Comparison of DORIS site position and reference frame time series with other space techniques

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Motivation

- A highly accurate and consistent ITRF is of vital importance for geodetic, geodynamic and geophysical projects
- The accuracy achieved today is mainly limited by systematic errors of the individual space techniques (e.g. ITRF 2000 results)
- To detect the systematic errors it is necessary to compare the individual solutions, especially the time series of the parameters

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Outline

- Analysis of DORIS, VLBI, SLR and GPS solutions (weekly/daily VLBI sessions)
- Helmert-transformation to ITRF 2000
- Time evolution of the reference frame (origin, scale)
- Investigation of site position time series at co-location sites
- Analysis with respect to non-linear effects, periodic signals, ...

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Data and solution characteristics

Technique	Analysis Center	Software	Data Time Span	Number of Stations	Station Coordinates Solutions
DORIS	IGN/JPL	GIPSY / OASIS	1992.8-2002.0	82	weekly SINEX files all DORIS satellites
GPS	CODE	Bernese	1996.0-2002.2	171	weekly SINEX files
GPS	JPL	GIPSY	1996.0-2002.2	172	weekly SINEX files
GPS	SIO	GAMIT	1995.0-2002.2	147	weekly SINEX files
SLR	DGFI	DOGS	1992.9-2002.2	62	weekly solutions, combined Lageos-1 & 2
VLBI	DGFI	OCCAM	1984.0-2002.0	47	2227 session solutions

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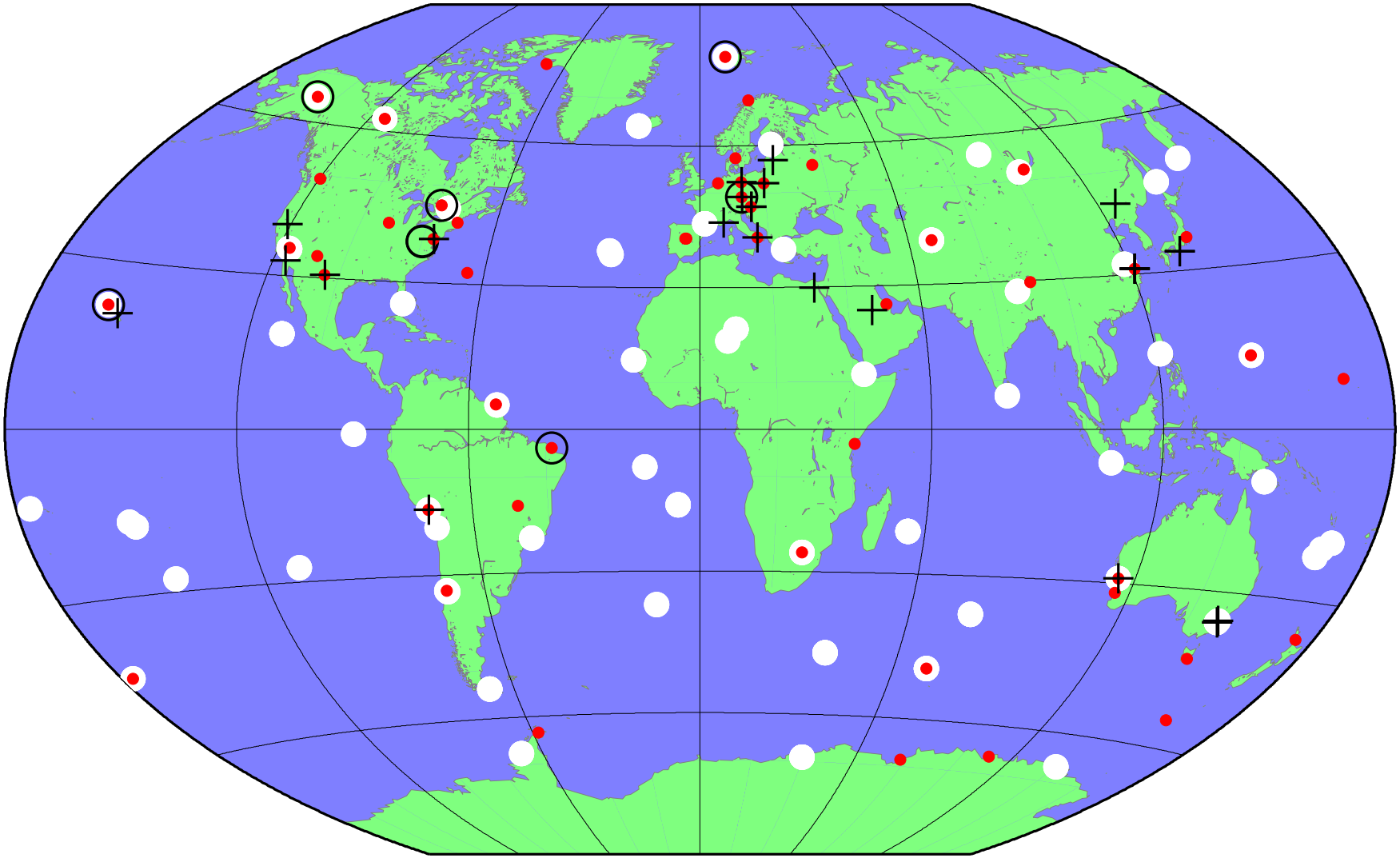
Station Networks used for Helmert-transformations



