OBSERVATIONS WITH SIBLING TELESCOPES: LOCAL EFFECTS AND INSTRUMENTAL DELAYS

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SIBLING VERSUS TWIN

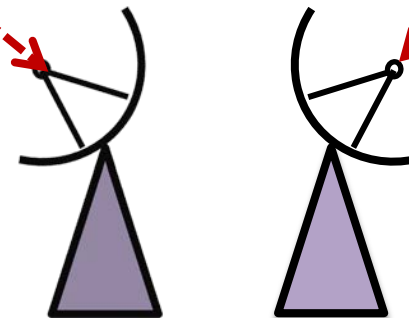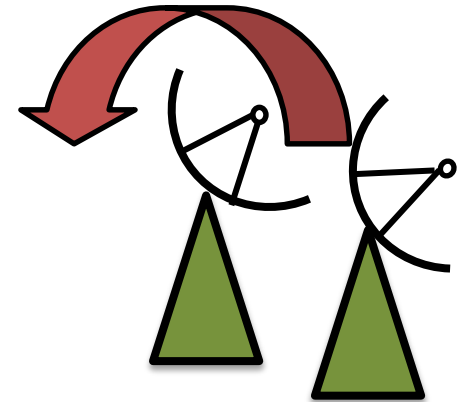- Co-located legacy and VGOS antennas

- Two VGOS antennas (e.g. Wettzell, Onsala, NyÅlesund)

MOTIVATION

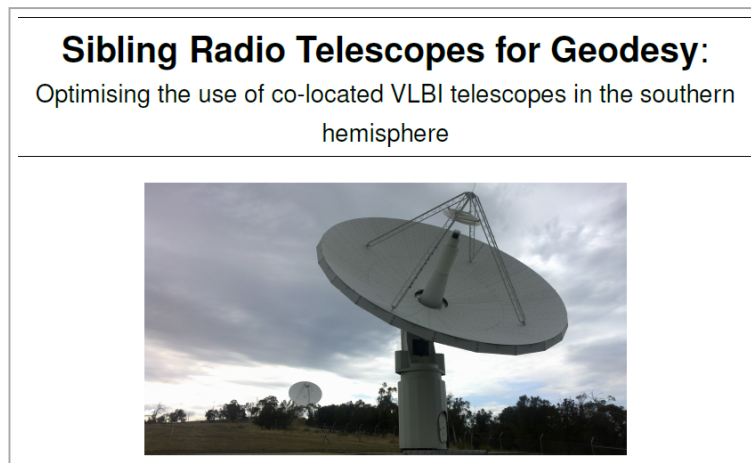- VGOS-twins are built, how to use them best?

WHY TWINS?

- One observes, one slews

- Overcome maintenance

- Resolve the troposphere

SCHEDULING

- Realise in scheduling software
- Identify best strategy
  - Interchanging
  - Common source
  - Different sources
  - Connect sub-networks
  - Add legacy antenna for weak sources
- VieVS (Vienna VLBI Software)

Sibling Radio Telescopes for Geodesy:
Optimising the use of co-located VLBI telescopes in the southern hemisphere

OBSERVATIONS

- It is difficult to successfully correlate local baselines. → RFI?

- In global sessions, local baselines are typically de-selected in the solution.

