katpoint vs CALC (SP-766)

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Software

- AlmaCalc11
- katpoint
- Astropy

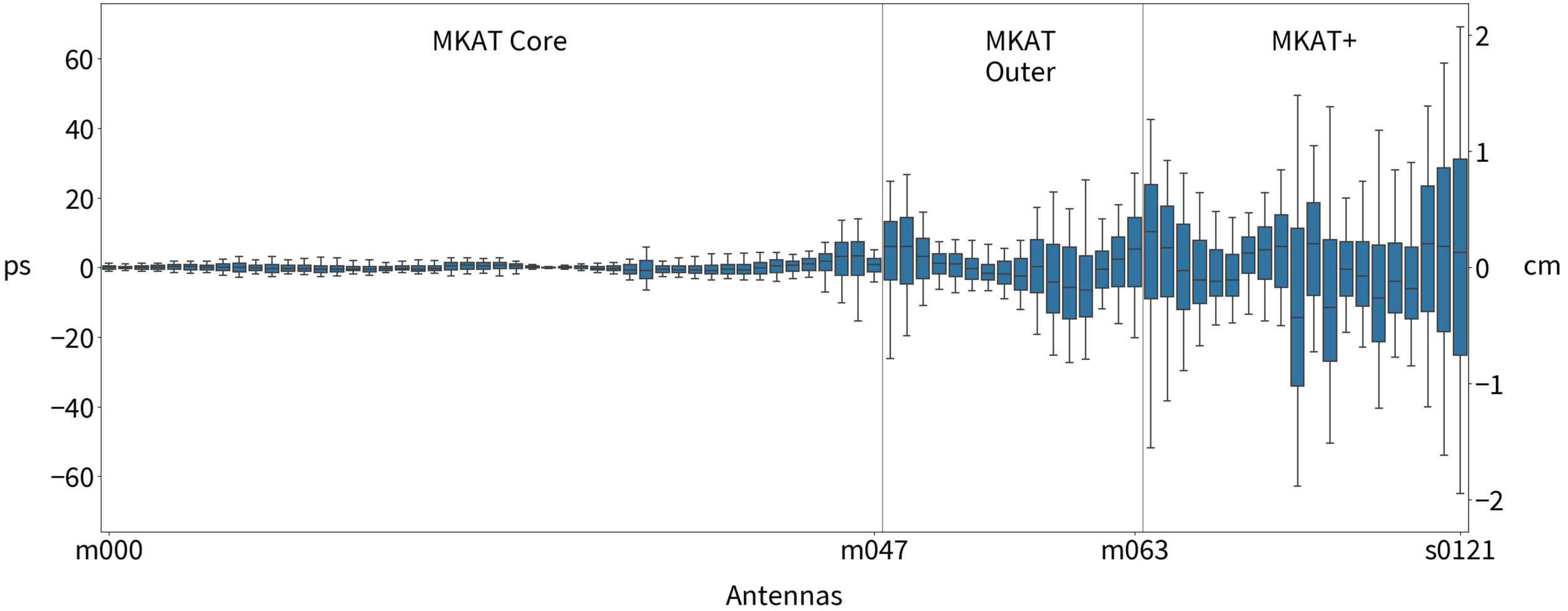
Types of Delays

- Geometric
- Atmospheric
  - Tropospheric
  - Ionospheric
- (Electronic / cable)

