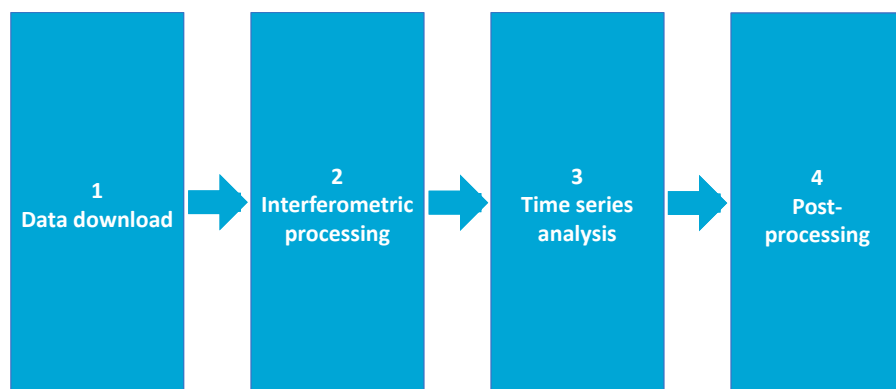


InSAR data processing

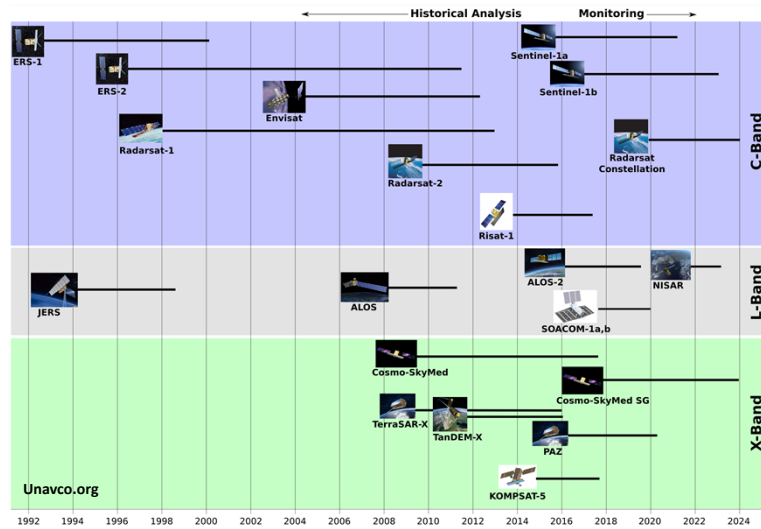
EUREF 2018 tutorial

Freek van Leijen
Delft University of Technology

InSAR data processing flow



1 Data download

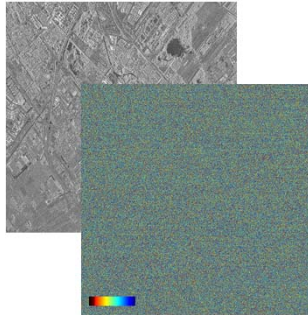
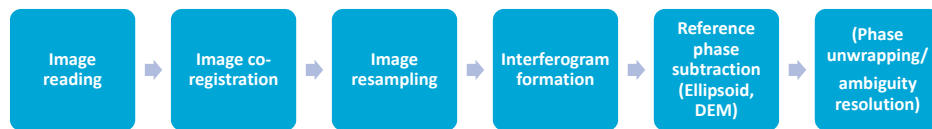


1 Data download

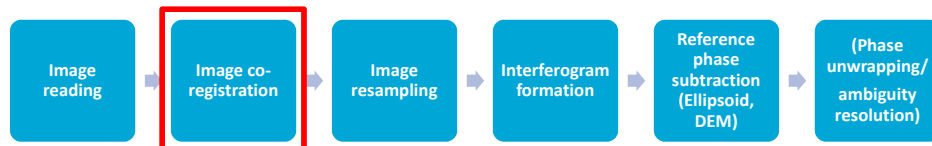
Data volumes (single polarization)