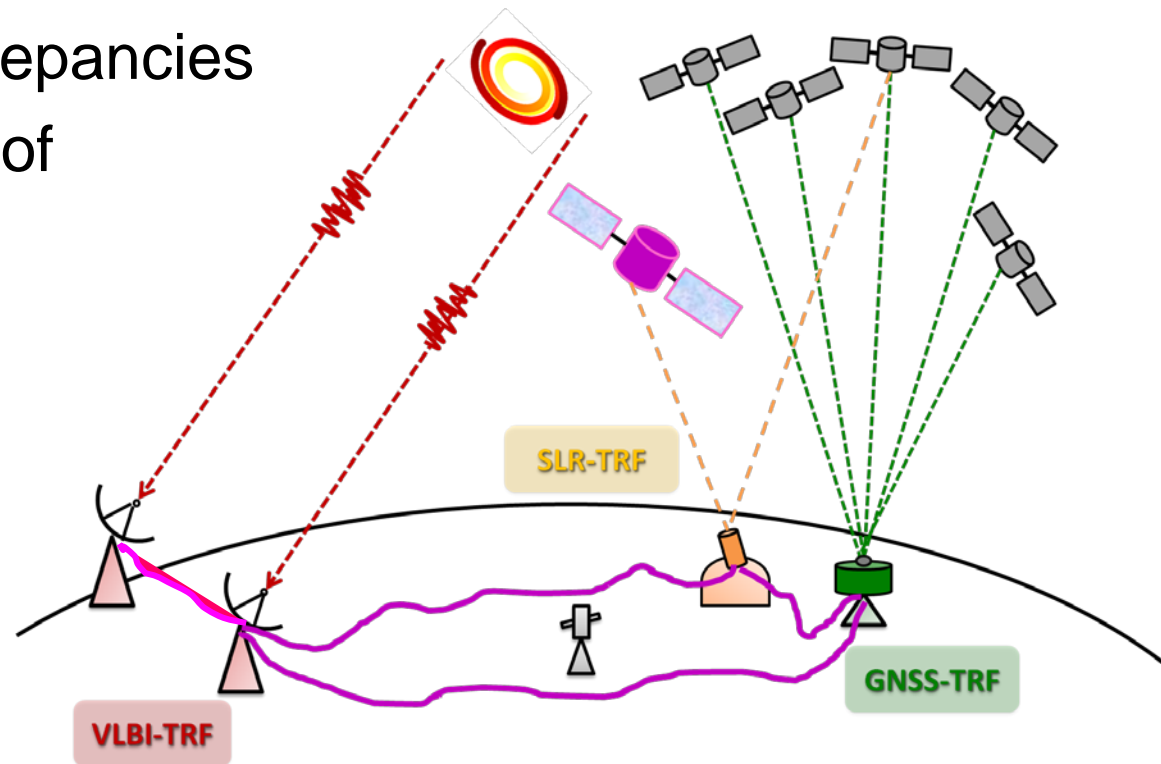- Observing program started using

  Hb-Ho and Ht-Hh.
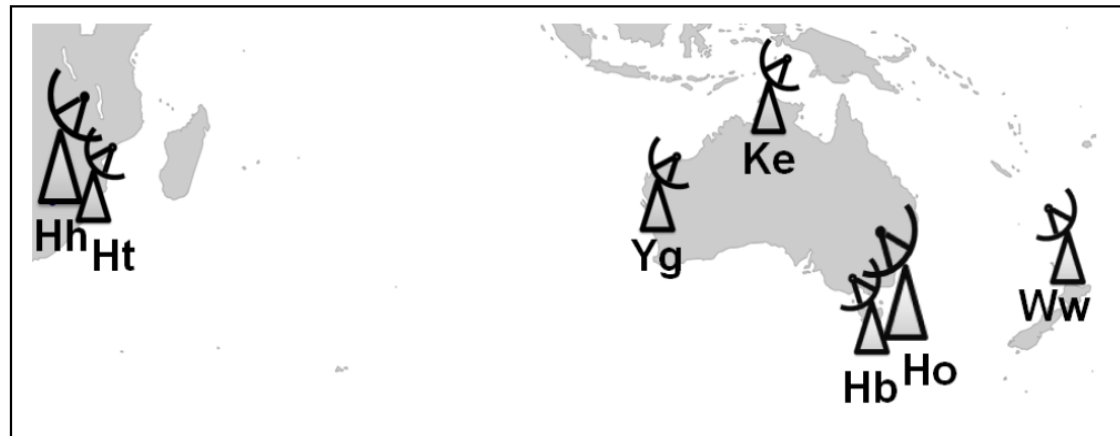
MOTIVATION

- VGOS-twins are built, how to use them best?
- Connection legacy-VGOS:
  - Local tie
  - Legacy needed to maintain the ICRF

