Atmospheric Non-Tidal Pressure Loading in GNSS–Analysis

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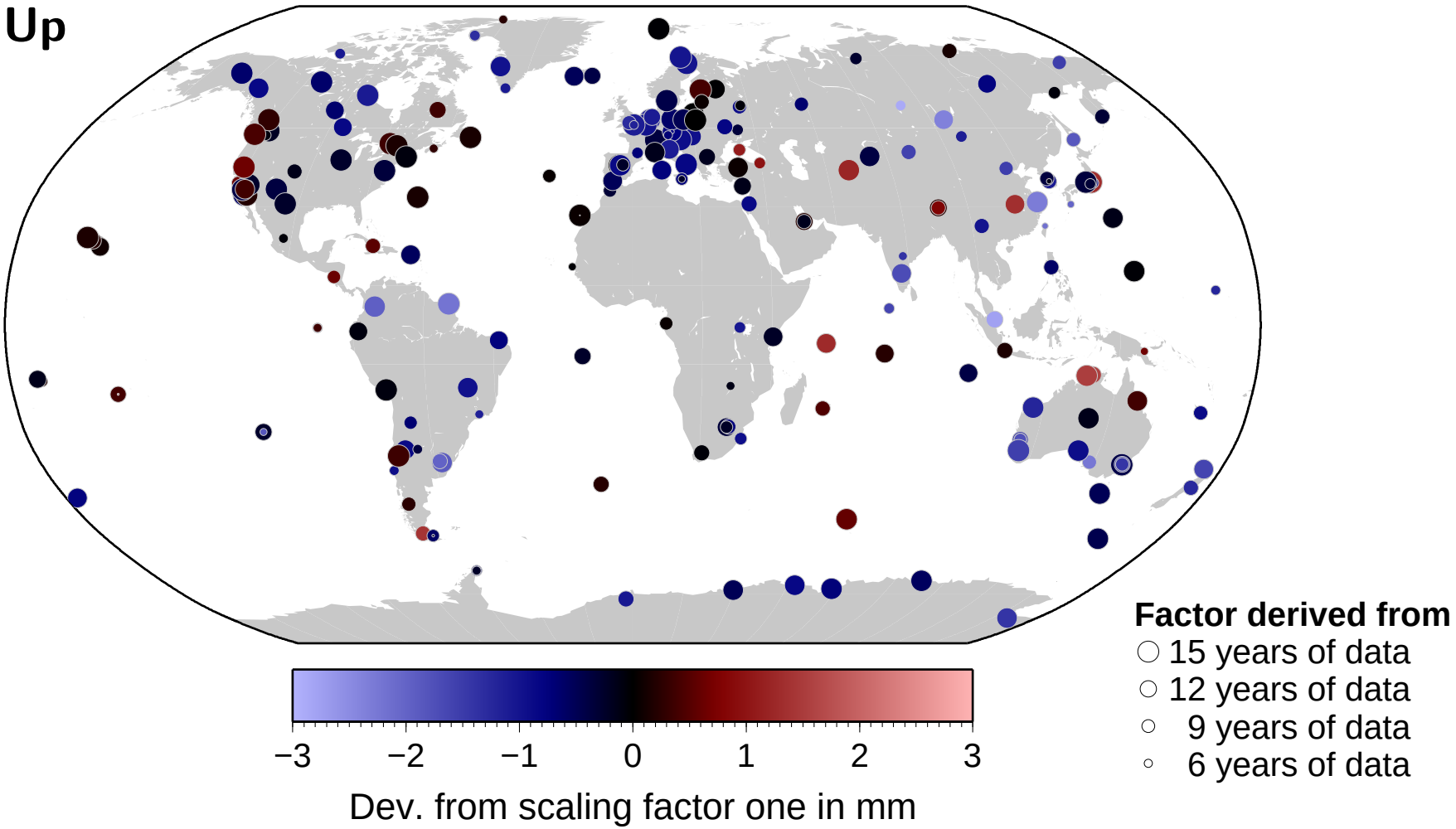
APL effect can clearly be detected in GNSS data