Mission	Size	Pixel spacing	Repeat cycle	Data size per product	Data size per year
TerraSAR-X (Stripmap mode)	50x30 km	~3x3 m	11 days	1.9 GB	63 GB
Cosmo-SkyMed (Stripmap mode)	40x40 km	~3x3 m	4 days (mean)	1.7 GB	155 GB
RadarSAT-2 (Stripmap (XF) mode)	125x125 km	~3x3 m	24 days	5.4 GB	81 GB
Sentinel-1 (TOPS (IW) mode)	170x250 km	~14x5 m	6 days	4.1 GB	246 GB

2 Interferometric processing



2 Interferometric processing



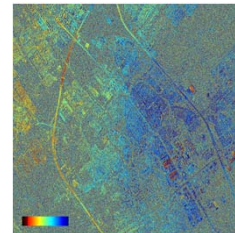
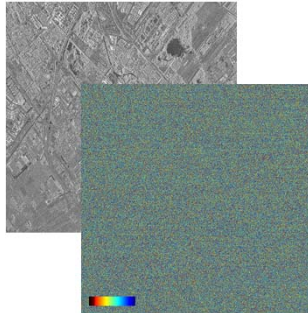
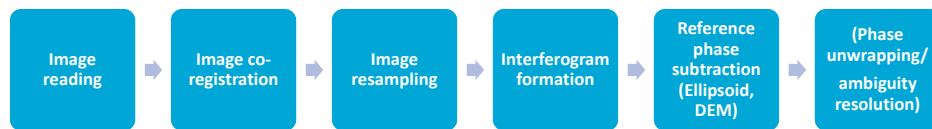
Based on:

- Image matching techniques, or
- Geometric relations (precise satellite orbits, DEM, image timing parameters)

Required precision:

- 0.1 pixel (Stripmap mode)
- 0.001 pixel (TOPS mode (Sentinel-1))

2 Interferometric processing



2 Interferometric processing

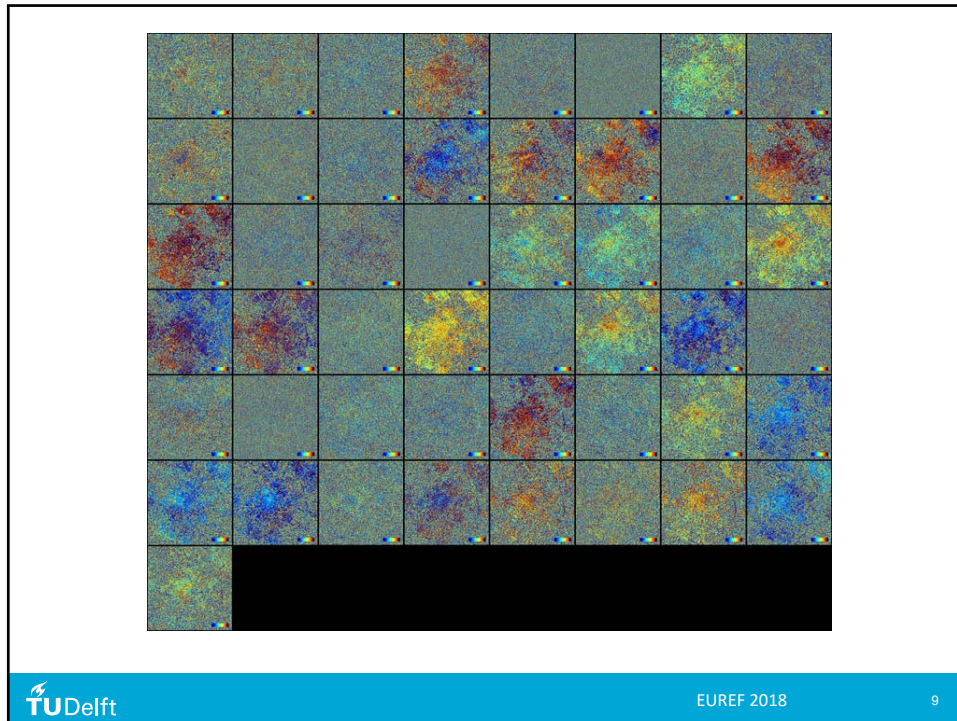
Software

Open source software, e.g.