INTRA-/INTER-TECHNIQUE TIES

- Compare results from local survey with results from geodetic measurements.
- ITRF is a multi-technique product
- ITRF2008: tie discrepancies of >10mm for 30% of VLBI-GPS ties

  [Altamimi et al. 2011]
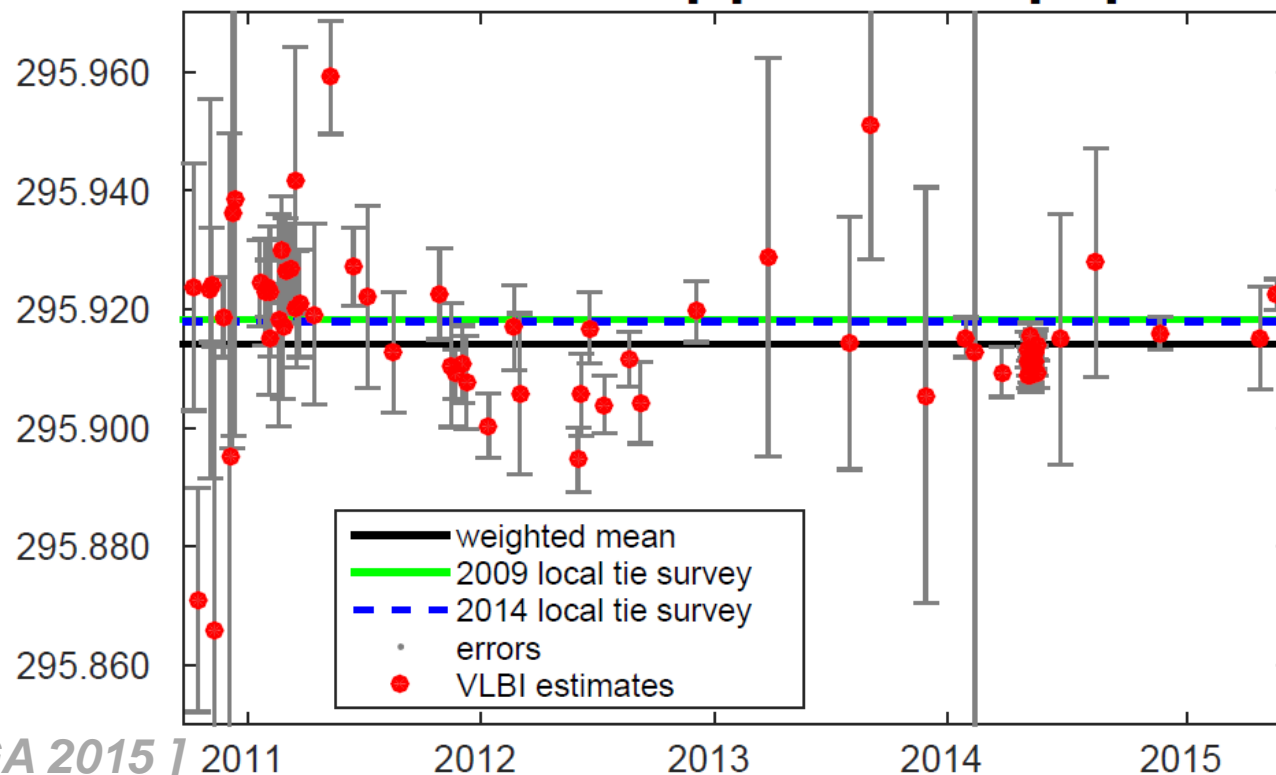

SLR-TRF

GNSS-TRF

VLBI-TRF

HOBART TIE

The Hobart-Hobart baseline determined of 72 common VLBI sessions. The black line shows the mean calculated baseline length of 295.914 m, which is 4 mm off from the baseline determined in two local tie surveys.

