The null line

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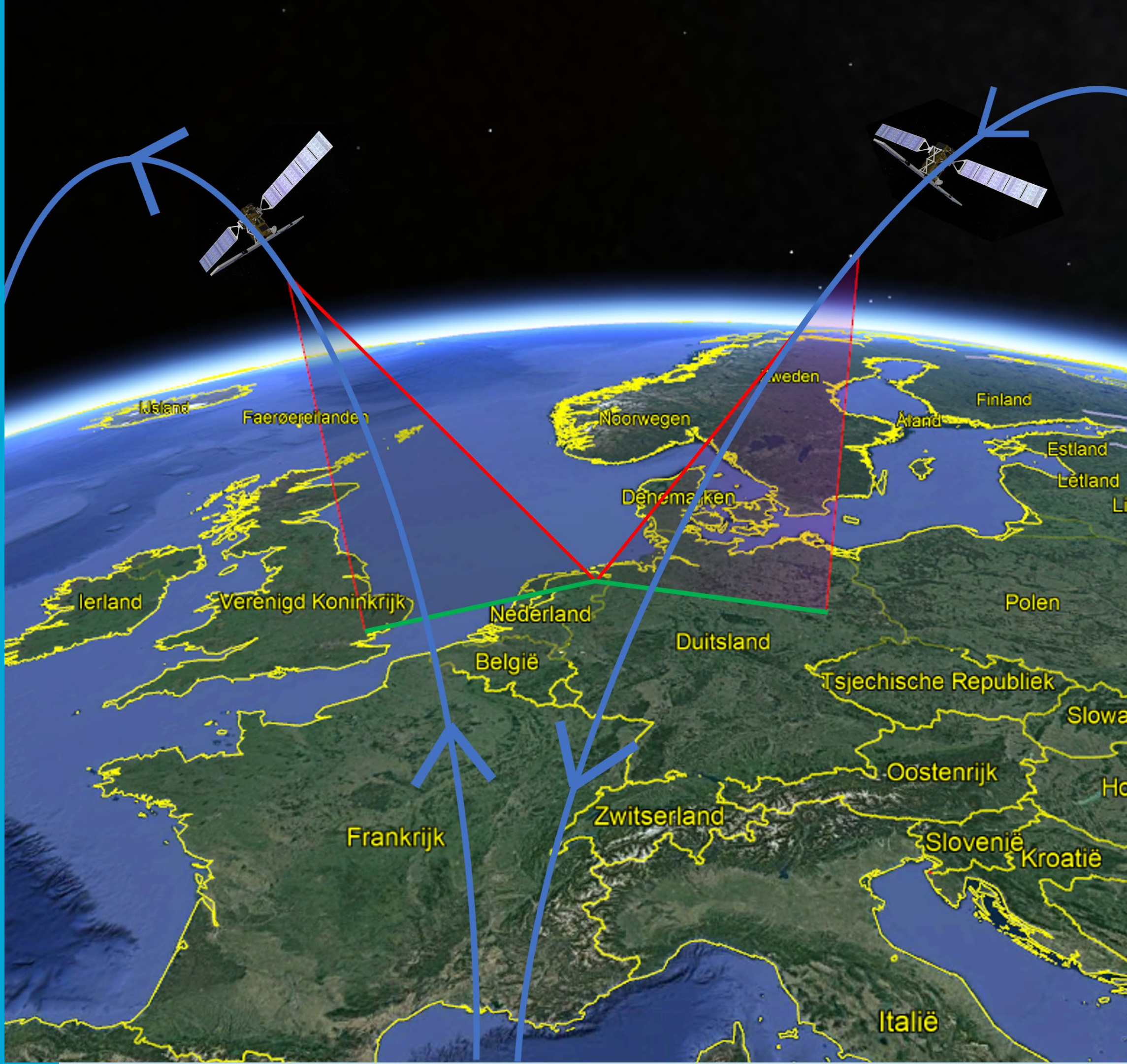
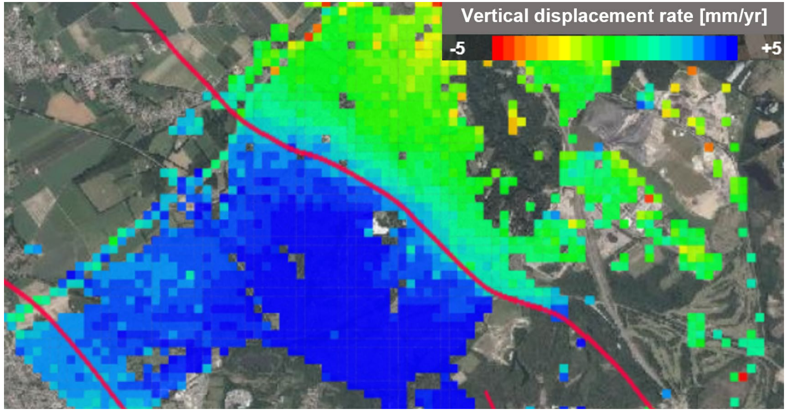