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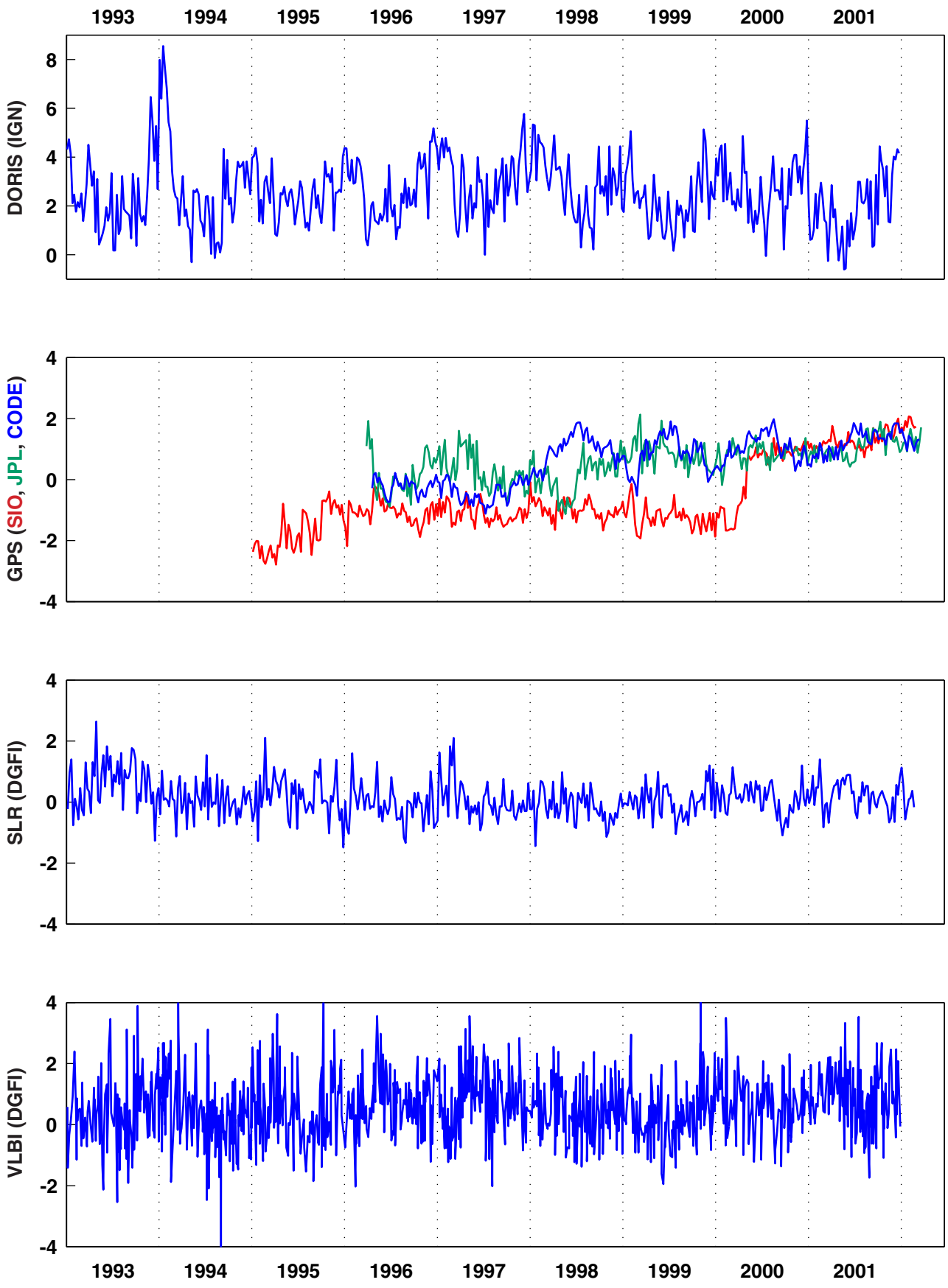
Scale [ppb]