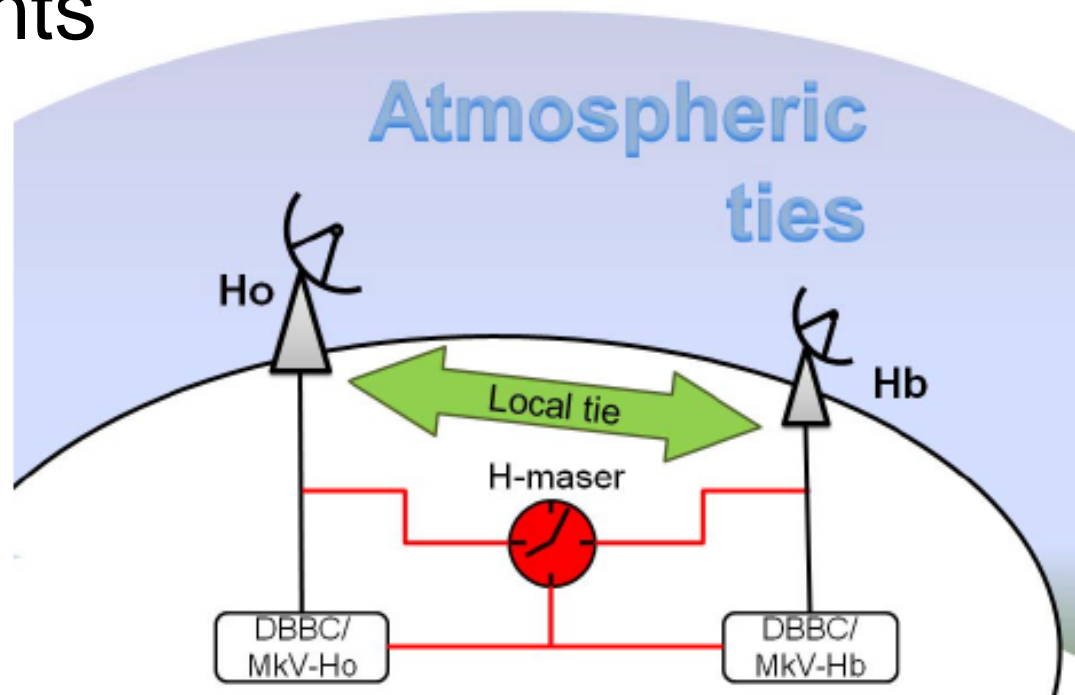HOBART26-HOBART12 mean BL [m]:295.914 WRMS [mm]:8.9

[Plank et al., Proc EVGA 2015]

MOTIVATION

- VGOS-twins are built, how to use them best?
- Connection legacy-VGOS:
  - Local tie
  - Legacy needed to maintain the ICRF
- **Chances for analysis**
  - Common parameters
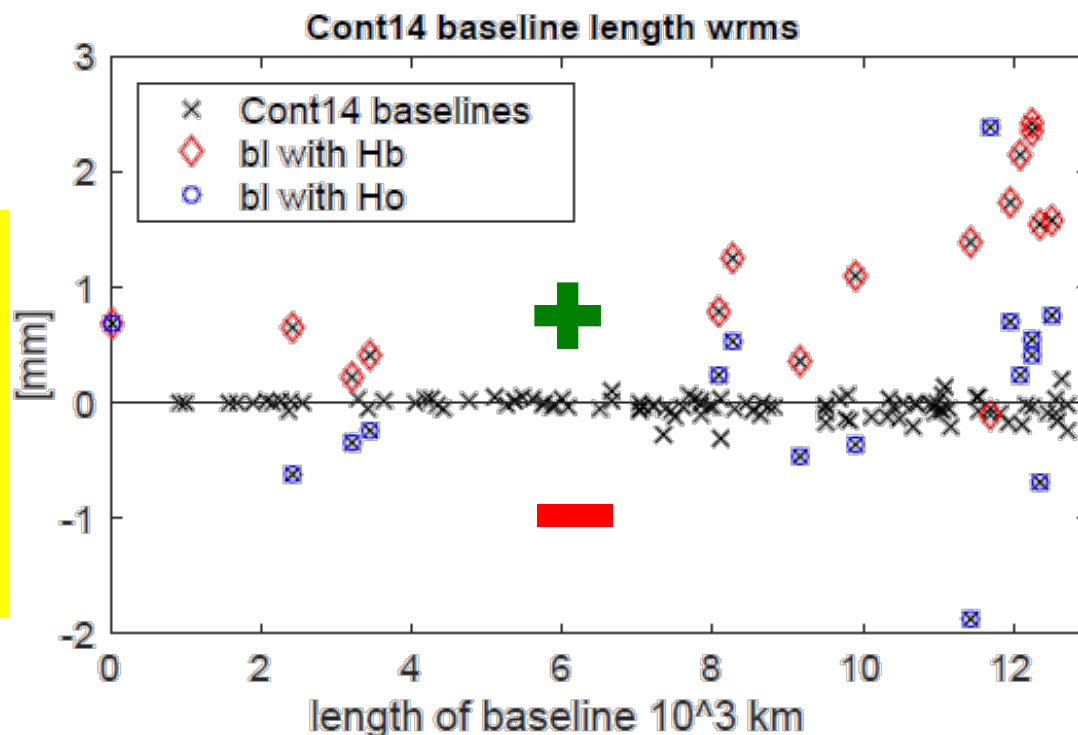 - Redundant observations