Another talk about InSAR geometry?



consecutive interferograms and a stacking approach. For the time series analysis the differential phase of unwrapped interferograms of select consecutive pairs was converted from SAR line-of-sight to vertical displacement using Eq. (1). Vertical displacement is considered to be broadly appropriate for the relatively flat Iqaluit Airport site and is necessary for comparison with thaw tube measurements.

$$d_v = \frac{\varphi(\lambda/4\pi)}{\cos\theta} \quad (1)$$

et al., 2001a). Here we first constrain the shape of the magma chamber by reconstructing vertical and horizontal components of the surface displacement using two interferograms, one from an ascending orbit and the other from a descending orbit. This approach is

Whenever two data sets of InSAR images are available, acquired over the same area and during the same time frame along ascending and descending orbits, the PSInSAR results can be used successfully to estimate the vertical and west–east components of the local displacement field [33]. For the present study, a number

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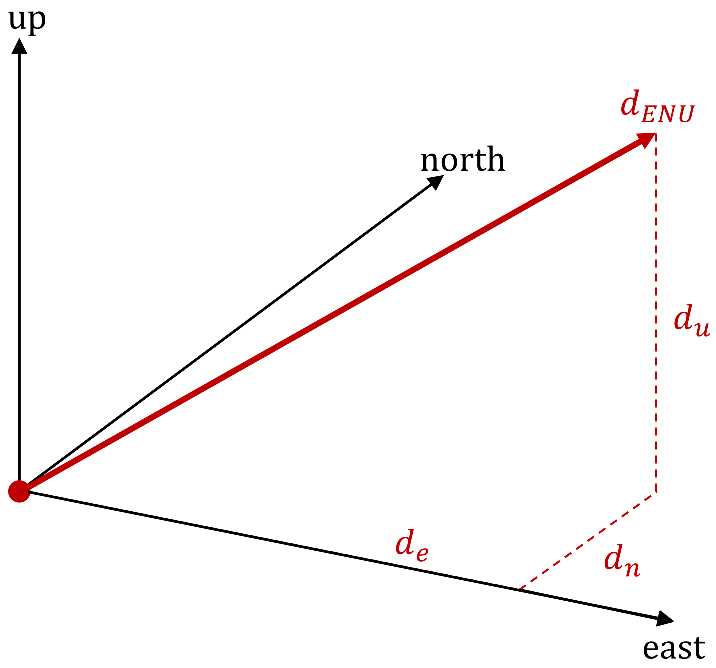
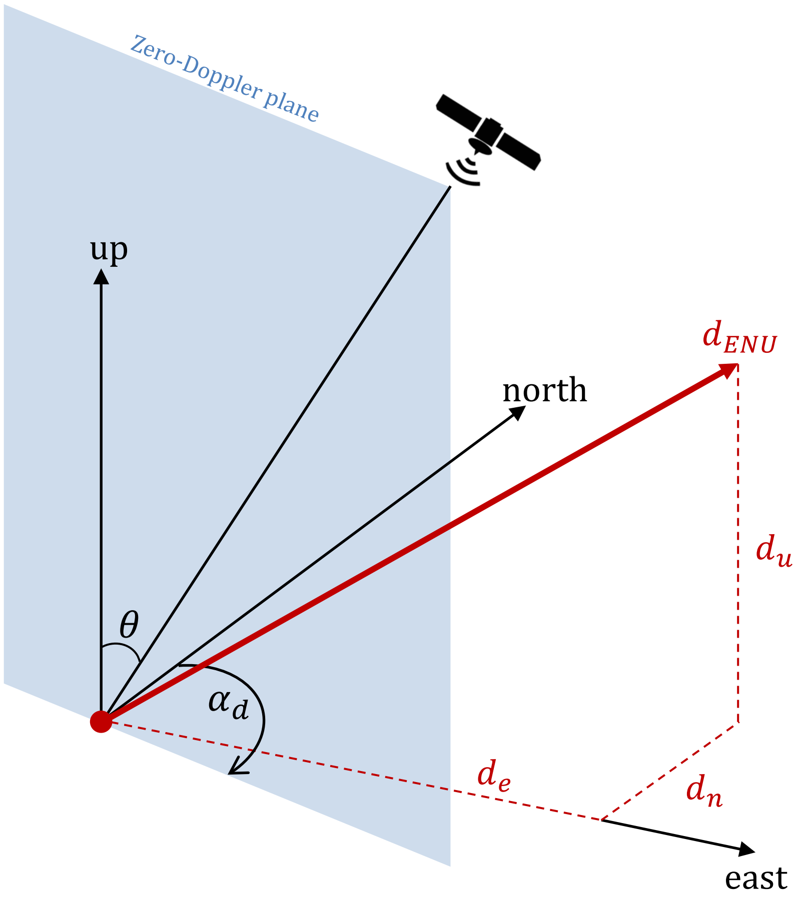
Geometry

