Data selection and interferometric baselines

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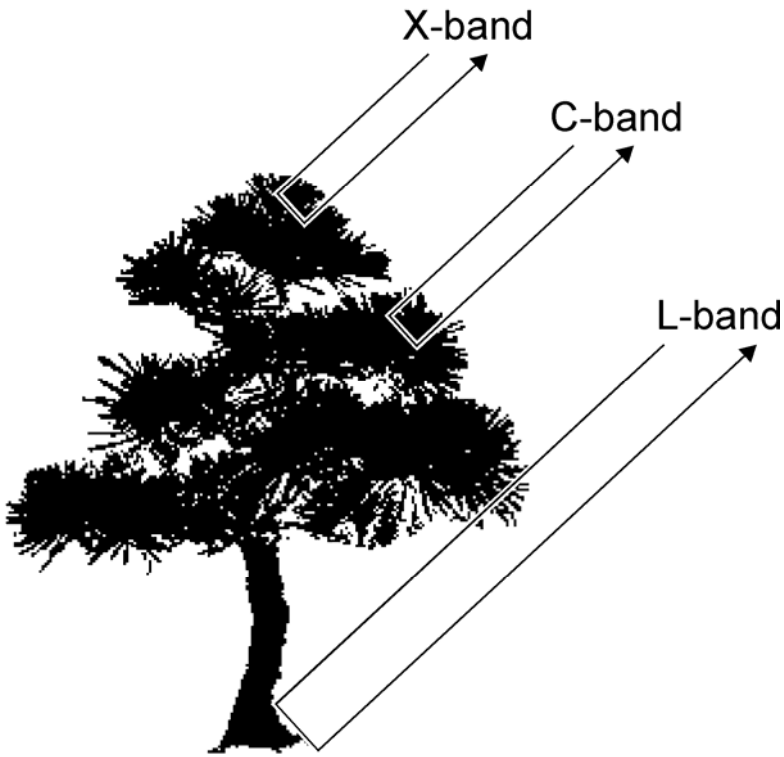
Data formats

- CEOS single look complex
  - does not require SAR processing
  - order deskewed (zero Doppler)
- CEOS level 0
  - frame based
  - requires SAR processing

Data formats

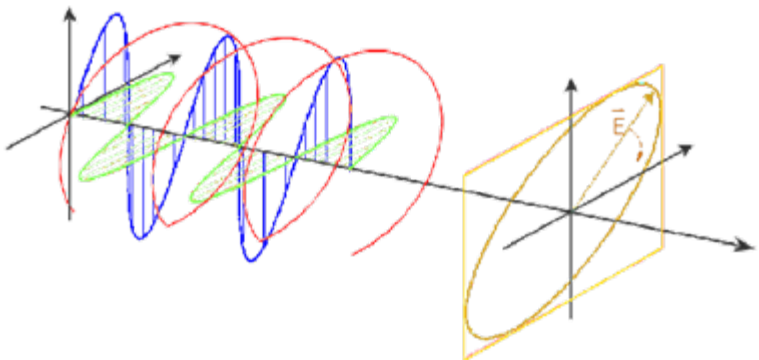
- Sky Telemetry format (STF)
  - swath data format
  - requires SAR processing
  - allows latitude constraints
  - flexible to cover any area of interest in azimuth direction
  - format of choice

Wavelength



- wavelength determines penetration depth
- shorter wavelengths are backscattered at the surface
- longer wavelengths reaches the topographic surface (sub-surface)

Polarization



- Radarsat:
  HH polarization better suited for sea ice
- ERS:
  VV polarization for observation of the oceans

Data availability

- Repeat cycle
  - ERS-1/2: 35 days
  - Radarsat: 24 days
  - JERS-1: 44 days
- Time
  - ERS-1/2: 1991 until present
  - Radarsat: 1995 until present
  - JERS-1: 1992 to 1998