Common Parameters

- Clock

- Atmosphere

- Station movements

ANALYSIS

- New analysis options implemented in VieVS
- Combining zwd & gradients, clocks, station coordinates.
- Need to refine.

Improvements in baseline lengths of Cont14 when common parameters are constrained in the analysis

Cont14 baseline length wrms

× Cont14 baselines
◇ bl with Hb
○ bl with Ho

[mm]

length of baseline 10^3 km
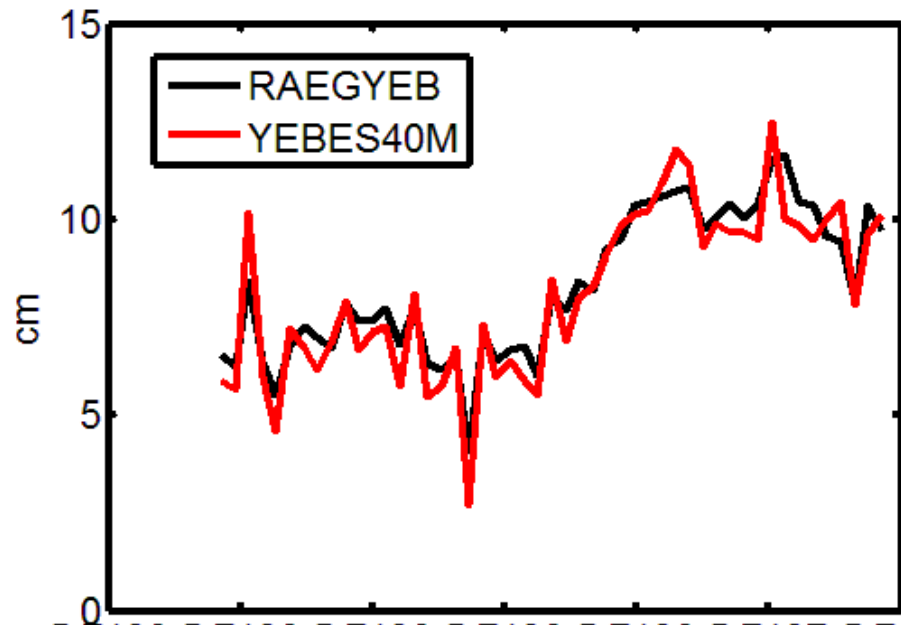
SYSTEMATIC EFFECTS?

