Visiting two 4th grade classes
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Walt Disney Elementary School, Burbank Unified School District
two 4th grade classes of 30 students each,
Dillon Ross teacher (husband of Caltech alum Heidi Privett)

How to Locate an Earthquake and Figure out how big it is

The goal of the activity was the locate the epicenter of an earthquake and determine its magnitude (using the richter nomogram).

The students were 4th graders which was a bit young to go into much of the science but the teacher prepared them for the exercises by giving introducing them to geology and earthquakes and also how to use the scale bar on a map.

I gave a 10 minute explanation of earthquakes and asked them if they had felt any. I asked them to guess how many earthquakes we have each day and told them how in our network we get about 40 per day just for so cal.

Then I had them split into 2 groups and line up so that they could simulate the movement of the P and S waves and see which one traveled faster (they really enjoyed this).

After that they broke up into groups of 4 (there were 7 groups) and they each represented a seismic station with their own seismograms. I asked them if they would help me locate an earthquake. I pretended that I was using actual data from an event that had not been analyzed. In reality what I did was simplify seismograms to clearly show S and P arrival times and to have easy math (for example S clearly arrived at 10 seconds and P at 20 seconds, for 10 seconds difference).

On the board I had an example seismogram and I showed them how to locate the P and S waves and then how to compute the seconds difference between their arrivals. They also measured the maximum amplitude for the S wave. They did this in groups and me and the teacher went around to help. Once they had the seconds difference and amplitudes they came up as a group and used the Richter nomogram to figure out the distance from their seismic station to the epicenter and also the magnitude of their quake. They all plotted their magnitudes on the same nomogram to compare them. It was critical here to use easy numbers for distance so that they wouldn't later have a problem with the scale bar. I made sure that the distances were either 100, 150, 200, or 250 km away.

Lastly, they used the number for distance to draw circles on a large map of

southern california that I had prepared in advance with their seismic stations marked on it. This part of the activity could use some improvement because I was not prepared for their inability to do fractions or their unrefined motor skills. The students had some trouble with the scale bar in places where I had used 50 km (example: the scale was 2 inches = 100 km. The groups with 150km or 250km distance had trouble figuring out how many inches away they were, but not the groups with 100 or 200 km distance). After they figured out their inches distance they were to measure that distance on a string and then while one person held one end of the string on their seismic station the other held the string taut and drew a circle around it. This was extremely difficult for them and took way longer than I wanted. If you are going to try this activity for a similar age group make sure to use a rigid device or a compass, not a string. They can't draw and hold the string taut at the same time.

Even though the circles were far from perfect and didn't intersect exactly, the fact that there were 7 groups made identifying a rough epicenter pretty easy. I thanked them for helping me locate the earthquake and they were pretty excited about the results.

I left 10 minutes at the end to take questions and they had plenty.

One additional thing I would advise is to make sure the teacher covers the material they will need. In my situation I went to 2 classrooms, 1 with the teacher who requested the visit and the other with a teacher who asked me to visit since I was already going to be there. The second teacher didn't go over geology or earthquakes or scale bars at all before hand and I would say that the students didn't get nearly as much out of the exercise because it was just too much for me to cover. It was very chaotic in the second classroom. It was really fun and rewarding though, especially in the first classroom, because they were genuinely excited about locating an epicenter and they asked very good questions in the end.