

Using Geophysics to image the subsurface

SE Enslin

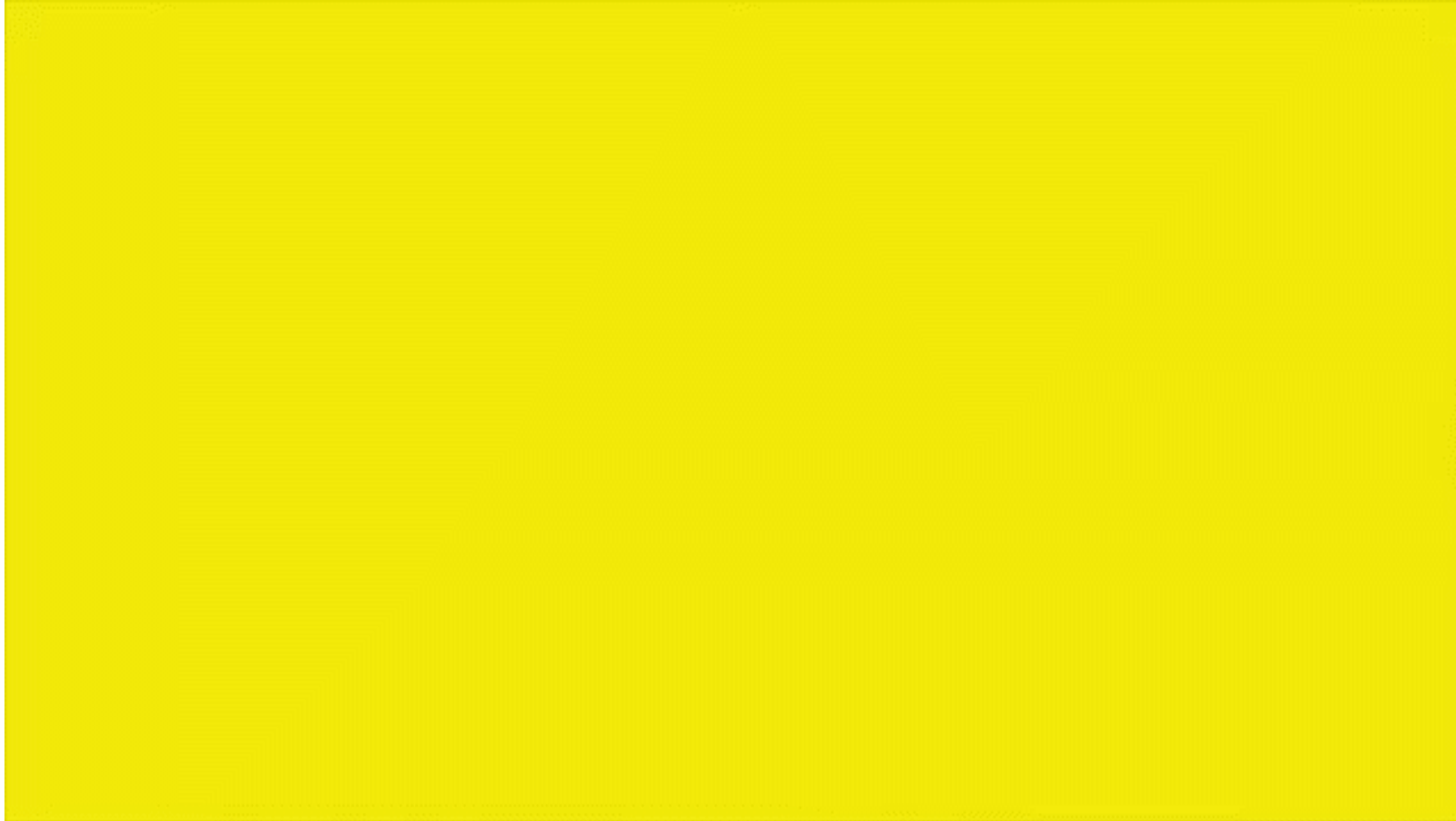
What cool things do you think of when I say Geology?

What is going on under the ground?



Early warning signs?