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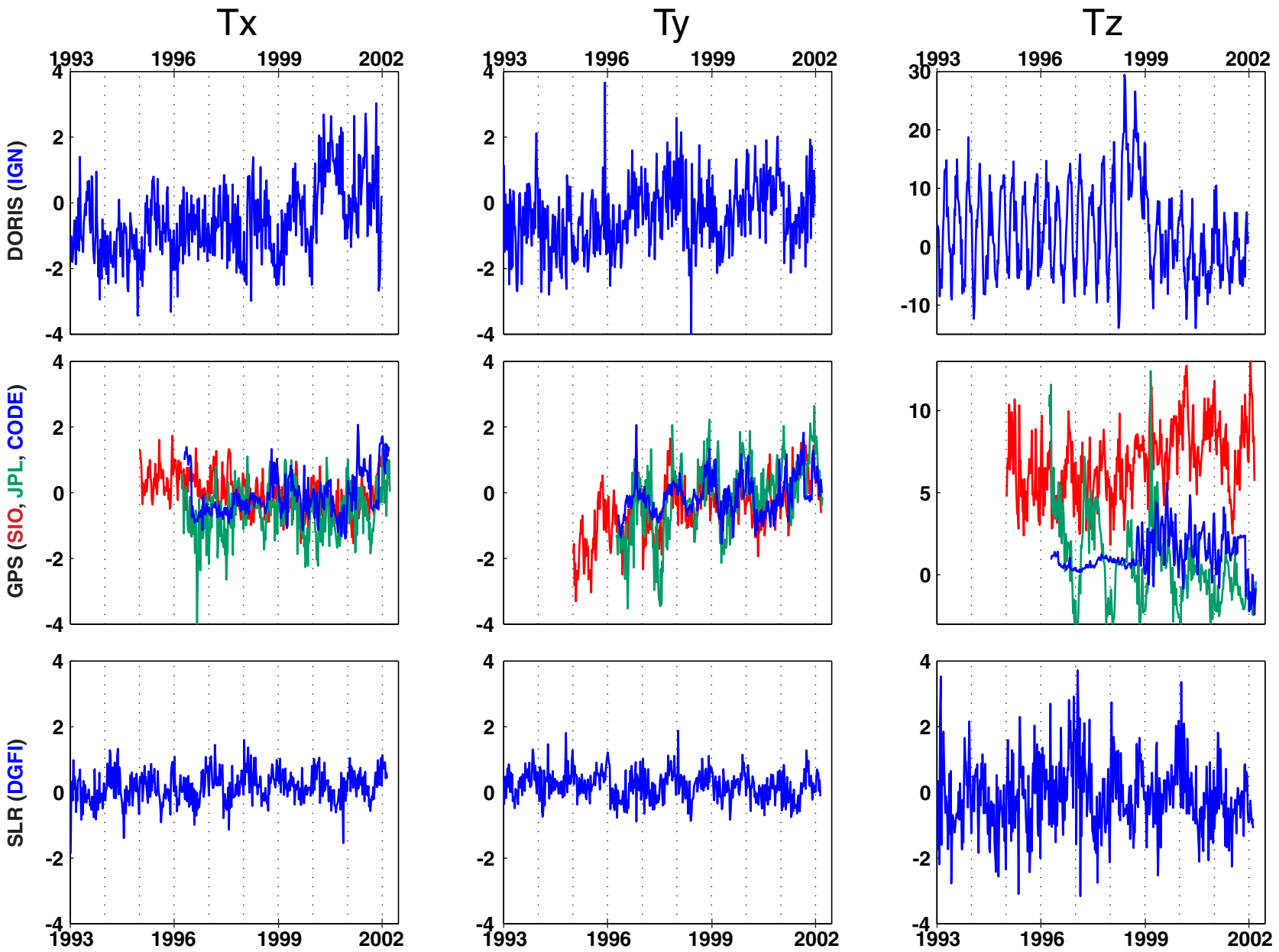
Translations [cm]



