Hi everyone. My name is Eleanor Dunn and I am a first year PhD student at the Dublin Institute for Advanced Studies. My PhD is part of the Seismological Parameters and Instrumentation international training network, or SPIN for short, which is provided funding by the European Union's Horizon 2020 research and innovation programme. My project, titled 'Ground motion and unrest triggering on volcanoes' is looking at the unique process of dynamic triggering, with my main focus being at the moment on Sierra Negra

The process of dynamic triggering has been understood for some time now. This is from a recent paper in 2018 which focused on Alaskan volcanoes. Evidence was found for 12 triggered responses at 9 volcanoes, but no evidence for triggered responses following hundreds of other earthquakes. The authors suggest that this weak link suggests that triggering susceptibility depends on time varying crustal conditions, such as the state of stress and distribution of pore pressure. The plot on the right is from Pavlof volcano which shows daily seismicity rates and rate changes for detected seismicity events. The blue lines indicate times of earthquakes of a magnitude 7-8 within 200-3000km of Pavlof and red lines are global earthquakes of magnitude greater than or equal to 8. Seismicity rates and rate changes are very low with the exception of during the time of two eruptions that occurred in the period of study, and in the days following the 2011 magnitude 9 Tohoku-Oki earthquake.

Now to move onto the specific volcano that I have been working on. Sierra Negra is a volcano in the Galapagos islands which are located to the west of Ecuador. It is an ideal natural laboratory to study dynamic triggering because of a number of reasons. Firstly it is located close to the eastern Pacific subduction zone, secondly it has a unique 'trapdoor' fault system and thirdly it experiences a cycle of deflation and inflation.

A paper was published last year by Bell et al. which posed some very strong evidence for dynamic triggering. This figure is taken from a 3-component seismometer, VCH1, following the magnitude 8.2 earthquake in Chiapas, Mexico in 2017. Peak dynamic stress which is represented here, is used to quantify the amplitude of stress perturbation based on measured ground velocities during teleseismic arrivals. Then, this figure represents all the picked locally triggered events at Sierra Negra.

What is most interesting is that this increase in locally triggered events increased leading up to the 2018 eruption before reducing after the eruption.

So now onto the first stages of my project and what I'm currently working on and why I'm working on it.

At the moment my main focus is on Sierra Negra due to the wealth of information we already have on it. I plan to use a STA/LTA algorithm to detect these triggered local events and apply this to the data we are currently getting from VCH1. To hopefully consistently monitor if there is any change in dynamic triggering levels.

I also want to locate these dynamic triggering events and see exactly where they fall around the Sierra Negra crater. Sierra Negra is quite a complex volcano with a trap-door fault system and any insight on if the triggered events occur in one particular location would be quite useful.

I also want to see where these triggered events fit into the actual triggering event. Does it fall within a compressional or dilatational period?

A bit more in the future I also want to look at other volcanoes to see if Sierra Negra is unique in its clear dynamic triggering. As I showed earlier previous volcanoes have displayed dynamic triggering behaviour but it would be interesting to see how a comparison would work.

I am using an STA/LTA algorithm here to detect the locally triggered earthquakes on Sierra Negra. As a test I am using the known dynamic triggering following the magnitude 7.5 earthquake which occurred north of Honduras. The main triggering events are successfully triggered from these red and blue lines however there are some very small events which are also detected which may just be background noise so may have to be removed.
I followed this by applying the algorithm to see if dynamic triggering occurred following the magnitude 7.3 Japanese earthquake that happened just a few months ago. Here 45 events are detected, suggesting this may not be dynamic triggering at work but a coincidental local earthquake swarm.

For the event location I will be using the single station method. I am still working on developing this. The single station method will involve rotating the current components to work out the event direction before using the p- and s-wave arrival times to configure the event distance.

For my next steps I will continue working on the event location. I also want to take my detected events and apply them to the arrivals of the triggering event and see where this fits in. For example where do these events fit into this.

Unfortunately I am unable to attend EGU this year as I am at a SPIN workshop but feel free to email me with any questions or message me on twitter. Thank you for listening.