Mini-Earthquakes



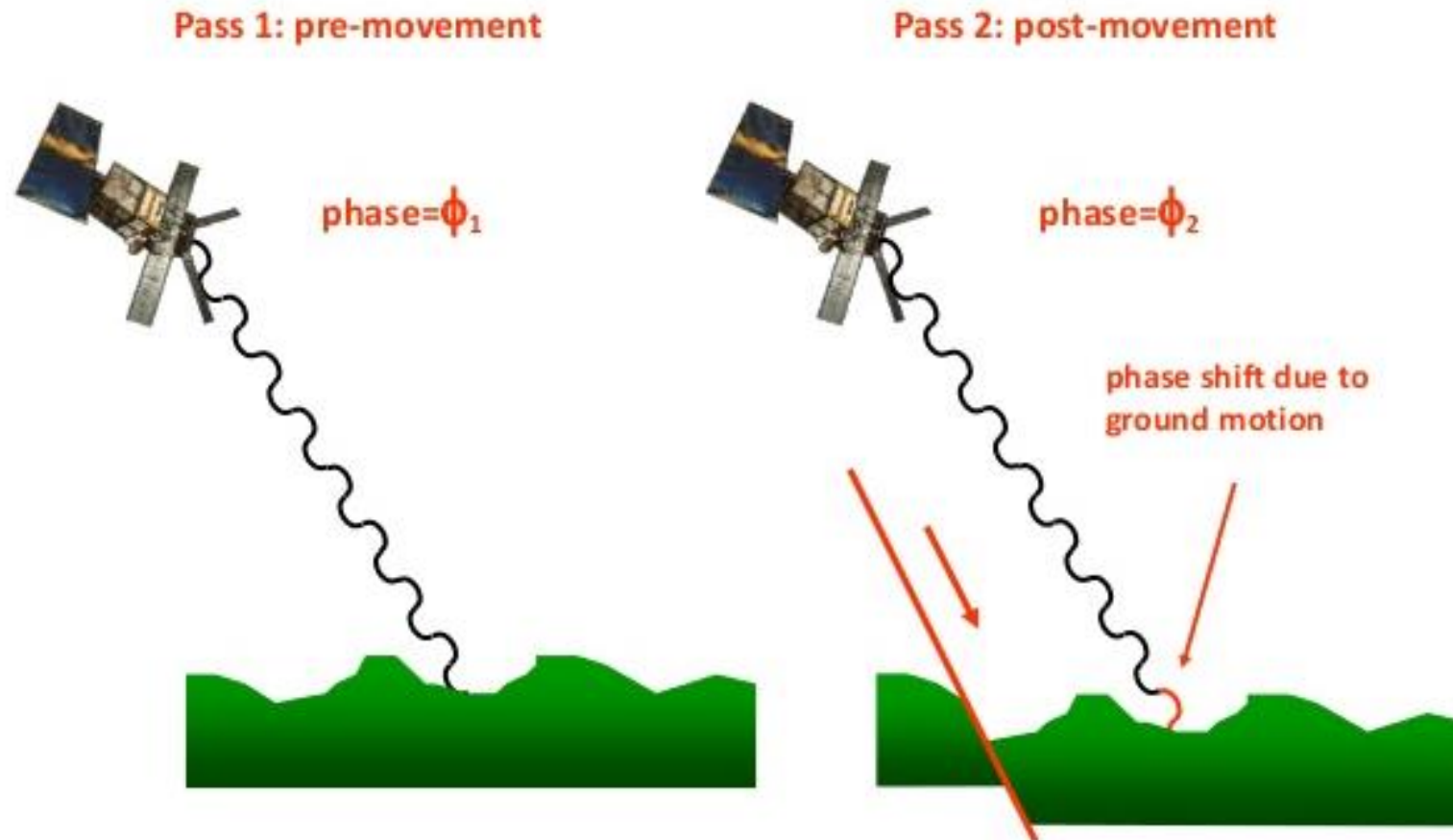
<https://www.youtube.com/watch?v=Gbd1FcuLJLQ>