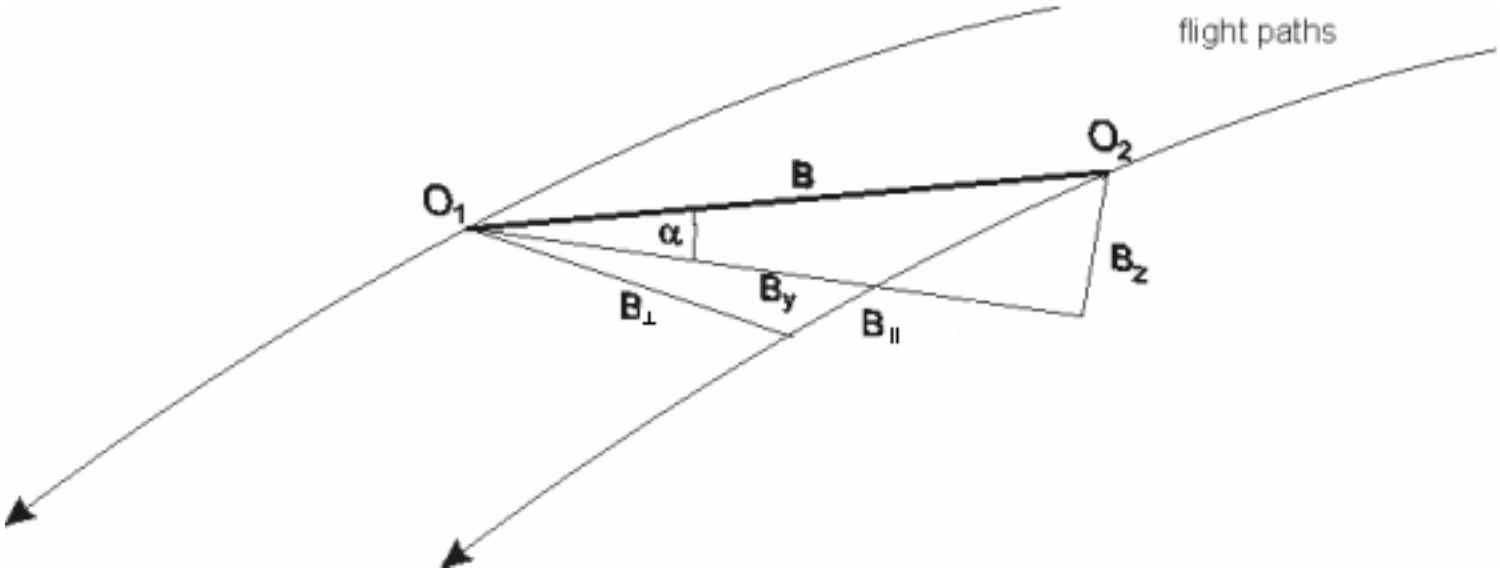
Resolution

- best ground resolution
  - Radarsat: 8 m
  - ERS-1/2, ENVISAT: 30 m
  - JERS-1: 30 m
- coverage
  - Radarsat: 500 x 500 km (ScanSAR)
  - ERS-1/2: 100 x 100 km
  - ENVISAT: 100 x 100 km
  - JERS-1: 75 x 75 km

Precise state vectors

- available for ERS-1/2 data
  - German Aerospace Center (DLR), Germany
  - Technical University Delft, the Netherlands
- effect on DEM accuracy caused by baseline decorrelation smaller than *one* meter

Interferometric baseline



Data selection

- different representations
  - length B and the orientation angle α
  - horizontal (By) and vertical (Bz) component
  - components ($B_{\parallel}$) and ($B_{\perp}$) component

Interferometric baseline

- applicability for applications (example ERS)

Applications	Baseline
Practical InSAR limit	< B_{perp} < 600 m
Digital Terrain Models	150 m < B_{perp} < 300 m
Surface Change Detection	30 m < B_{perp} < 70 m
Surface Feature Movement	< B_{perp} < 5 m

