



# Data selection and interferometric baselines

Rüdiger Gens



# Data formats

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

Data selection



# Data formats

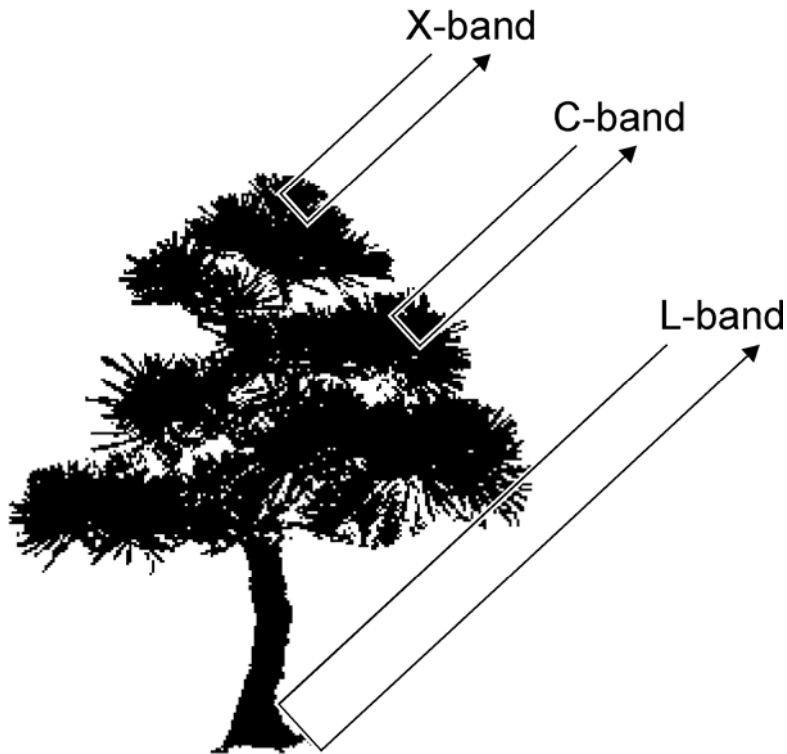
- Sky Telemetry format (STF)
  - swath data format
  - requires SAR processing
  - allows latitude constraints
  - flexible to cover any area of interest in azimuth direction
  - format of choice

Data selection



# Wavelength

Data selection

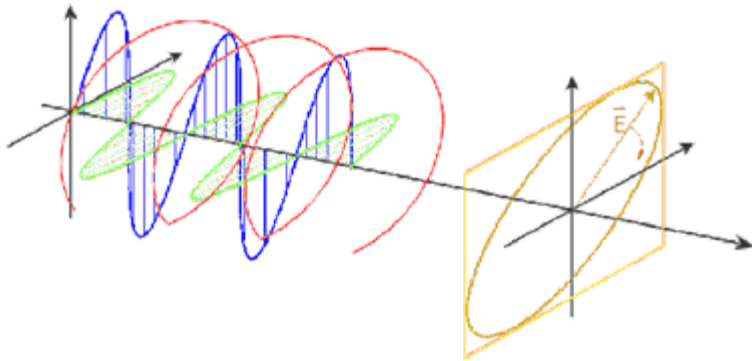


- wavelength determines penetration depth
- shorter wavelengths are backscattered at the surface
- longer wavelengths reaches the topographic surface (sub-surface)



