UAVSAR

The NASA/JPL UAVSAR (Uninhabited Aerial Vehicle Synthetic Aperture Radar), is an airborne, L-band, fully polarimetric radar, housed in a pod that is mounted to the belly of a piloted Gulfstream III aircraft. Interferometric radar images, or interferograms, are generated from repeat passes flown over a site of interest. Interferometric radar observations are made from the swaths received, which are
approximately 22 km wide and typically between 100 and 300 km long (Donnellan, A., et al., 2010)

Below is an image of how the swath is determined by a UAVSAR flight.

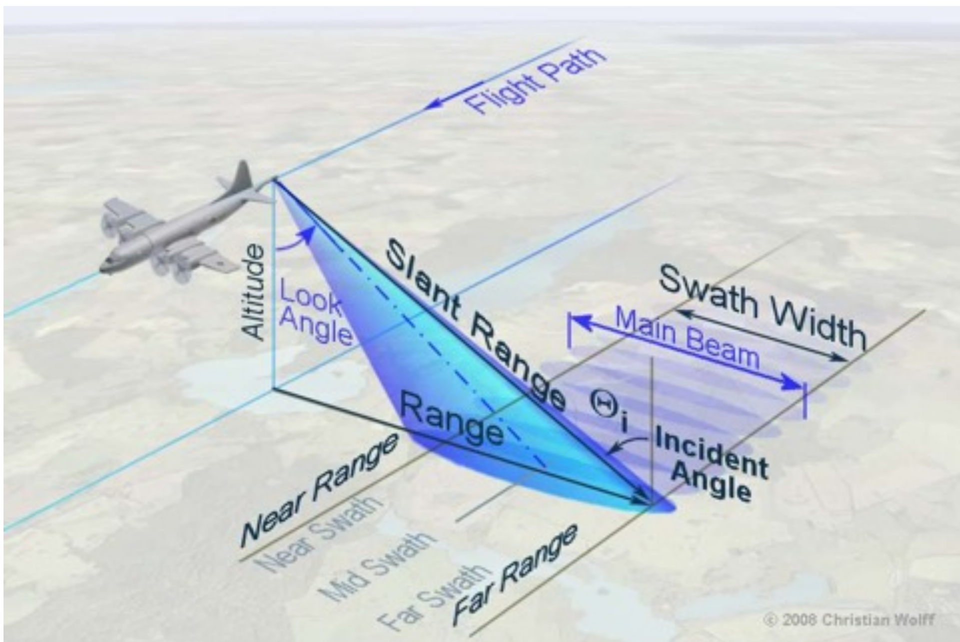


Figure adapted from (Jensen, 2000).

The wide swath of the UAVSAR instrument results in a large incidence angle variation across the swath. Near range incidence angles are approximately 25° whereas far range incidence angles are approximately 65° resulting in a 40° incidence angle variation across the swath.

Since repeat pass radar interferometric measurements only capture the component of surface motion along the line-of-sight vector, it is important to account for imaging geometry variations. Thus, a constant vertical displacement will exhibit a line-of-sight displacement that varies as the cosine of the look angle (angle between aircraft nadir vector and line of sight) and a constant cross-track displacement will exhibit a line-of-sight displacement that varies as the sine of the look angle.

Different fault geometries and types of slip produce different surface motions and project differently onto a line-of-sight change between points on the ground and instrument.

Interpreting line-of-sight changes for fault motions requires assumptions for the style of faulting. Slip of a certain orientation, corresponding to fault slip, can be projected onto line-of-sight between the ground and instrument using the following parameters (Donnellan, A., et al., 2014).