Estimated scaling factors for the atmospheric loading model

Deviation from one over 15 years, norm. with the RMS



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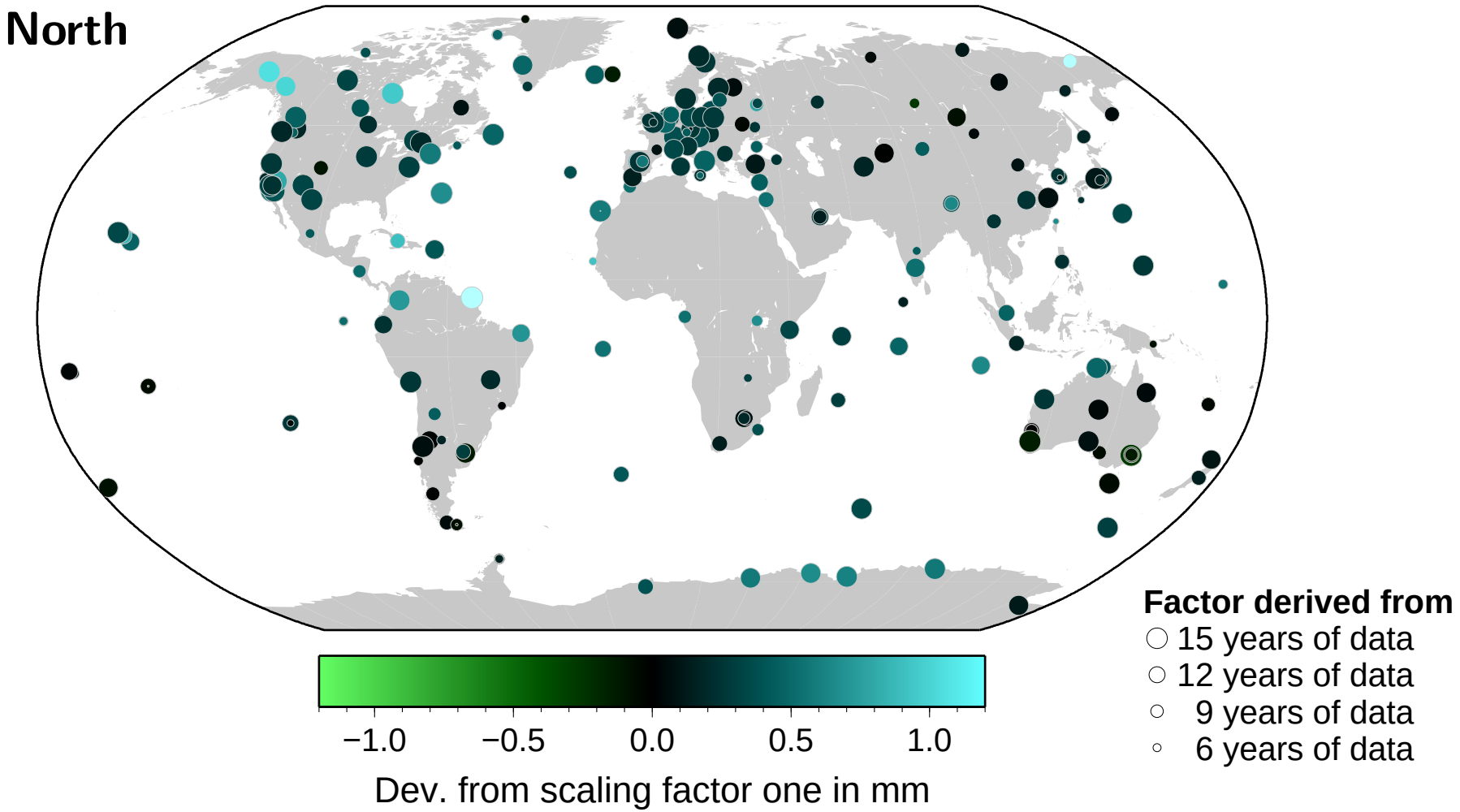

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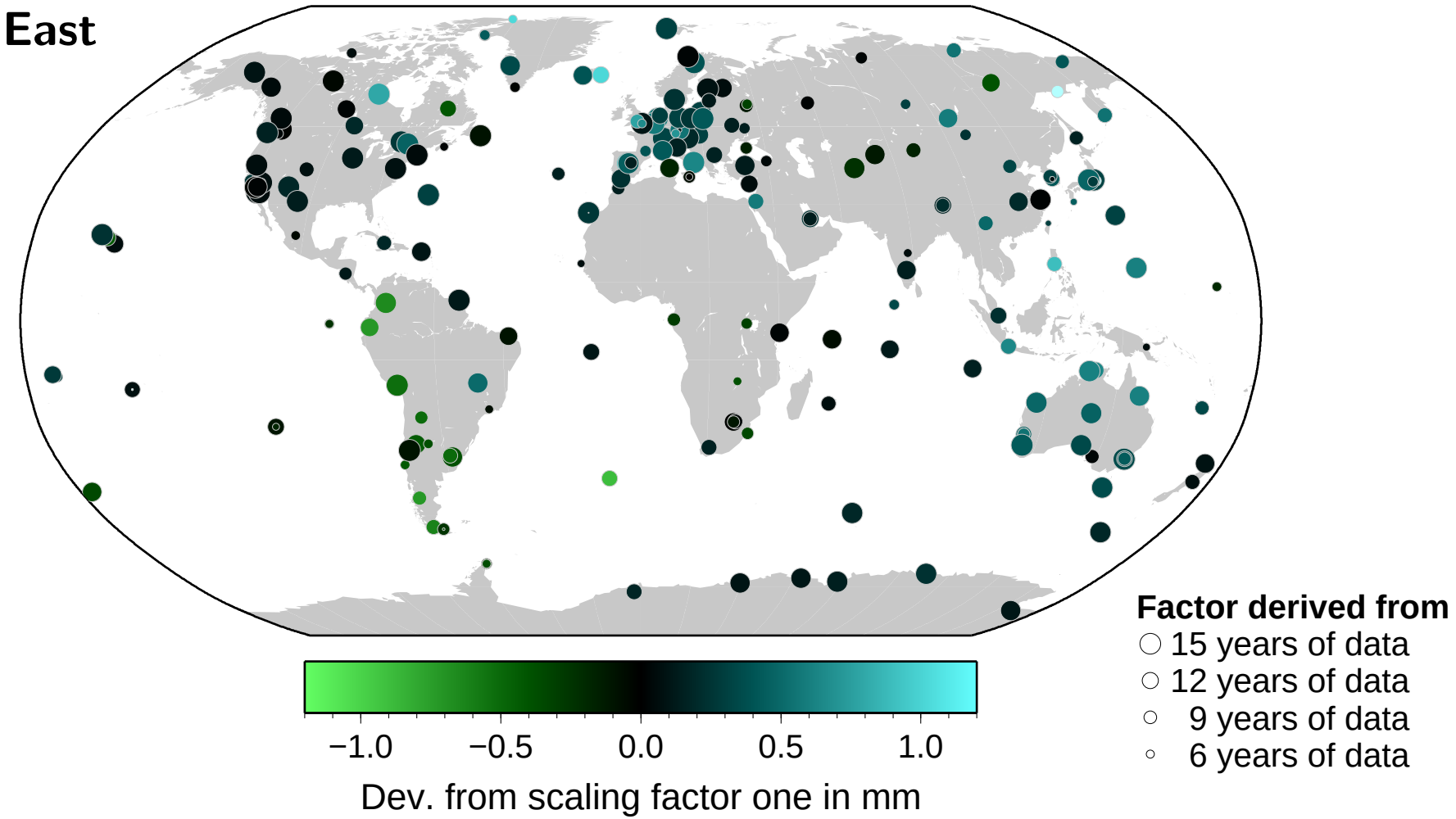

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- Non-tidal atmospheric pressure loading (APL) can clearly be detected in GNSS–derived time series.
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- In consequence, GNSS–results must be corrected for the effect.