- Displacement vector



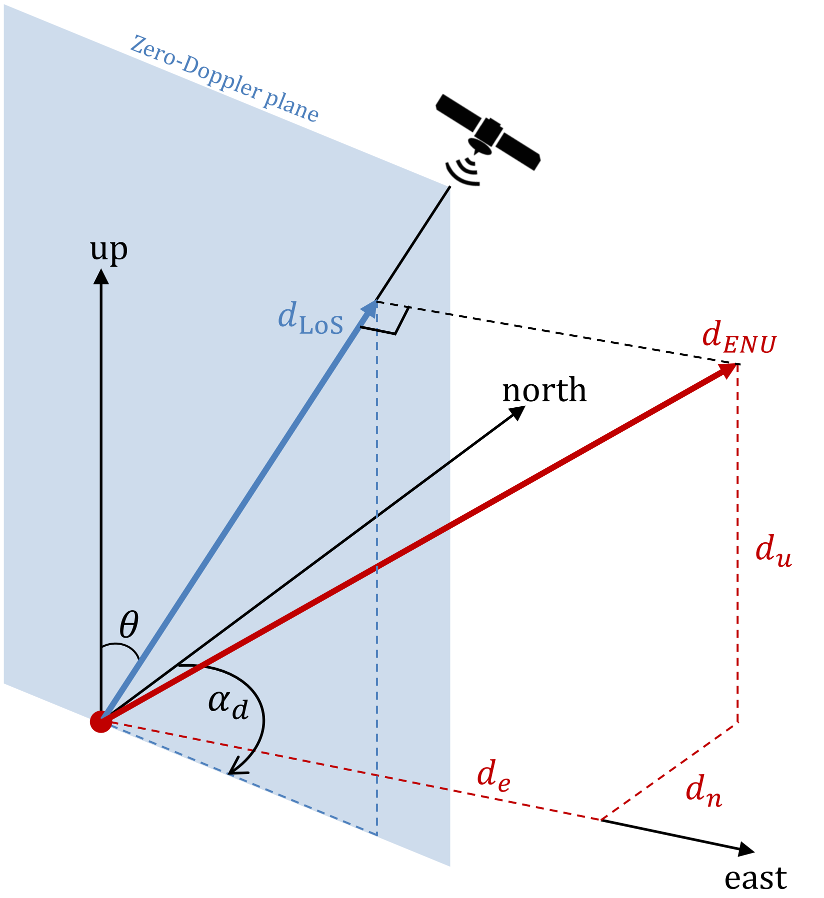
Geometry

- Displacement vector

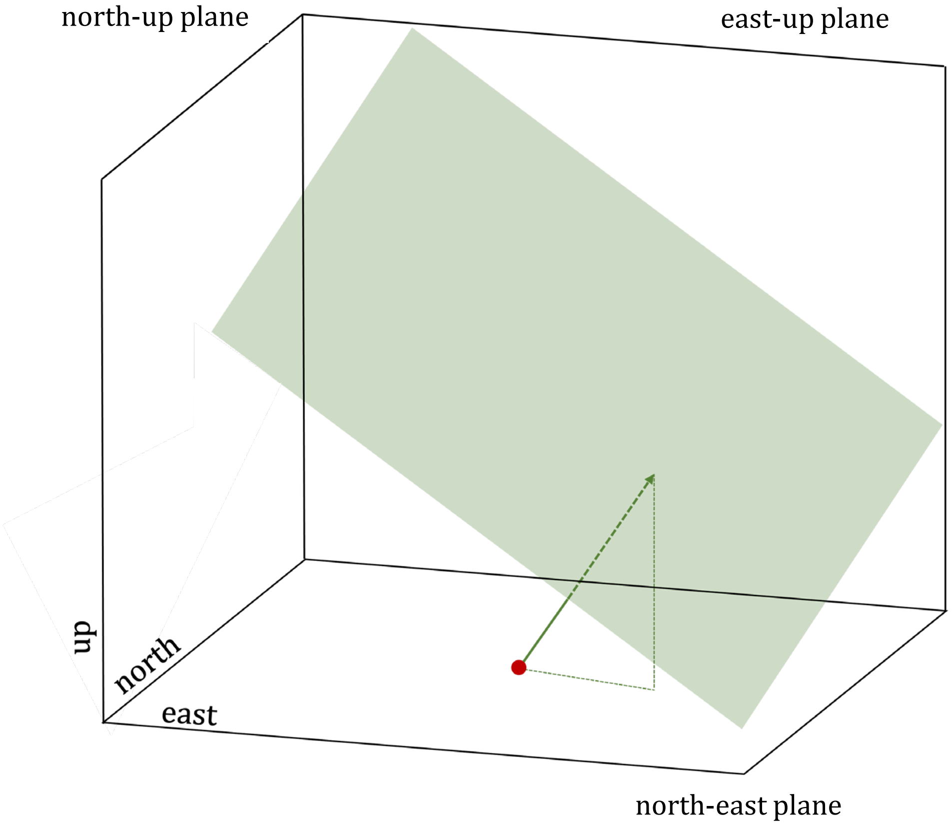


Geometry

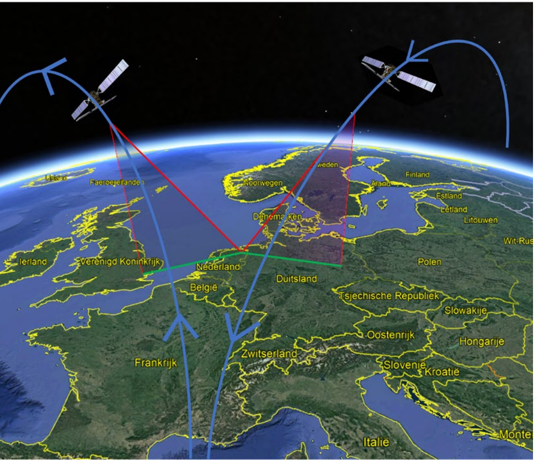
- Displacement vector