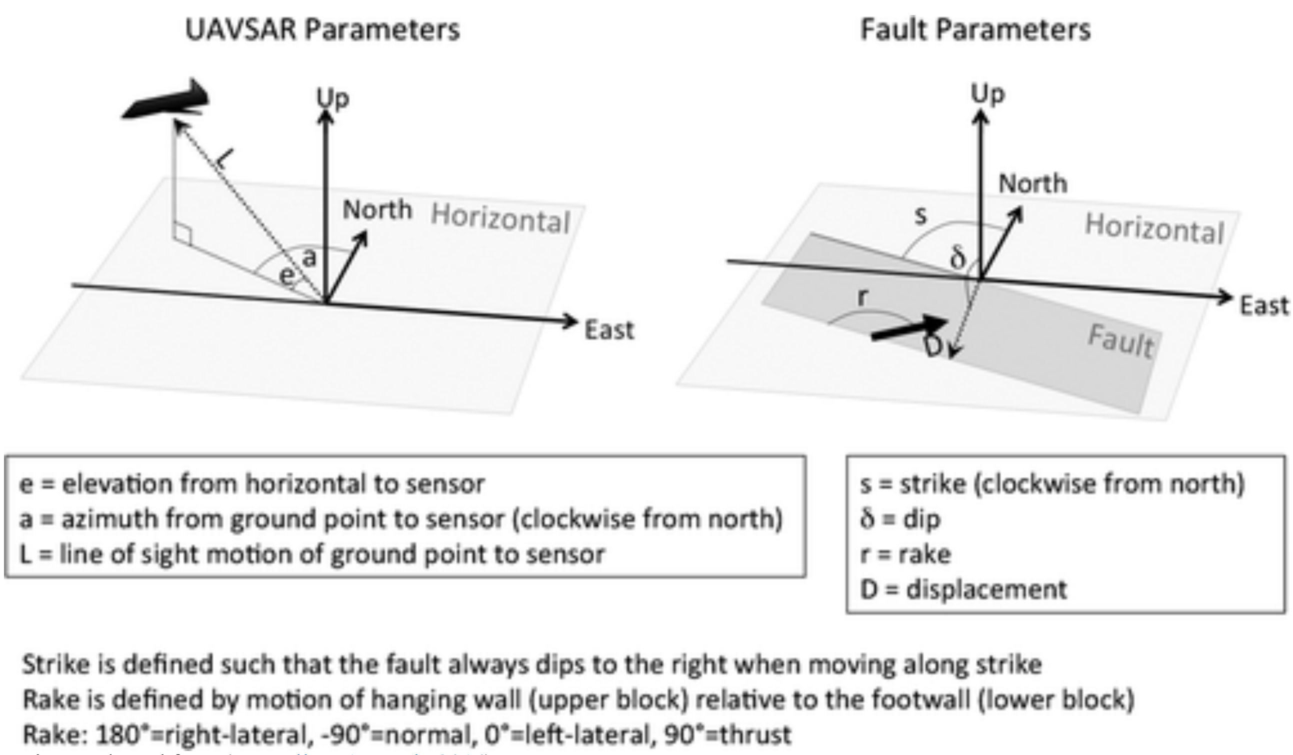


Figure adapted from (Donnellan, A., et al., 2014).

To the right, we see two different radar images creating the interferogram (shows the change or difference from each radar image).

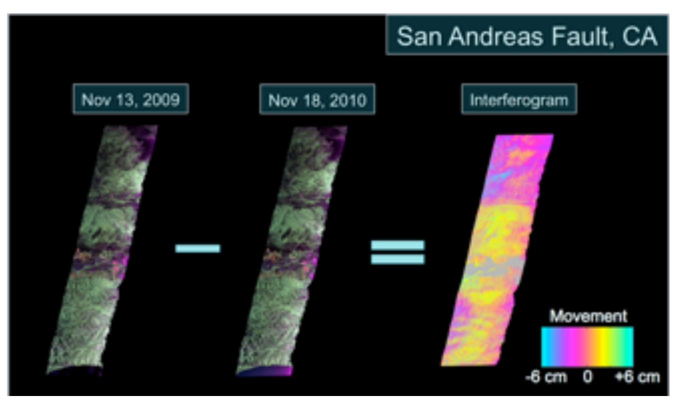


Figure adapted from (NASA, 2014).

