Study of common **aperiodic** displacements at ITRF co-location sites

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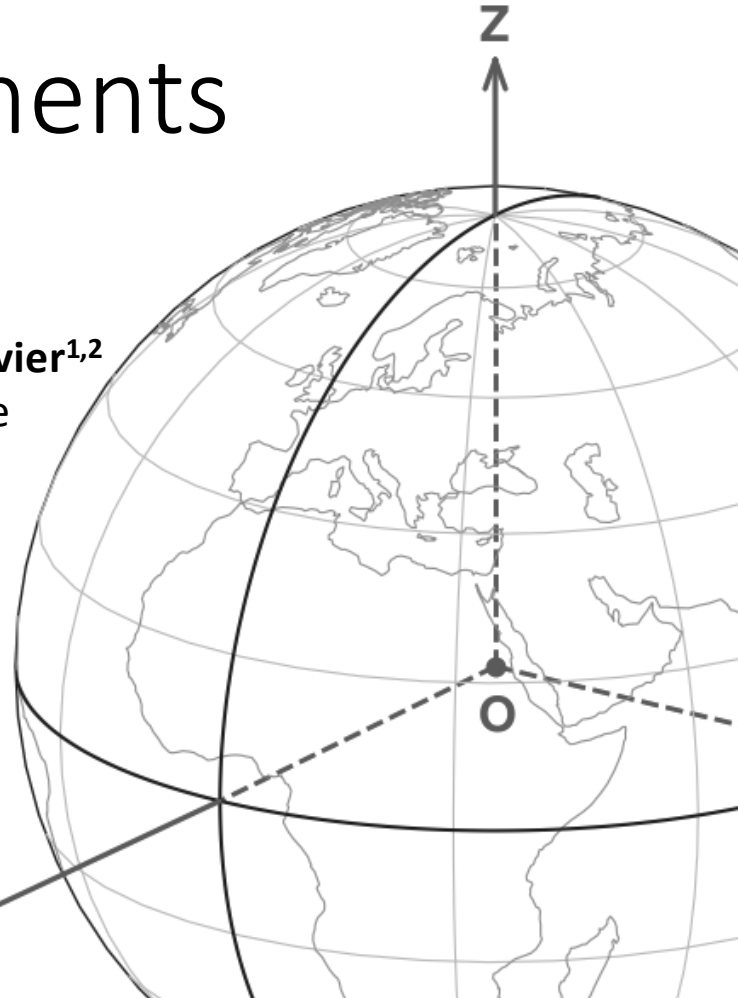

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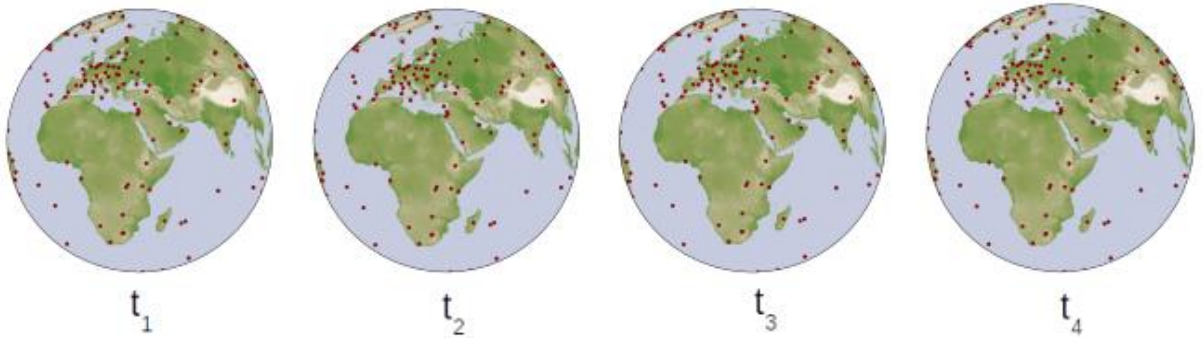
Dong et al. (1998), Wu et al. (2015), Abbondanza et al. (2017)