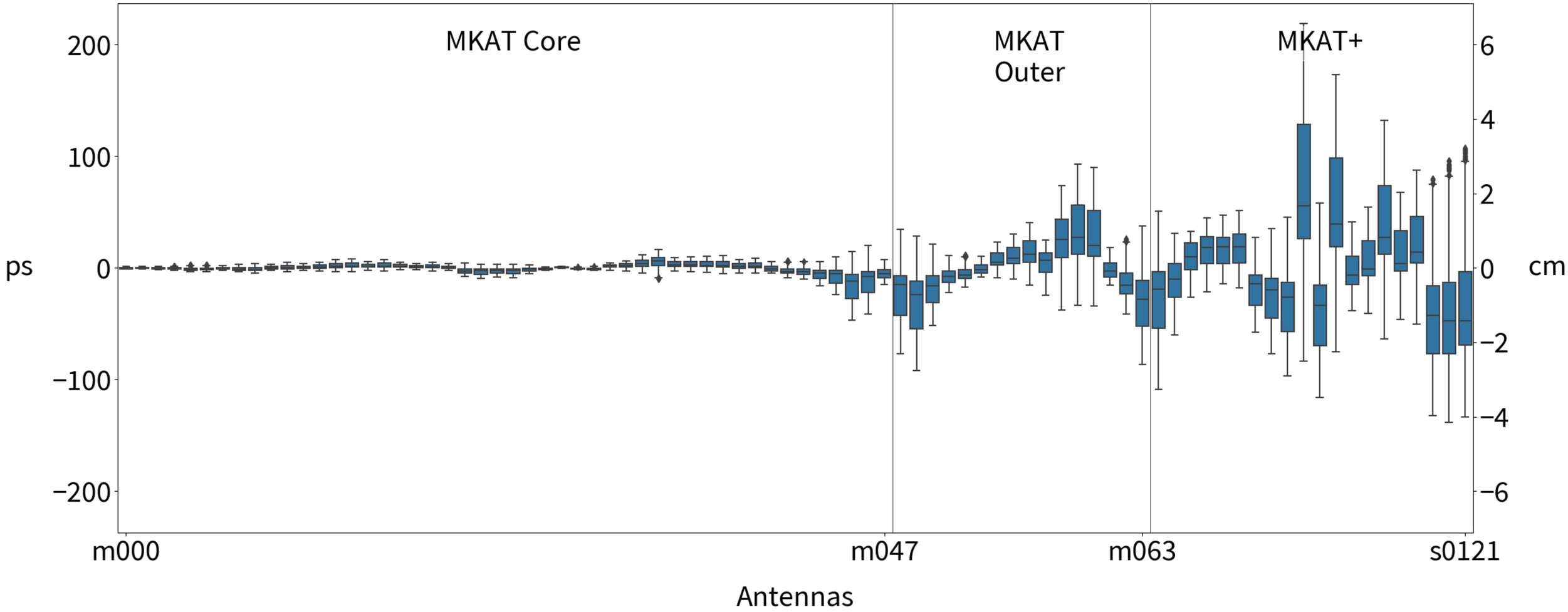
Geometric delays

- AlmaCalc11 has the whole gamut of features:
    1. ITRF, ICRF, precession, nutation (Solar System ephemeris = DE421)
    2. Support for EOPs (UT1 + polar motion, fed from IERS A)
    3. Diurnal spin, solid-earth and pole tides, atmospheric loading, …, but no ocean loading + ocean pole tide loading for ALMA
    4. Troposphere but no ionosphere
- Astropy has features 1 and 2 (I think)
- katpoint only has an older version of feature 1

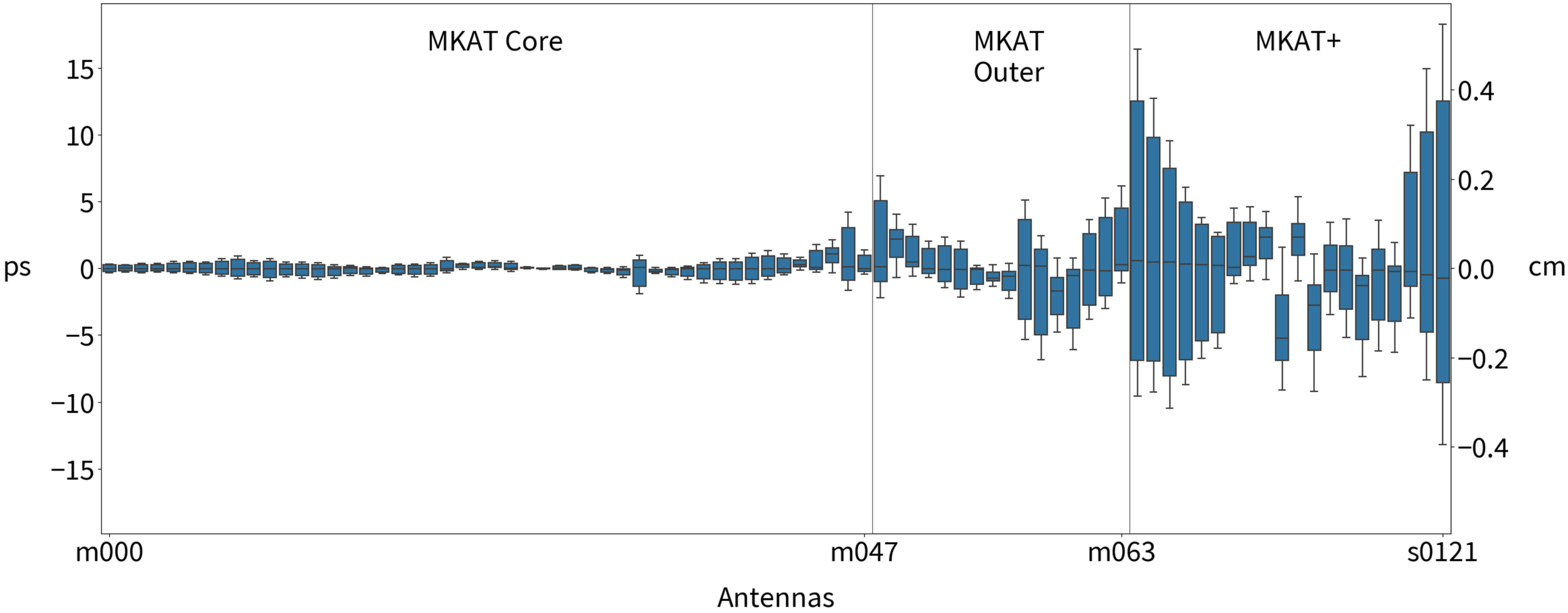
katpoint – CALC (without EOPs)