- DORIS (TU Delft, NL)
- SNAP toolbox (ESA)
- GMTSAR (Scripps Institution of Oceanography, USA)

Commercial software, e.g.

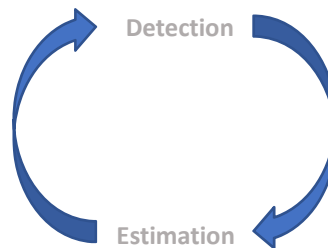
- GAMMA (GAMMA Remote Sensing, CH)
- SARscape (SARmap, CH)



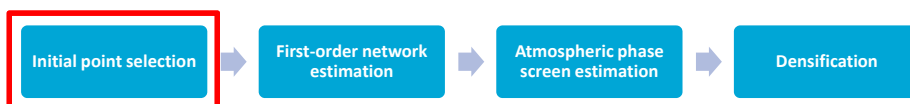
3 Time series analysis



3 Time series analysis



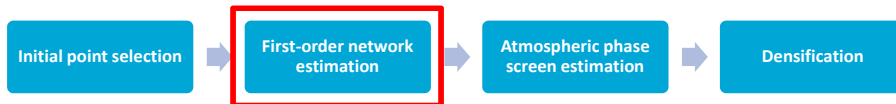
3 Time series analysis



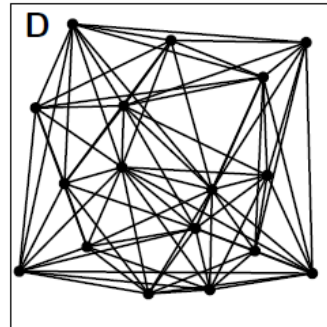
- Based on radar intensity consistency
- Typically 3-5 pts/km²



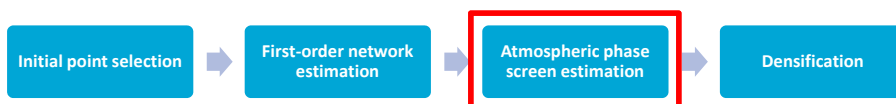
3 Time series analysis



- Typically 3-5 pts/km²
- Ambiguity resolution and parameter estimation based on spatial and/or temporal smoothness, e.g., linear deformation rates

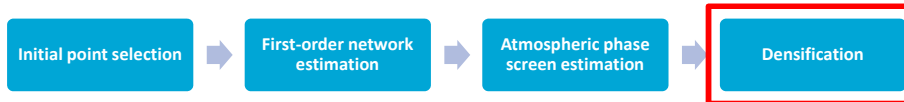


3 Time series analysis



- Estimation of differential tropospheric and ionospheric signal delay

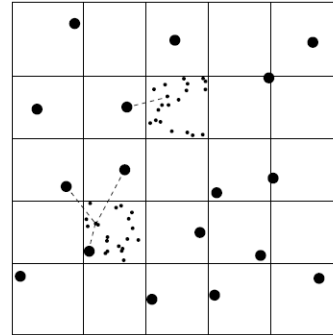
3 Time series analysis



In urban areas, typically

- 1000 pts/km² for medium-resolution data
- 10000 pts/km² for high-resolution data

Corresponding to max ~10% of original number of pixels.



3 Time series analysis

Software

Open source software, e.g.

- StaMPS (Leeds, UK)

Commercial software, e.g.

- GAMMA (GAMMA Remote Sensing, CH)
- Sarscape (SARmap, CH)

4 Post-processing

E.g.,

- Georeferencing
- Point classification
- Separation deformation regimes
- Creation derived products (e.g., data gridding)