- LoS observation

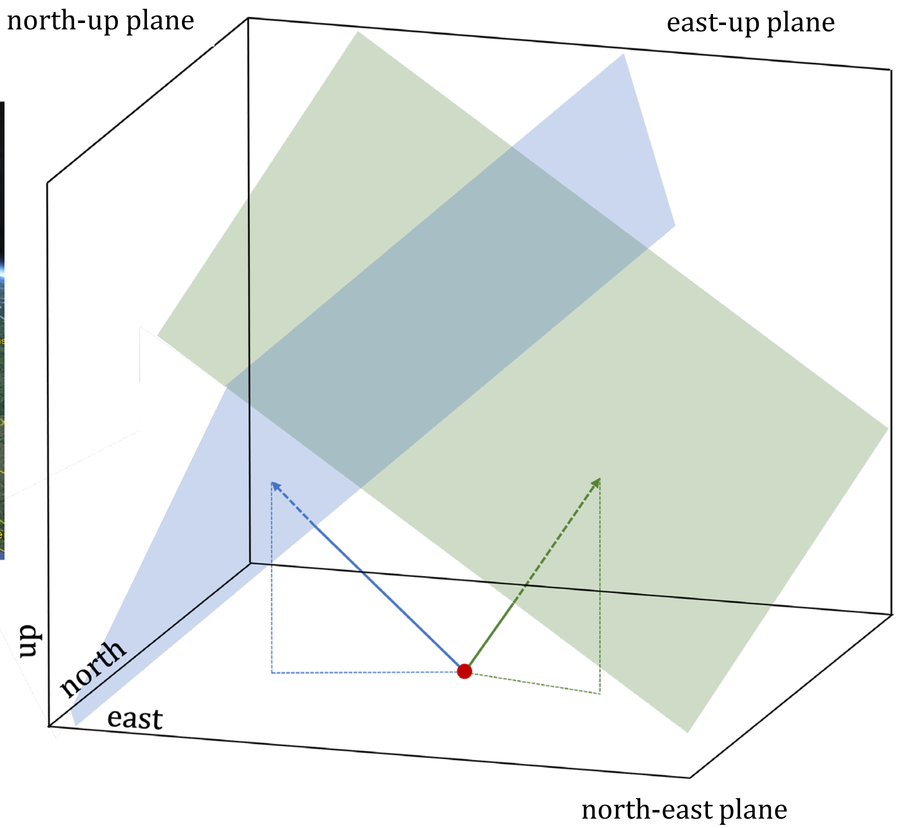


1 LoS observation



2 LoS observations





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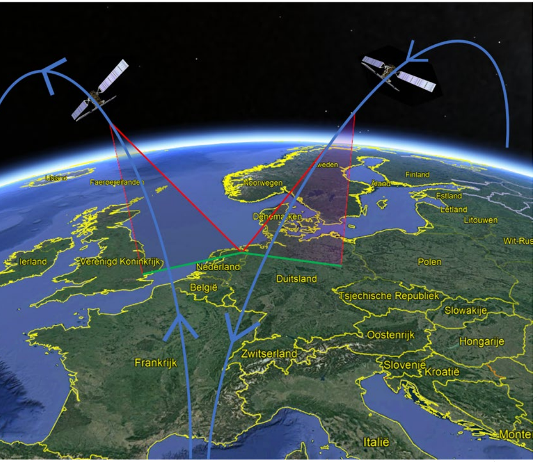