# Polarization

Data selection



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



# Data availability

Data selection

- 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

Data selection



# Precise state vectors

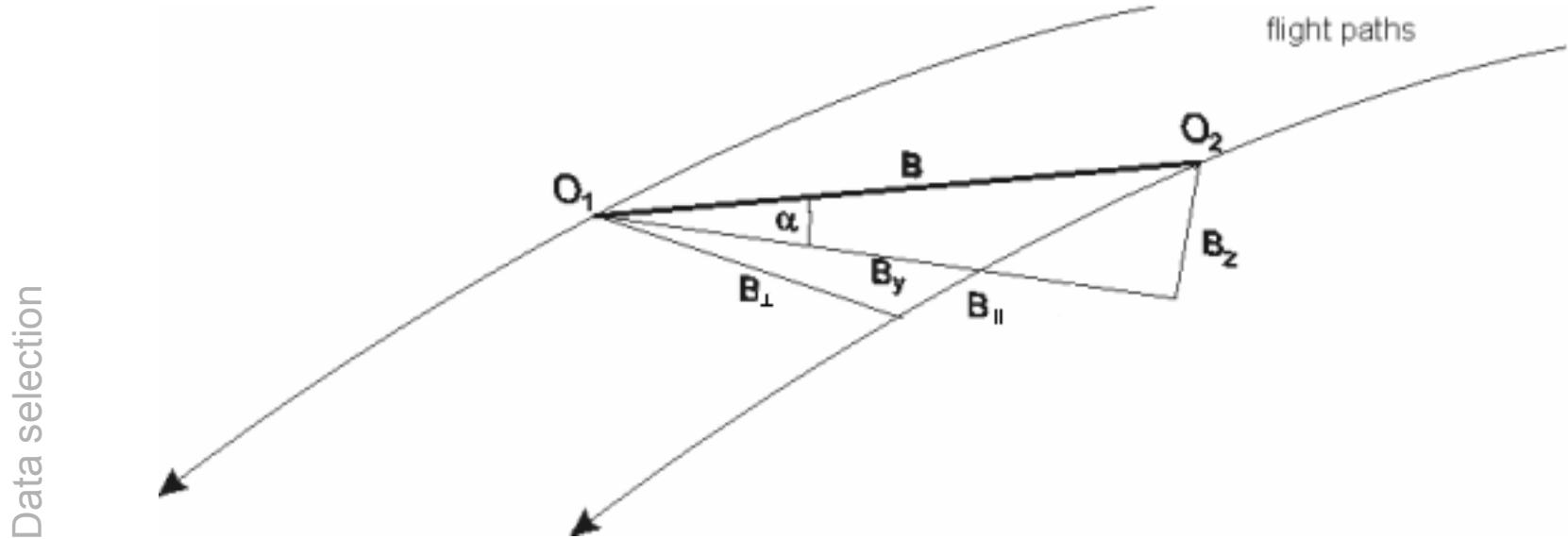
- available for ERS-1/2 data
  - German Aerospace Center (DLR), Germany
  - Technical University Delft, the Netherlands
- effect on DEM accuracy caused by baseline decorrelation smaller than *one* meter

Data selection





# Interferometric baseline



- different representations
  - length  $B$  and the orientation angle  $\alpha$
  - horizontal ( $B_y$ ) and vertical ( $B_z$ ) component
  - components ( $B_{\parallel}$ ) and ( $B_{\perp}$ ) component



# Interferometric baseline

- applicability for applications (example ERS)

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

Data selection



# 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

Data selection



# Interferometric baseline

- critical baseline
  - loss of all coherence

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

- wavelength  $\lambda$
- range  $r$
- resolution in range  $R_y$
- look angle  $\theta$

