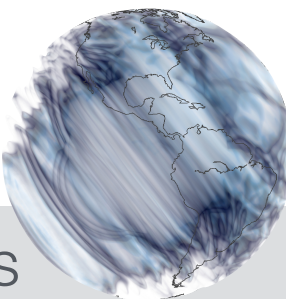
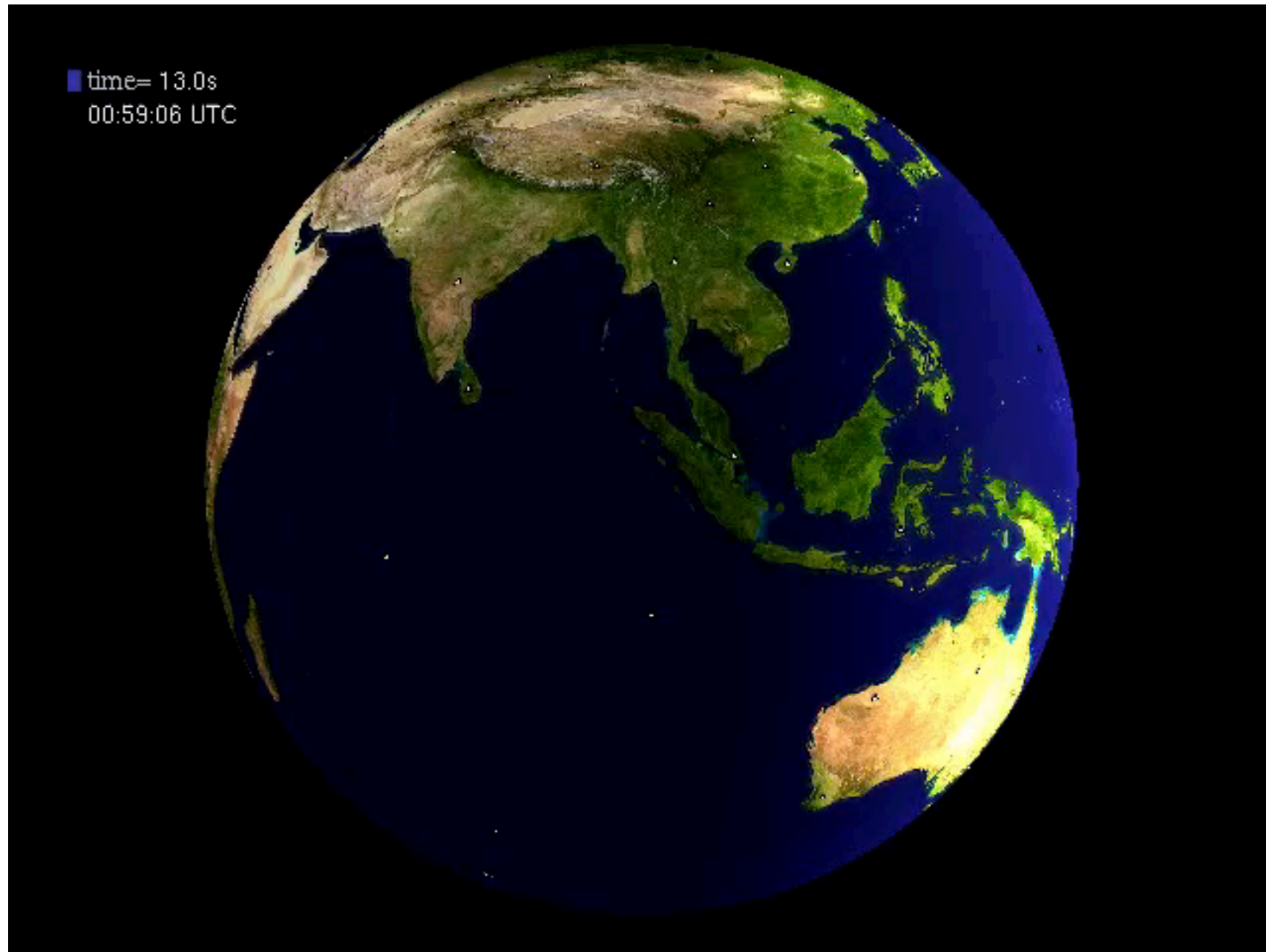


Computational Geophysics

ErSE 326



Computational Geophysics - ErSE 326

Fall Semester 2021

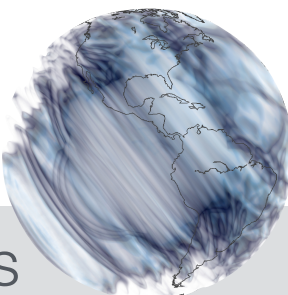
- Lectures:**
- This class will be given as a full semester course
 - Language of instruction: English
 - Wed/Thu, 8:30 – 10:00
 - Lecture material available

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

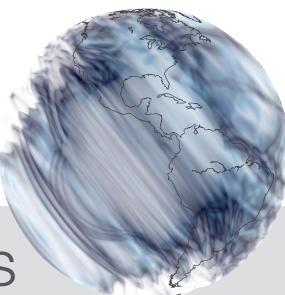


Computational Geophysics - ErSE 326

Fall Semester 2021

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 3D elastic wave propagation
- week 14 Physics-based ground shaking simulations



Computational Geophysics - ErSE 326

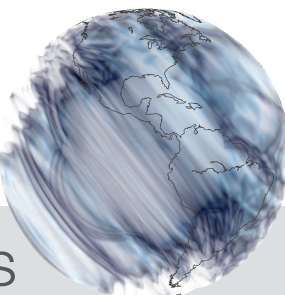
Fall Semester 2021

Student work:

Hands-on programming exercises and computer lab reports

Requirements:

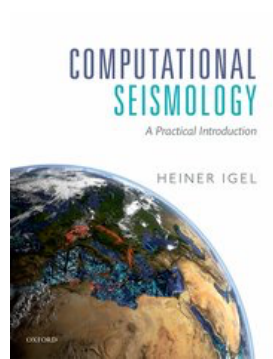
- Attendance (highly recommended)
- Grades will be given as follow:
80% lab reports, 20% quiz(zes)



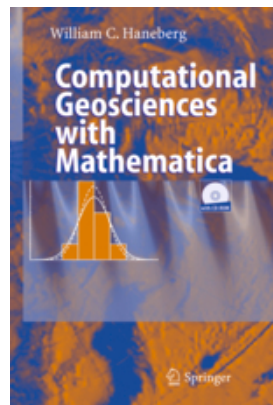
Computational Geophysics - ErSE 326

Fall Semester 2021

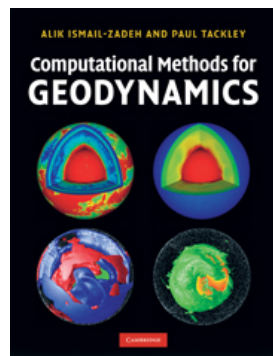
Reading material:



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.