Interferograms allow a user to see how the difference in fringes portrays an uplift within a location, as seen in the image on the right.

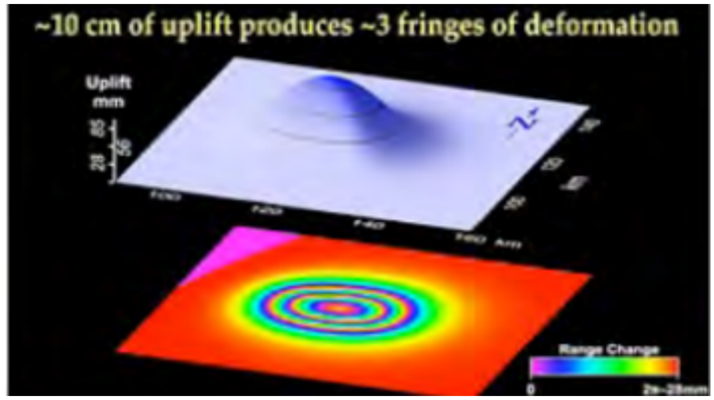


Figure adapted from (NASA, 2014).

Example UAVSAR cases:

a.

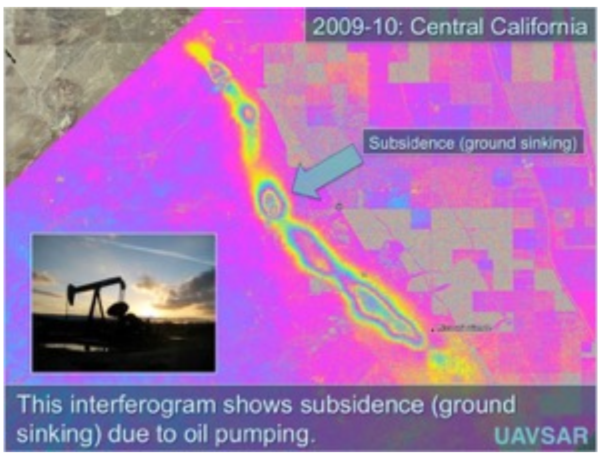


Figure adapted from (NASA, 2014).

b.

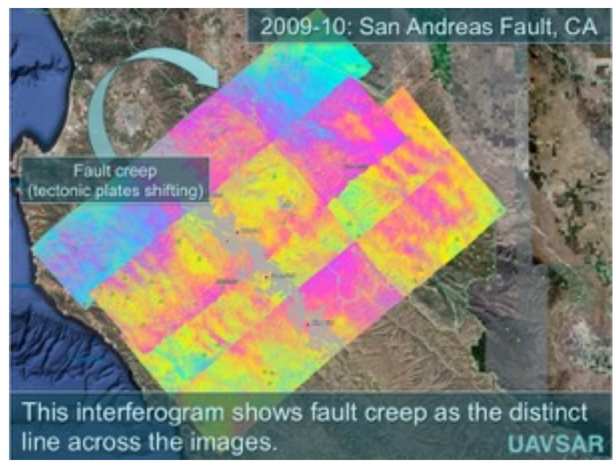


Figure adapted from (NASA, 2014).

c.