katpoint – CALC (with EOPs)



Astropy – CALC (with EOPs)



Atmospheric delays

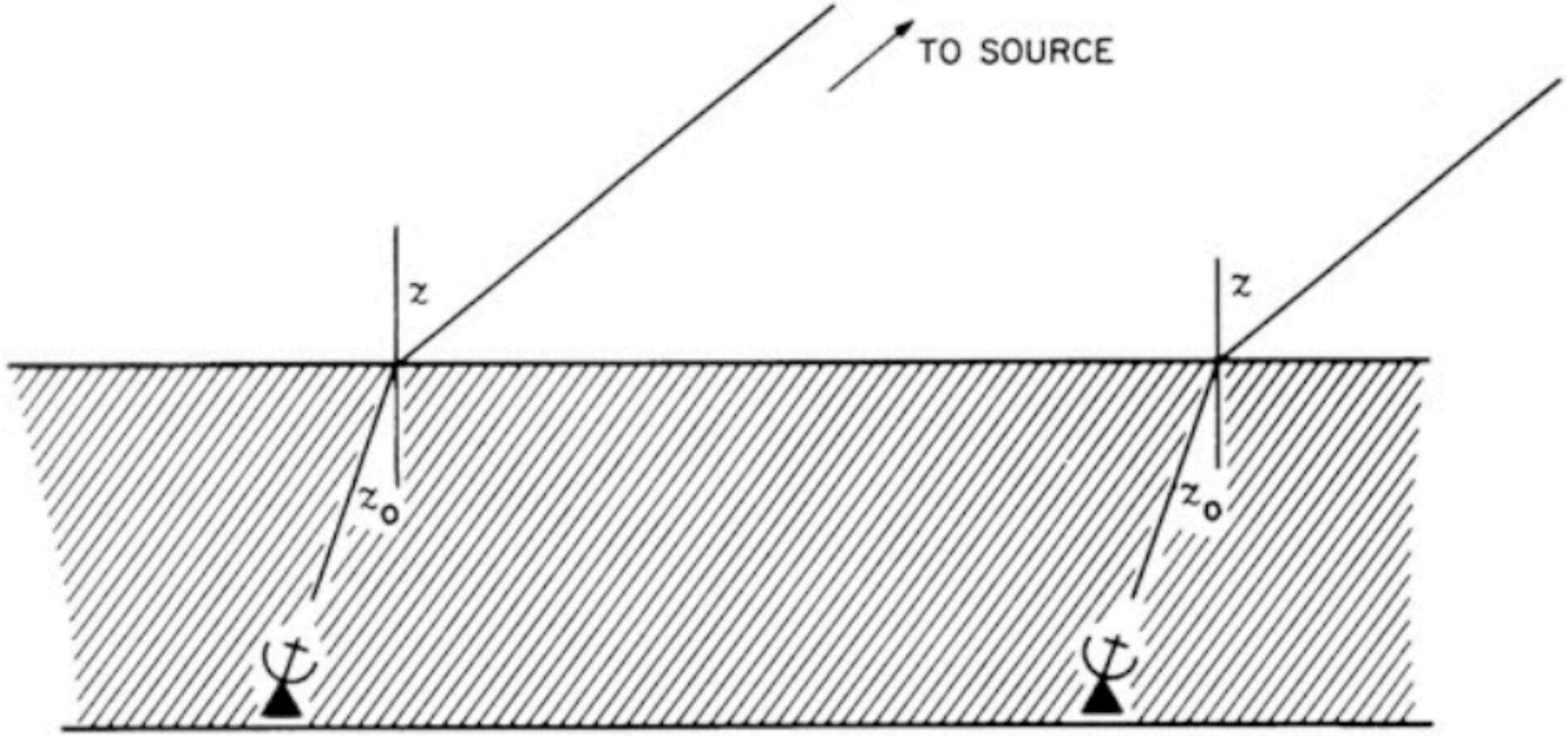
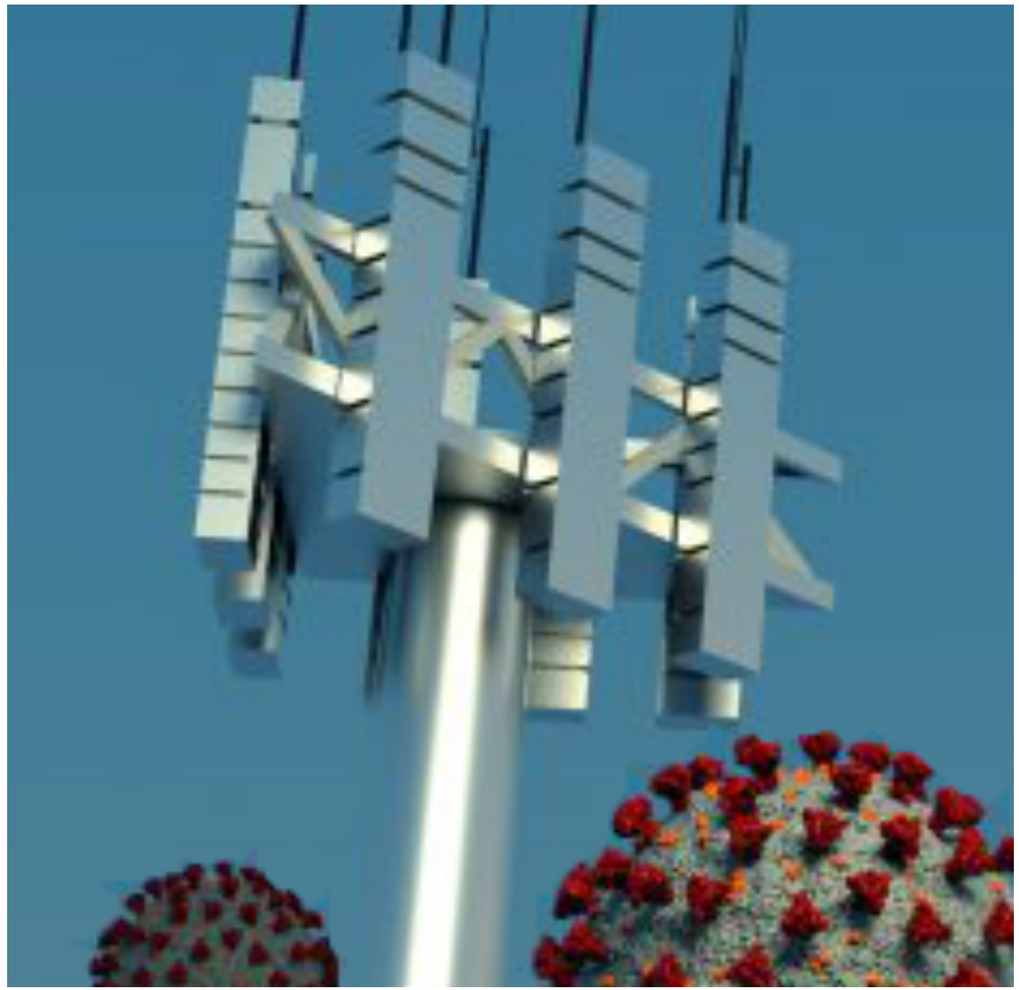
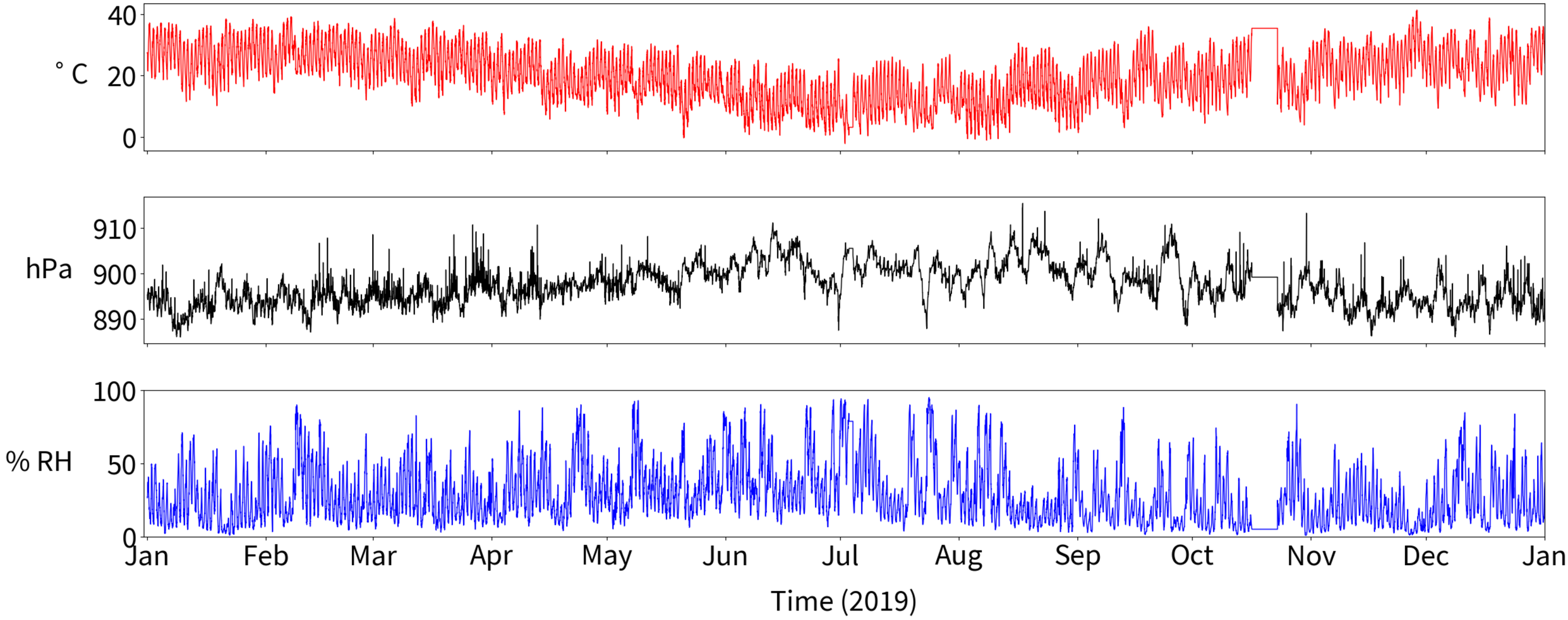


Fig. 13.3 Two-element interferometer with the atmosphere modeled as a uniform flat slab. The geometric delay is the same as it would be if the interferometer were in free space. **[TMS, 3rd Ed]**

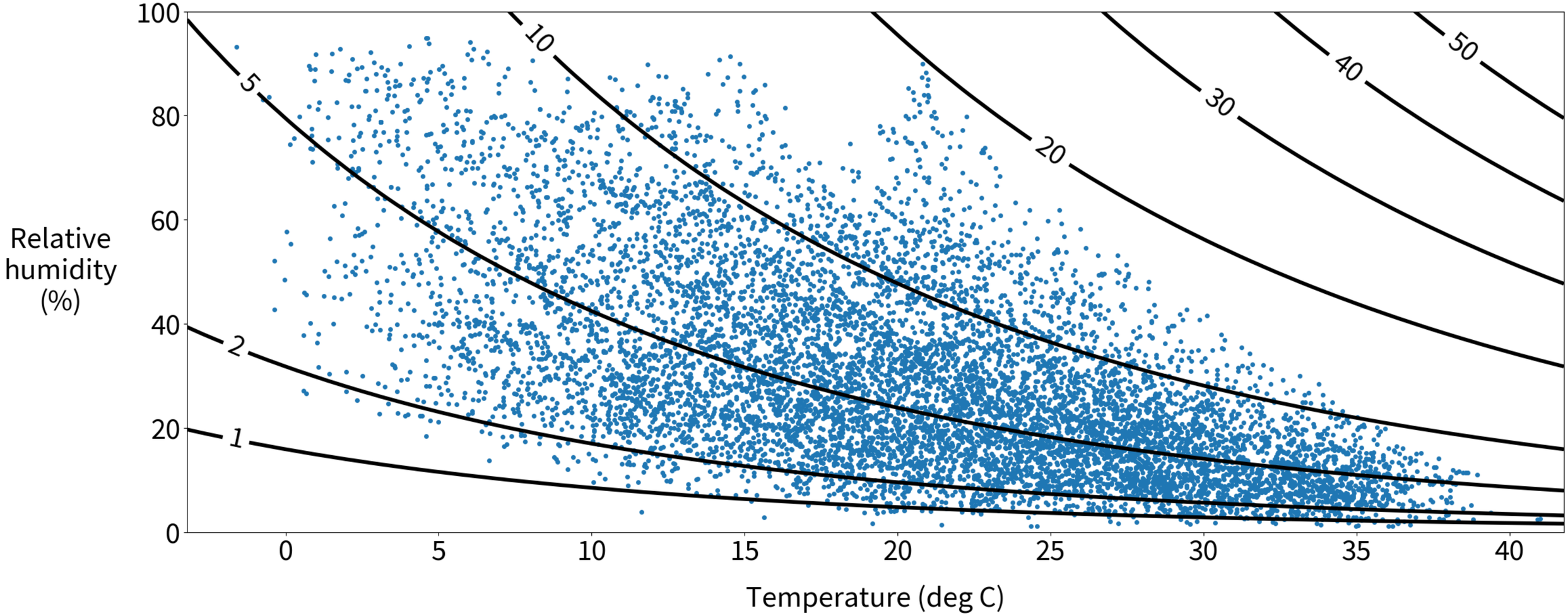
Some overlap with online “debates” 🤦🏾‍♂️🤣