- What is the best/correct procedure?

  1. correction on observation level during the data processing
  2. correction of resulting coordinate time series

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   ☺ GNSS results are fully corrected for APL

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   - ☹ APL effect may migrate into estimated parameters

Network–solution versus PPP

CASE 2: Correction of resulting coordinate time series

Network solution
(weekly IGS solution)

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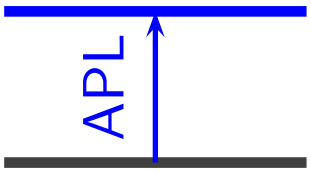

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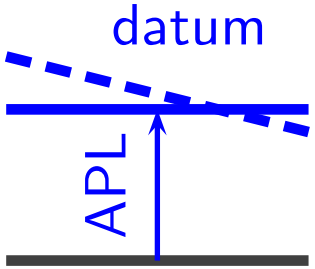

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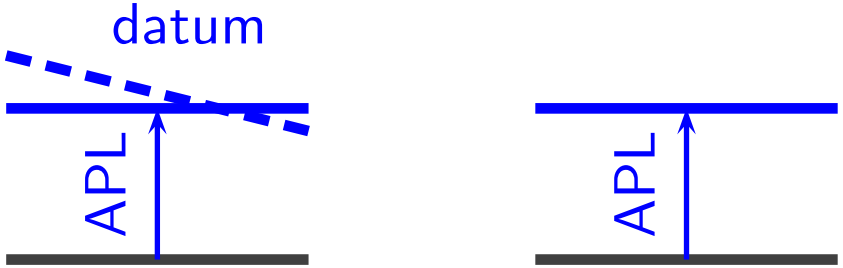

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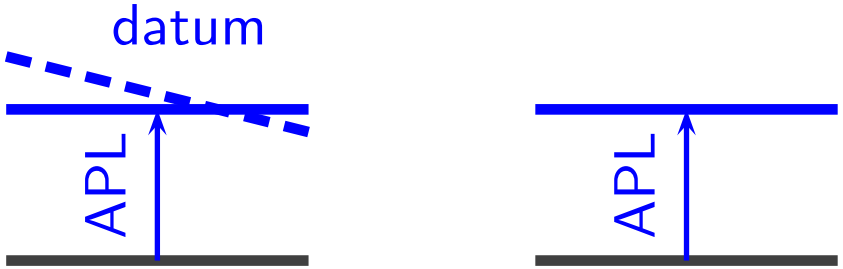

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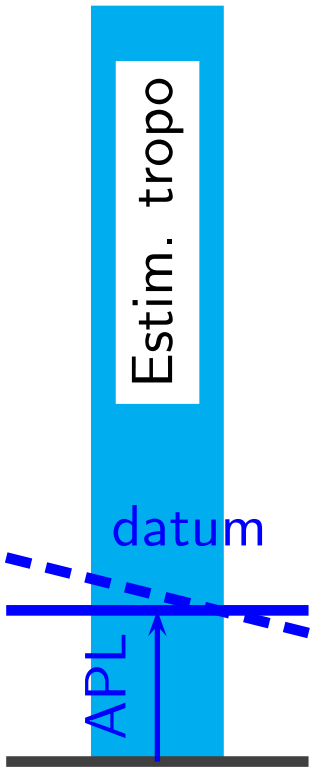

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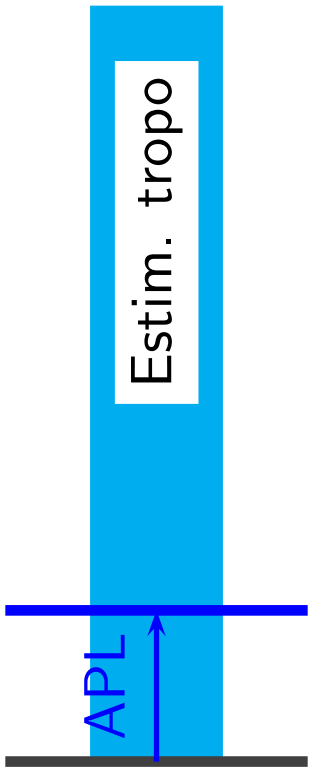

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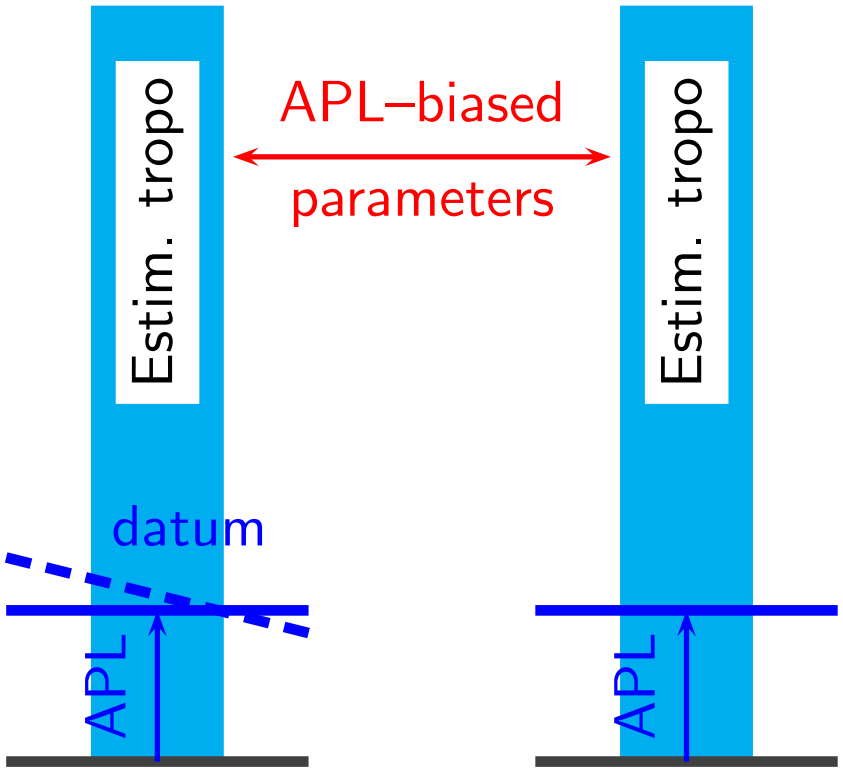