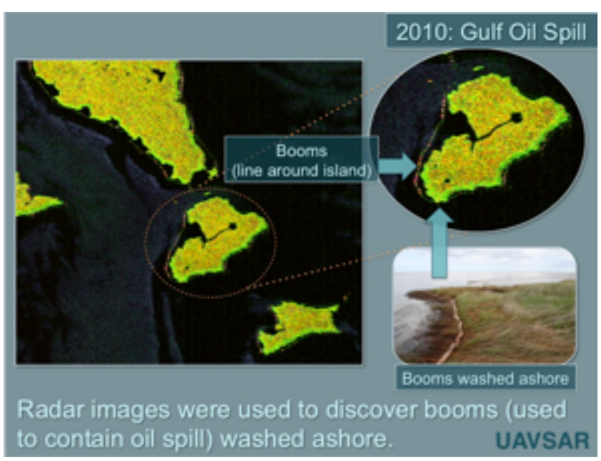
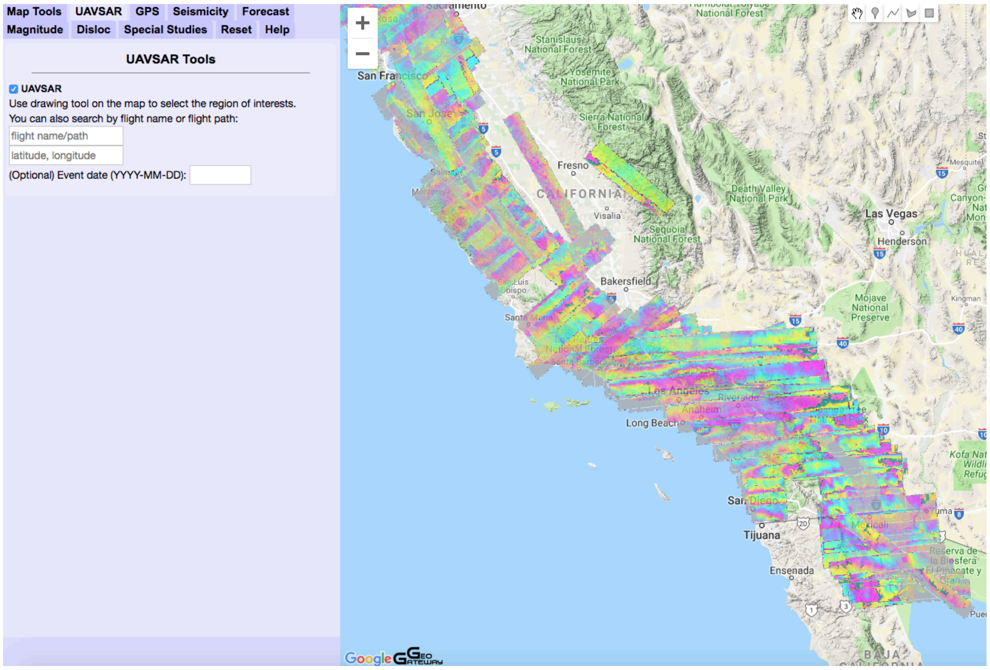


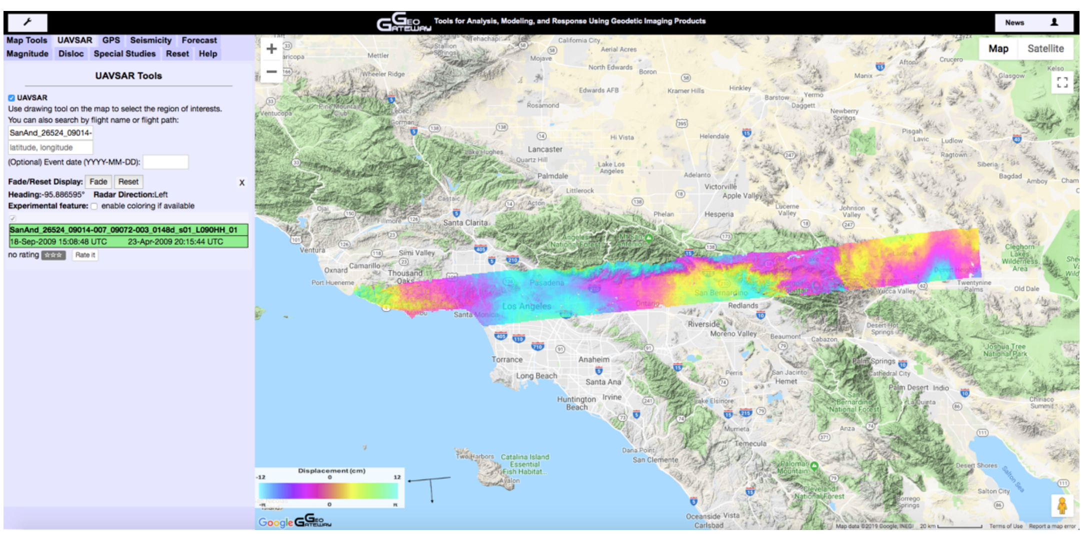
Figure adapted from (NASA, 2014).