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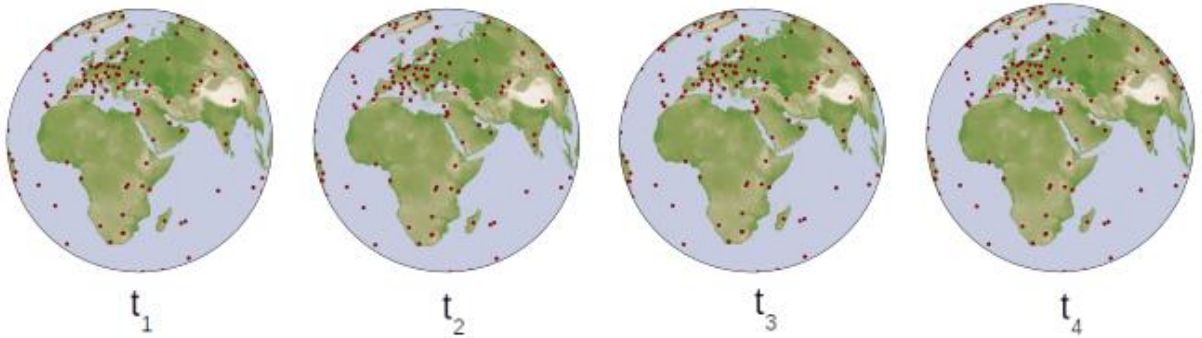


➡ Requires **aperiodic** motions of the different space geodetic techniques to be tied in a common frame by means of co-motion constraints

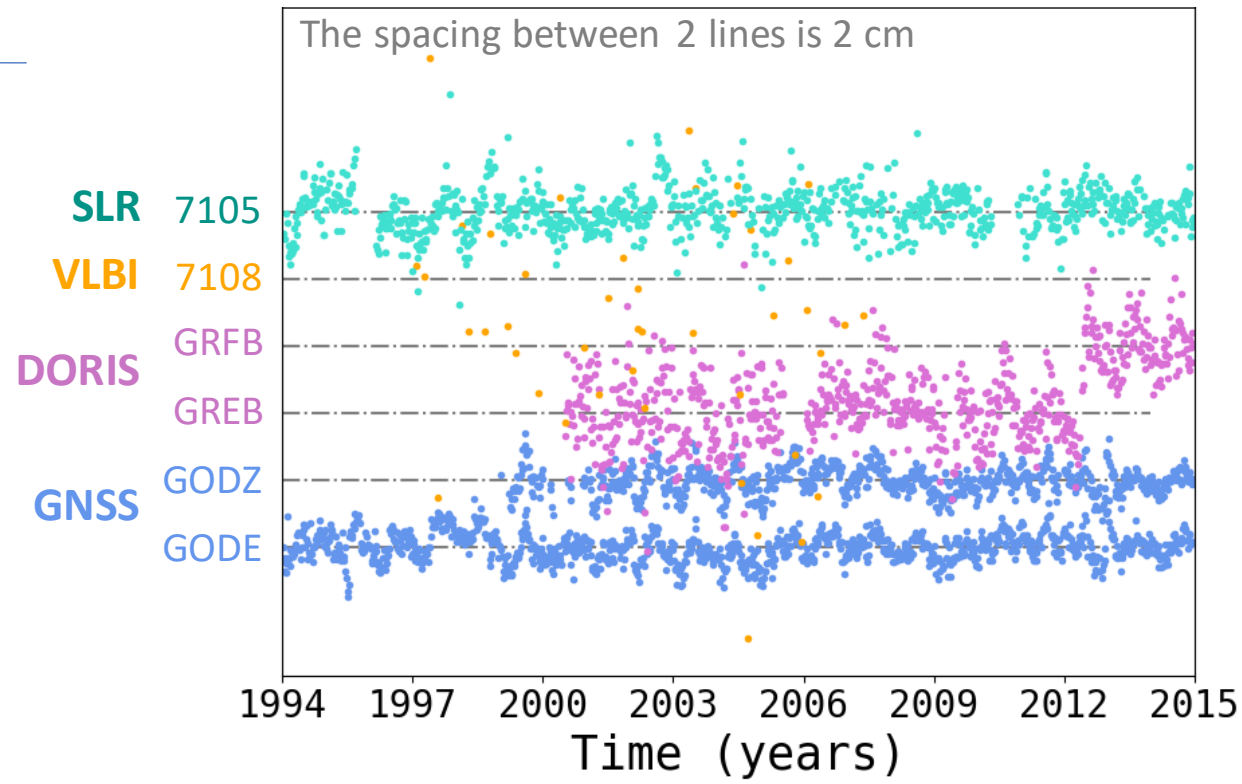
But are there detectable common **aperiodic** movements at ITRF co-location sites?