Ground deformation



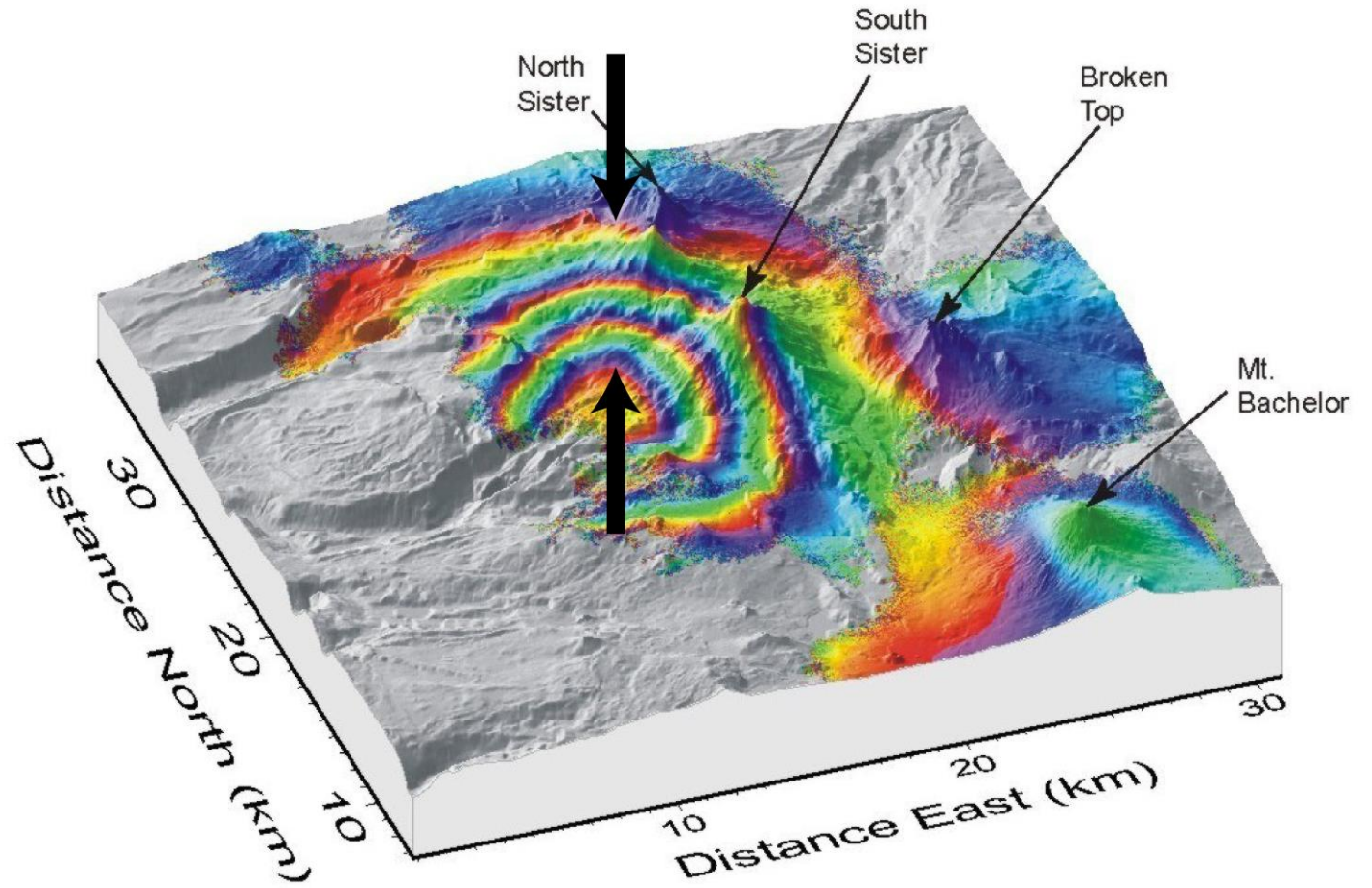
https://www.youtube.com/watch?v=sNYQkxxd_0Q

InSAR



<https://comet.nerc.ac.uk/earth-observation/insar/how-insar-works/>

Interferometric Synthetic Aperture Radar (InSAR)



https://ds.iris.edu/aed2/c/escope/research/freel_Escope_research_P4.html



Cleaning up the mess...