By checking the “UAVSAR” box in the “UAVSAR” tab, various UAVSAR strips will show.

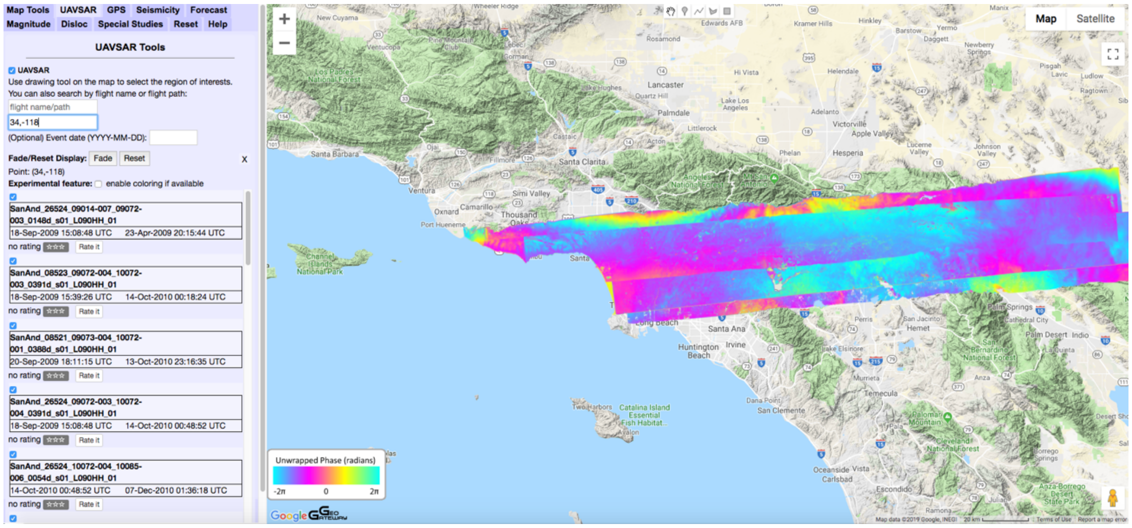


To individually select a UAVSAR flight path choose either method (1) or (2).

1. Insert the flight name in the “flight name/path” section.



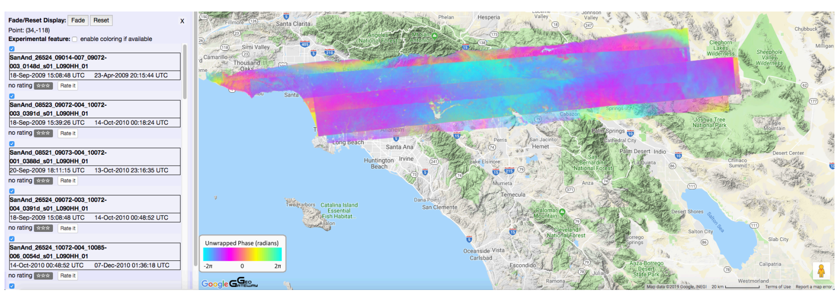
2. Insert “latitude, longitude” of the region of interest. And choose a strip from the region.