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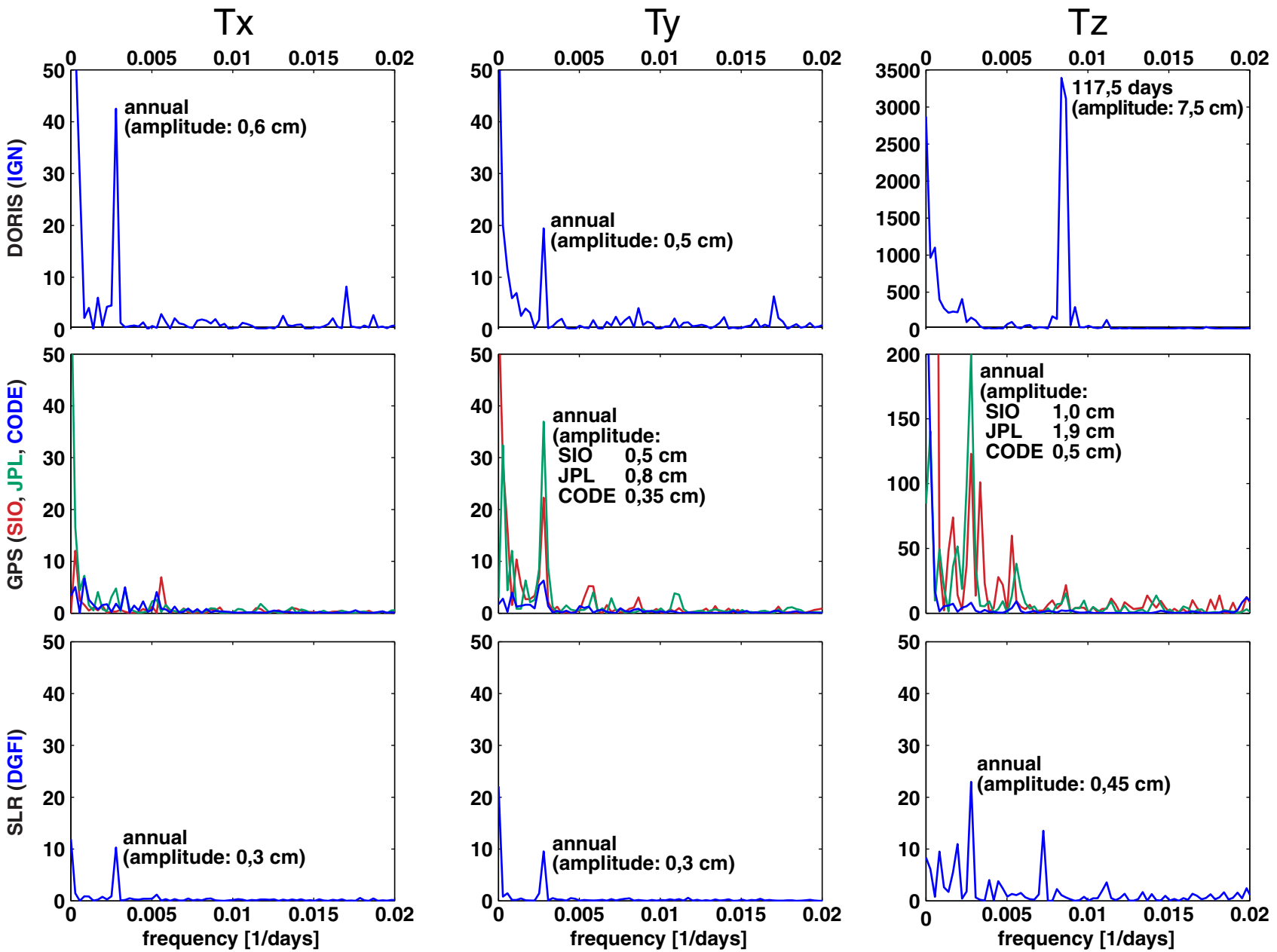
Power spectrum (FFT) - Translations



