wege entstehen, indem wir sie gehen
ways emerge in that we go them

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Atmospheric Remote Sensing and Climate System Research Group
ARSCliSys

Radio Occultation Data

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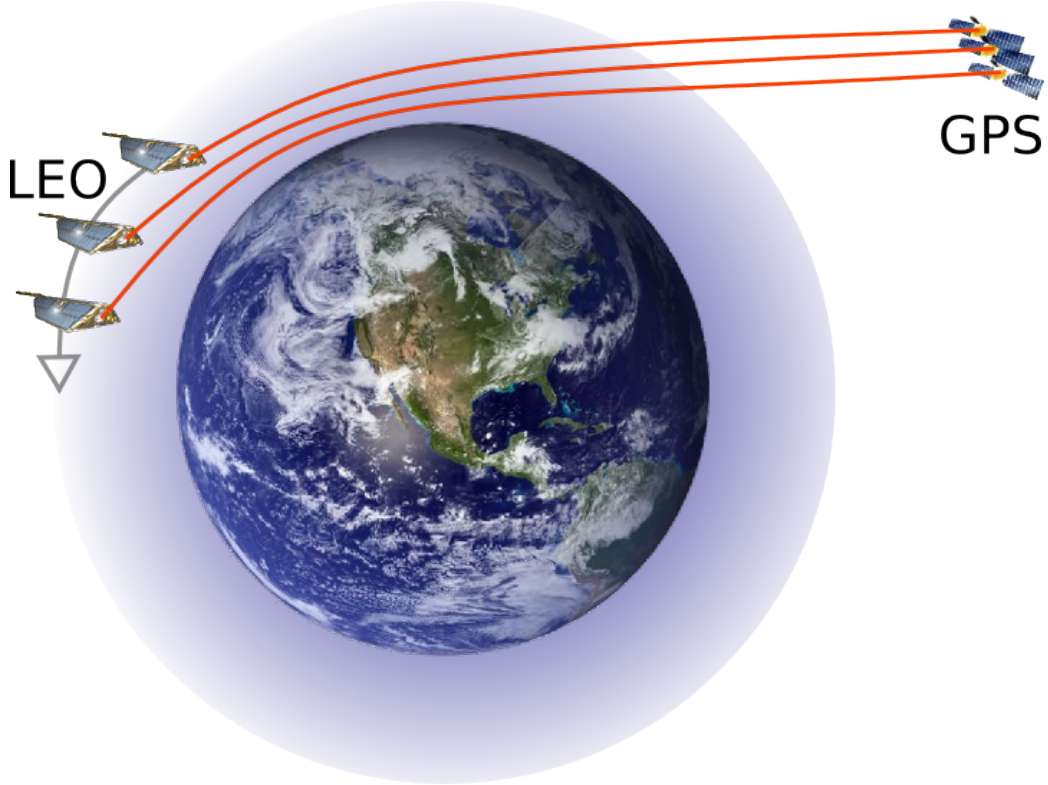
Short Intro to GPS Radio Occultation (RO)



- global coverage e.g. ≈250 profiles per day from a single LEO or ≈2500 from COSMIC (6 sats)
- best results for UTLS with high vertical resolution
- bending angle, refractivity $\left(N = k_1 \frac{p}{T} + k_2 \frac{p_w}{T^2}\right)$, geopotential height, pressure, temperature, humidity