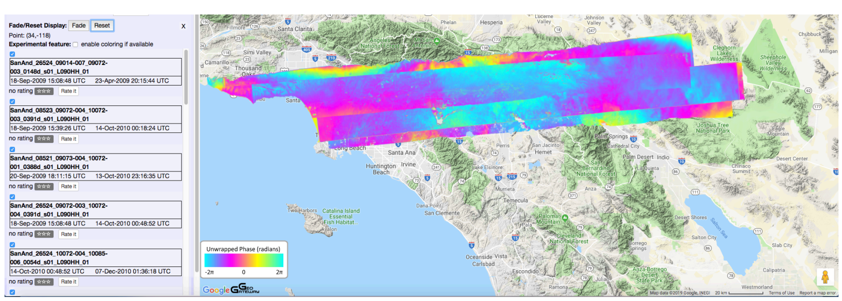
It is optional to put in an event date (YYYY-MM-DD) in order to narrow the selection.

The option is given to (a) “Fade” the UAVSAR strip(s) and (b) “Reset” the strip(s) to their orginal format.

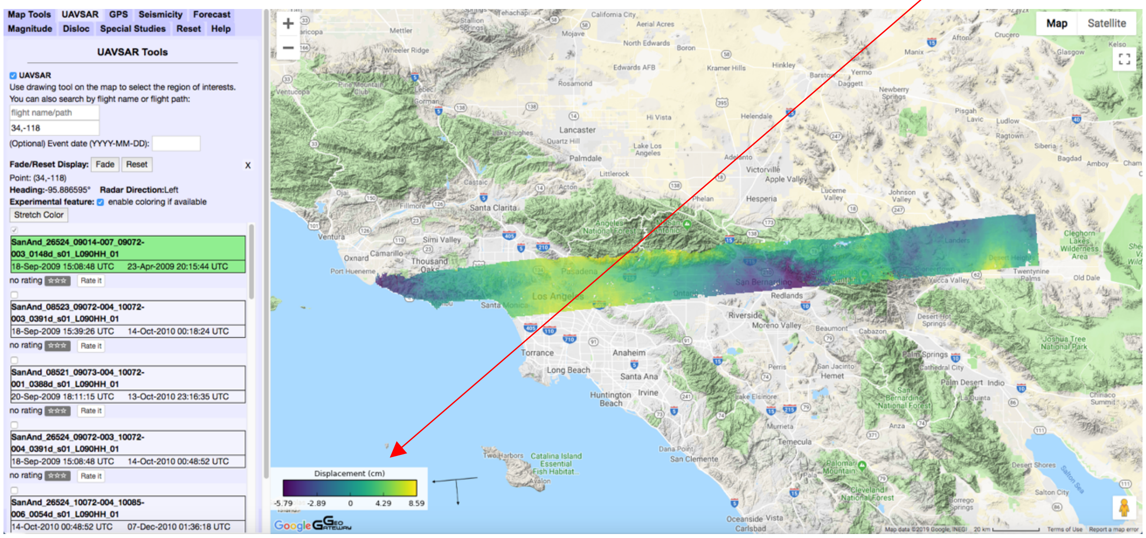
a.