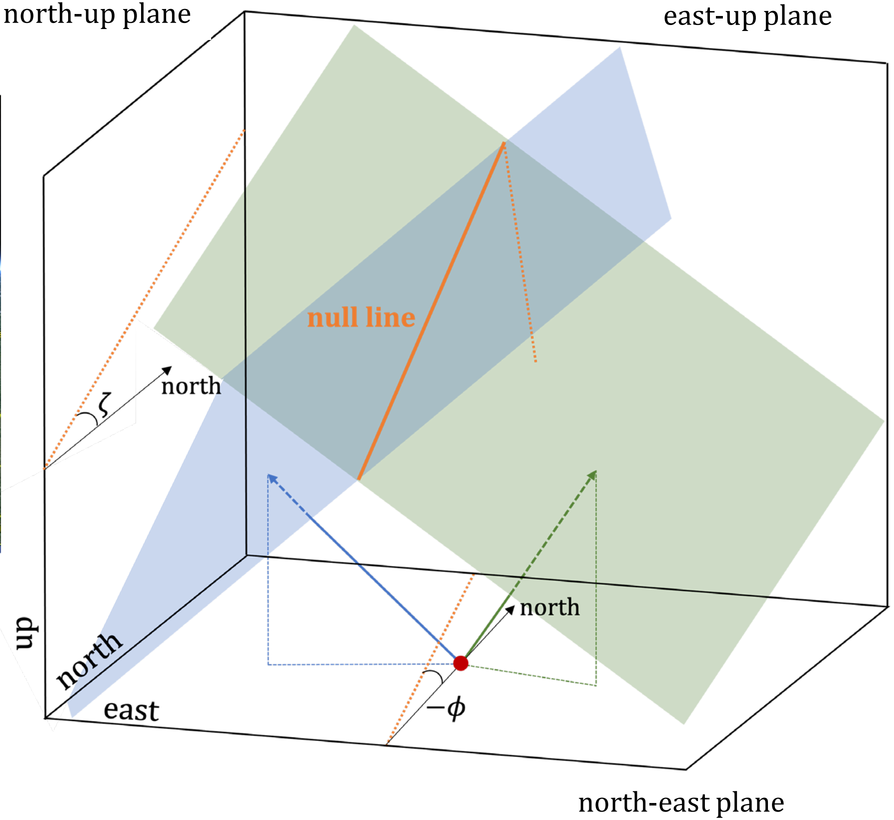

Described by 2 angles:

1. Azimuth angle ϕ
2. Elevation angle ζ

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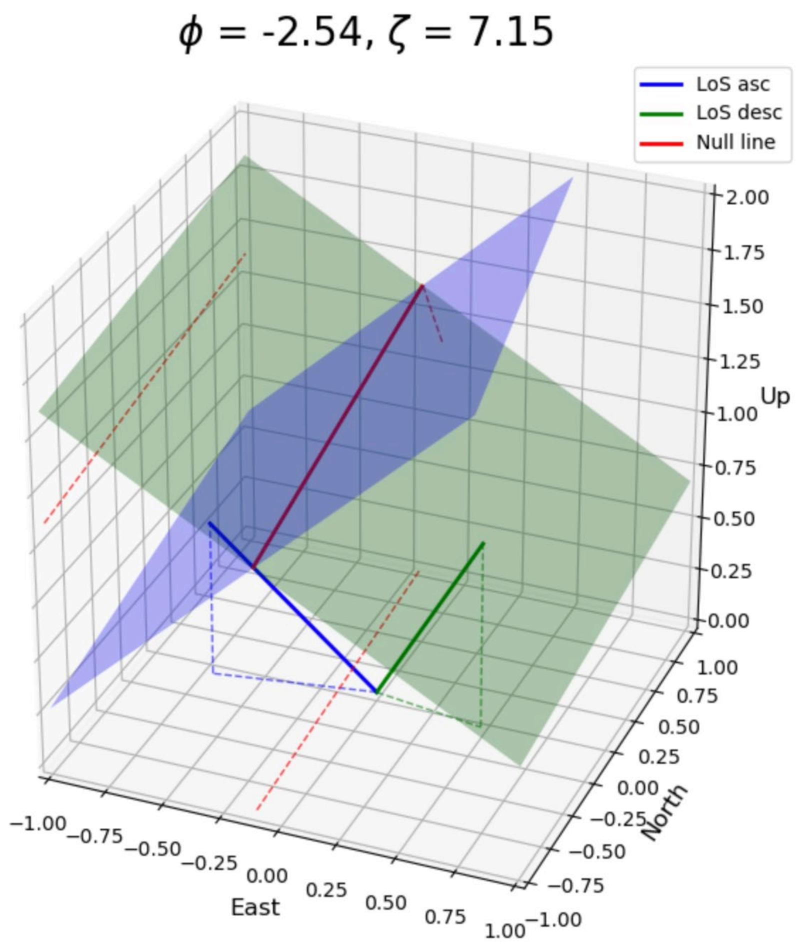
The null line