Ground Penetrating Radar



<https://www.youtube.com/watch?v=oQaRfA7yJ0g>

Frequency

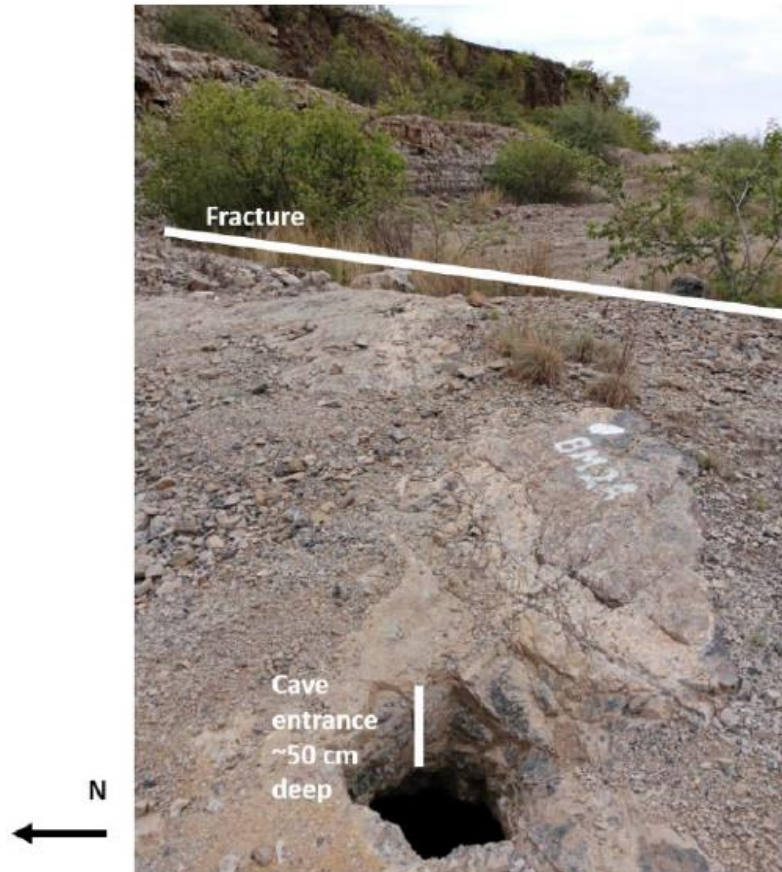
- High – shallow/deep?
- Low – shallow/deep?
- What would you use on Bree Street?