Data and preprocessing

- Station position time series provided by the four space geodesy technique services for ITRF2014. Sampled on a weekly basis.

  Altamimi et al. (2016)

Vertical component of detrended station position time series at Greenbelt co-location site.



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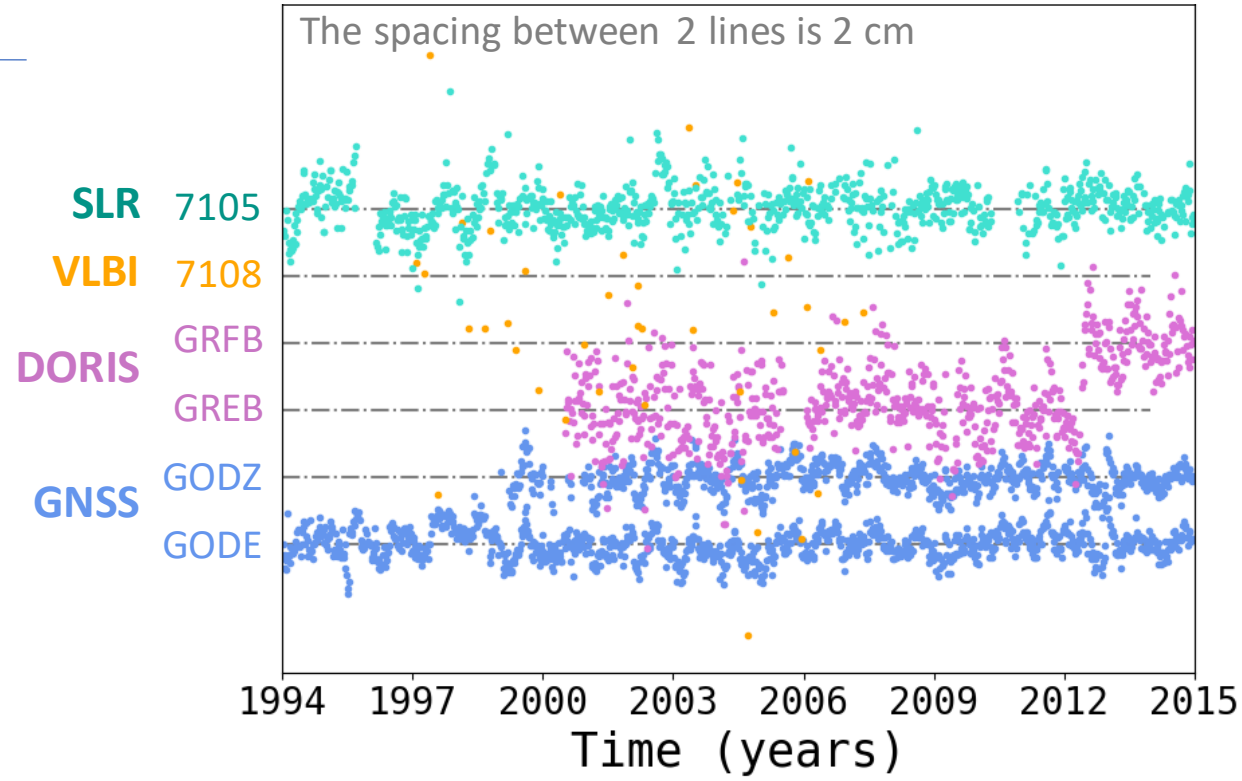

