In the Thurber et al paper they use three different tomographic inversion methods to locate a magnitude 2 earthquake which the San Andreas Fault Observatory at Depth (SAFOD) project was trying to hit with the borehole and satellite corehole. The aim was to have absolute accuracy of the hypocenter within 100m, and they did not quite reach that. They also used explosions and the vertically seismic array in the pilot hole as virtual sources to determine how accurate they could with enough information, and with that it was more accurate than the 100m.

We discussed the virtual sources, how they are more accurate because they had more information since they knew all the locations, unlike the inversions from the earthquake data where do not know where the earthquakes are as well as not knowing what the structure is. Also talked about how the point was to determine if they could ever get the accuracy they wanted if they had enough information.

We also talked about how the reason they are trying to determine the location of the earthquake so accurately is so that they can look at the material properties of the slip patch of the earthquake. We talked about how unlikely it would be to actually hit the high slip area even with the accuracy they are aiming for because the diameter of the slip patch would be small, and it is also heterogeneous, though towards the end they could also use relative positions because the borehole is seismic source while the drilling is happening.

Also mentioned how they expected to be able to tell they reached the target by the change in geology from (whatever granite) to (whatever metamorphic stuff) but it is more complicated than that.

In the Chavarria et al paper they use migration of microearthquakes detected by the vertical seismic profiling array in the SAFOD pilot hole to look at the local fault structure.

It was mentioned that the reflectors seen in the figures might not all be faults, they could also be geologic contacts.

We talked about how they expected the borehole to run into unexpected faults. According to Ramon the borehole did run into a fault that could be close to c in figure 3, as well as more faults.

It was explained how the concentric pattern seen in the figures is a relic of migrations.

The fact that the vertical array was better at seeing vertical or steep reflectors unlike most methods that see horizontal reflectors best was mentioned.

Ramon also showed us some slides about the geology, showing a geologic map and cross-sections based on the surface geology and what the borehole ran into. He talked about how it probably would have been better the geophysicists had waited until the mapping had been done before drilling the holes. He talked about how complicated the geology is, and how there are many sub-parallel faults to the active trace that have displaced a lot. They expected to know when they crossed the fault by the change in geology but it wasn't that clear at all.