Strong signal

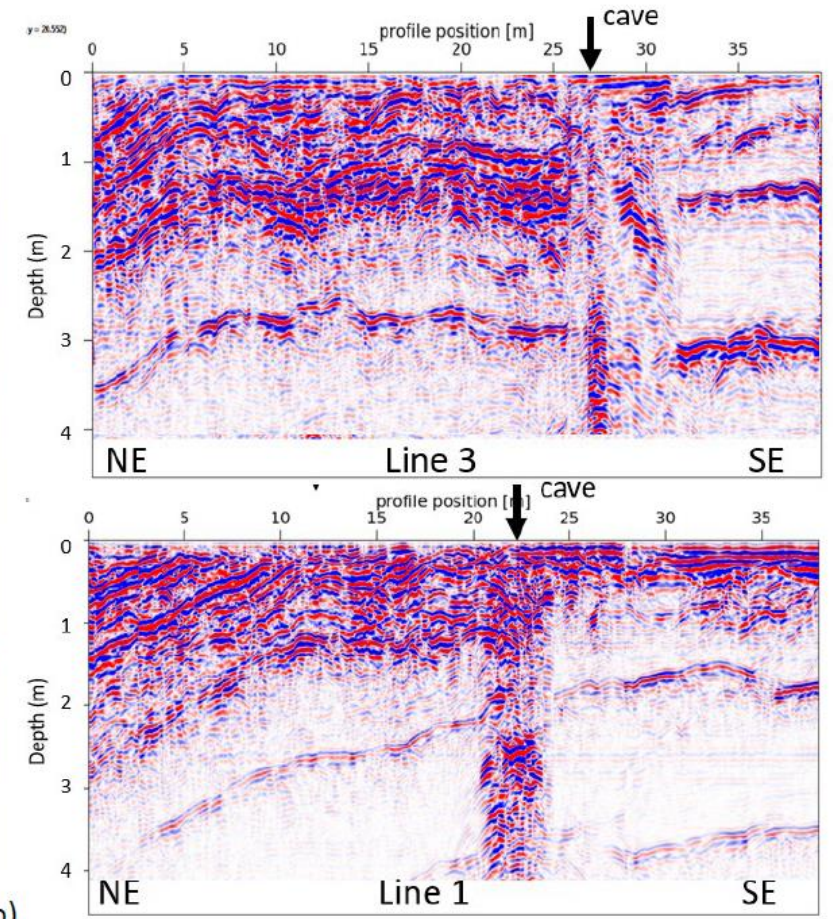
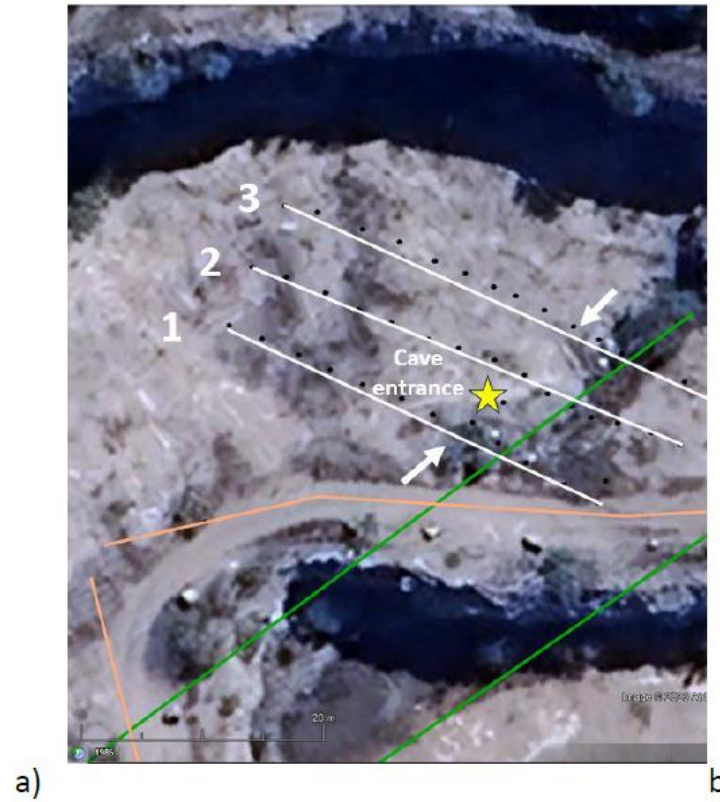
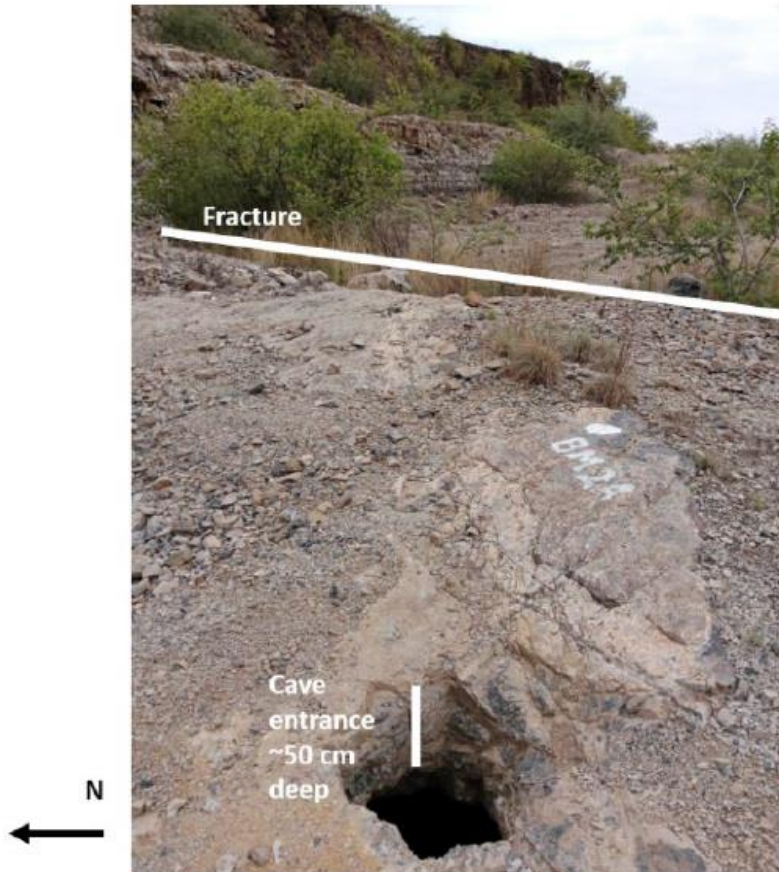
= Big change in dielectric constant?

