

Comprehensive questions: Grand challenges in Earth Sciences and the role of data analysis

Please browse/read the IRIS document on Grand Challenges. Write a few bullet points per questions for discussions during the lectures.

1. What are some of the key issues involved with the problems of earthquake-induced **strong ground motions**, what needs to be done to better forecast strong ground motions?
2. What are the most damaging **wave types** after large earthquakes? Do you know what was so special about the earthquake that destroyed Mexico City in 1985?
3. What type of information from seismograms is used usually to obtain **tomographic images** of the subsurface? What physical properties of the Earth's interior can be imaged? How does seismic tomography compare with medical tomography? What strategies are possible to make the images of the Earth's interior sharper?
4. Visit the following www sites and explore their content:
 - neic.usgs.gov
 - www.iris.edu
 - www.usarray.org
 - www.emsc-csem.org
 - www.orfeus-eu.org

Describe the **missions** of the projects.

Explore the information given on recent earthquakes (e.g., the M9 earthquake in Japan March 11, or the recent local earthquake near Parma Italy, January 25, 2012. Make a table on what **information is extracted from the observed seismograms**.

5. What could be the differences, similarities between **vibrations** in a building and vibrations of the Earth?
6. Why did **permanent** seismic observations (rather than seismic event based observations) lead to a revolutionary new field in seismology?
7. Try to find information from the www sites given above on the sampling frequency of seismic observations in global networks. Estimate the **amount of data** that is collected in a day, month, year.
8. Which of the topics you read in the "Grand Challenges" do you find most **exciting** and why?