A few notes on InSAR

Laszlo Kestay
Outline

• What is it good for (on Earth)
• Why it's hard to... for planetary
SAR vs InSAR

• SAR = synthetic aperture radar: uses the motion of the spacecraft to simulate having a bigger antenna than you really have. Great images!

• InSAR = Interferometric SAR: combine multile SAR passes to create interferograms
Interferograms

• Color bands are each one wavelength of ground deformation – cm level geodesy over wide areas!

• Very useful for measuring ground deformation after an earthquake, as magma moves subsurface, etc.

• Hard to use when deformation is many wavelengths
**Figure 6.** Interferogram showing deformation of Akutan Island (August 1993 to October 1996), draped over shaded-relief map of the island. Based on European Remote Sensing Satellite imagery (C-band radar). From Lu and others, 2005.

**Figure 7.** Interferogram showing deformation of Akutan Island (October 1994 to June 1997), draped over shaded-relief map of the island. Based on Japanese Earth Resources Satellite imagery (L-band radar). From Lu and others, 2005.
Challenges:

• You need at least 3 passes - 2 to get topography, the 3\textsuperscript{rd} is the first to measure changes.

• Not good if topography changes between the first two “topo” passes so new designs work with tandem antennae or spacecraft to get topo in one pass
Challenges:

• You need to have the spacecraft in the “same” location for each pass. Within 300 m to 20 km (tighter tolerance for shorter wavelengths).

• Power: 2-10 kW (1000x typical science instruments)

• Mass: +1000 kg
One more thing...
One More Thing: