

# RISE Status Update

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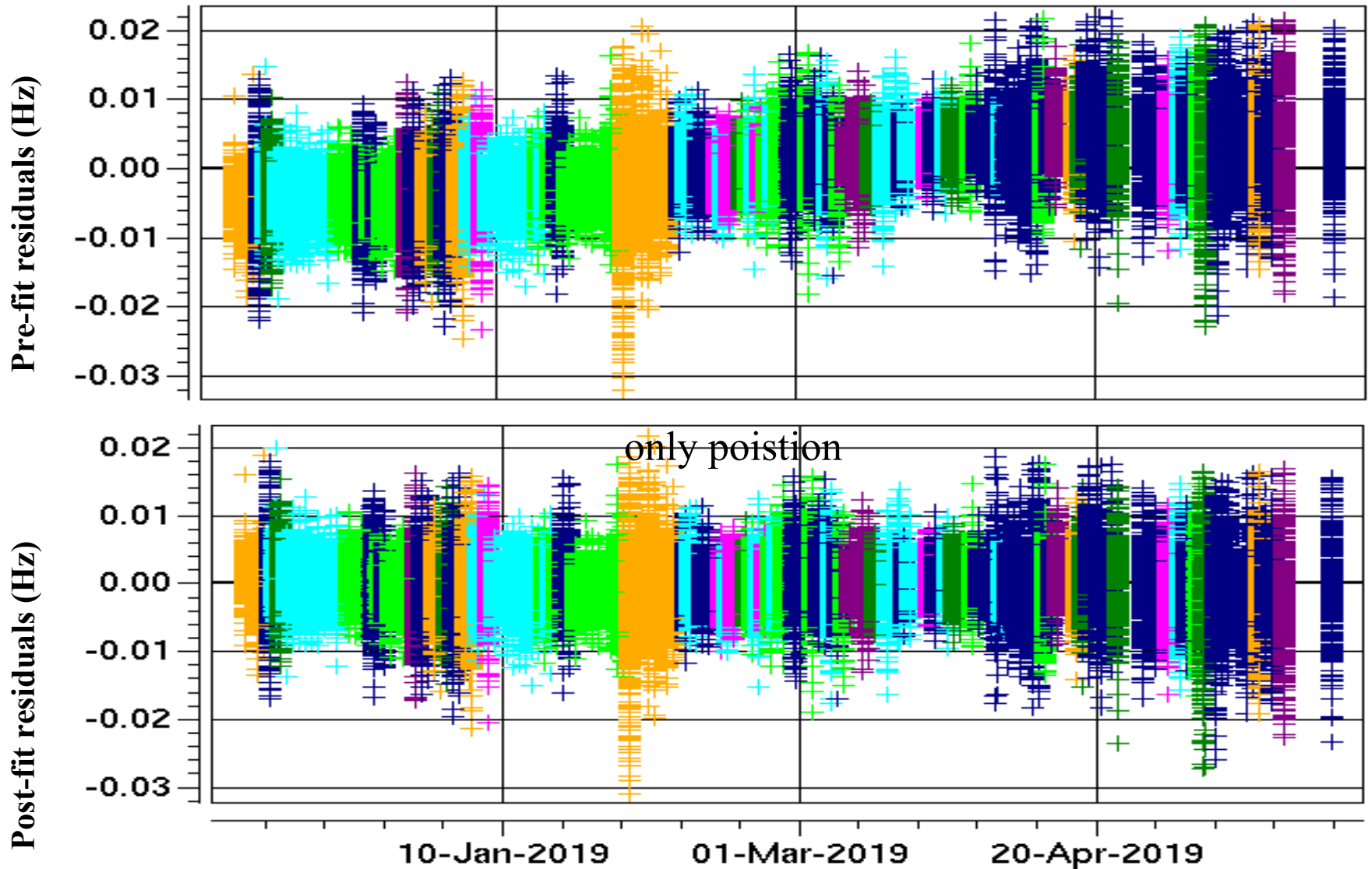
Science Team Meeting

10 June 2019

# Summary

- Radio Doppler data has been collected on most sols.
  - Most on East-pointing antenna. 15 tracks on West antenna April 8 to June 8.
  - Sparse West-pointing antenna data makes data set weaker.
- Data shows sensitivity to Mars rotation and need for update.
  - RISE data span not long enough to separate seasonal rotation from precession.
  - Needs to be added to previous lander data.
- Calibrations for effect of Mars troposphere mostly done.
  - Not applied to previous lander Doppler.
  - Average surface pressure applied so far; daily pressure to be added.
- Data weighting not yet optimized.
  - Insight data noise dominated by low SNR, different than previous lander data.
    - Data noise from SNR, Earth troposphere, and solar plasma evaluated automatically.
    - Need new weighting program to properly apply to data.
- New precession results planned for August 2019.
  - More important nutation result not expected until spring 2020.

