Topics Seismology

- Definition of strain, units
- Connection between displacement and strain, crustal deformation
- Meaning of trace
- Plane wave equation
- Strain estimation from plane waves
- C = ω/k = λ/T meaning, examples
- Displacement, velocity, acceleration (time derivatives)
- Curl of displacement
- Definition of stress, physical units
- Stress as force per area
- Values of stress inside the earth
- Traction vector, surface normal, stress on faults (normal, parallel)
- Stress-strain relation, generalized Hooke's law
- Isotropic definition of stress-strain, λ and μ
- Definition of P and S velocity, values in crust, mantle; density
- The acoustic (scalar) wave equation, plane waves, solution
- Geometrical divergence, origin of 1/r decay
- Transmission, reflection coefficients, meaning
- AVO, AVA what does it stand for, why is it important, applications?
- Surface waves, dispersion of L/R waves in homogeneous half space or layered half space
- Dispersion characteristics, why are long periods faster?
- Concept of depth-dependent sensitivity (i.e., frequency dependence)
- How can dispersion curve be derived from observations?
- What is the polarization of L and R waves?
- What are the characteristics of R wave polarizations?
- Which wave types are contained on the ocean generated wave fields at around 5s period?
- Which mathematical operation can be used to exploit ocean generated noise?
- What is this operation usually used for?
- What is the result, when noise between two stations is correlated and stacked?
- Why is this so useful, what are applications?
- What is the physical model of an earthquake point source (graphically)
- What is the radiation pattern of the P-wave of such a source?
- What is the connection between the P-wave radiation pattern and the "beachball" representation of an earthquake source mechanism?
- What are the three basic source types and how are they called?
- What are the tectonic characteristics of areas corresponding to the basic source types?
- What are two regional examples for these basic types?
- What is the definition of the seismic moment, what is the meaning of the terms?
- What are the physical units of the seismic moment?
- What is the connection between seismic moment and magnitude?
- What is responsible for the "energy" or "size" of an earthquake?
- What is the energy ratio between two earthquake magnitude units (e.g., M5 to M4)? $log_{10}E = 4.8 + 1.5M$, here E is energy in J, M is magnitude