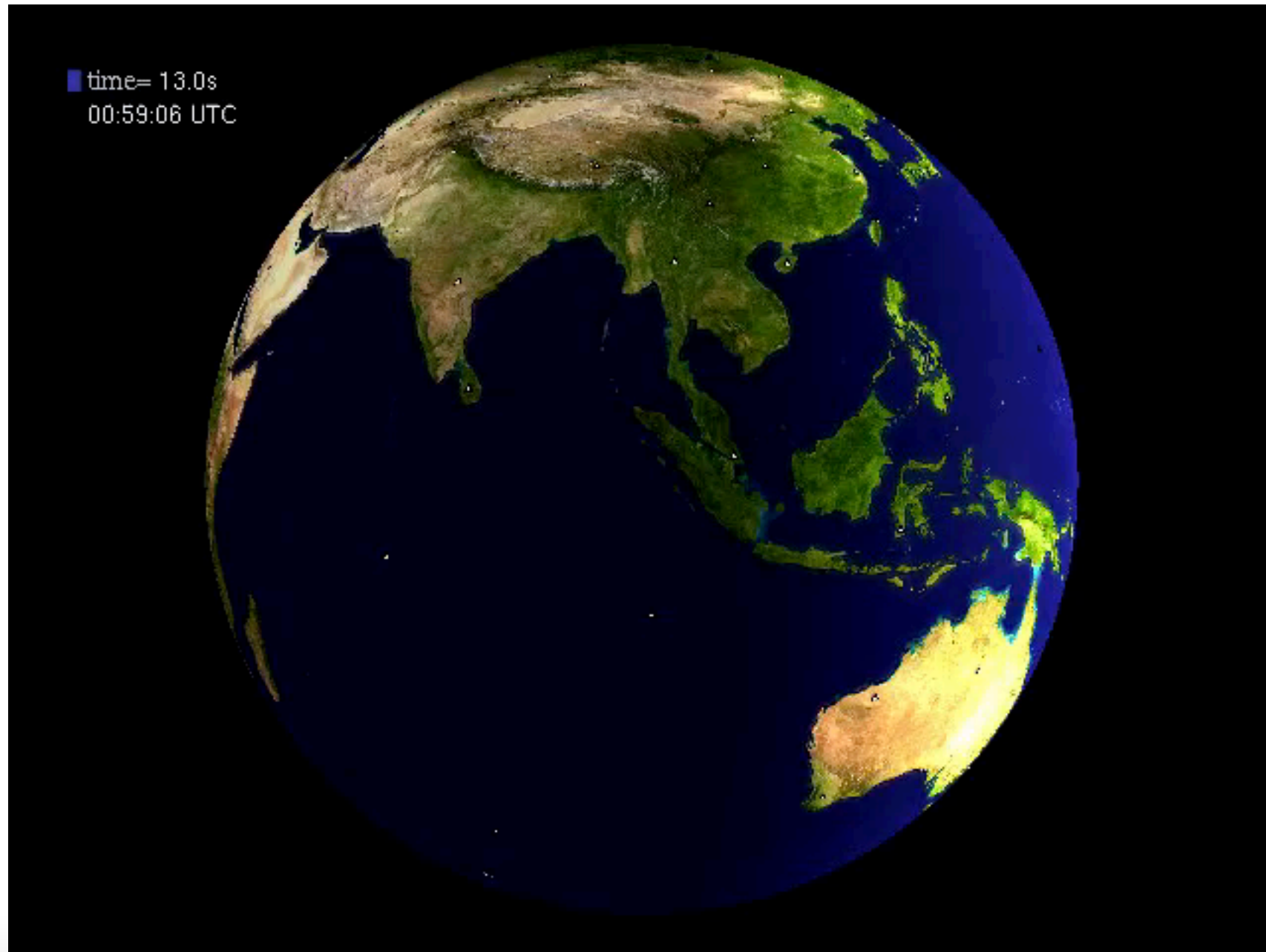


# Computational Geophysics

## ErSE 326



# Computational Geophysics - ErSE 326

Fall Semester 2020

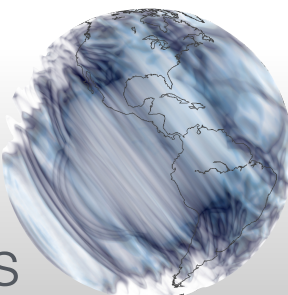
- Lectures:**
- This class will be given as a full semester course
  - Language of instruction: English
  - Wed/Thu, 8:30 – 10:00, remote teaching
  - Lecture material available