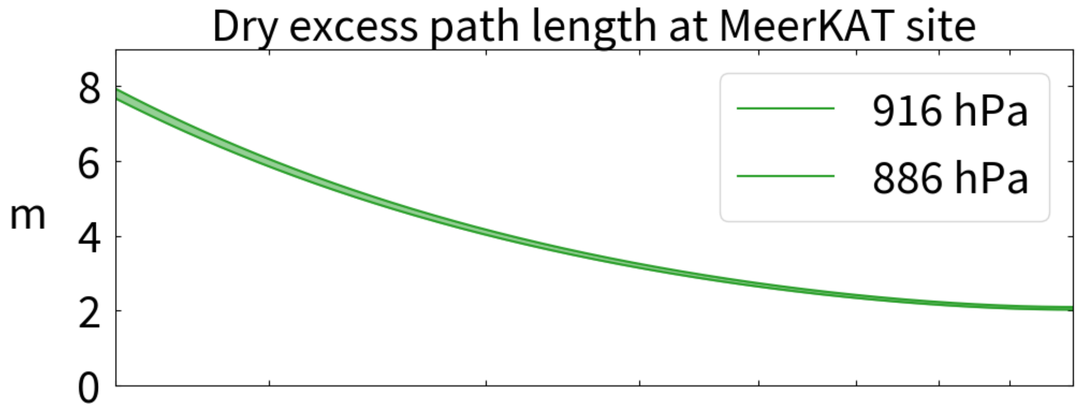
Weather at MeerKAT site

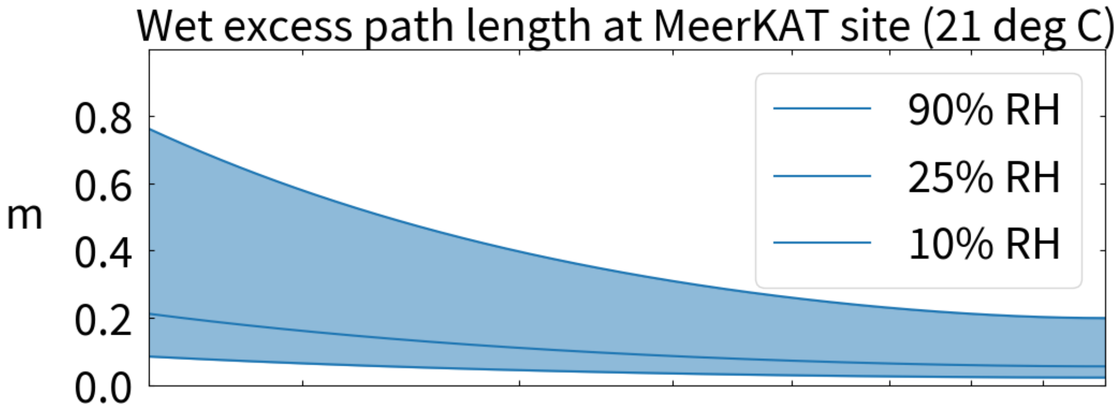


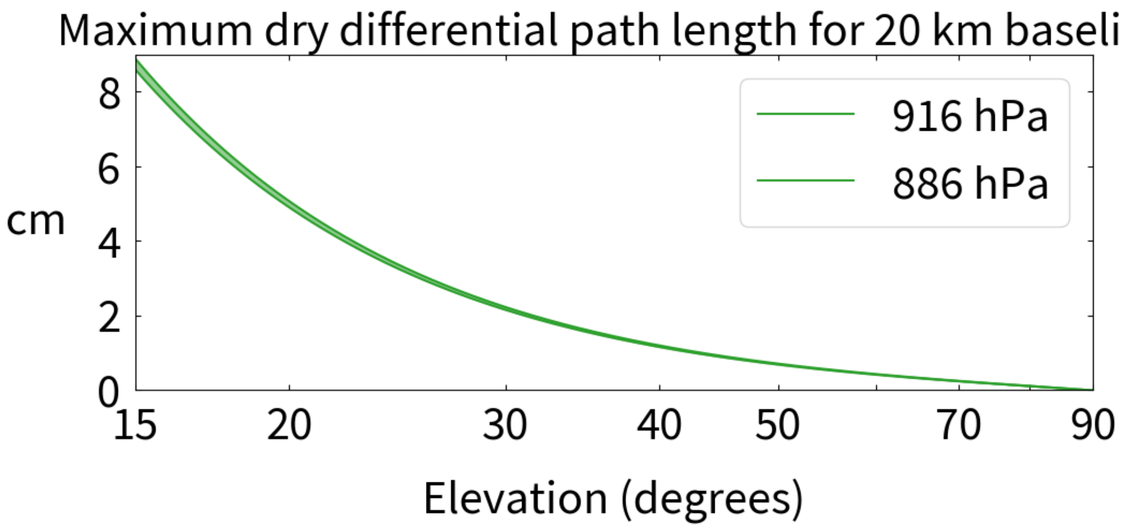
Wet excess zenith path length (cm)