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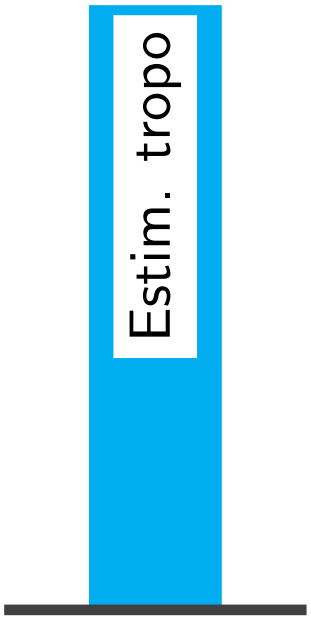

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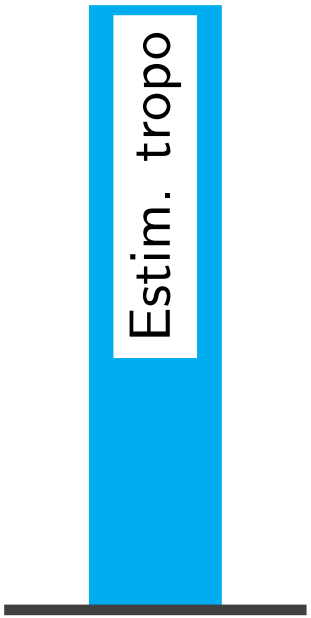

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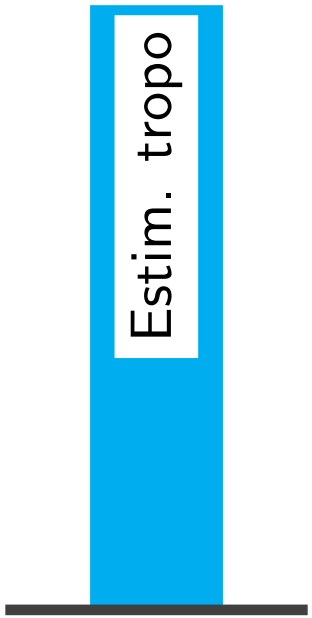

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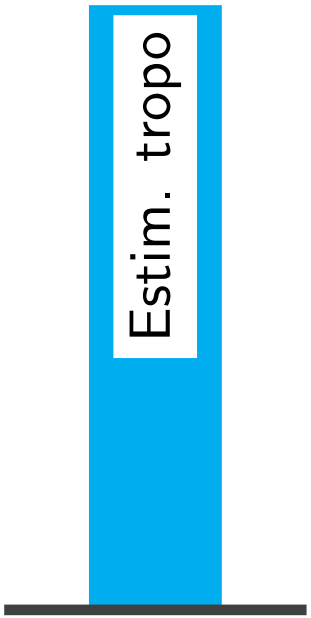

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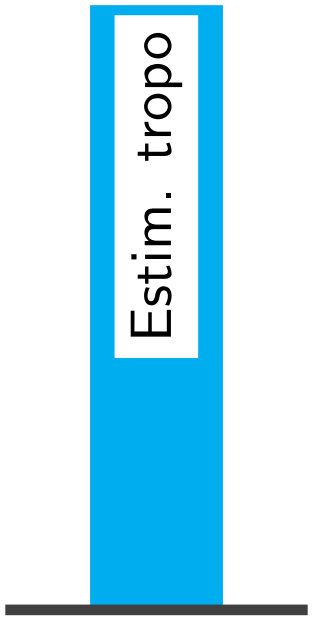

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- Results are APL–corrected as they come out of the PPP–solution.

All results are APL–corrected and fully consistent.

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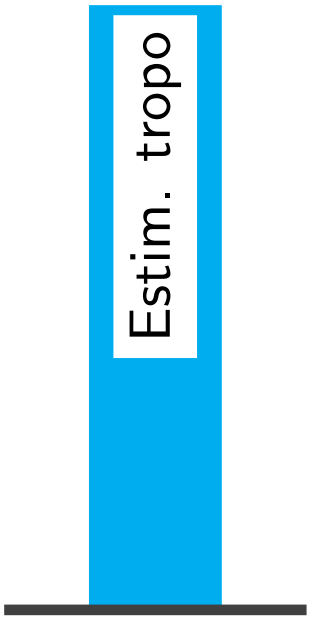

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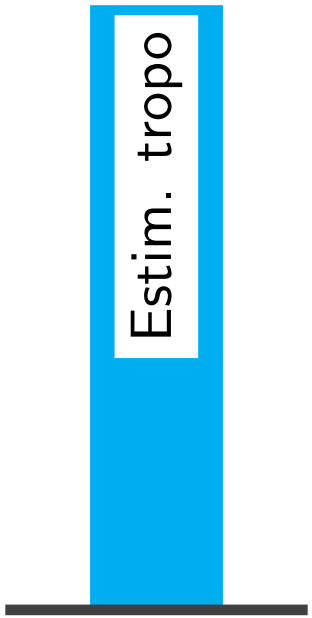