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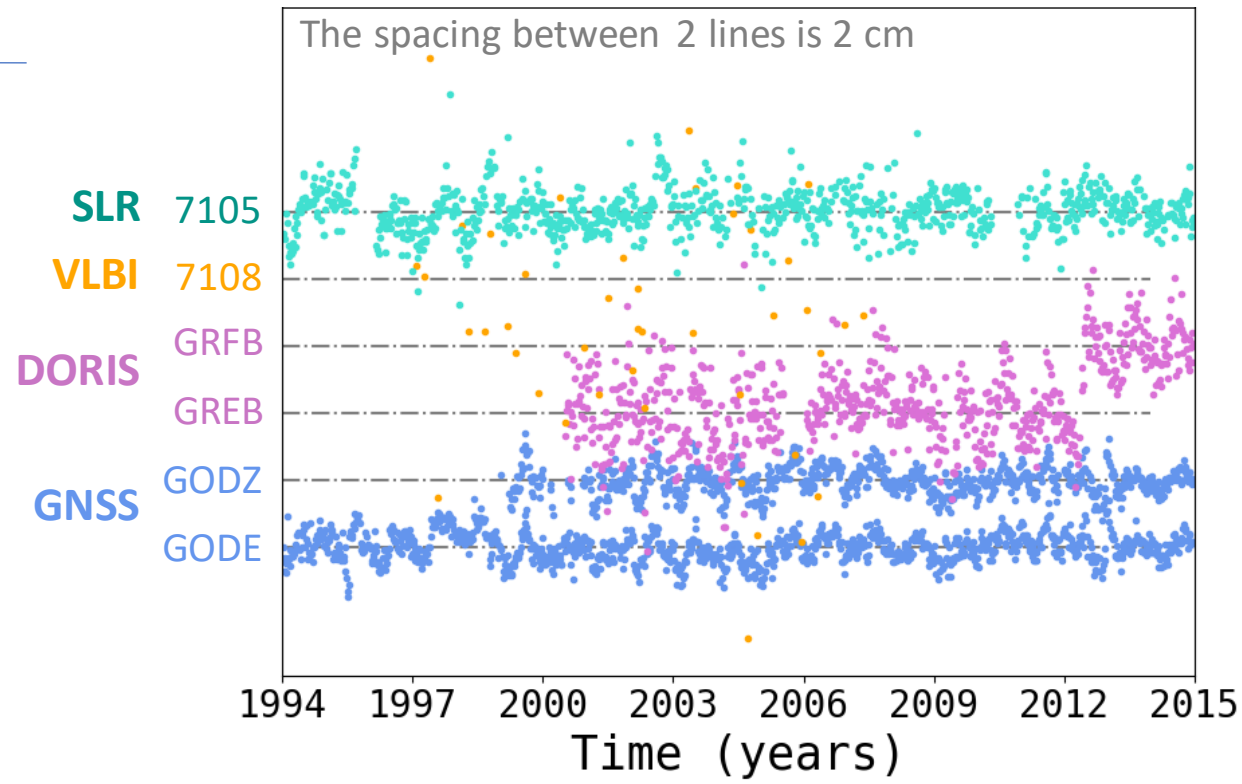


- In order to minimize technique-specific network effects, the solutions of the other techniques are aligned to the GNSS solution of the same week.

