Towards Bi- and Multi-static SAR

Björn Rommen

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Why towards bi- and multi-static SAR?

Compared to a single monostatic SAR system:

- providing *single-pass* geometry/line-of-sight/baseline diversity

Depending on the application, it is not always representing the only viable solution (see next slides), but

- possibly a cost-efficient solution when flying with an existing high duty-cycle monostatic system (e.g. Sentinel-1 & Harmony)
- enabling single-pass InSAR / TomoSAR (depending on number of "companions")

Challenges

- Relying on a cooperative transmitter
- Next generation SAR monostatic SAR systems go towards DBF-SAR architectures
- Synchronisation!

Topography & Tomography

"Backbone" SAR missions at C- and L-band operate ~zero-baseline

B	veg. gain	deformation gain
↑	↑	↓
↓	↓	↑

P. Siqueira, 2003

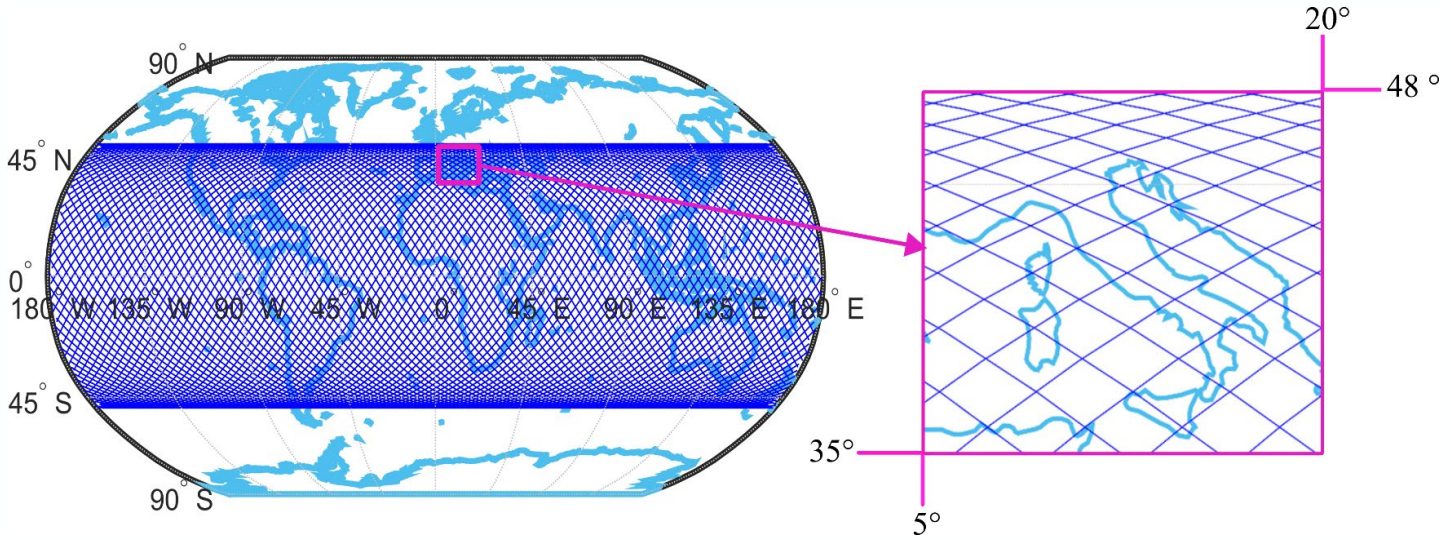
- Largely benefiting surface deformation
  - reduction of volume / baseline decorrelation
- Not optimised for height measurements (analogy: limited 'parallax')
- Dedicated missions in favour of SAR tomography or for increasing InSAR/PolInSAR height sensitivity:

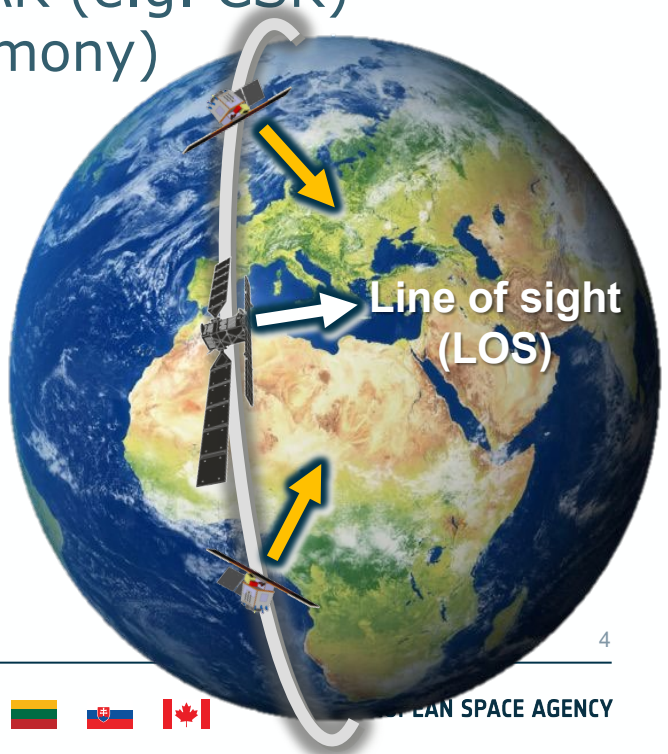
1) Multi-pass acquisition stack collection for a single mission with controlled across-track baselines (e.g. Biomass)
2) Tandem satellite operation (e.g. TerraSAR-X+Tandem-X, LuTan-1)
3) Single-pass acquisition stack collection for a companion mission with controlled across-track baselines (e.g. Harmony)
4) Single-pass acquisition stack collection for interferometric cartwheel like concepts (dedicated transmitter) → Hongtu-1 (see next presentation)

North-South sensitivity / 3D deformation

Options (non-exhaustive):

1) Exploiting ascending/descending + left-/right-looking geometries (e.g. ALOS-2/NISAR)
   - Disadvantage as toggling between left- and right-looking decreases the temporal resolution for each stack
     - ➢ could still be fine when implemented systematically
2) Exploiting burst-overlap region in TOPS modes (e.g. Sentinel-1)
   - only applicable in the limited overlap region
3) Mid-inclination orbits (e.g. NIMBUS IRIDE), combined with SSO SAR (e.g. CSK)
4) Dedicated companions with large along-track separation (e.g. Harmony)






Enjoy the workshop!
Image courtesy of OHB