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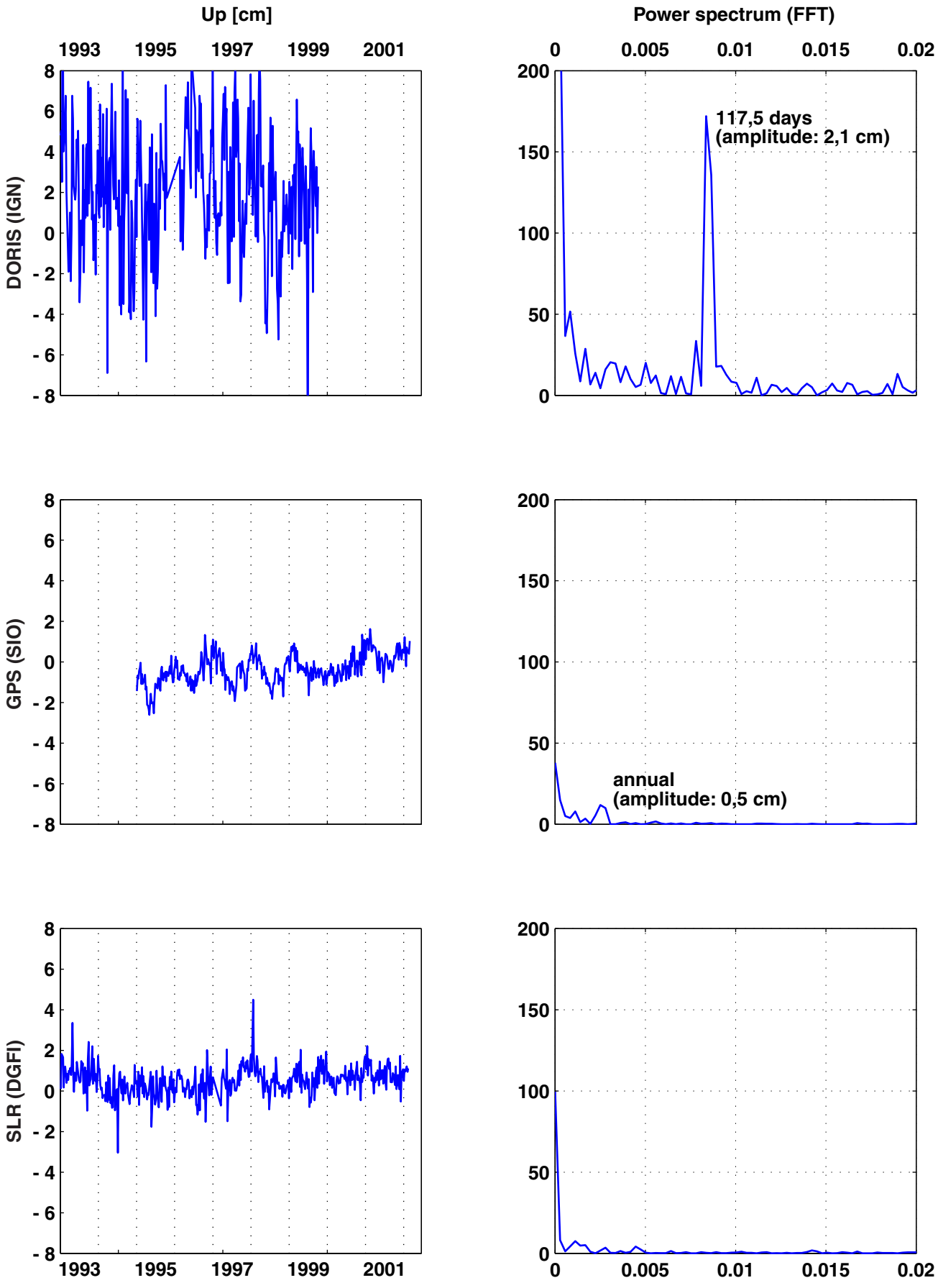
Yarragadee