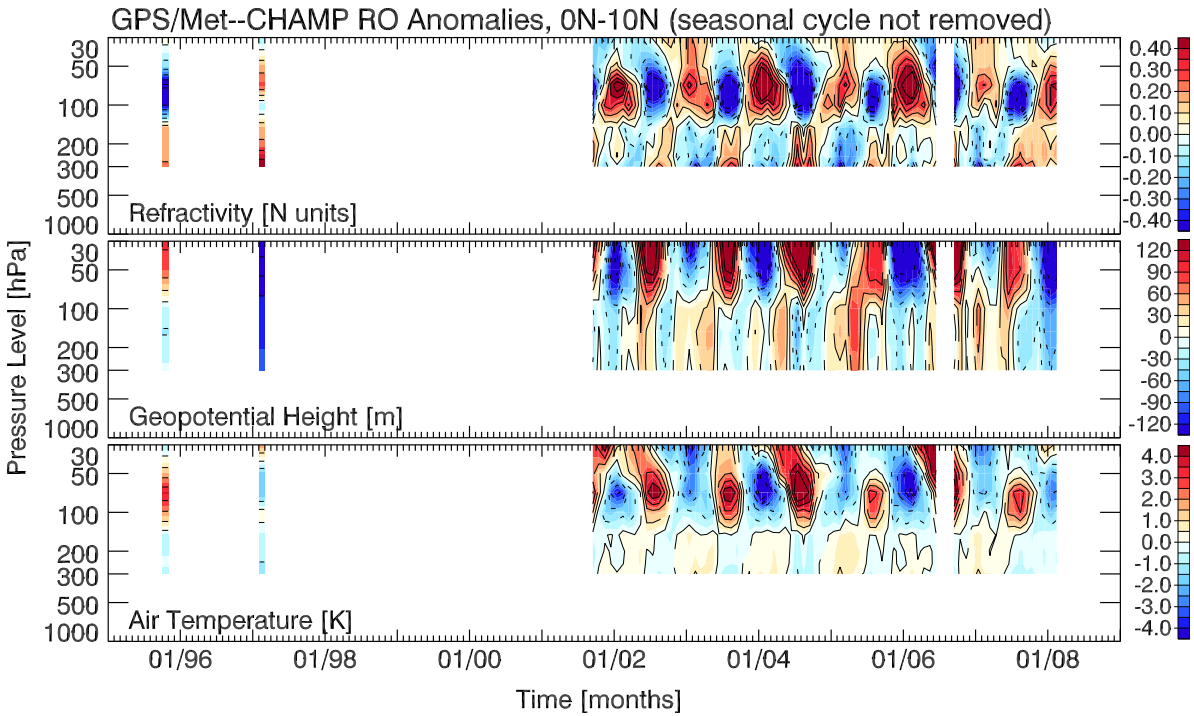
RO Characteristics

- all weather capability
- measured quantity based on precise atomic clocks $\longrightarrow$ long-term stability
- no need of inter-satellite calibration, e.g. seasonal climatologies of COSMIC satellites within $< 0.1\,\mathrm{K}$ (*Foelsche et al., 2009, TAO*)
- overall total error below 30 km mainly due to uneven sampling
  - $< 0.25\,\mathrm{K}$ in tropics
  - $< 0.50\,\mathrm{K}$ in mid-latitudes

  (*Steiner et al., 2009, GRL*)
- structural uncertainty estimates for 5-year trends of
  - refractivity $< 0.03\,\%$
  - temperature $< 0.06\,\mathrm{K}$

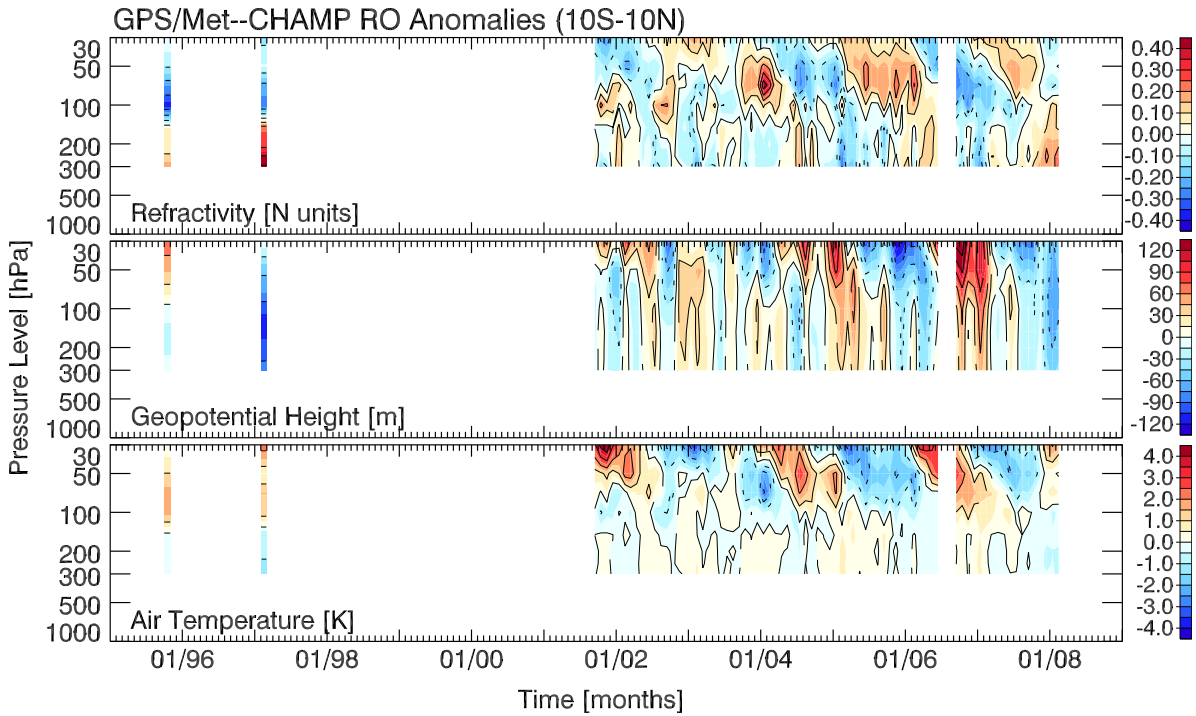
  (*Ho et al., 2009, JGR*)