Why?

- ‘Blind’ for displacements in the direction of the null line

- Adding a third viewing geometry?



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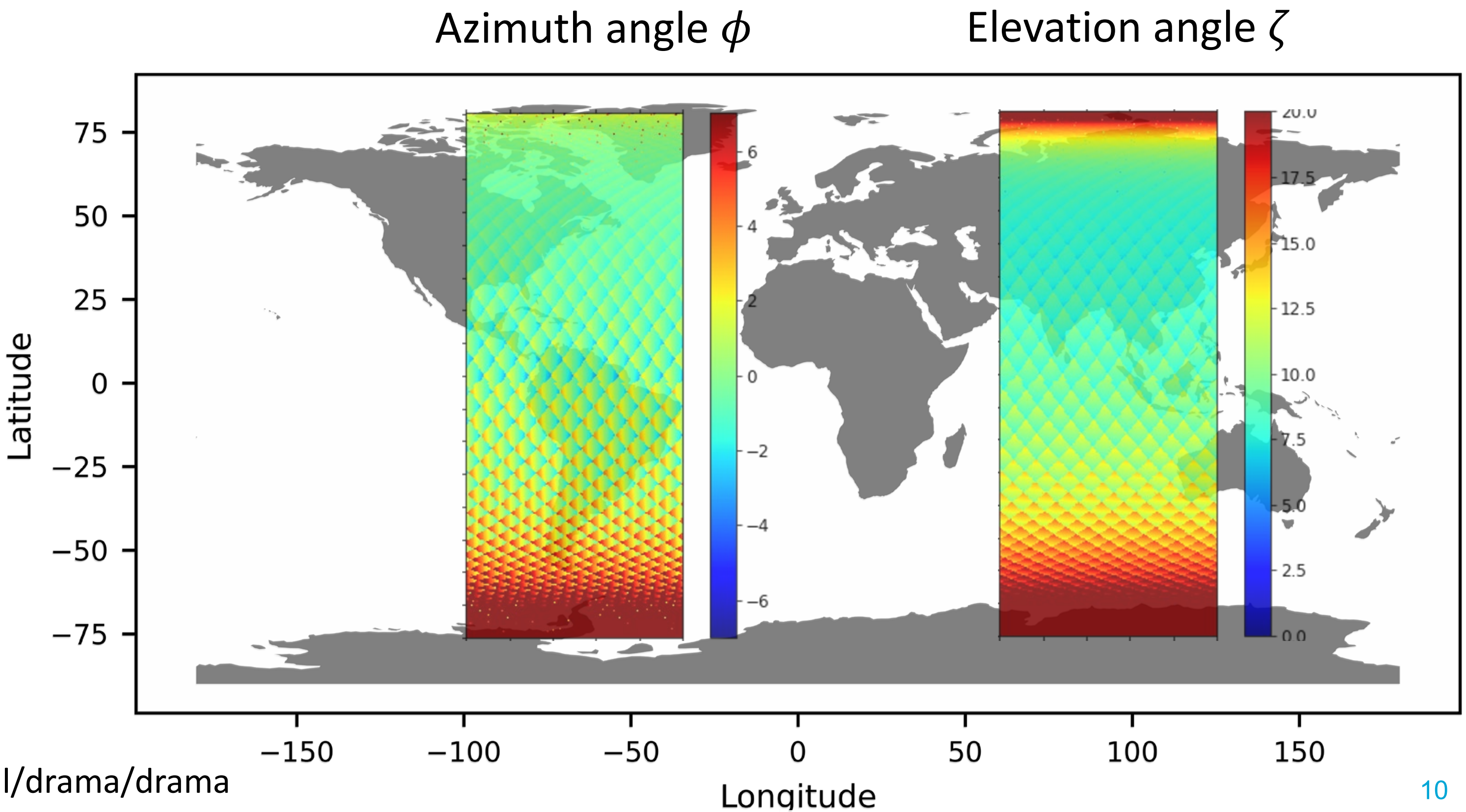
The orientation of the null line: No-DRaMA

