**Learning Seismic Tomography: Designing a Seismic Array**

**Summary:** Following an initial lecture on the basics of seismic tomography, students are asked to design an array of seismometers to study some feature of their choice – they then have an example that they can reflect on during more detailed lectures on seismic tomography.

**Learning goals:**

1. Give students a big-picture understanding of the subject of seismic tomography before diving into the details
2. Identify any basic misconceptions about wave propagation through the Earth, about what types of physical properties affect seismic waves, or about a particular tectonic setting prior to covering the material.

**Level:** This activity is intended to be 1) brief, 2) engaging, and 3) at a lower level – most likely an introductory geophysics course (before going through the details of seismic tomography) or an interdisciplinary workshop (where non-geophysicists are present). The idea can be adapted to cover longer time scales (week long project) or to be geared at higher levels of complexity. The activity should be quick and provides students with an example to contemplate throughout the remainder of more detailed lectures/discussions of seismic tomography.

**Structure:** The activity would have 4 parts (compressed into one class period or potentially spread out over several classes ~15-30 minutes per class)

1. Identify a feature of interest and make a “back of the envelope” design of a seismic array that will be used to resolve the feature – using some basic assumptions: straight ray paths between source & station.
2. Post-design array swap/review of other students’ seismic arrays
3. Post-review reflection (after seeing others’ arrays) where the student thinks about what she/he would do differently
4. Returning the reviews, a few more reflection questions – where student knowing the others’ comments thinks about what she/he would do differently

**Preparation:**

Prior to the activity, students must have or be taught some **basic** concepts about seismic tomography:

* a general understanding of the different types of seismic tomography and the parts of the earth through which seismic waves travel
* The seismic observables that each technique can detect (i.e. seismic velocity/attenuation) and what physical characteristics they are sensitive to (i.e. temperature, melt, composition)

Students must be given “the rules” of the chosen region:

* Tectonic setting (& possibly some suggestions for features of interest?)
* Local earthquake distribution
* Global earthquake distribution relative to the region

**Assessing Student Learning:** This activity isn’t intended to assess student learning, but rather a way for students to identify what they don’t understand yet, for students to develop their problem-solving and critical-thinking skills, creativity, etc, and for you (the instructor) to identify possible misconceptions that you can address during the following lectures.