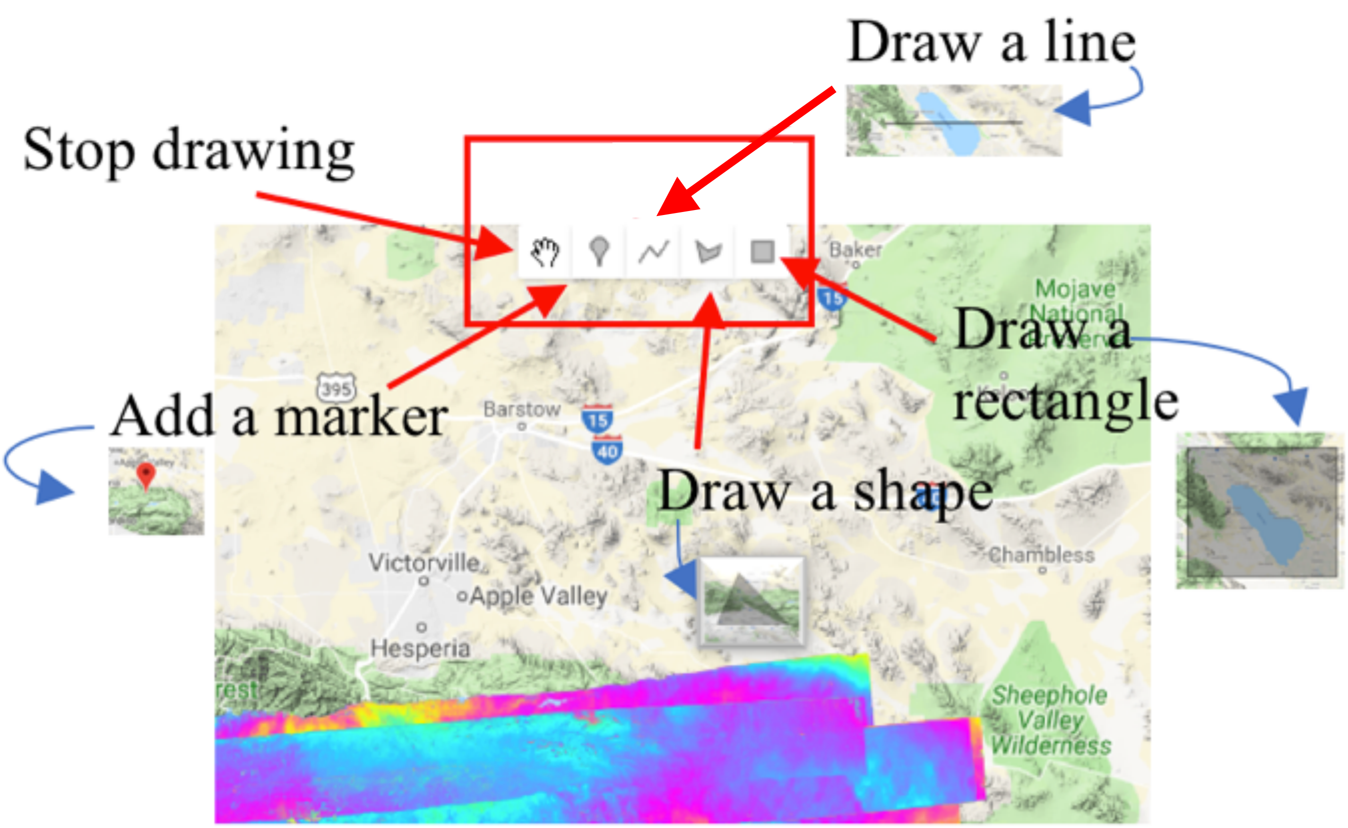
b.



c. To further look into the surface fracturing, click on "enable coloring if available". Notice the units of displacement change to "cm".



Within the "UAVSAR" section, users are given **five** tools, as shown by the arrows below in the image.

