

Integrated Solutions from the GPS-GRACE-CHAMP Constellation

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Content

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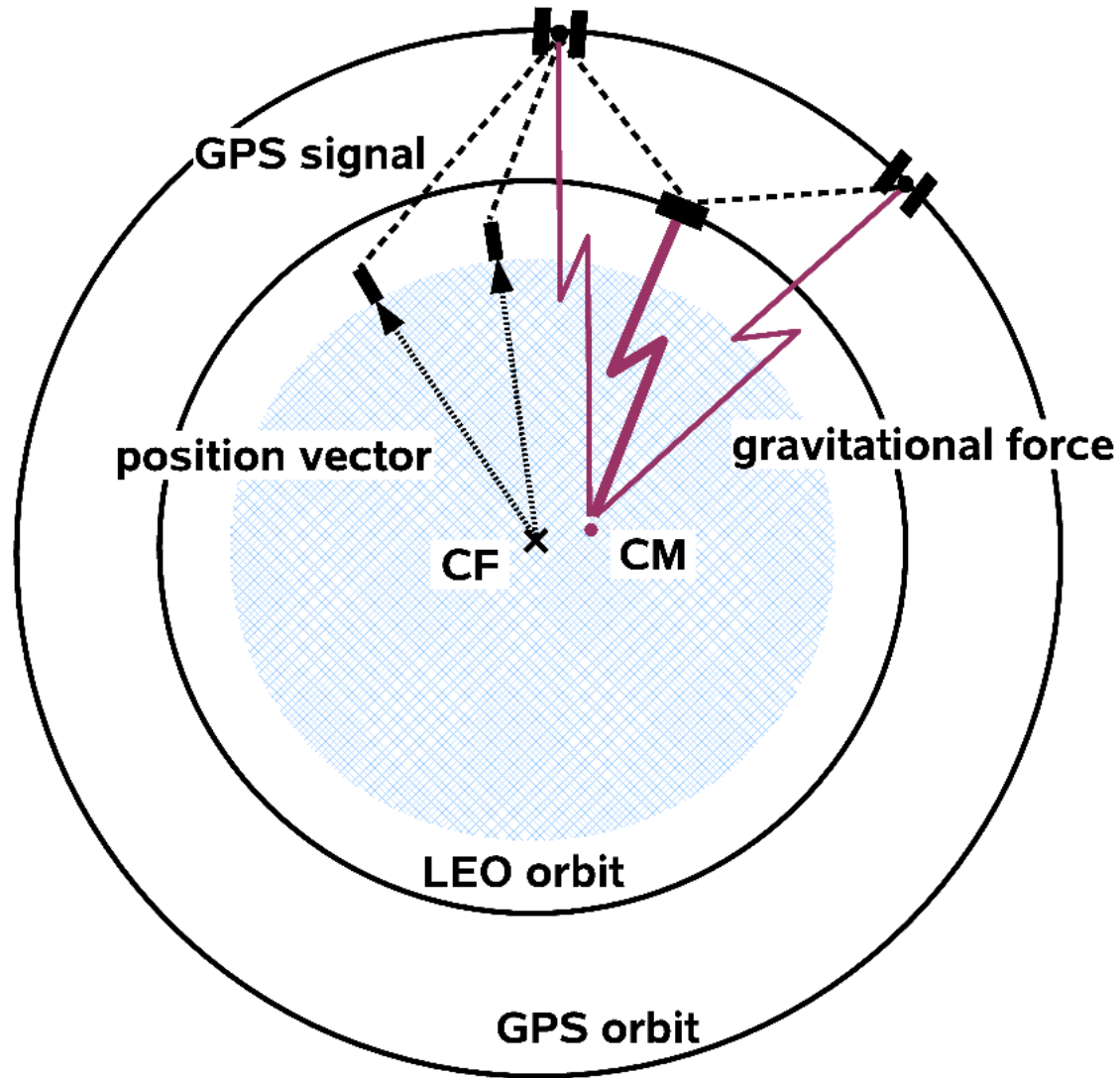
Motivation

- Use the integrated approach to generate dense and accurate geocenter time series
- Clarify solvability, separability and possible accuracy of the dynamic and geometric geocenter parameters

The Integrated Approach

- Simultaneous dynamic modelling of an ensemble of satellites
- Simultaneous solution of all orbits from an ensemble of tracking types
- Simultaneous solution of an ensemble of parameters
 - Dynamic
 - Orbit
 - Low degree harmonics
 - ...
 - Geometric
 - Station coordinates
 - ...