Interferometric baseline

- critical baseline
  - for interferometric pairs with a perpendicular baseline $B_{\perp}$ beyond a critical value, correlation vanishes because the spectral shift exceeds the pulse bandwidth

Interferometric baseline

- critical baseline
  - loss of all coherence

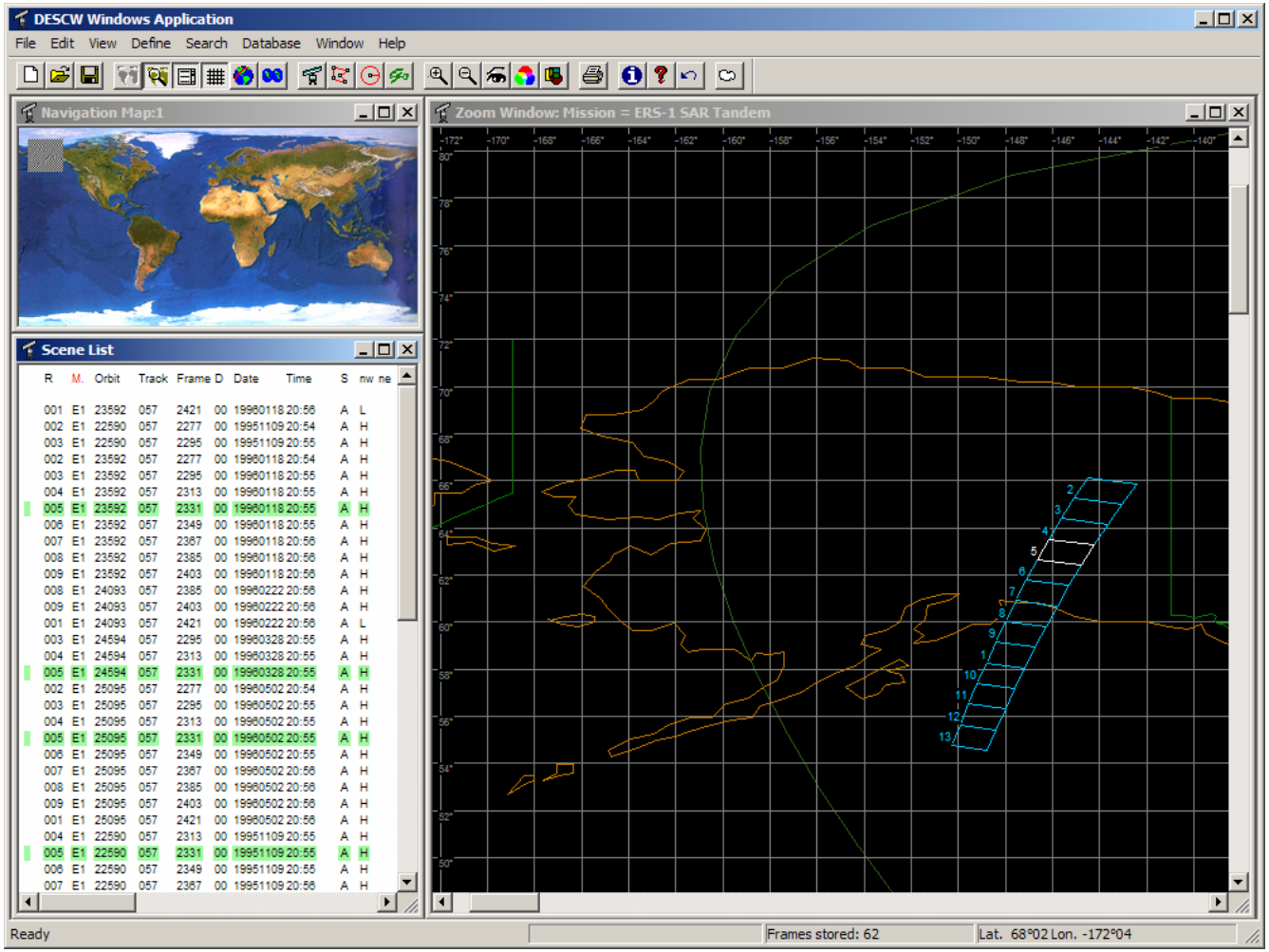
$$B_c = \frac{\lambda \, r}{2 \, R_y \cos^2 \theta}$$