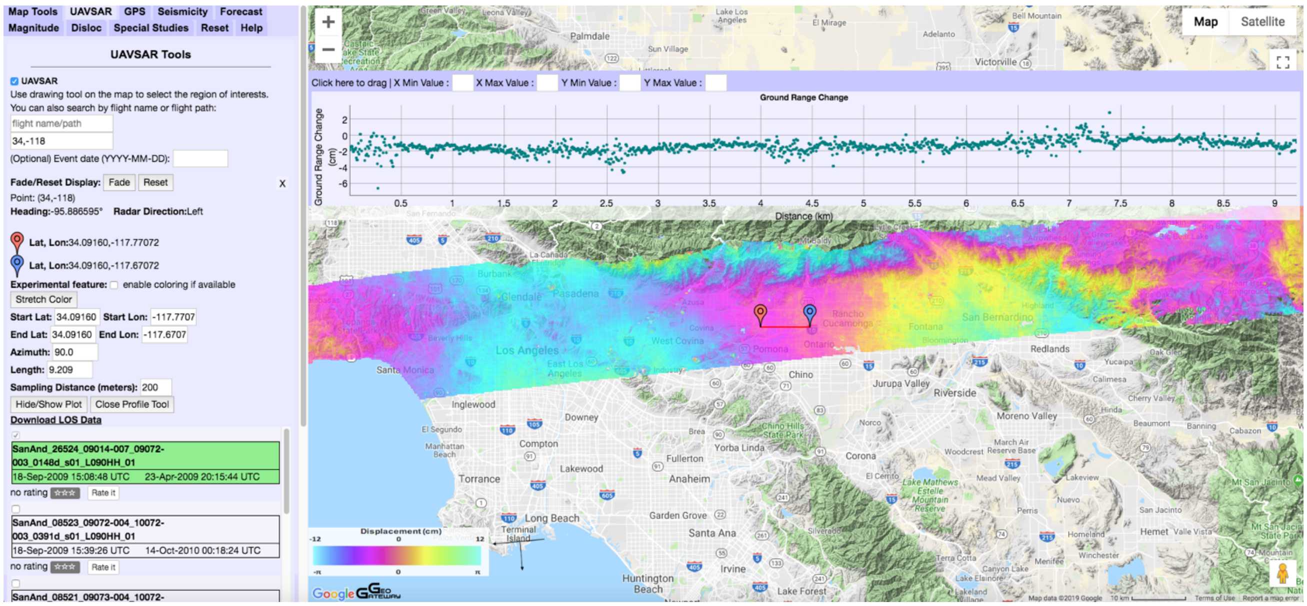


To look closer into the UAVSAR strip,

1. Search for a flight path.

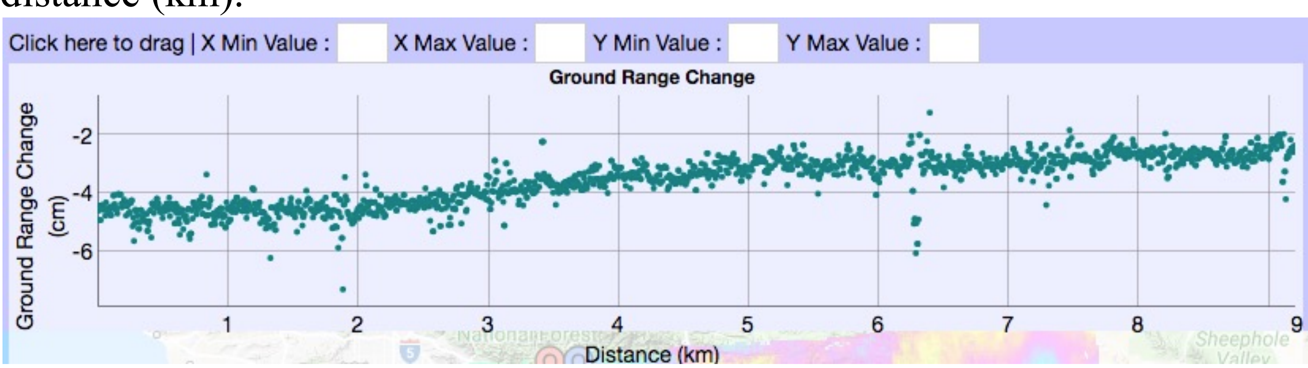
2. Select the flight path by clicking on it (flight path selction should be highlighted in green).

3. Click on the UAVSAR flight path that is shown on the map, allowing the Line-of-Sight (LOS) tool to appear.



Place the two markers on any location along the UAVSAR strip, to look at different ground range change.

The LOS tool allows users to study ground range change (cm), along a distance (km).



As shown above, users are open to put in X and Y values of their choice.