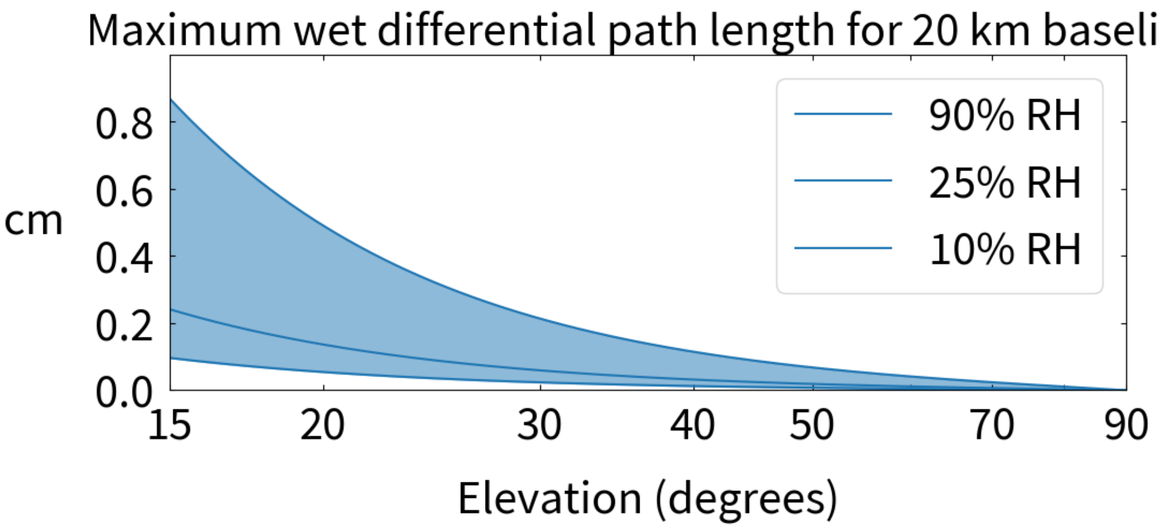


Path lengths in the troposphere

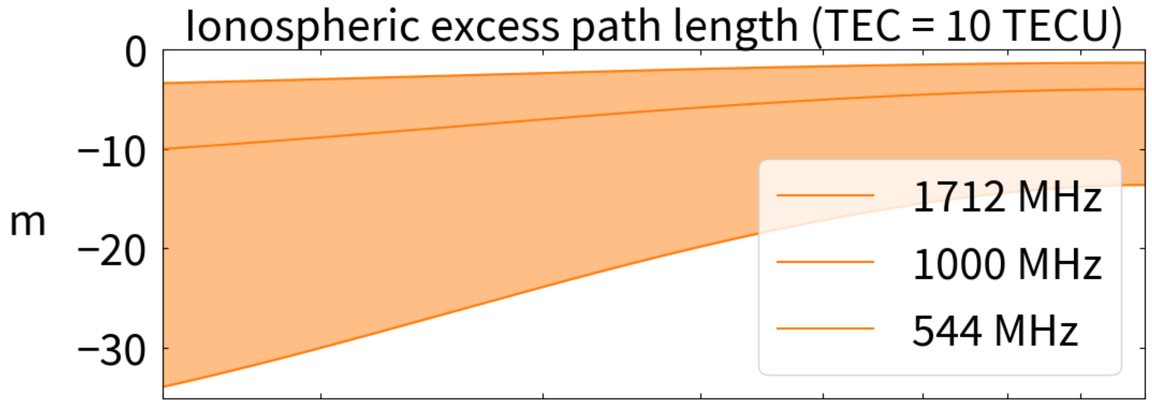


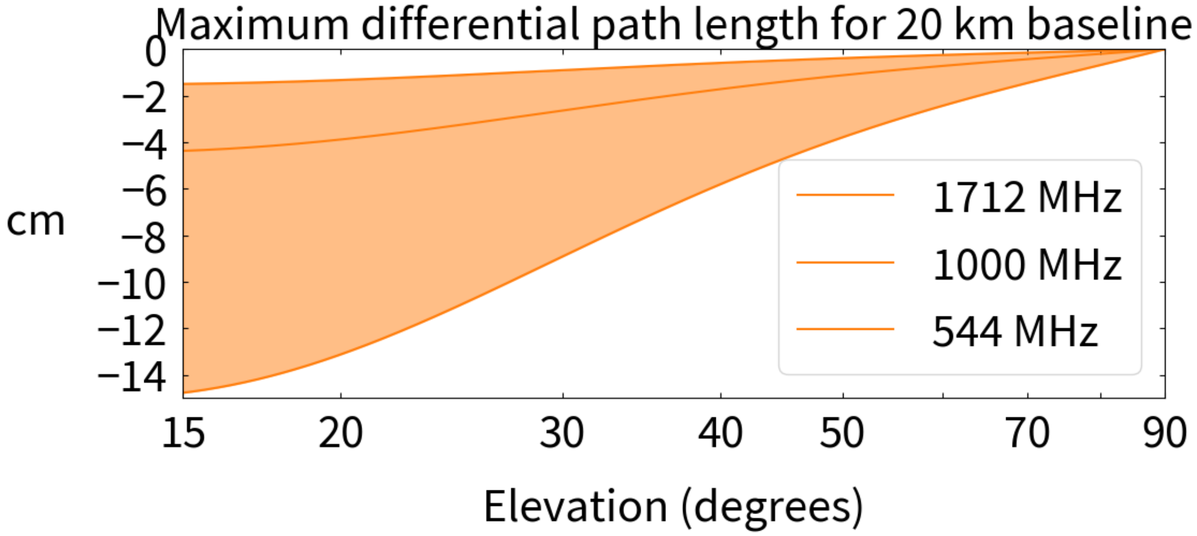


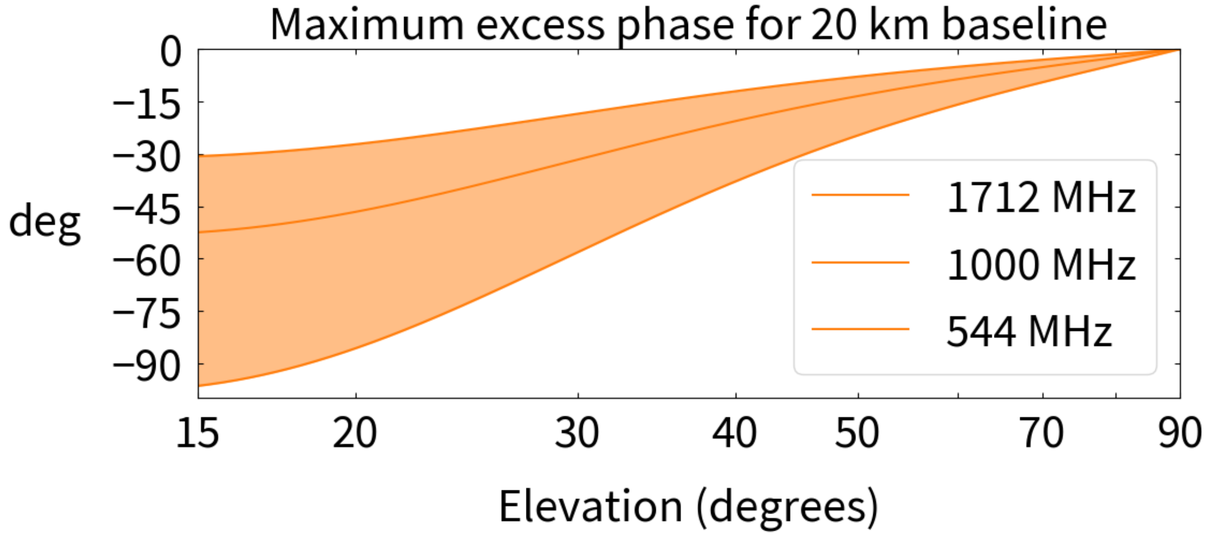




Path lengths in the ionosphere







Conclusions

- Use Astropy for basic geometry (ITRF, ICRF, precession / nutation, EOPs)
- Investigate additional terms (solid-earth / pole tides, ocean loading, …)
- Construct a tropospheric model from the best parts of CALC and TMS, e.g. Rüeger refractivity + Crane water vapour + Global mapping function
- Consider ionospheric corrections (VLBI uses GPS maps for astrometry)
- COMPLETE THE MIGRATION of katpoint to Astropy!