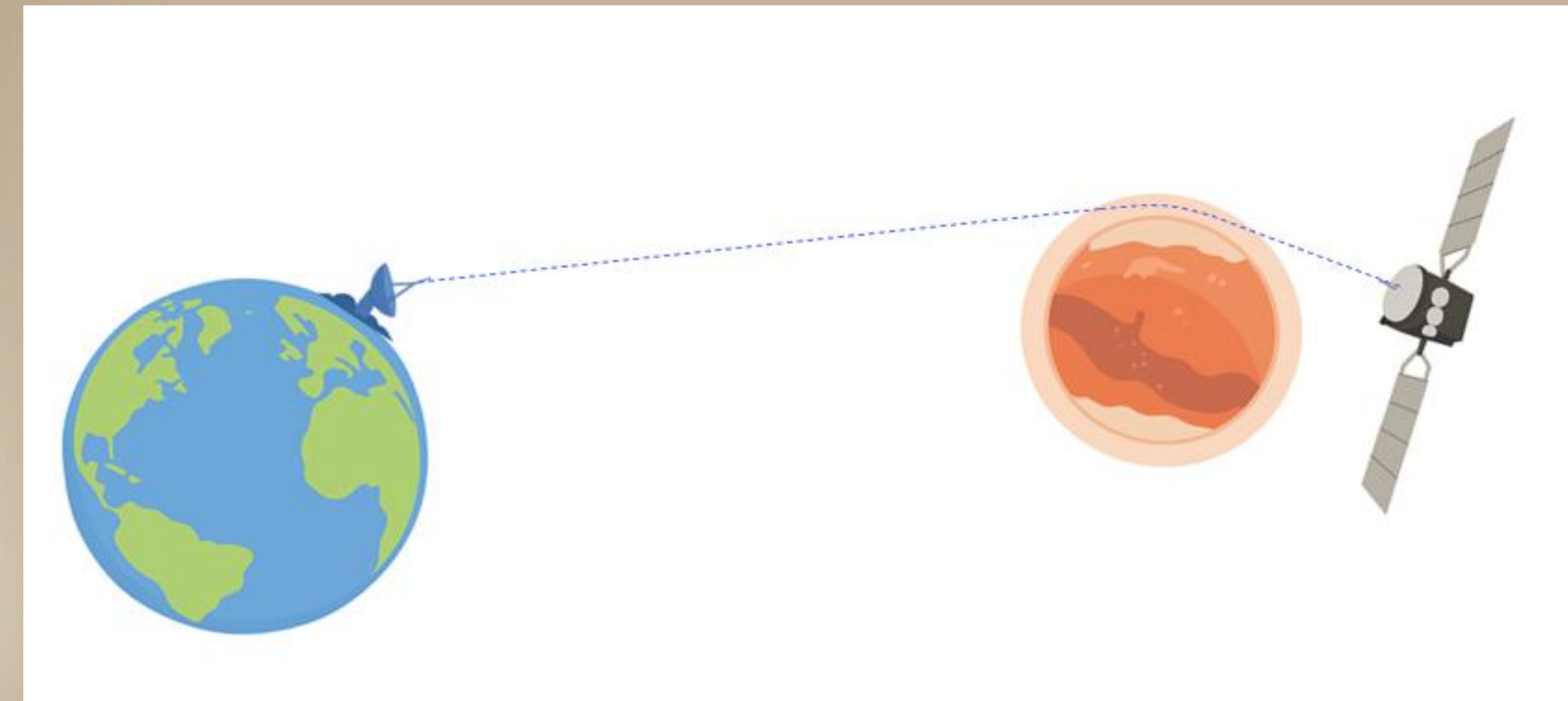# TGO – Earth Radio Occultation

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Dataset - Ingress/ egress events covered by DSN/ ESTRACK ground stations:
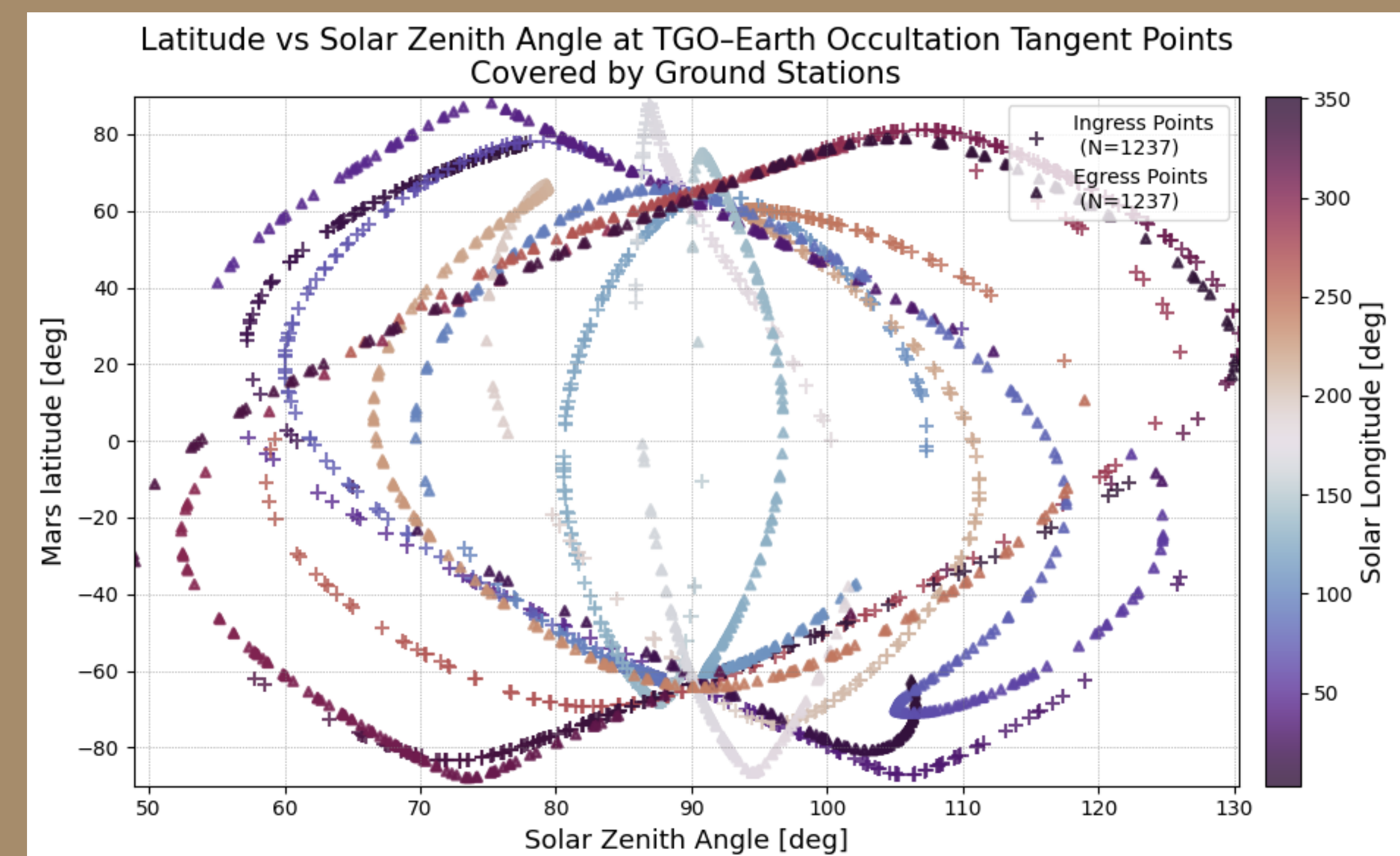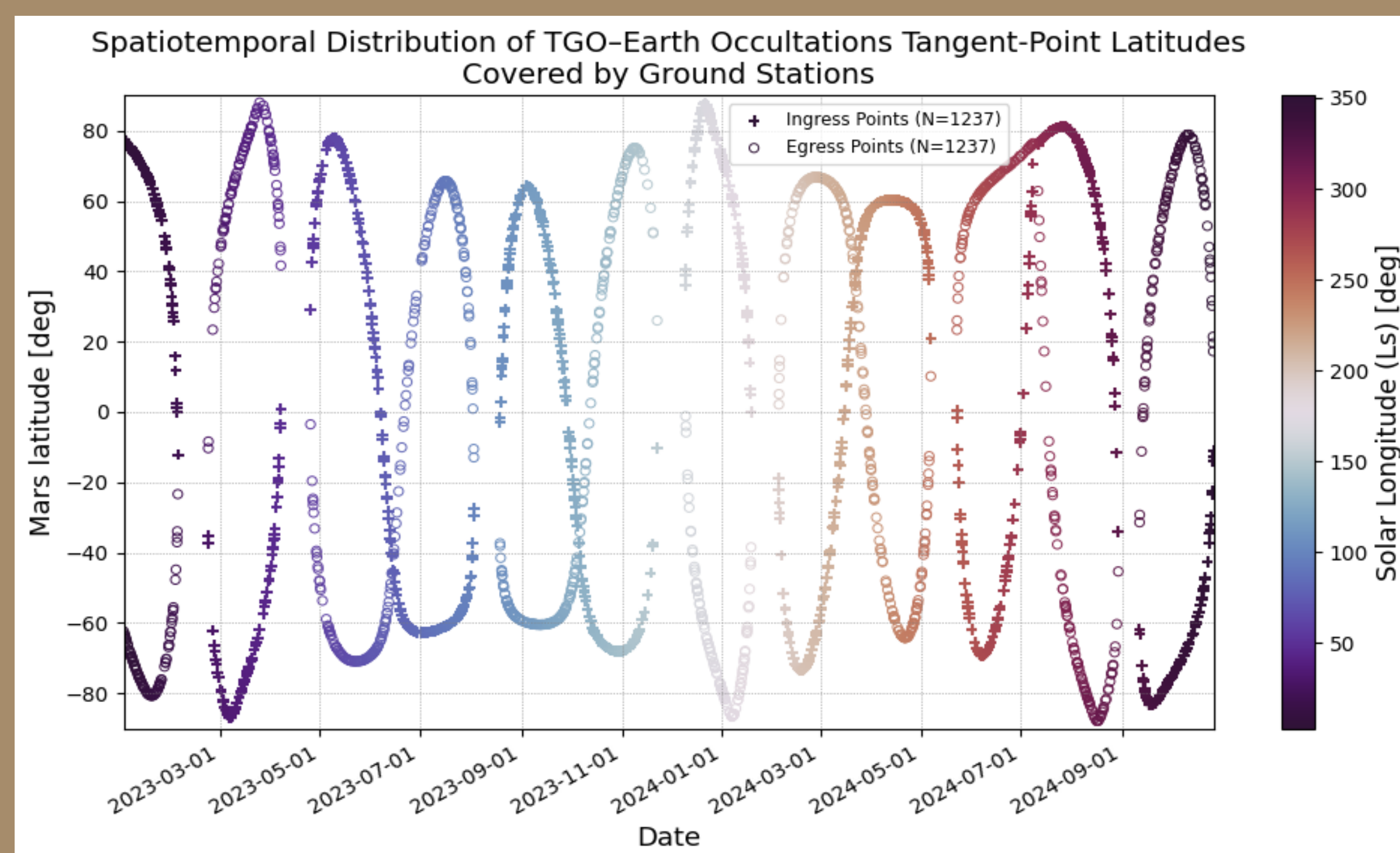
- Near-global (~ ±80°) latitude coverage for both ingress and egress.
- Scientific phase started in 2018, usable records currently available from 2023 onward.
- Occultations in 2023: 3636
- **Ground-station coverage by ESTRACK & DSN (2023): 671** of 3.636 occultations (18.5%)

Current Status - first processing step: Deriving Doppler residuals from phase delay.

- Ground station files: Providing the carrier phase and phase delay.
- Observed frequency: Calculation from ground station files.
- Predicted frequency: Calculation with SPICE.