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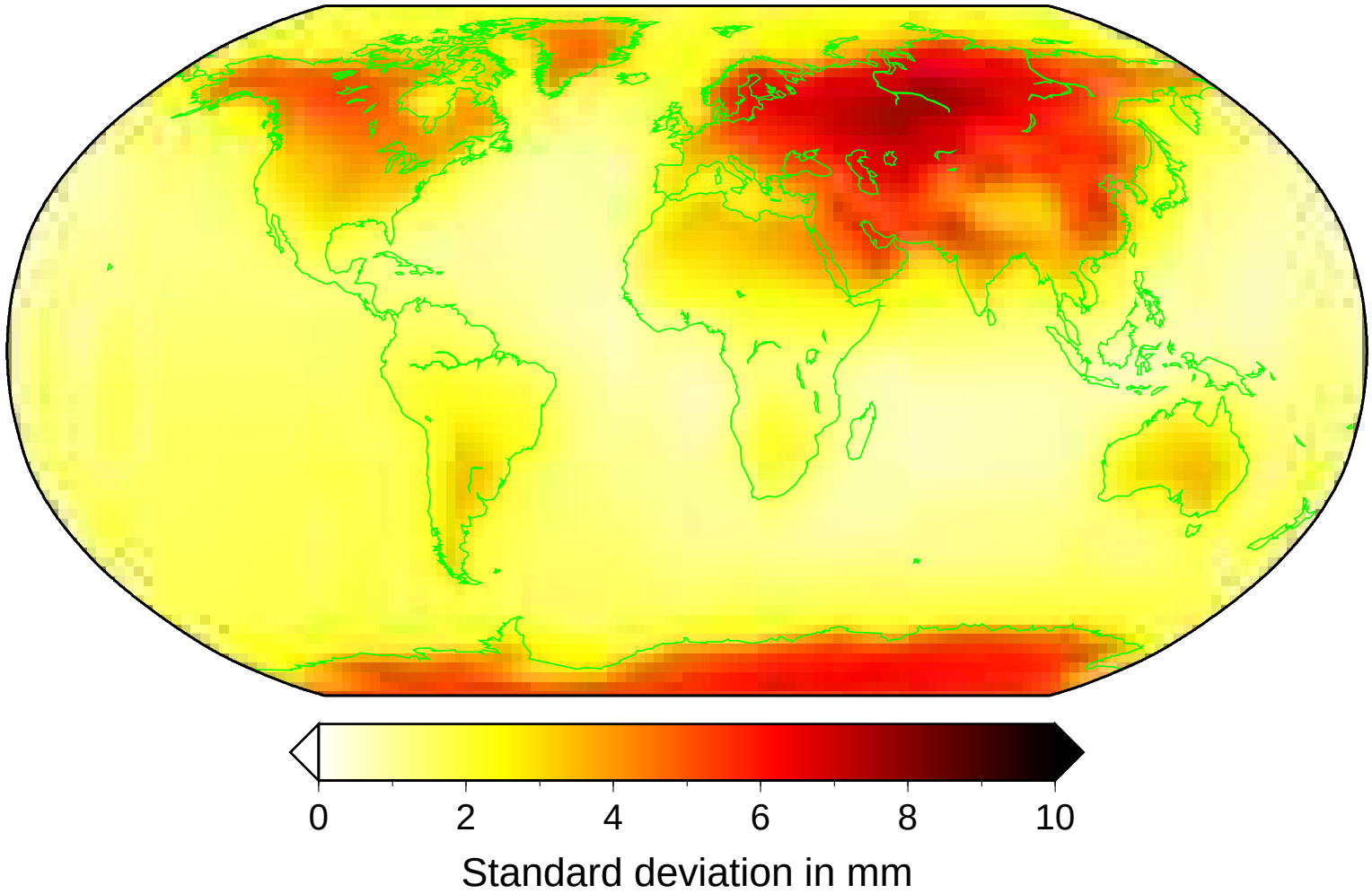
PPP–user using IGS–products

- Results are APL–corrected as they come out of the PPP–solution.
- Grid with APL–corrections for the user community is needed.

All results are APL–corrected and fully consistent.

Characteristics of APL effect

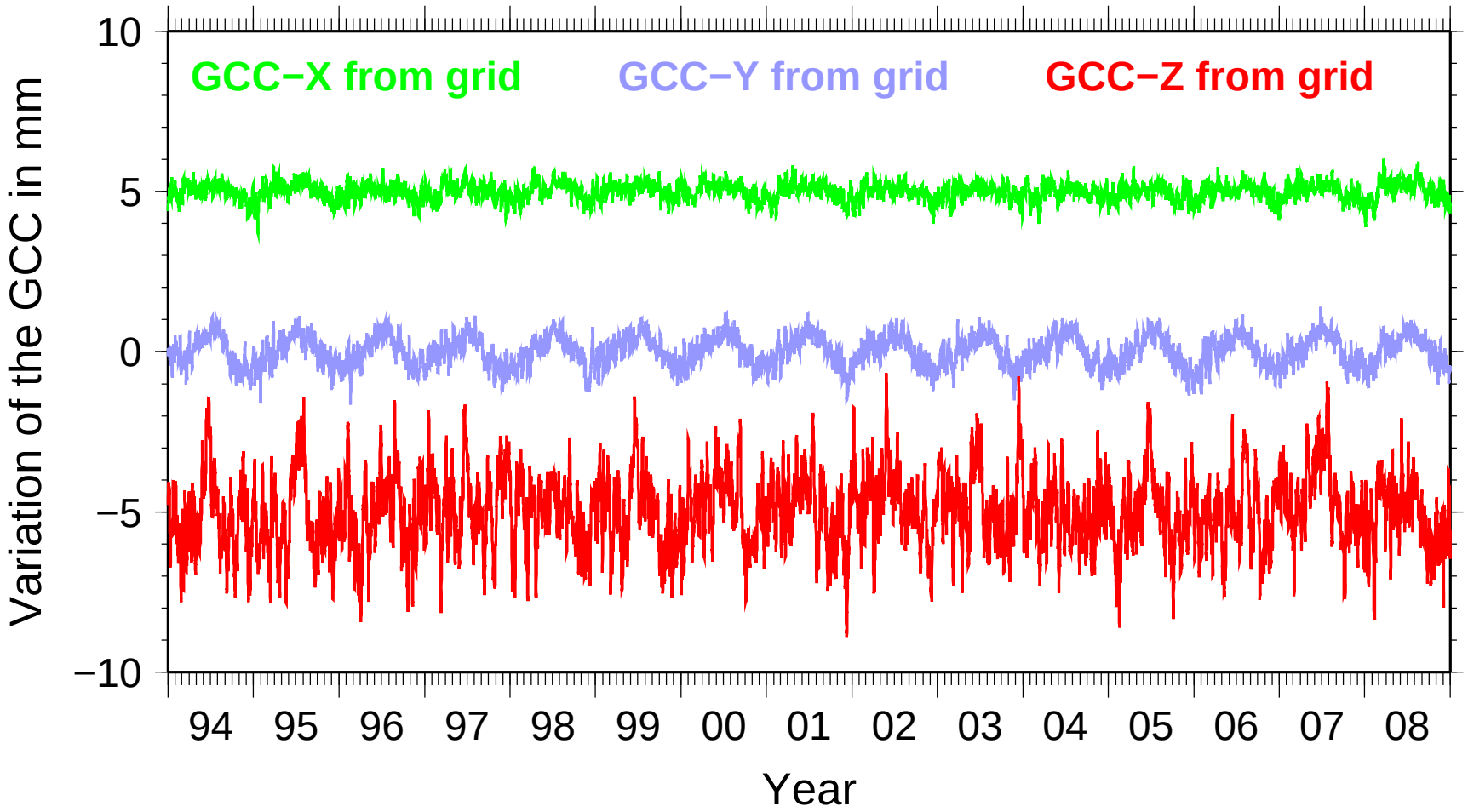
RMS of the non–tidal correction over 15 years