  - wavelength λ
  - range r
  - resolution in range R_y
  - look angle θ

Interferometric baseline

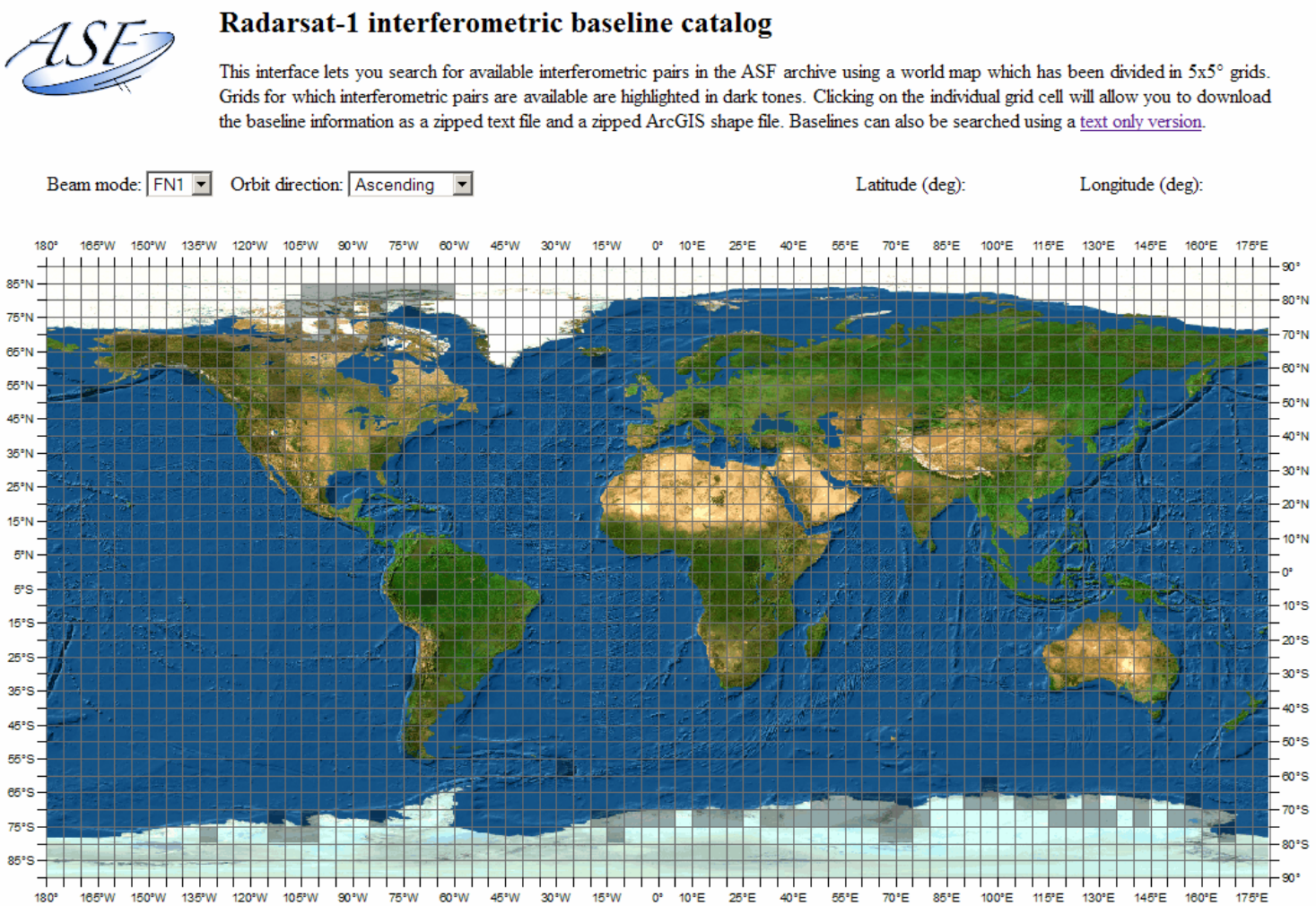
- perpendicular baseline component $B_{\perp}$ can be used to describe the sensitivity of an interferometric pair to topographic elevation
- large parallel baseline component $B_{\parallel}$ will produce a high background fringe rate due to "flat" topography – needs to be known quite accurately to get a topographic map with no cross-track tilt

