Physical Principles of Remote Sensing - Gareth Rees
Chapter 8 - Scattering Techniques

- Another Cambridge physicist...
- Bounces man-made radar waves off target
- Return signal influenced by surface properties
- Lots of data processing needed to do useful science

Radar Basics

- Emit pulses of 1cm radio waves
- Collect return signal with same antenna
- Measure power in / power out
- Temporal and frequency shape of pulse
- Essentially get an albedo
- Which varies with...

Basic Scatterometry

- Scatter-what-ery?
- Obtain albedo for restricted range of parameters
- Targeted, point-like beam or
- Doppler processing of line-like beam
- Applications

Side-looking Airborne Radar (SLAR)

Ä Along track resolution ~ $H\lambda/L$

Ä Across track resolution ~ $c\tau$

SLAR Distortions

Ä Layover

Ä Shadowing

Ä Along track resolution from space

Synthetic Aperture Radar (SAR)

- More signal processing => Better resolution
- Record amplitude and phase to synthesize very long antenna

- Lengthy data processing
- Radar imaging applications

SAR in action - Magellan

- Image Venus with 150m x 150m pixels
- 12 cm radar, 26μsec pulses every 200μsec
- Saw through optically thick cloud layer to image previously unseen volcanic features
- Entire surface ~ 500 My old
- Characterized nature of Venusian tectonics