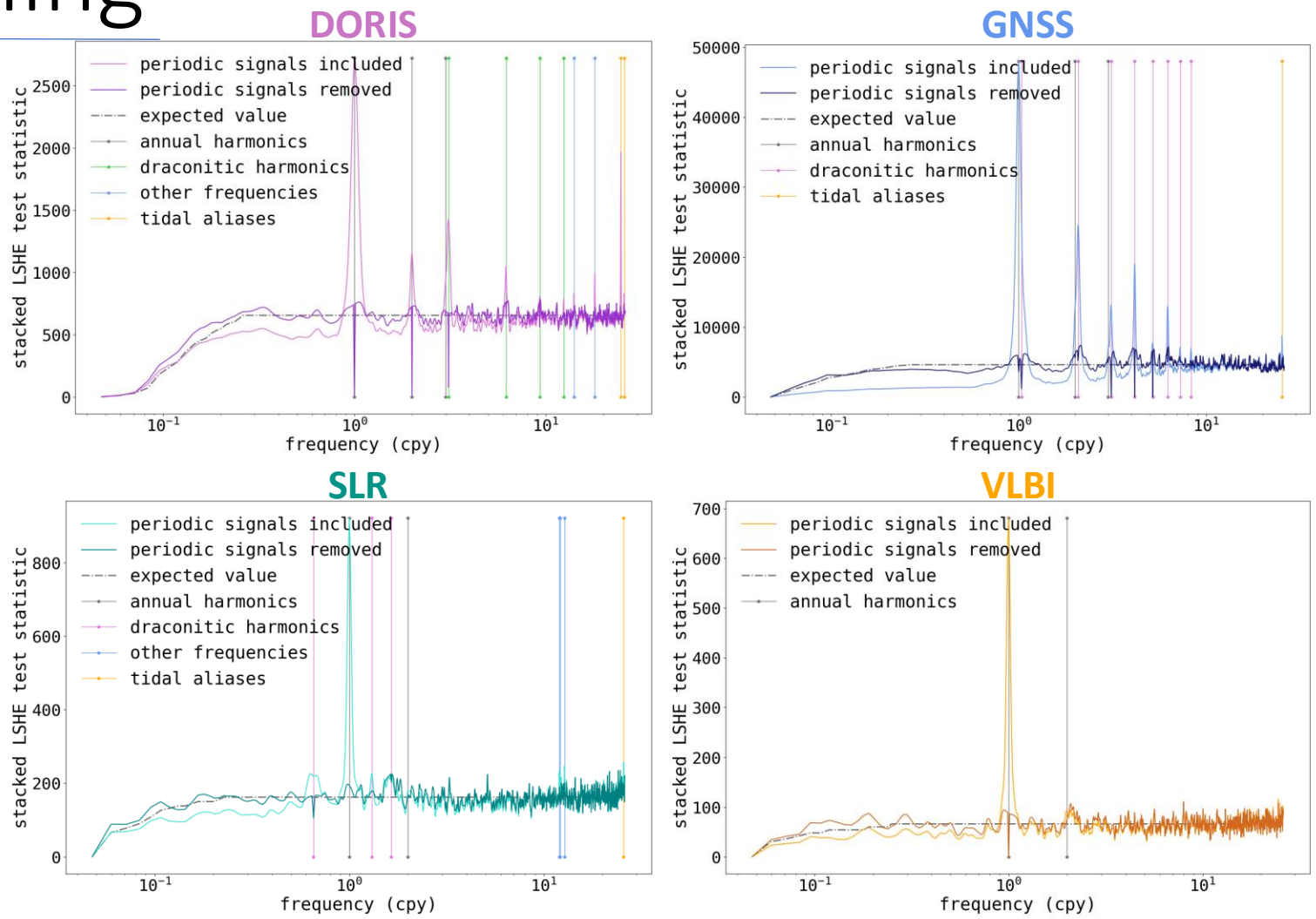
  Collilieux et al. (2007)

Time series modeling

- ITRF2014 deterministic model
  - Piece-wise linear
  - Post-seismic deformation

