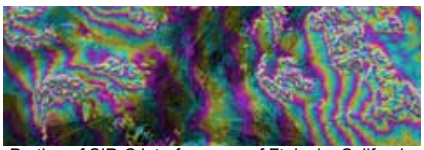
Instrument

INTERFEROMETRY EXPLAINED Radar interferometry is the study of interference patterns caused by radar signals. It's a technique that enables us to generate three dimensional images of the Earth's surface.

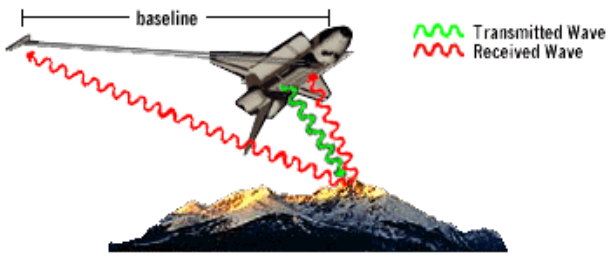
Interferometry is the study of interference patterns created by combining two sets of radar signals. If you've ever seen a puddle of water with a film of oil on it, you've probably noticed bands of color on the surface. These bands of color are caused by light rays bouncing off the smooth surfaces of the oil and underlying water, making interference patterns.


Portion of SIR-C interferogram of Ft. Irwin, California

When two interferometric radar data sets are combined the first product made is called an interferogram (also called a fringe map). A fringe map looks similar to those bands of color you see in a film of oil

SRTM is a fixed-baseline interferometry mission. This means two radar data sets were collected at the same time and the antennas that collected the data were separated by a fixed distance. During the SRTM mission, the main antenna onboard the space shuttle collected one data set and the other data set was collected by the outboard antenna located at the end of the 60 meter (200 foot) mast.

The main antenna located in the payload bay of the Shuttle Endeavour illuminated a portion of the surface of the Earth with a beam of radar waves. When the radar waves hit the surface of the Earth, rays were scattered in various directions. These scattered waves were collected by the two SRTM antennas.



Radar signals being transmitted and recieved in the SRTM mission (image not to scale).

The baseline distance between the main antenna and the outboard antenna was known very accurately and remained constant. What did change was the distance to the Earth's surface in relation to the two antennas. Within the reflected radar beam, the point which represented where the reflection took place was slightly different between the main and outboard antennas.

Using the information about the distance between the two antennas and the differences in the reflected radar wave signals, accurate elevation of the Earth's surface can be calculated.

More Information

- **The ABC's of Interferometry**: Space.com has an article written by Andrew Bridges that nicely explains interferometry.
- **How Does SRTM Work**: The NASA Human Spaceflight web site explains how the SRTM radars captured data.
- **SIR-C/X-SAR Interferometric Images**: Web page containing links to interferometric images made from the Shuttle Imaging Radar flight of 1994.