RO Data Provided



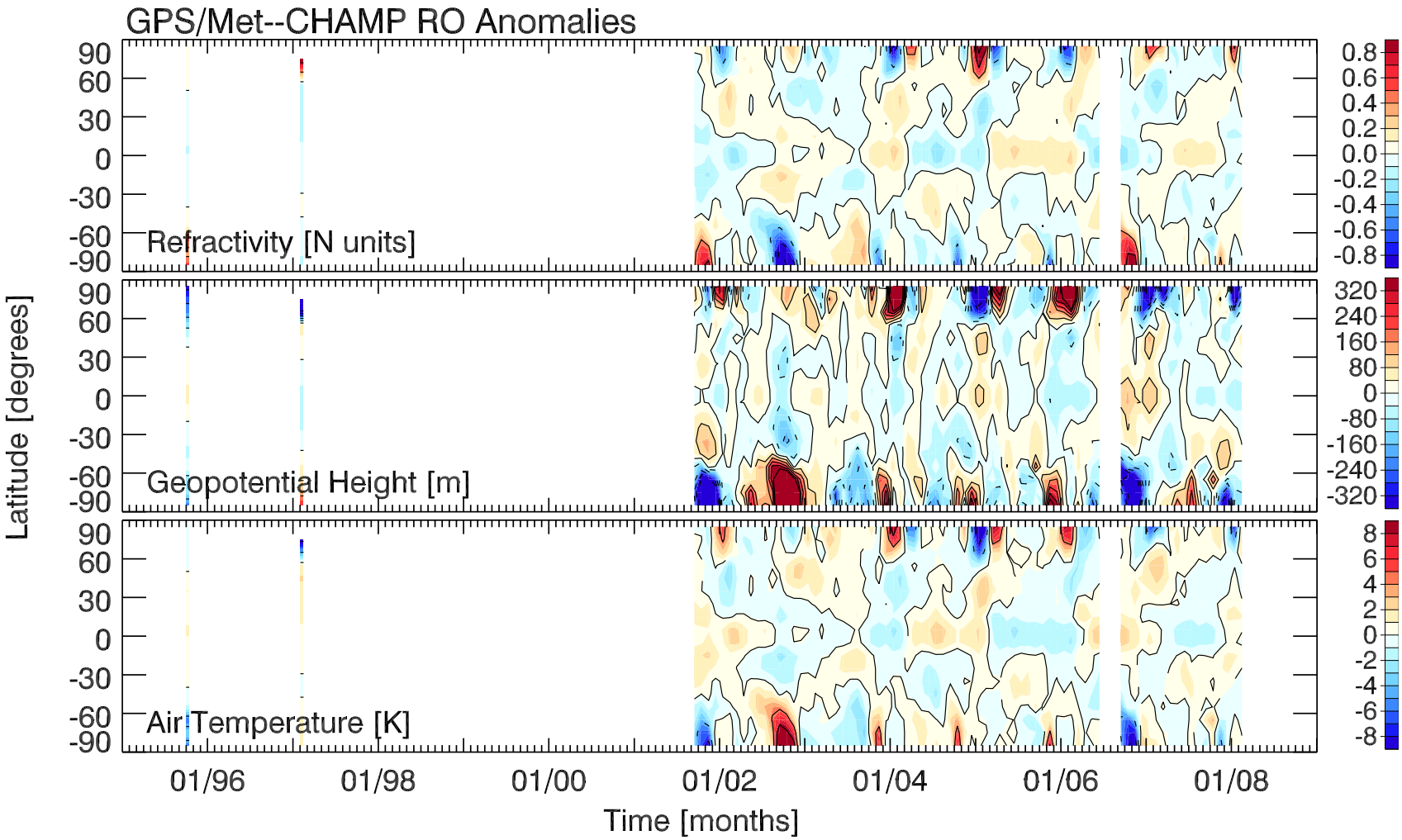
- monthly mean GPS/Met (10/1995, 02/1997, not in your data file) and CHAMP (09/2001–02/2008, without 07-08/2006) data (plot above shows anomalies, seasonal cycle was **not** removed)
- 18 zonal mean bands between 90°N and 90°S
- 9 pressure levels from 8500 m to 28 000 m
- refractivity, temperature as function of height

The Quasi-Biennial Oscillation *QBO*



- equatorial descent of easterly wind over westerly, followed by W-erlies over E-erlies between 10 hPa to 100 hPa (downward propagation speed $\approx$ 1 km per month)
- variable period of $\approx$ 28 months (20 months to 36 months)
- E-erlies stronger than W-lies; W-erlies last longer than E-erlies
- considerable variability of the QBO in period and amplitude

Latitudinal Characteristics of QBO in RO Data at 50 hPa



QBO and El Niño During the Study Period