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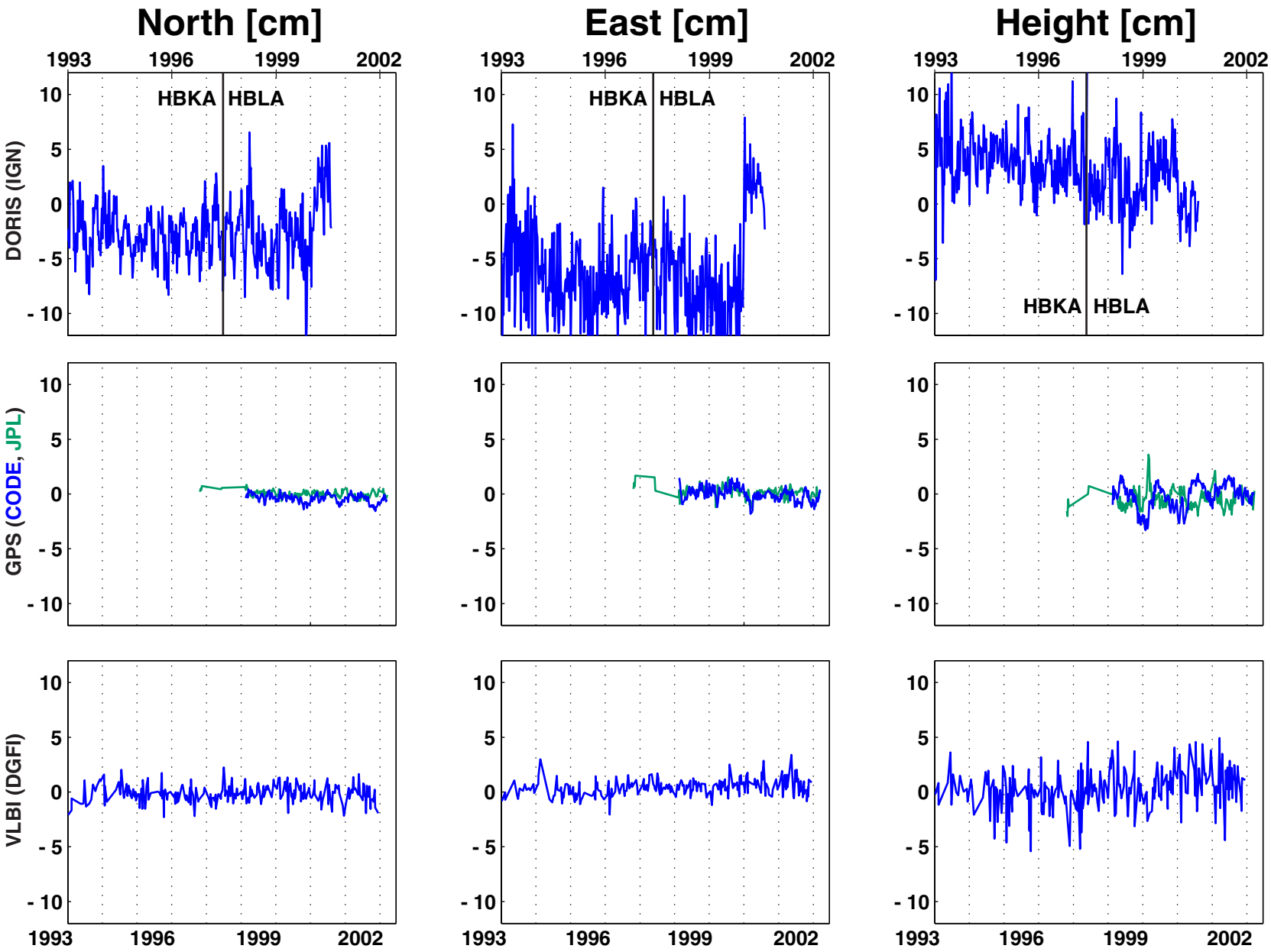
Hartebeesthoek