Data selection



# Interferometric baseline

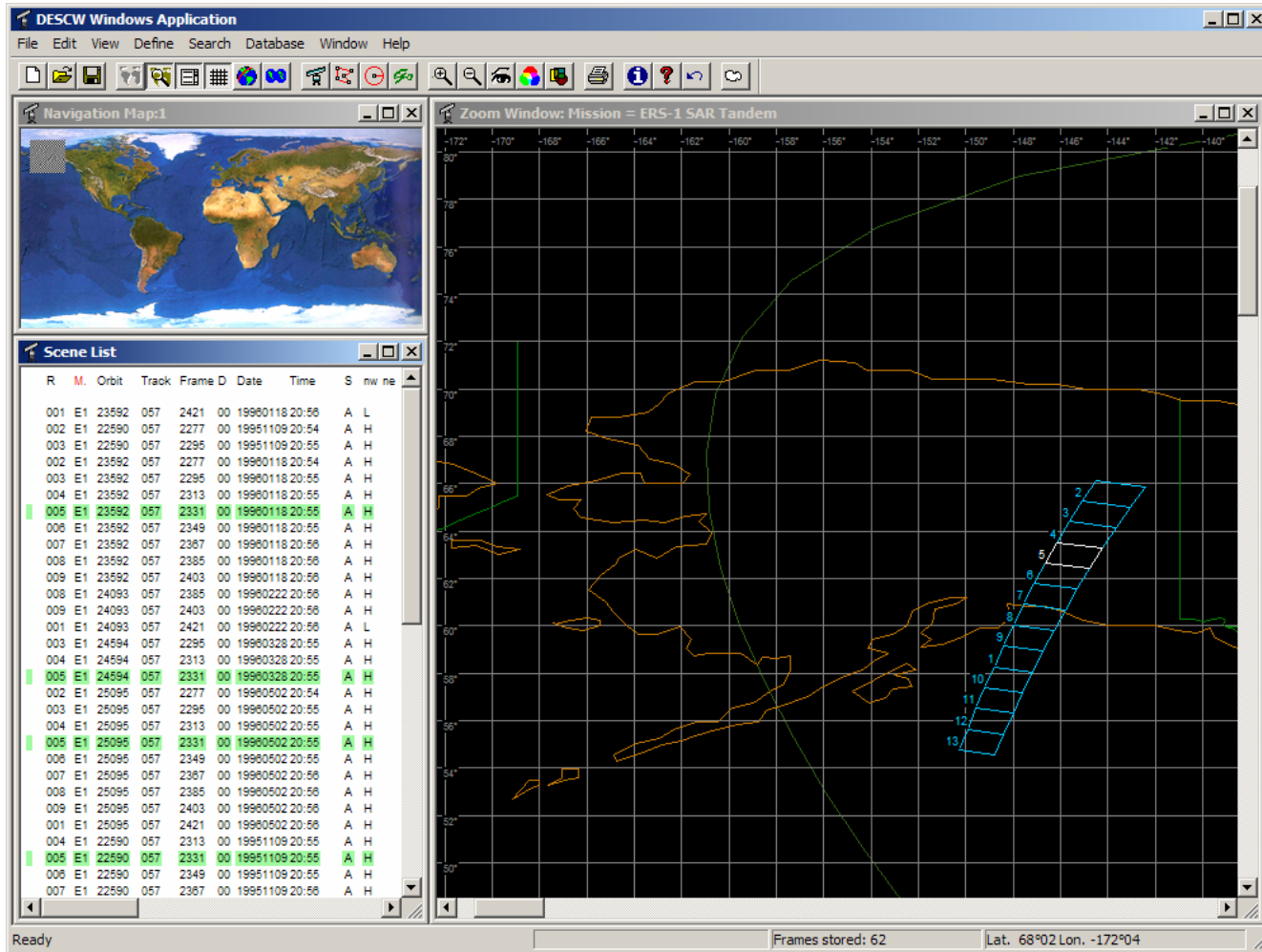
- perpendicular baseline component  $B_{\perp}$  can be used to describe the sensitivity of an interferometric pair to topographic elevation
- large parallel baseline component  $B_{\parallel}$  will produce a high background fringe rate due to “flat” topography – needs to be known quite accurately to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

Data selection



# Descw

Data selection





# Radarsat baseline catalog



## Radarsat-1 interferometric baseline catalog

This interface lets you search for available interferometric pairs in the ASF archive using a world map which has been divided in 5x5° grids. Grids for which interferometric pairs are available are highlighted in dark tones. Clicking on the individual grid cell will allow you to download the baseline information as a zipped text file and a zipped ArcGIS shape file. Baselines can also be searched using a [text only version](#).