- Difference in the ionospheric delay of redundant observations of the Hobart sibling telescope in AUST65.
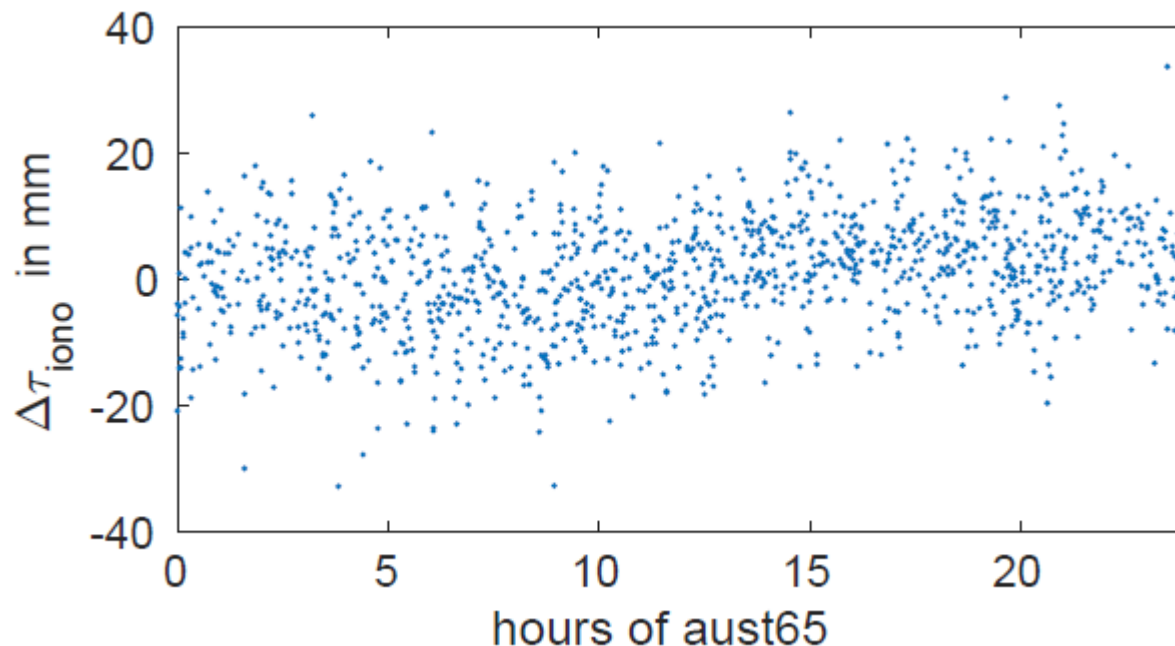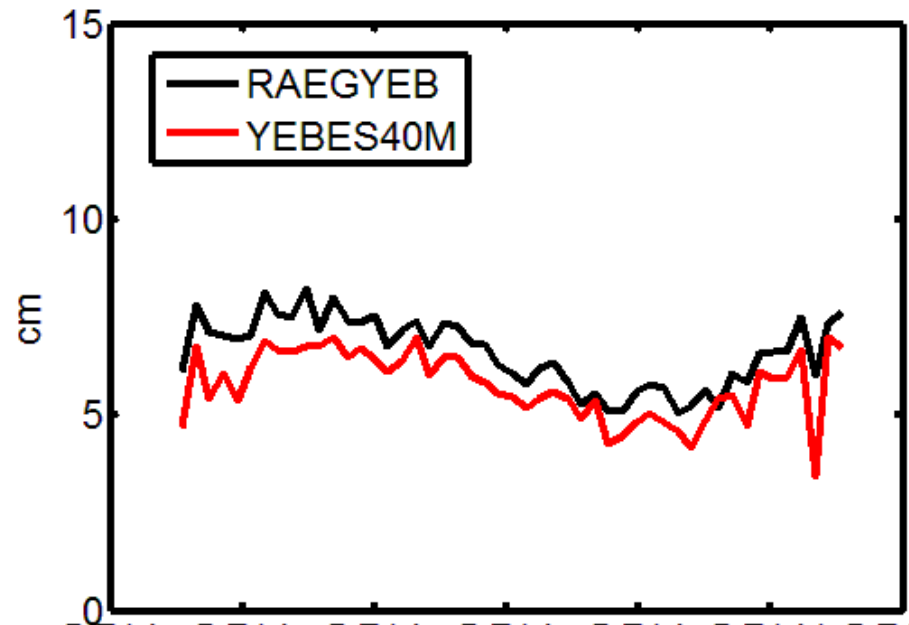
REAL TROPOSPHERE?