APL model from Petrov and Boy, 2004

APL effect may translate to geocenter

APL model



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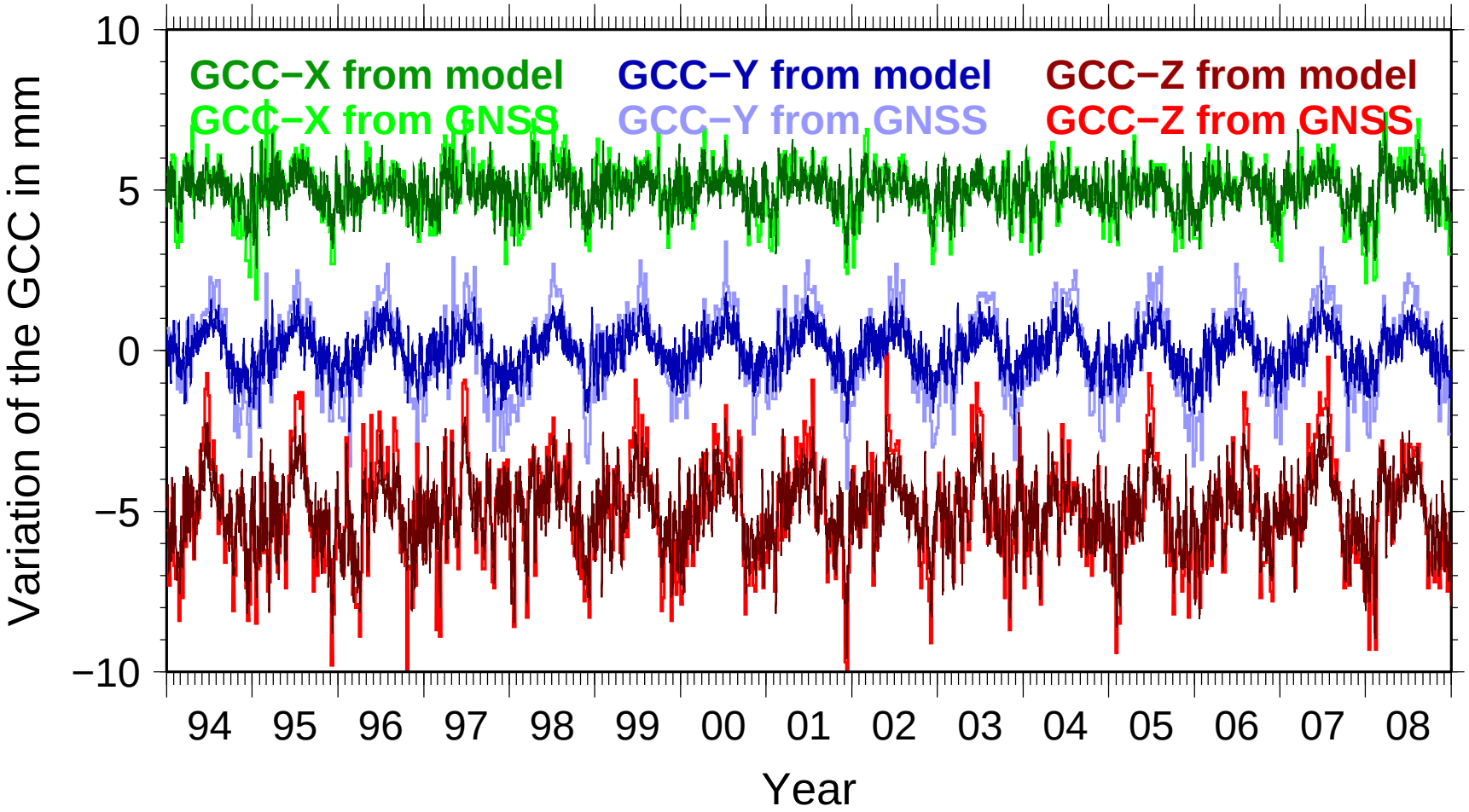
APL model versus translations from two GNSS–solutions



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- Previous slide: translations between weekly coordinates generated