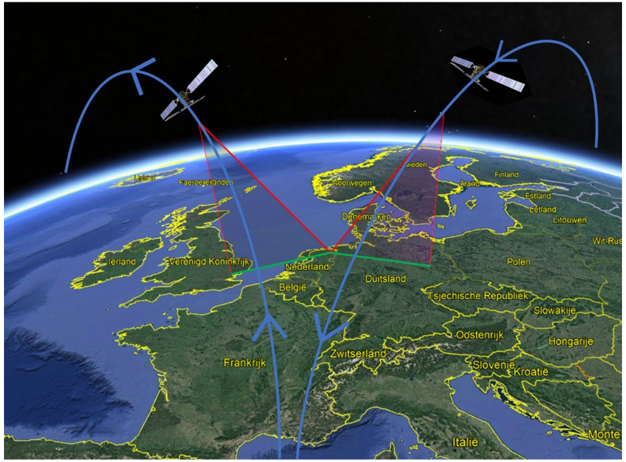
Estimate the orientation of the null line with No-DRaMA:

Dependening on the location on Earth



Download via:
https://gitlab.tudelft.nl/drama/drama

east and up → Biased estimates



$$E\left\{\underbrace{\begin{bmatrix} d_{\text{LoS}}^{\text{asc}} \\ d_{\text{LoS}}^{\text{dsc}} \end{bmatrix}}_{y}\right\} = \underbrace{\begin{bmatrix} \sin(\theta_1)\ \sin(\alpha_{d,1}) & \sin(\theta_1)\ \cos(\alpha_{d,1}) & \cos(\theta_1) \\ \sin(\theta_2)\ \sin(\alpha_{d,2}) & \sin(\theta_2)\ \cos(\alpha_{d,2}) & \cos(\theta_2) \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} d_e \\ \cancel{d_n} \\ d_u \end{bmatrix}}_{x}$$

$$E\left\{\underbrace{\begin{bmatrix} d_{\text{LoS}}^{\text{asc}} \\ d_{\text{LoS}}^{\text{desc}} \end{bmatrix}}_{y}\right\} = \underbrace{\begin{bmatrix} \sin\theta_1\ \sin\alpha_{d,1} & \cos\theta_1 \\ \sin\theta_2\ \sin\alpha_{d,2} & \cos\theta_2 \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} d_e \\ d_u \end{bmatrix}}_{x}$$

Biased estimates

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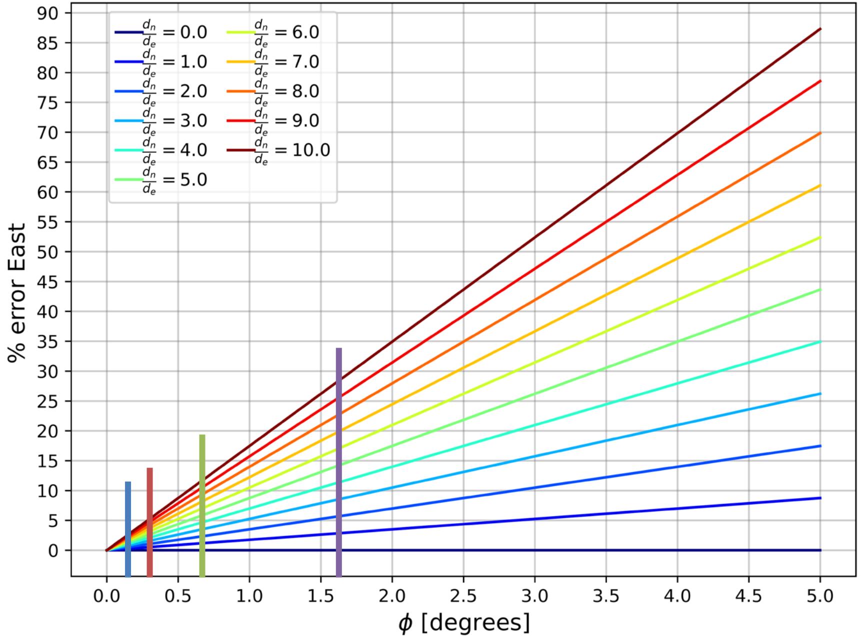
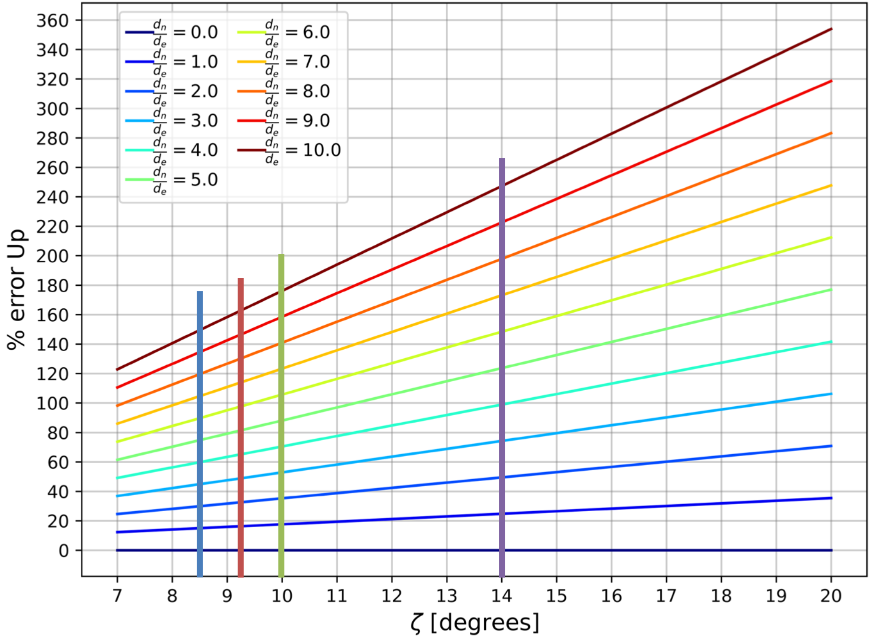
Biased estimates