- Spectral analysis in order to remove seasonal signals and technique-specific periodic errors from the position time series

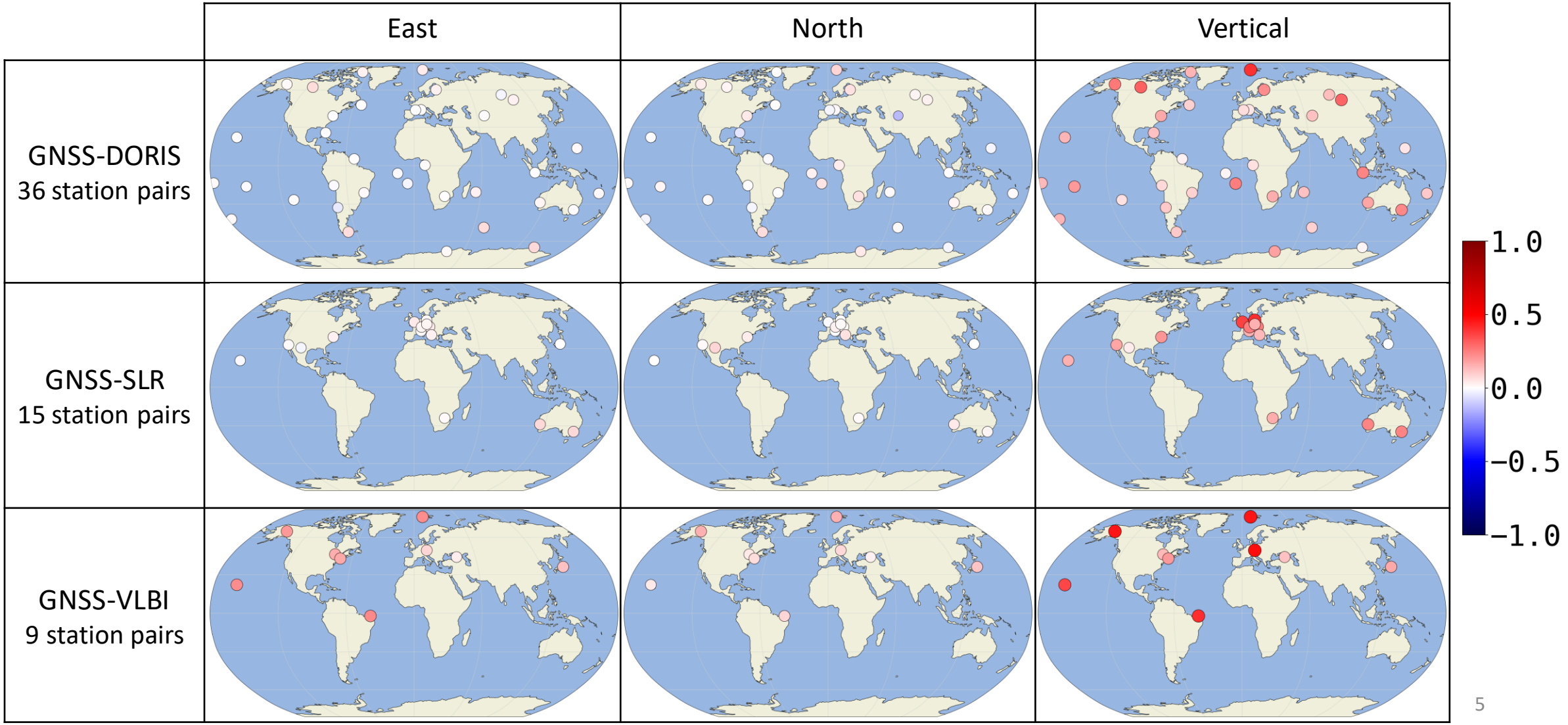
  Least Square Harmonic Estimation
  Amiri-Simkooei et al (2007)