Descw



Data selection

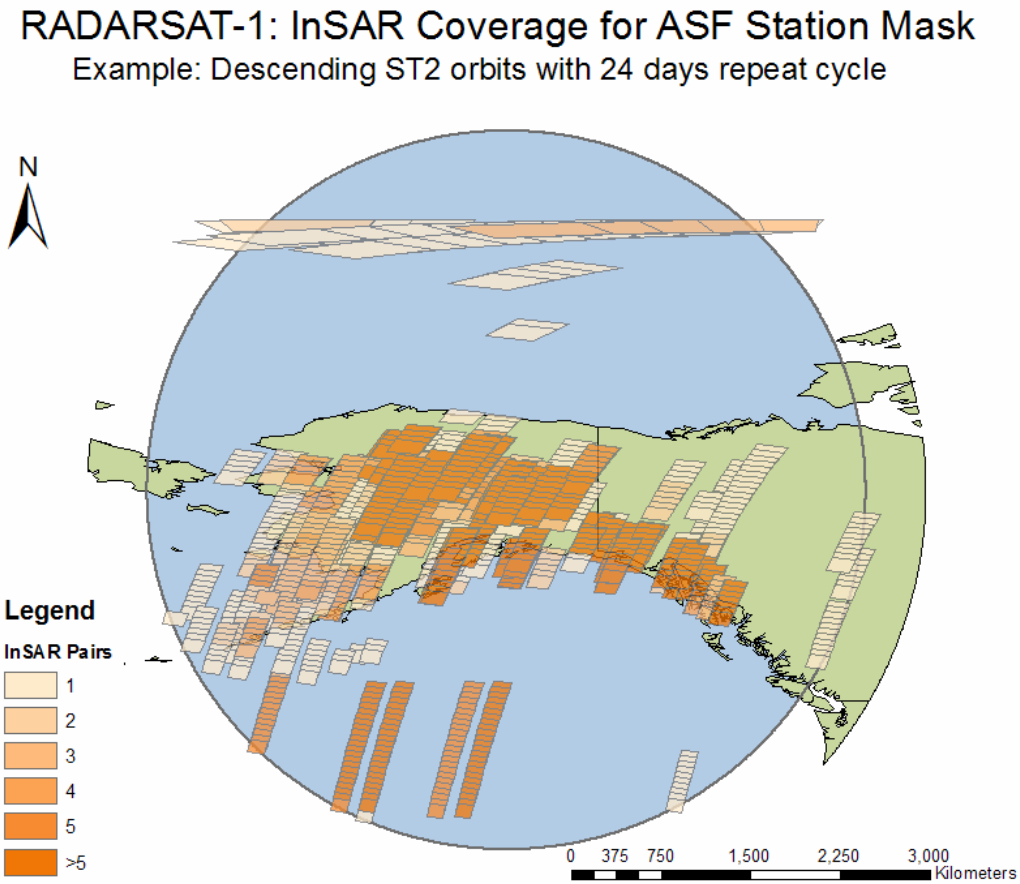
Radarsat baseline catalog



Data selection

http://www.asf.alaska.edu/baselines/

Radarsat baseline catalog



Data selection