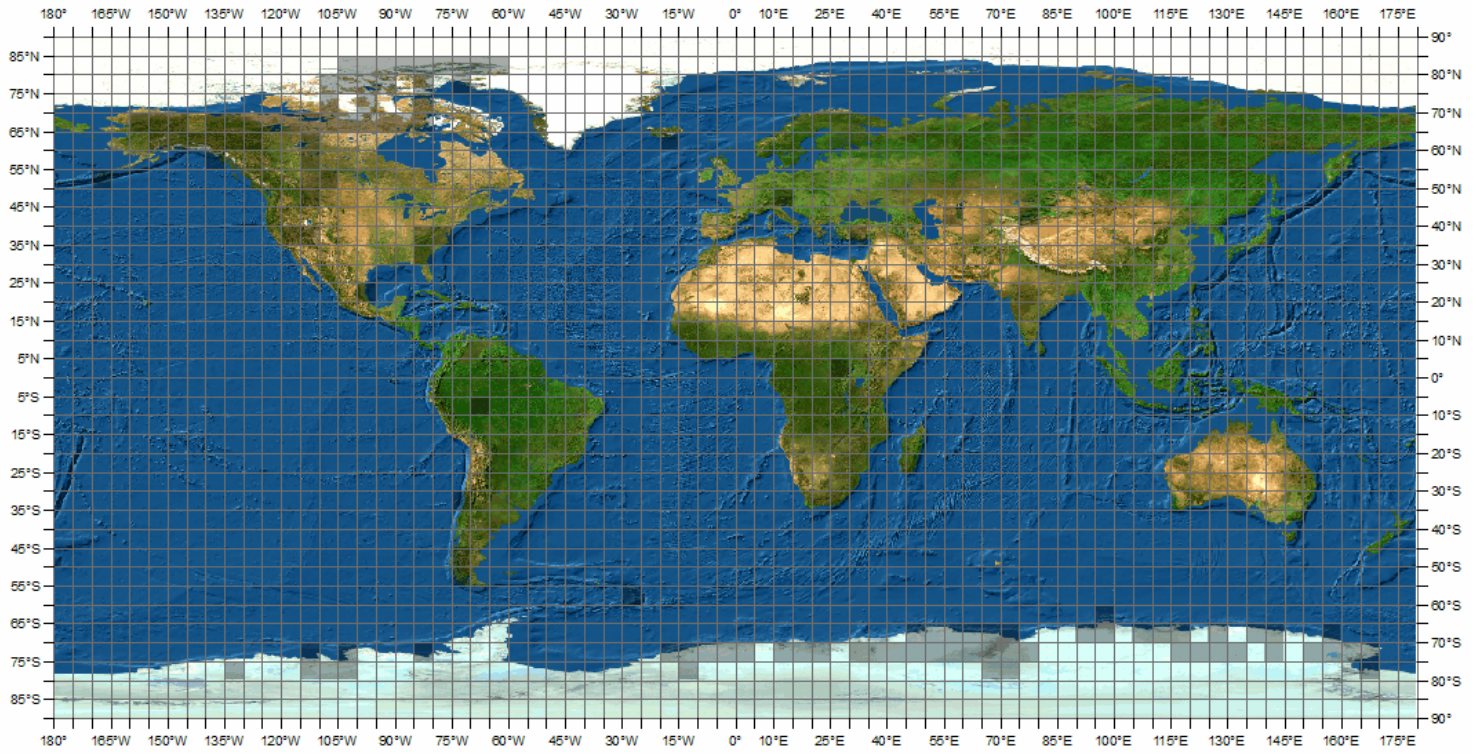
Beam mode:

Orbit direction:

Latitude (deg):

Longitude (deg):

Data selection



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





# Radarsat baseline catalog

RADARSAT-1: InSAR Coverage for ASF Station Mask  
Example: Descending ST2 orbits with 24 days repeat cycle

Data selection