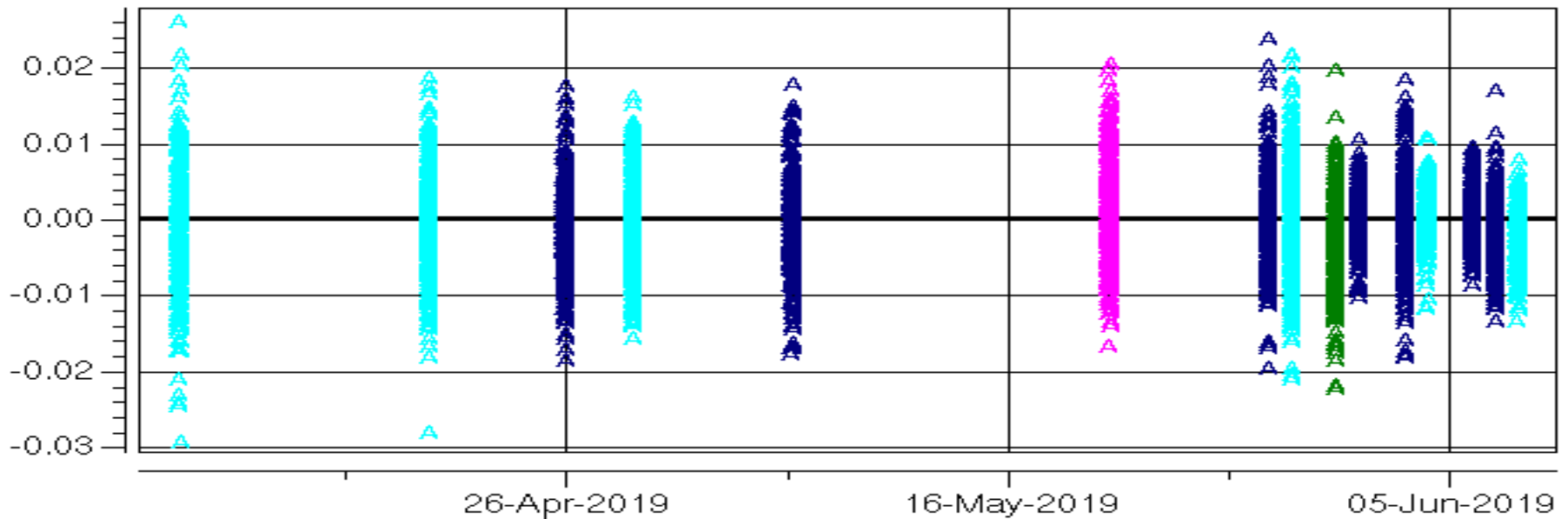
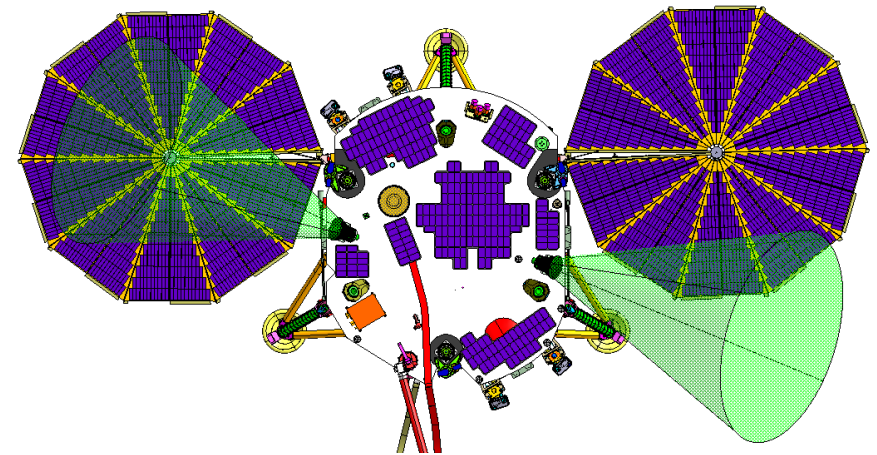
# East antenna Doppler tracking residuals



Upper graph shows residuals to IAU rotation model from 2016 (Viking, Pathfinder, Opportunity). Lower graph shows residuals to fit of InSight position only. rotation model depend!