Stacked LSHE spectra before (light curve) and after (dark curve) removing the periodic signals

Concordance correlation coefficient

Lin (1989)



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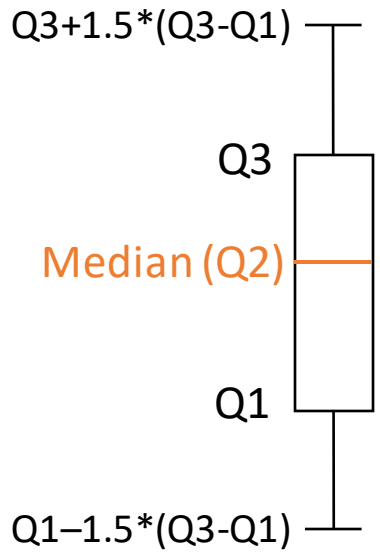
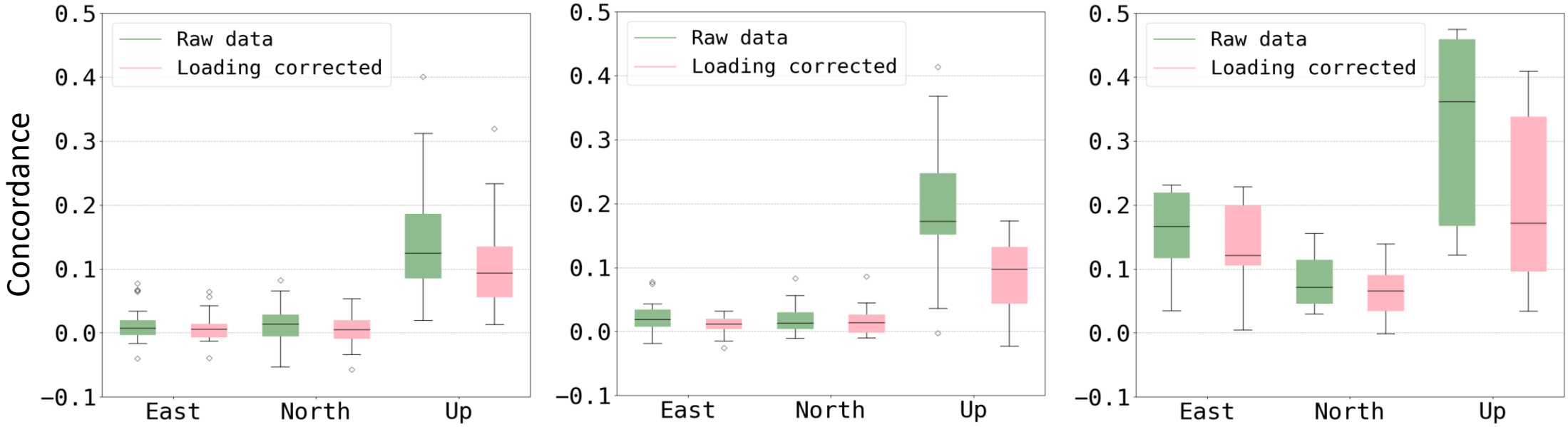


- Impact of correcting time series for loading deformation model
  - IERS / GGFC (Boy, 2021)



GNSS-DORIS
36 station pairs

GNSS-SLR
15 station pairs

GNSS-VLBI
9 station pairs

Conclusion and perspectives

- The goal of this work is to assess the coherence of non-linear and non-periodic station motions at co-location sites
- Unfortunately, this work is limited by the heterogeneity of the space geodetic techniques data: difference in precision, global coverage and amount of data
- Modest correlations are observed between GNSS residual position time series and the other space geodetic techniques, mostly in the vertical component and especially for VLBI
- Only part of those correlations is explained by loading effects
- Are such modest concordances sufficient to allow the implementation of a terrestrial reference frame in the form of time series?

Ongoing work : Extract common signals with generalized three-cornered hat method

Paper in preparation