(a) with correcting for APL directly on observation level

(b) without correcting for the APL effect

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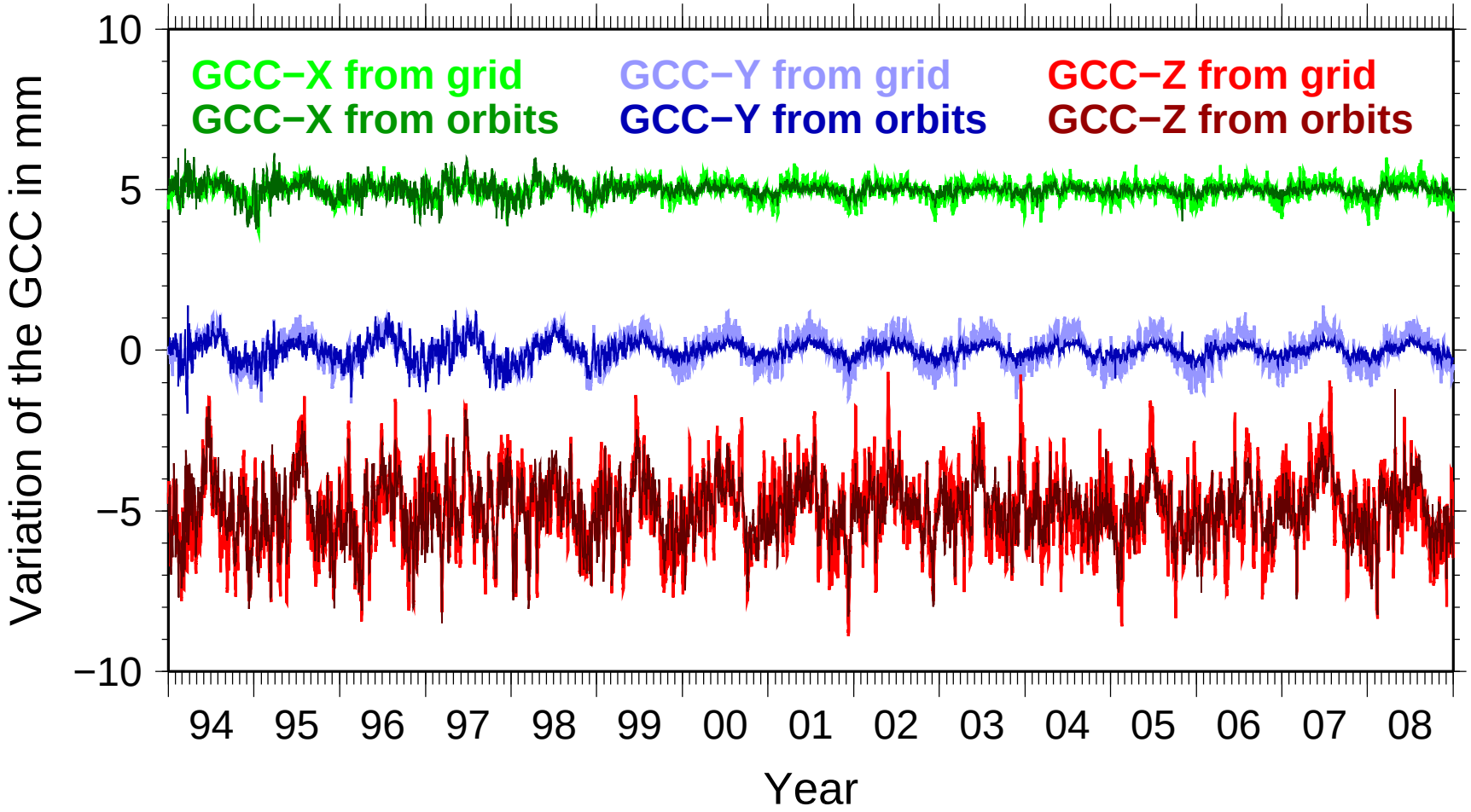
- The datum of the ground station coordinates in the two solutions is unified by applying the translations to the coordinates from solution (a). The corresponding orbits are computed.
- If the ground stations are in a consistent reference frame it can be expected that also the corresponding GNSS orbits will show no systematic differences.

APL effect may mitigate into the orbits

Translation parameters between GNSS–orbits from solution (a) and (b)
after unification of the datum of the ground stations



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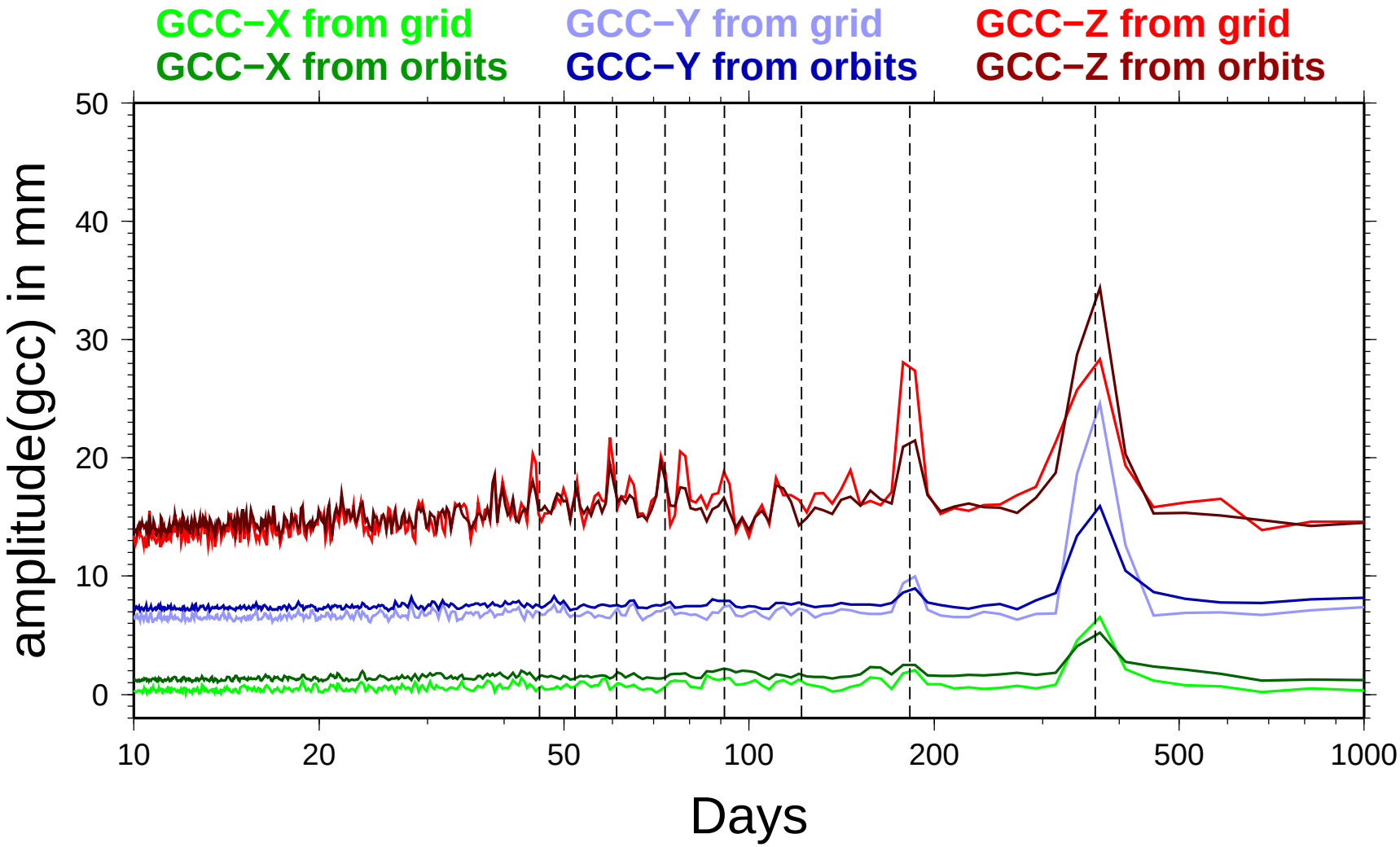