- Residual zenith wet delay at Yebes.
- Instrumental effects?
- Fix the clock?

24 h   24 h

MOTIVATION

- VGOS-twins are built, how to use them best?
- Connection legacy-VGOS:
  - Local tie
  - Legacy needed to maintain the ICRF
- Chances for analysis
  - Common parameters
  - Redundant observations
- **New applications**
  - Use multiple dishes (S/X, L, K receiver) as one antenna
  - Determine antenna deformations
  - Zero baseline flux monitoring

NEW FREQUENCIES

- Include single-frequency antennas in geodetic network (transfer ionosphere)

- Combine with L-band antennas (e.g. to track GNSS-satellites)

Ww 30m (only x-band)
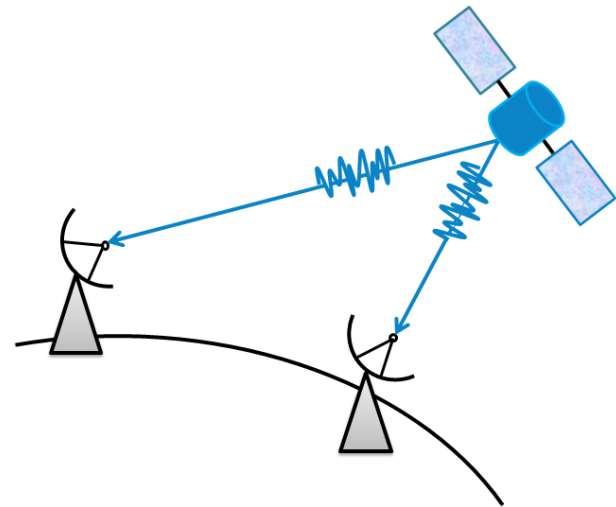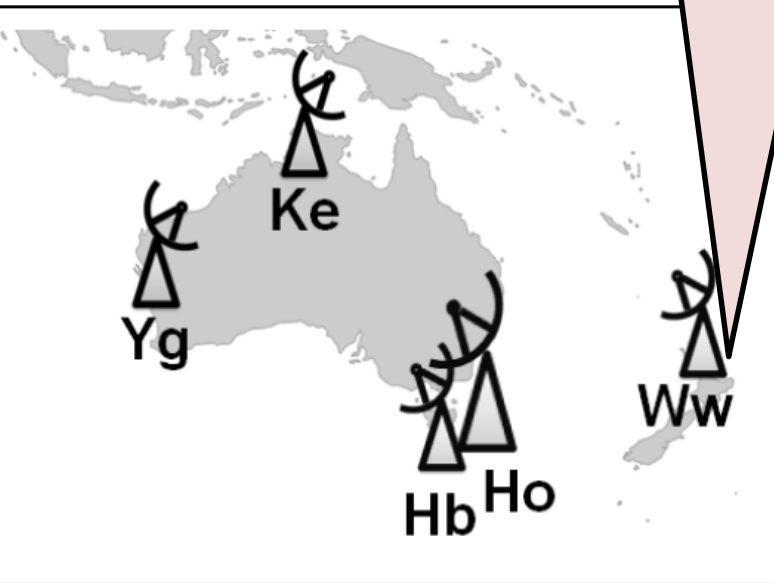
Antenna Effects

- Develop models for thermal / gravitational deformation by using more stable small antenna

- E.g. via more precise phase delay solution

Summary

- Sibling / Twin Telescopes ask for research on the observing strategy (scheduling).

- They offer new possibilities in the analysis.

- Enable new insights into instrumental delays which may help to better understand our systems.

- … And there is some other cool stuff with can do with them.

THANK YOU FOR YOUR ATTENTION!

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