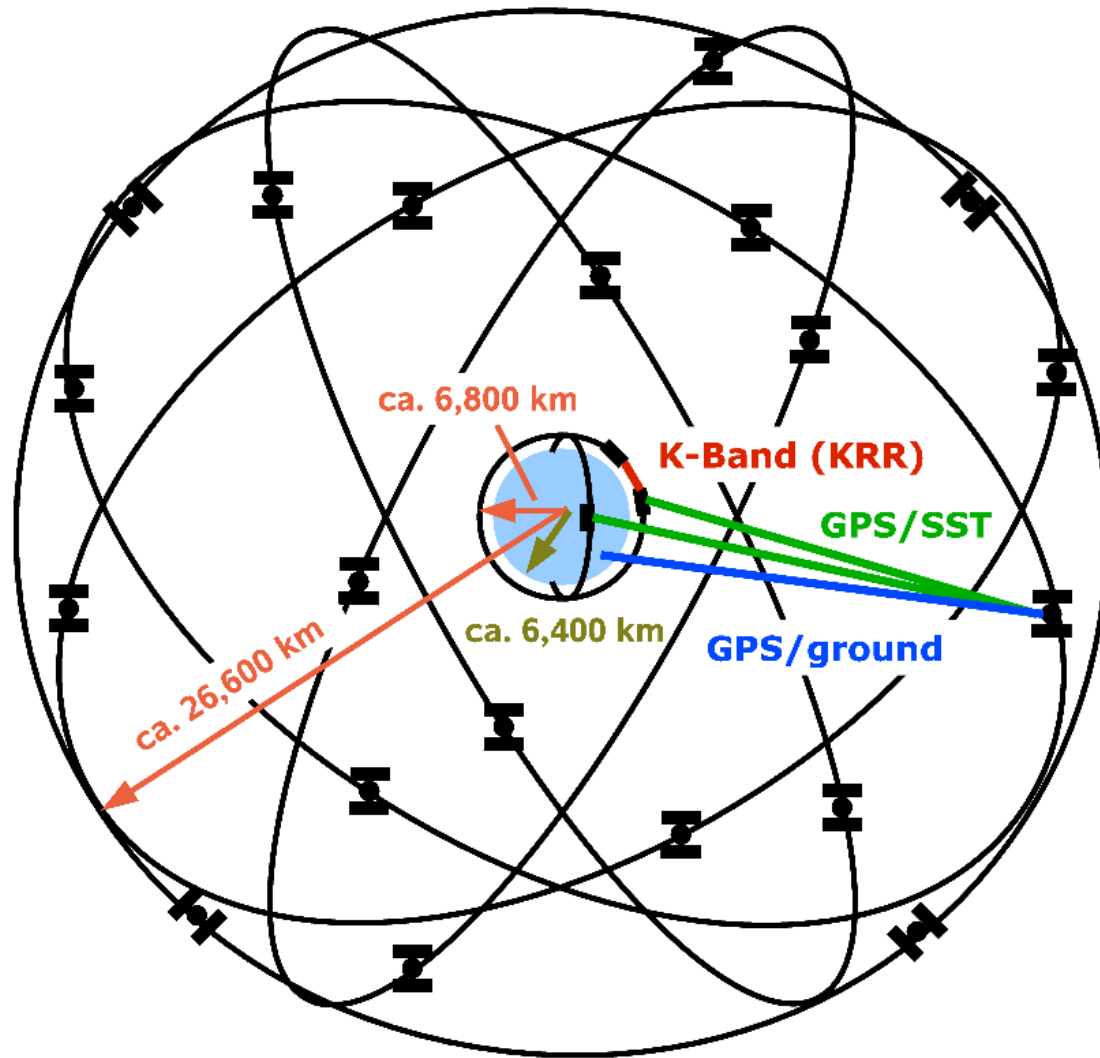
Dynamic and Geometric Origin



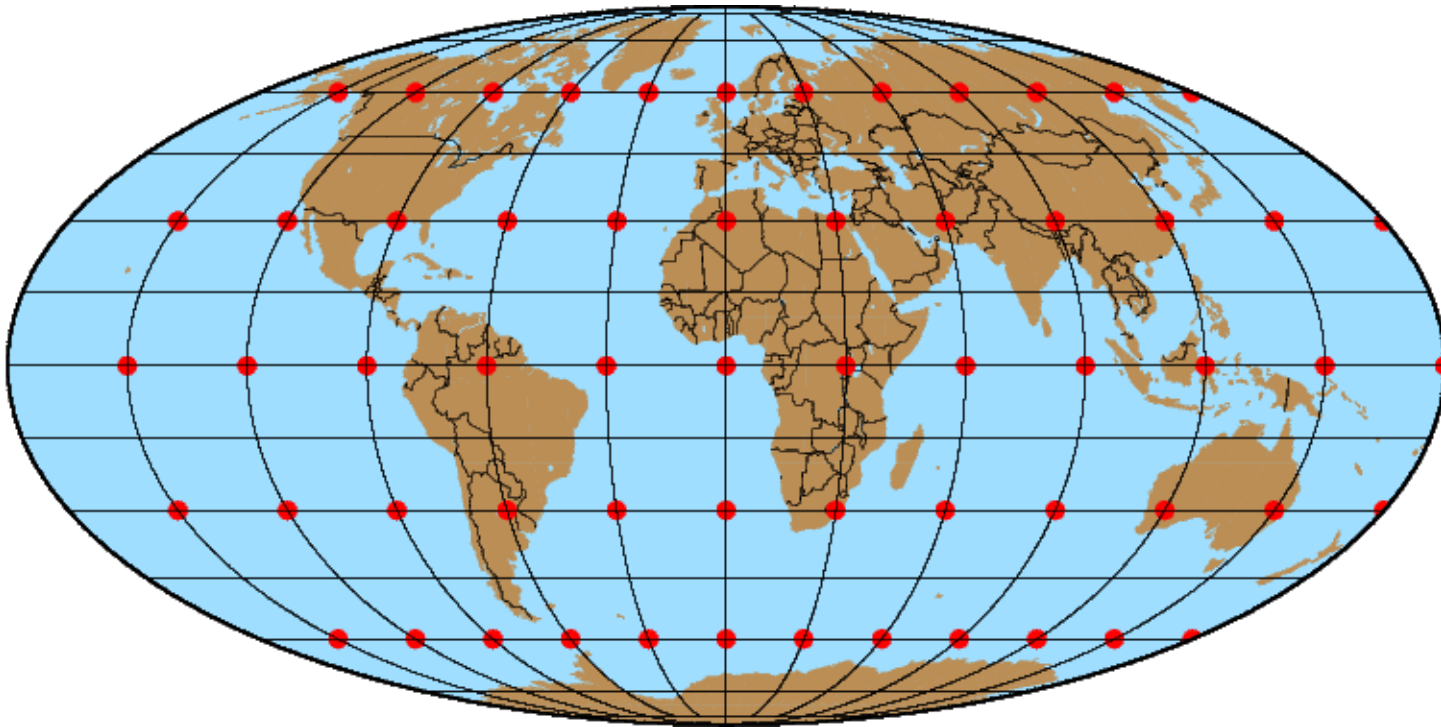
Simulations

- Assessment of solvability, separability and accuracy
 - Simulation
 - Satellite constellation here: GPS+CHAMP
 - Synthetic GPS ground stations network (60 stations)
 - State-of-the-art background models
 - Recovery
 - Changed background models:
artificial errors on dynamic origin and on stations coordinates (+6 cm on each component)