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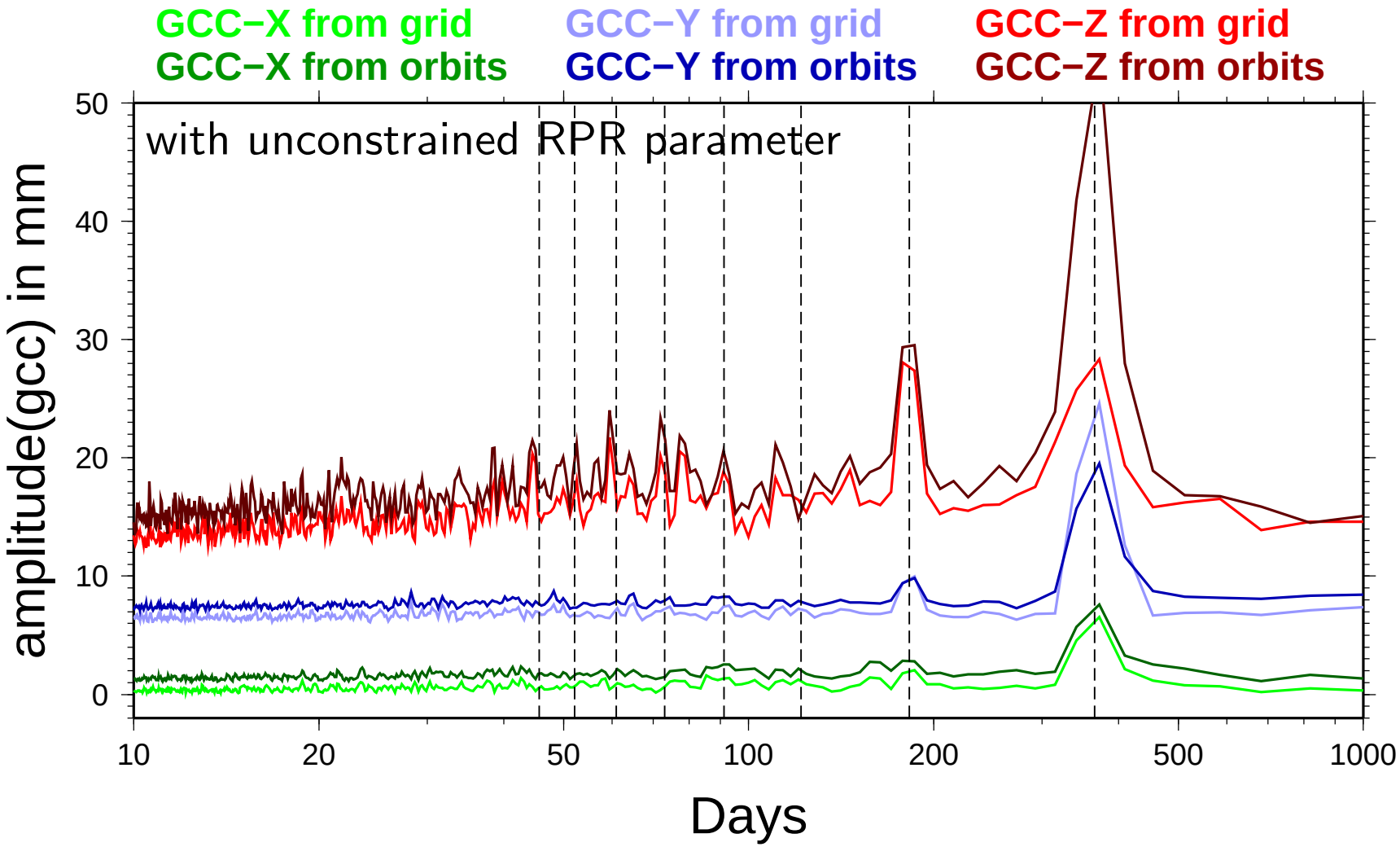

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  This is clearly not practicable.

Concluding questions

- We need APL corrections used by all services, accurate enough for all techniques, in time for at least the final products and covering the complete time span of data for consistent reprocessing.

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- What is the optimal compromise between latency of products and quality of the models providing the mass distribution for loading computations?