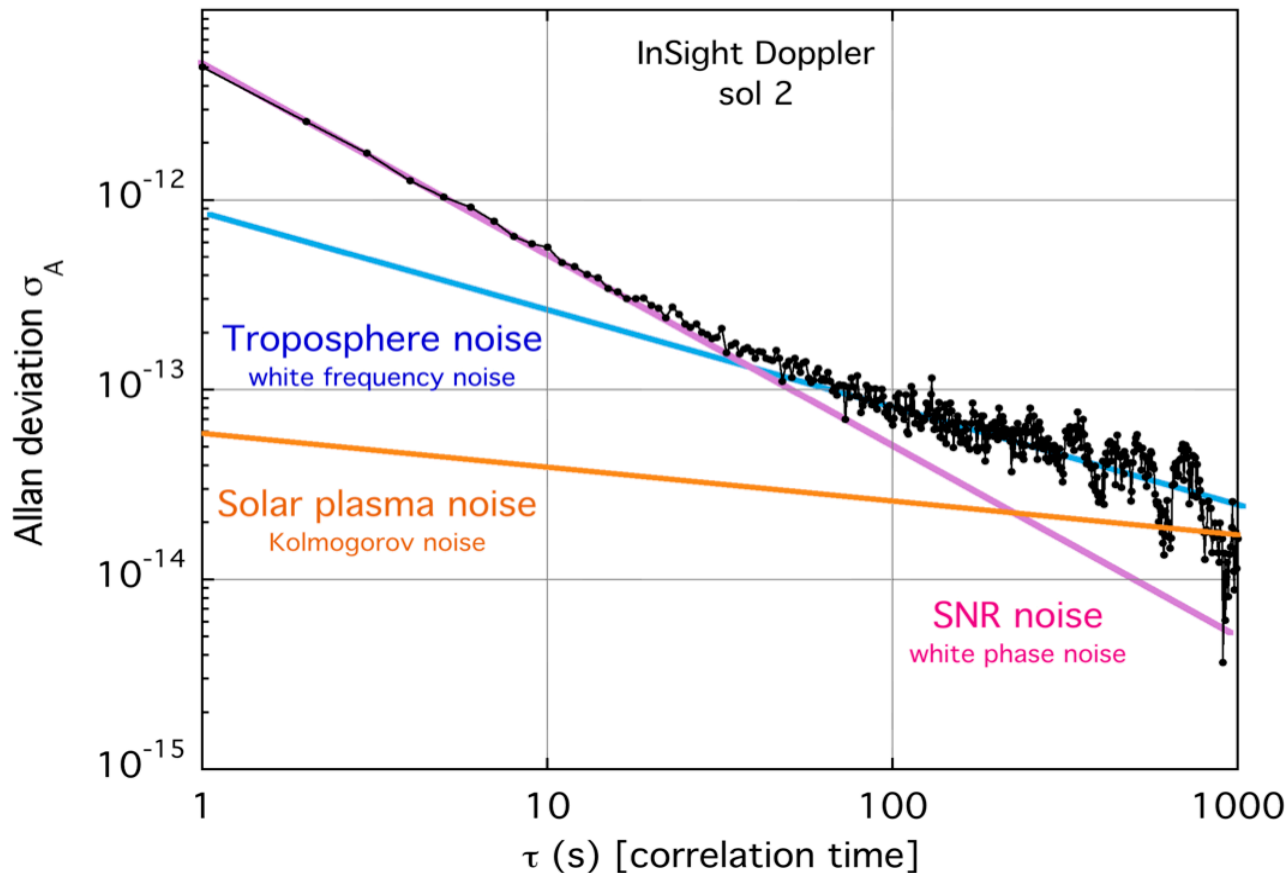
# West antenna Doppler tracking residuals

- West antenna data set too short for sensitivity to Mars rotation.
- Instead just solve for position of West antenna relative to East antenna.
- Offset consistent with expectations.