= Small change in dielectric constant?

Real data over cave system



Real data over cave system



Assignment

Where would you setup?

Monitoring:

4 seismometers

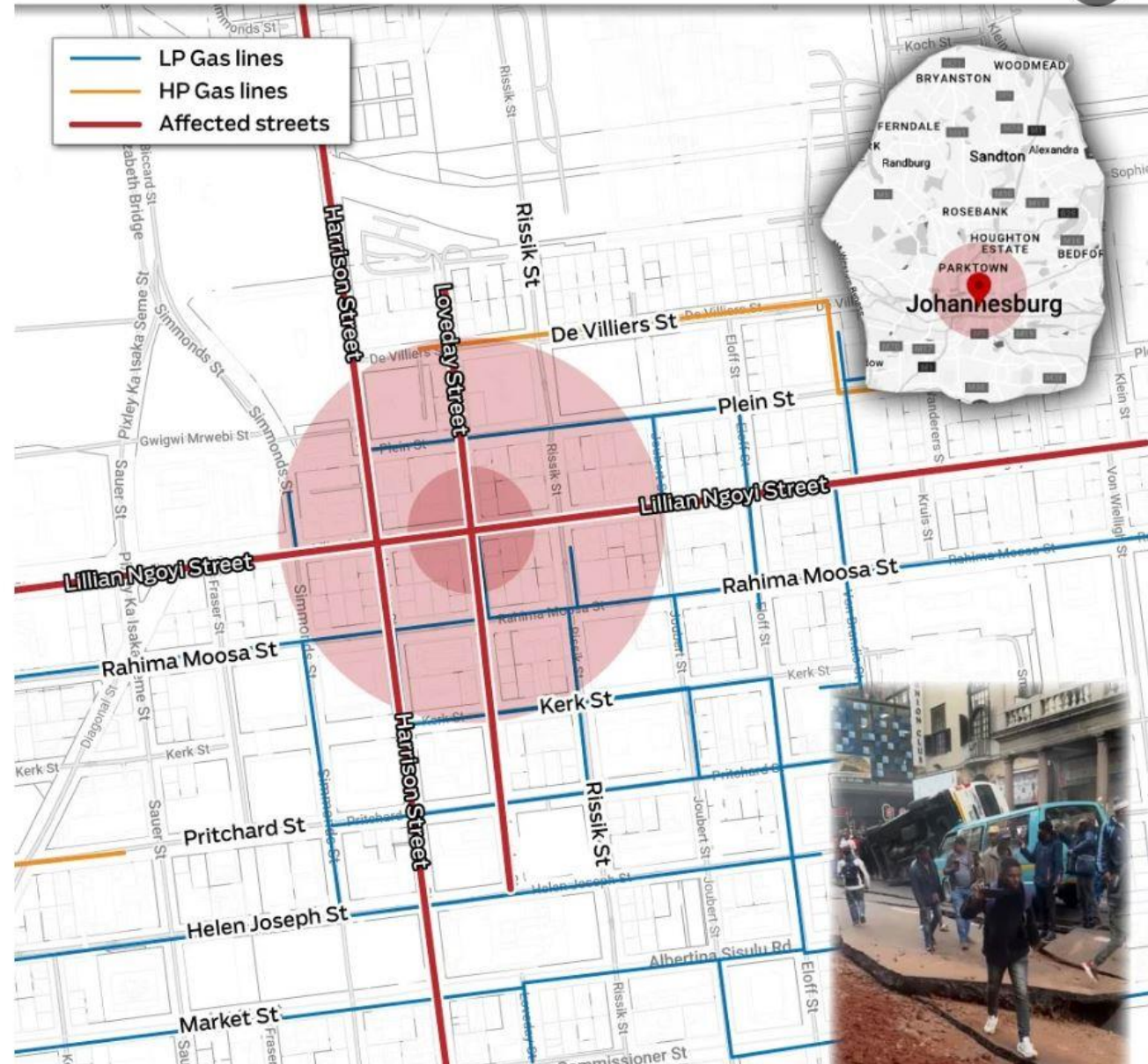