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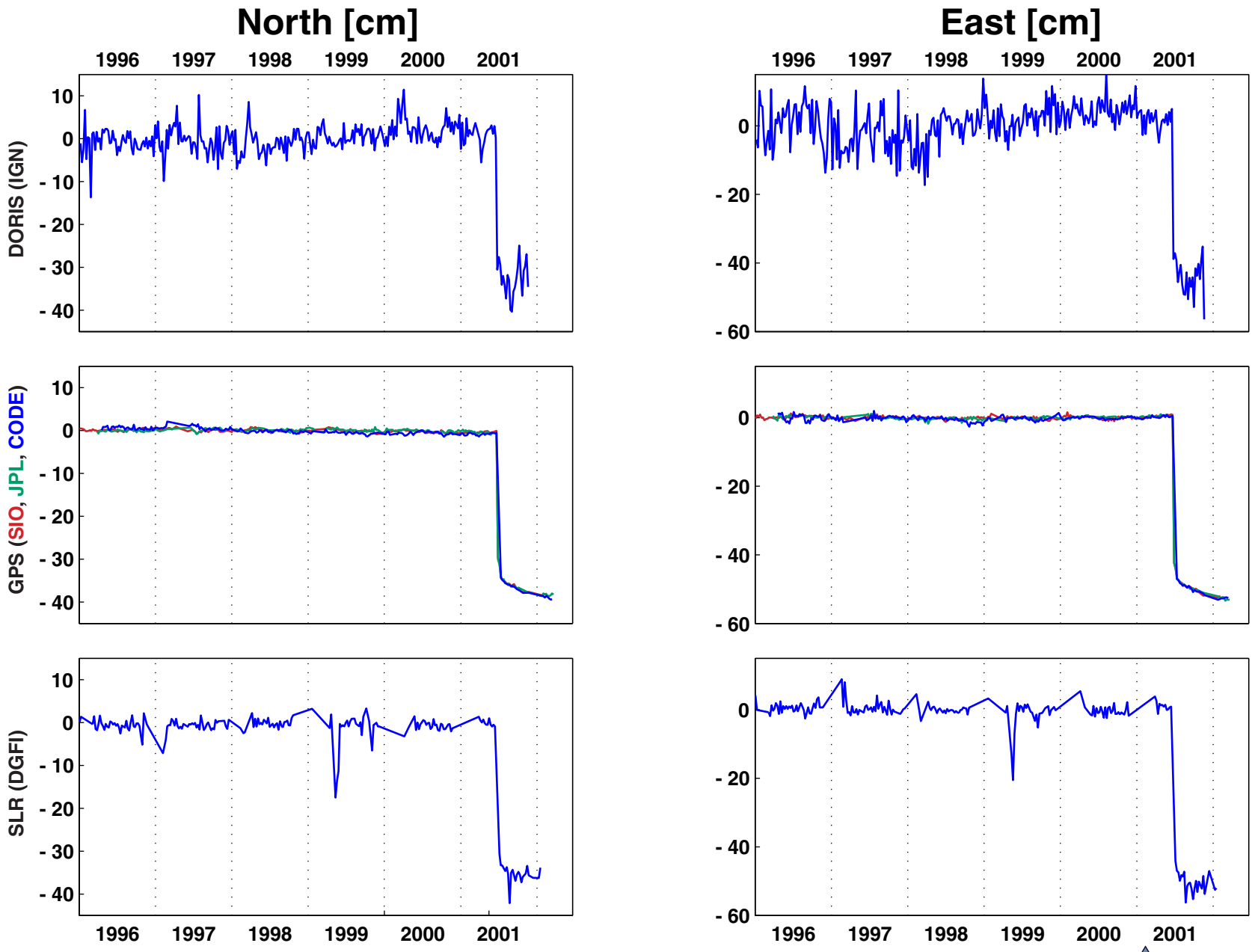
Arequipa (Peru)



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Conclusion

- Recommended contribution of space-techniques for the datum definition of the ITRF
  - Origin: x,y SLR (DORIS, GPS possible)
  - z SLR
  - Scale: VLBI, SLR (GPS, DORIS possible)
- Realistic annual signal only in SLR translations (amplitudes: 3-4 mm)
- 120 days periodic signal in DORIS z-component (amplitudes: ~7,5 cm)
- Position time series reveal jumps (e.g. earthquakes) and periodic signals (e.g. annual, 120 days for DORIS)
- Further analysis of systematic differences between individual solutions is required (e.g. software, models, strategies)

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