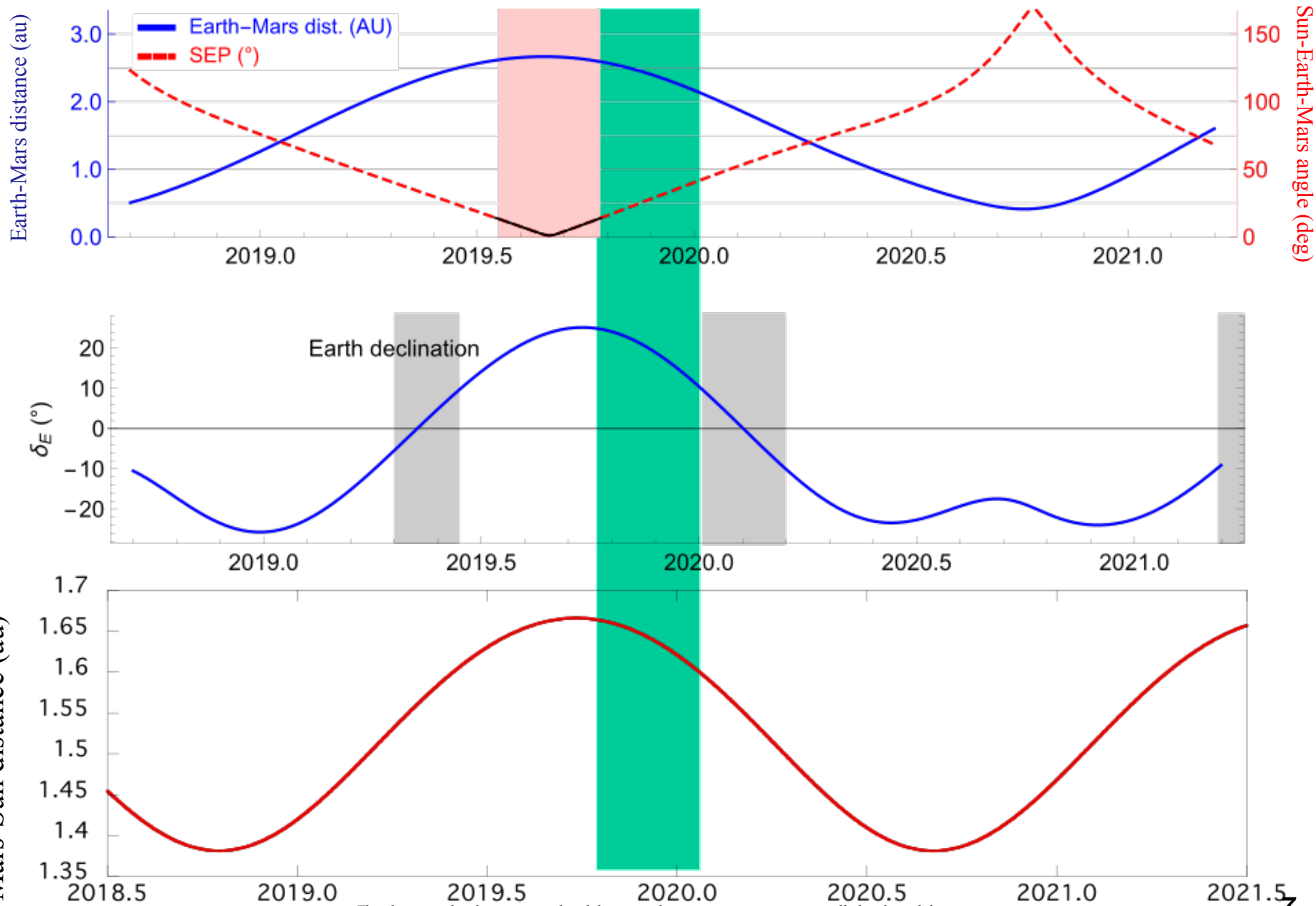
# Doppler Allan Deviation

- Doppler has 3 main noise sources.
  - Automated system now determines noise levels for each InSight track.
    - Not yet decided how to determine noise levels for previous landers.
  - Need new program to apply optimized data weights.



- RISE uses  $\sim 78$  W-Hr for each hour-long track.
- Currently Mars is nearing solar conjunction, so RISE passes are noisier and so less useful.
  - So cancelling or shortening RISE tracks has less science impact.
- When exiting conjunction, starting about November 1, 2019 through about February 2020, RISE geometry and noise are optimum.
  - Getting 4 hour-long tracks per week or equivalent is important for RISE.
    - 6 tracks per week of 40-minutes each are equivalent to 4 hour-long tracks.

# RISE Geometry Factors



- RISE data distributed within team weekly by e-mail.
- PDS status
  - RISE has completed the peer review of the raw (Doppler data) and derived (rotation model) PDS archives.
  - Delivered raw (Doppler) data products and Earth troposphere/ionosphere calibrations through March 31, 2019 to PDS for Release 1A.
    - No additional data for planned release 1B.



# Next Steps

- Develop program to weight data for different noise types.
  - Previously done for troposphere and solar plasma; need to add low SNR.
- Determine optimal weight for previous landers.
  - Limited by different level of saved data for Viking, Pathfinder, MER.
- Perform new Mars rotation estimate for August 2019.
  - Expect slight revision of precession and seasonal LOD.

# RISE Geometry Factors

