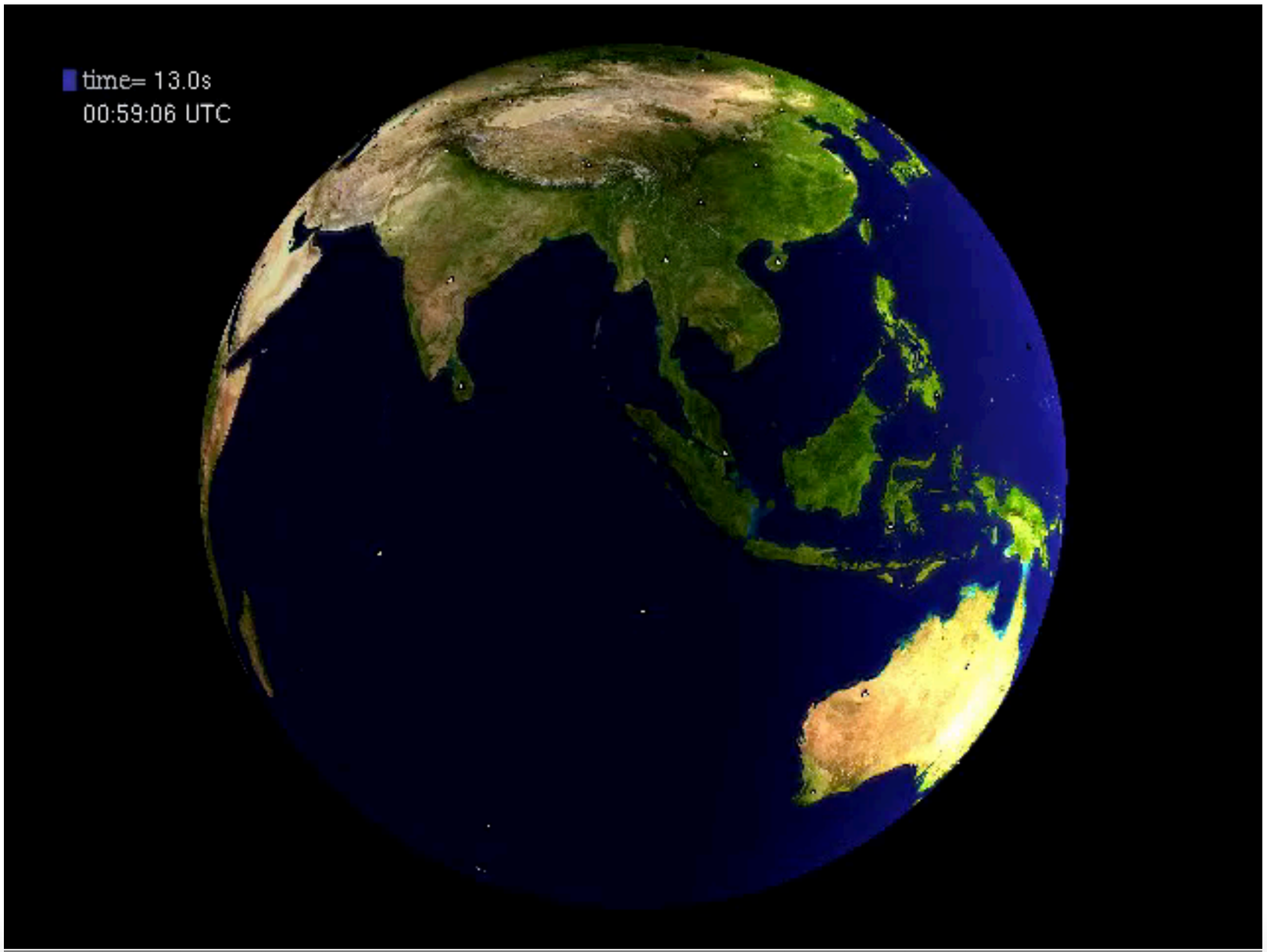
# Computational Geophysics
# ErSE 390C



# Computational Geophysics - ErSE 390C

**Fall Semester 2016**

**Lectures**: - This class will be given as a full semester course
- Language of instruction: English
- Mon/Wed, 10:30 – 12:00, building 9, room 4137
- 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 progagation.*

**Instructor**: Daniel Peter
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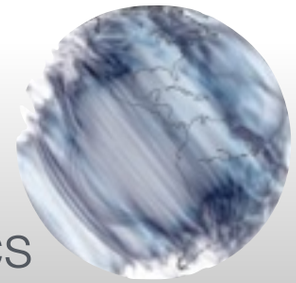
daniel.peter@kaust.edu.sa



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**Fall Semester 2016**

**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

- No classes - Eid Al-Adha break

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

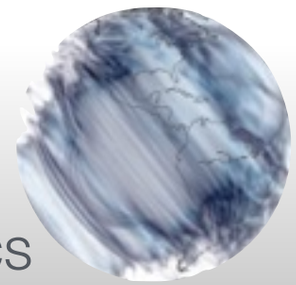
- No classes - semester break

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



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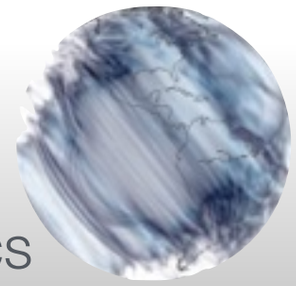
**Student work**:

Hands-on programming exercises and computer lab reports

**Requirements**:

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



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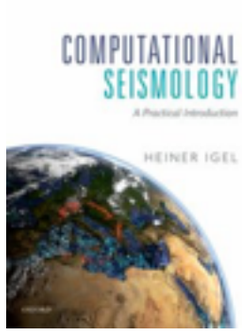
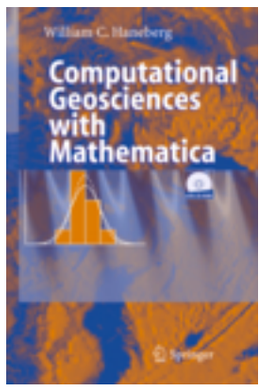
Fall Semester 2016

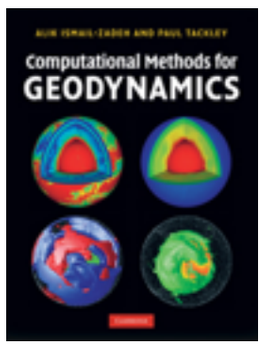
## Reading material:




**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.