Bonn: 51°

Los Angeles: 34°

Singapore: 1°

Sydney and Cape town: −34°

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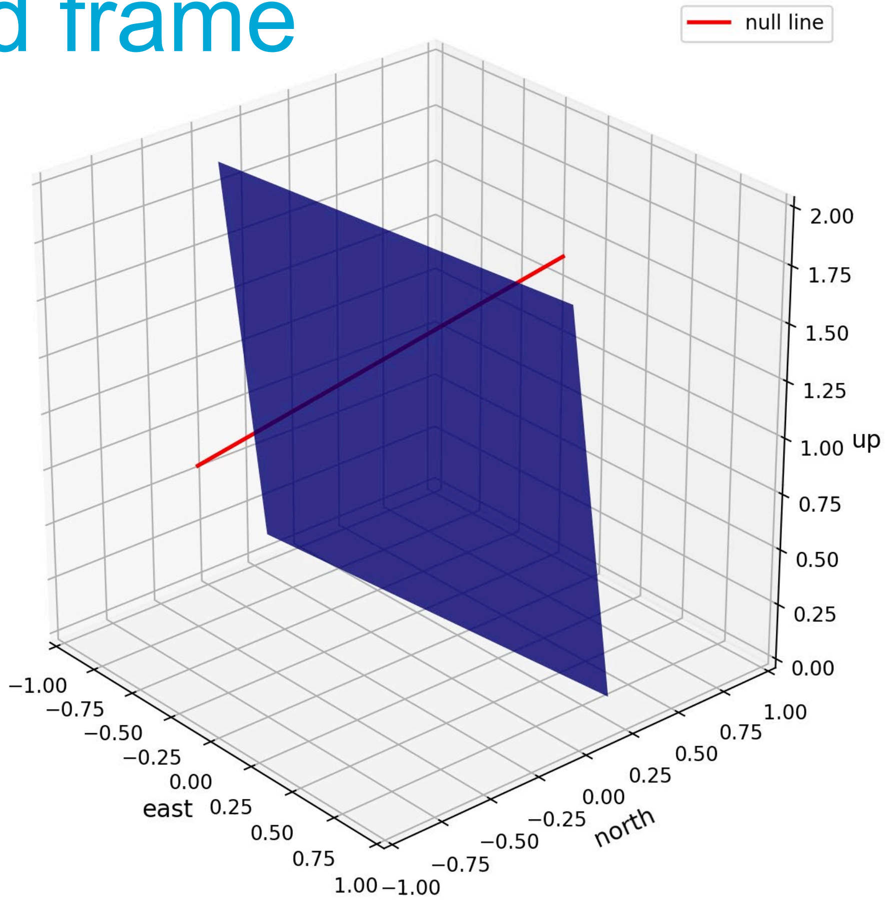
The null line aligned frame

- Unbiased estimates
- What are going to do with the results?
  - Risk models
  - Finite element models
  - Earth quake models



Conclusions

- Guidelines and taxonomy required
- Always estimate the orientation of the null line
  - No-DRaMA
  - InSAR is blind in the direction of the null line
- Consider to align the reference frame along the null line

Download No-DRaMA:
https://gitlab.tudelft.nl/drama/drama