4 tiltmeters

Post explosion:

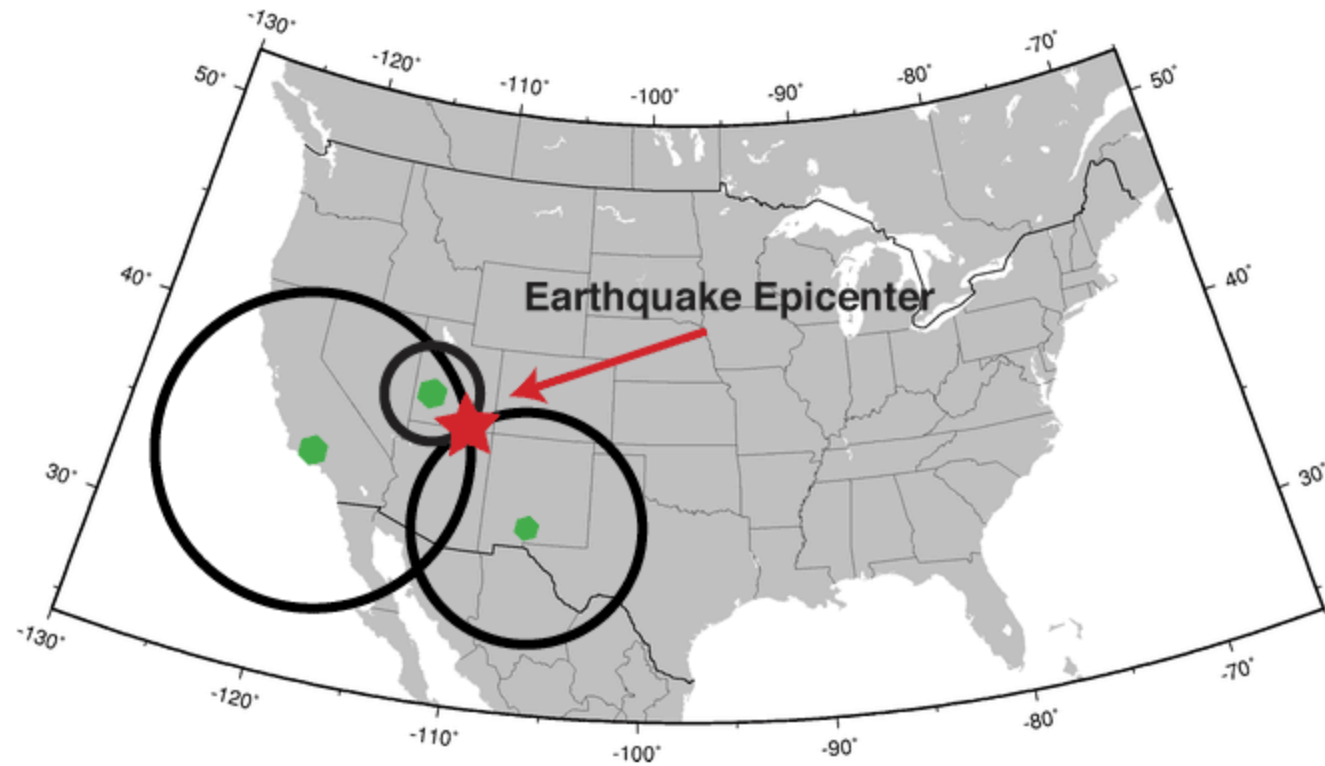
4 GPR profiles

Explosion rocks Johannesburg CBD

news24



Triangulation



<https://www.usgs.gov/media/images/triangulation-locate-earthquake>