Zygmunt Kowalik

A new course on

Tsunami Waves: Calculation and Physics

(Summer semester, 2009; 3credits)

The main purpose of this course is to learn basic relations between tsunami calculations and their physics with the help of numerical solutions. The learning process aims at understanding tsunami physics through the computation of generation, propagation and runup for the historical tsunami around Alaska.

Basic topics to be considered:

Section 1. Tsunami Generation

- 1a. Generation by earthquakes
- 1b. Generation by nonseismic sources

Section 2. Tsunami Propagation

- 2a. Propagation in the open ocean
- 2b. Tsunami energy scattering
- 2c. trapping tsunami energy

Section 3. Coastal Problems

- 3a. Tsunami runup
- 3b. Tsunami amplification due to resonance in the local water bodies

Section 4. Methods of Tsunami Calculations

- 4a. Numerical methods based on the finite difference approximation of equations of motion and continuity
- 4b. Two-dimensional solutions based on the vertically integrated equations
- 4c. Solutions of three-dimensional problems

Basic requirements: a. Introductory course to physical oceanography or fluid dynamics, b. Understanding partial differential equations, and c. Understanding FORTRAN or similar programming language.

Additional information on topics and problems solved in this course can be gleaned from the tsunami group website: http://www.sfos.uaf.edu/tsunami/

The learning process will include: a) literature study and b) computer programming techniques for tsunami models.

Course time will be mainly dedicated to the practical projects for the real hands-on experience in applying numerical methods for the tsunami generation/propagation/runup processes. Students will be evaluated through the practical projects and these projects will be graded.