**Objectives:**

An introduction to finite-difference, pseudo-spectral, finite-element, and spectral-element methods will be presented and applied to basic geophysical problems including heat flow and wave propagation. The course offers hands-on lab experience in numerically solving partial differential equations relevant to geophysics.

*Students will acquire the skills to program different numerical methods relevant for solving geophysical problems, in particular for heat flow and wave propagation.*

**Instructor:** Daniel Peter  
Building 1, Office #0146  
[daniel.peter@kaust.edu.sa](mailto:daniel.peter@kaust.edu.sa)

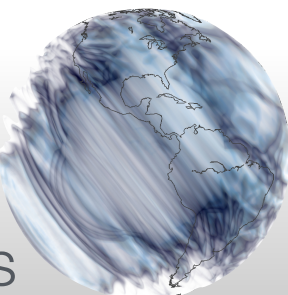


# Computational Geophysics - ErSE 326

Fall Semester 2020

## **Schedule:** (tentative)

- week 1 Introduction to conservation laws for heat flow and wave propagation
- week 2 Finite-differences method for heat flow
- week 3 Finite-differences method for wave propagation
- week 4 Higher-order Finite-differences method for tsunami waves
- week 5 Introduction to Pseudo-spectral method
- week 6 Pseudo-spectral method for wave propagation
- week 7 Introduction to Finite-element method
- week 8 Finite-element method for steady-state heat flow
- week 9 Finite-element method for unsteady-state heat flow
- week 10 Introduction to spectral-element method
- week 11 Spectral-element method for heat flow
- week 12 Spectral-element method for 1D wave propagation
- week 13 Spectral-element method for 2D elastic wave propagation
- week 14 Spectral-element method for 3D viscoelastic wave propagation



# Computational Geophysics - ErSE 326

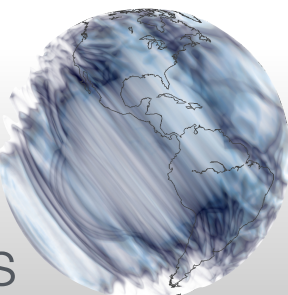
Fall Semester 2020

## **Student work:**

Hands-on programming exercises and computer lab reports

## **Requirements:**

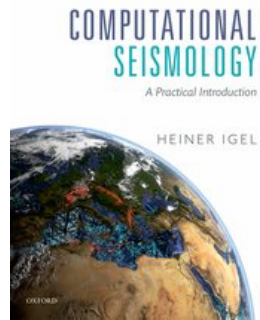
- Attendance (highly recommended)
- Grades will be given as follow:  
80% lab reports, 20% quiz(zes)



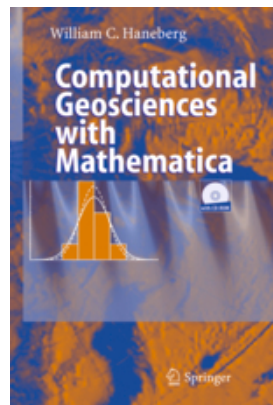
# Computational Geophysics - ErSE 326

Fall Semester 2020

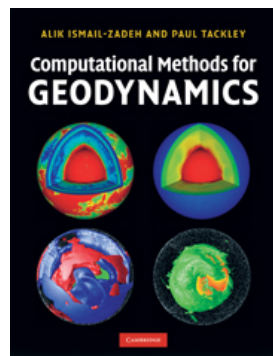
## Reading material:



**Igel, H.** *Computational Seismology*  
Oxford Press University, 2016.



**Haneberg, W.** *Computational Geosciences with Mathematica*  
Springer, 2004.



**Ismail-Zadeh, A. & Tackley, P.** *Computational Methods for Geodynamics*  
Cambridge University Press, 2010.