- Doppler residual = observed – predicted frequency
- Example: Ingress on 3.5.2023
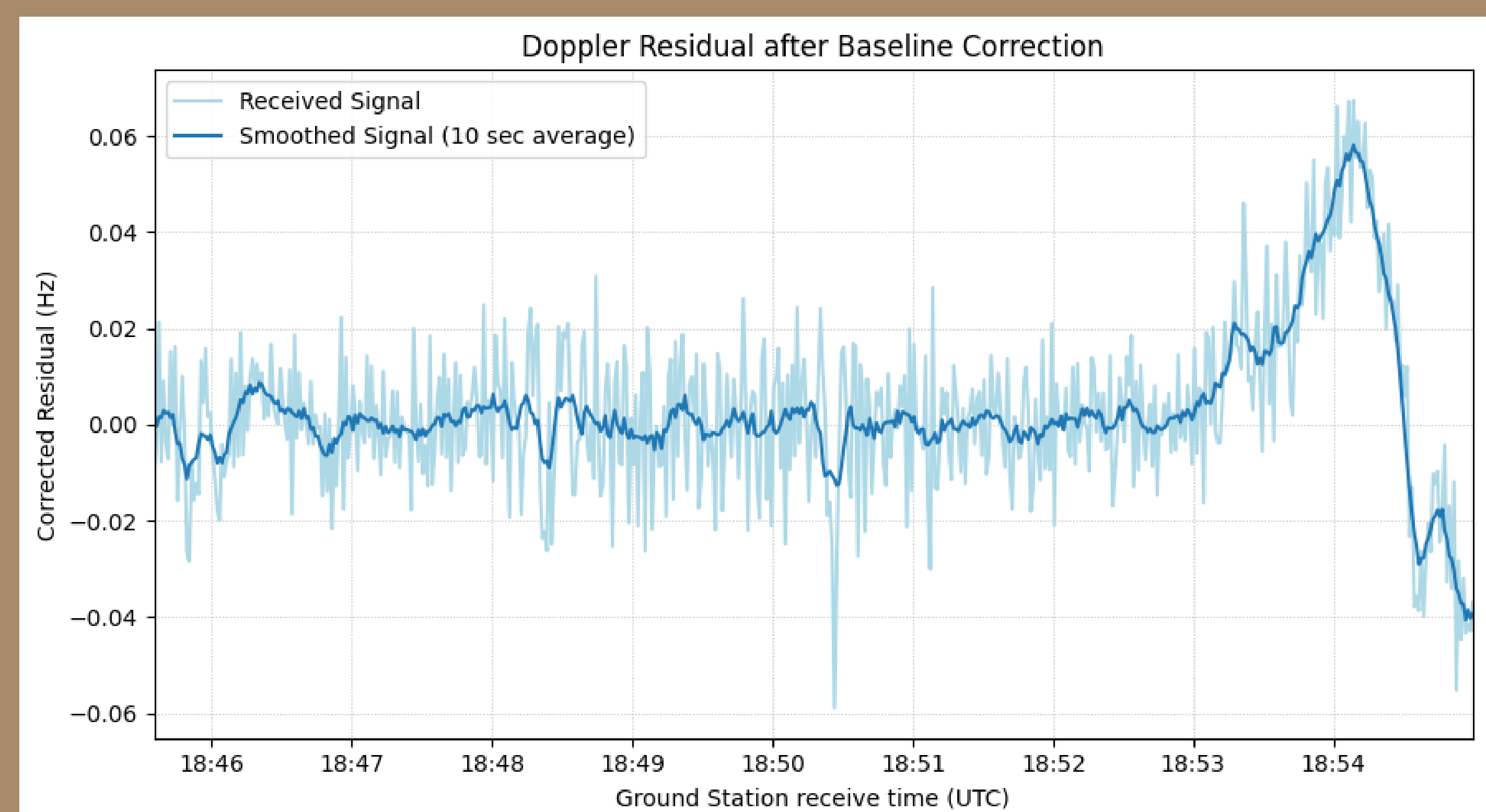
Future Work:

- Correct Earth-atmospheric propagation delays (troposphere and ionosphere).
- Derive vertical profiles of density, pressure, and temperature from Doppler residuals.
- Automate the processing pipeline for large-scale datasets.
- Characterize the Martian atmosphere using the newly retrieved profiles.

Conclusions:

- Radio occultation (RO) analysis is routinely performed for MEX-Earth and MEX-TGO signals, but **not yet for TGO-Earth**.
- Near-global latitude coverage.
- TGO-Earth RO is a huge dataset: Thousands of profiles to analyse!
- These occultations show good potential for studying the Martian atmosphere.