How do InSAR detect changes in the landscape?

Multiple satellite passes are needed to measure changes.

Example of InSAR detecting change
(Earthquake)

**Satellite Pass #1 — Pre-deformation**

- SAR satellite crosses area before deformation
- 2) Signal becomes of higher amplitude and returns in SAR images along line of sight path

**Satellite Pass #2 — Post-deformation**

- 3) More power/energy used, SAR satellite passes over same spot
- 4) Change in signal (less energy) shows ground deformation

What Do We Already Know?

- Location of satellite during both passes
- Speed of light

What Do We Need to Know?

- Phase of the return signal for both satellite passes
- Local topography and atmospheric conditions at time of measurement

So, Now What?

- After measuring the phase for both satellite passes, and applying any corrections, subtract the difference in phase to create an interferogram

Different SAR satellites emit different microwave wavelengths, providing different levels of detail.

- All SAR satellites operate in the microwave band, but different satellites use different wavelengths: ~24 cm (e.g., Jason-2), ~6 cm (e.g., Sentinel-1B), and ~3 cm (e.g., TerraSAR-X)
- Shorter wavelengths mean more detail
- Longer wavelengths allow measurement of larger surface deformations
- Vegetation and geology will affect what wavelength you use to study the feature of interest