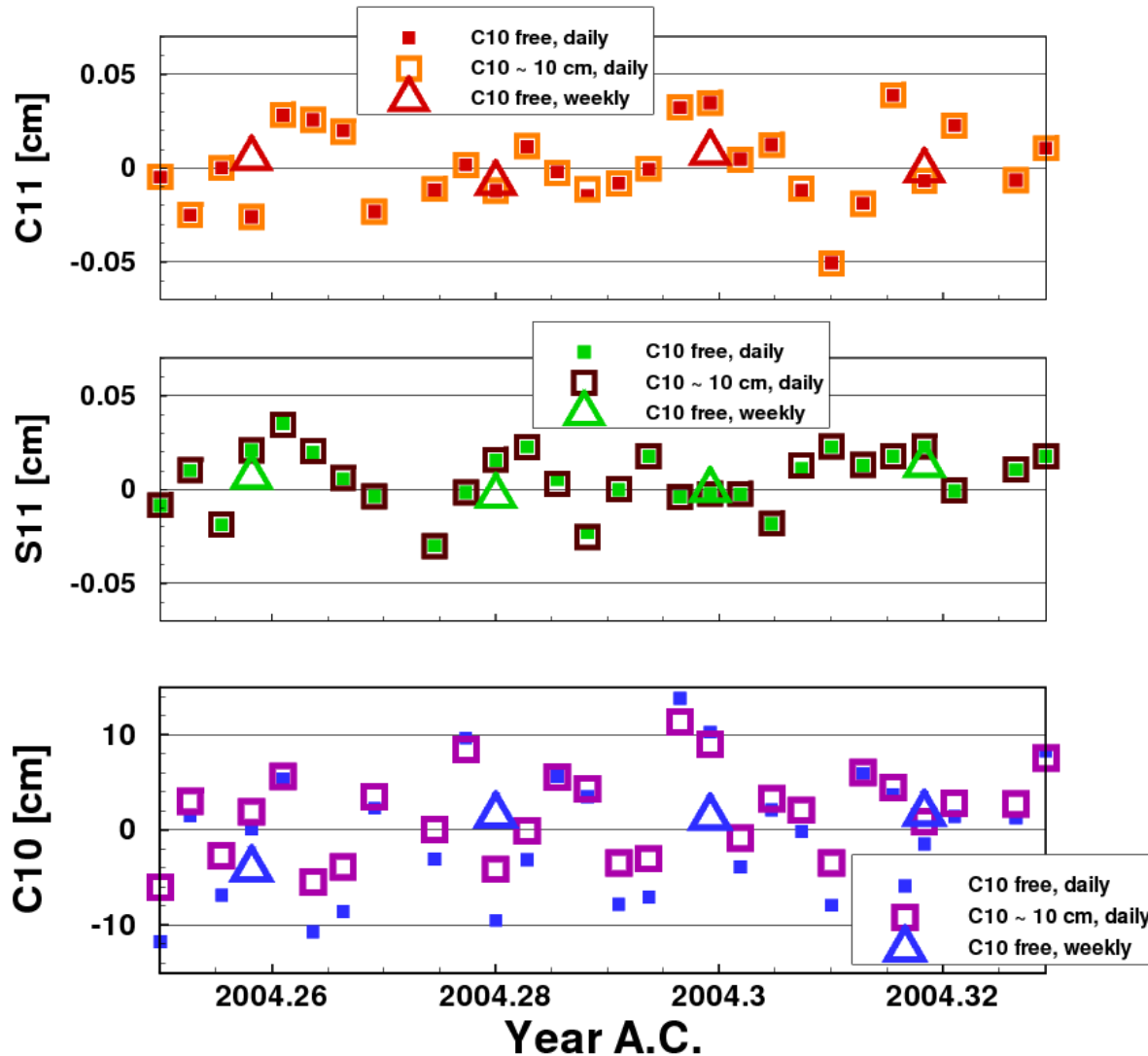
GPS-GRACE-CHAMP Constellation



Synthetic Ground Stations Network



Recovery of the Dynamic Origin

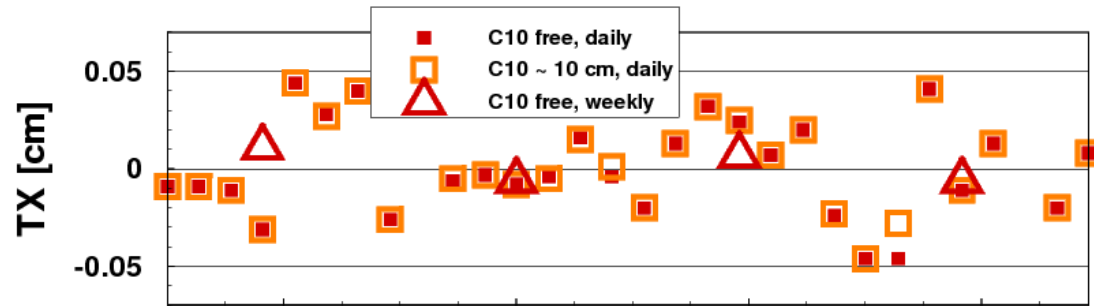


C10	Resolution	RMS [cm]
free	daily	0.021
~ 10 cm	daily	0.021
free	weekly	0.006

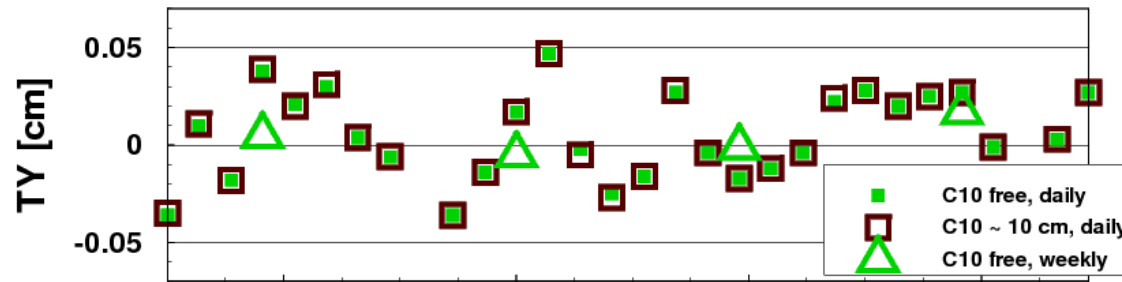
C10	Resolution	RMS [cm]
free	daily	0.016
~ 10 cm	daily	0.017
free	weekly	0.008

C10	Resolution	RMS [cm]
free	daily	6.732
~ 10 cm	daily	4.899
free	weekly	2.451

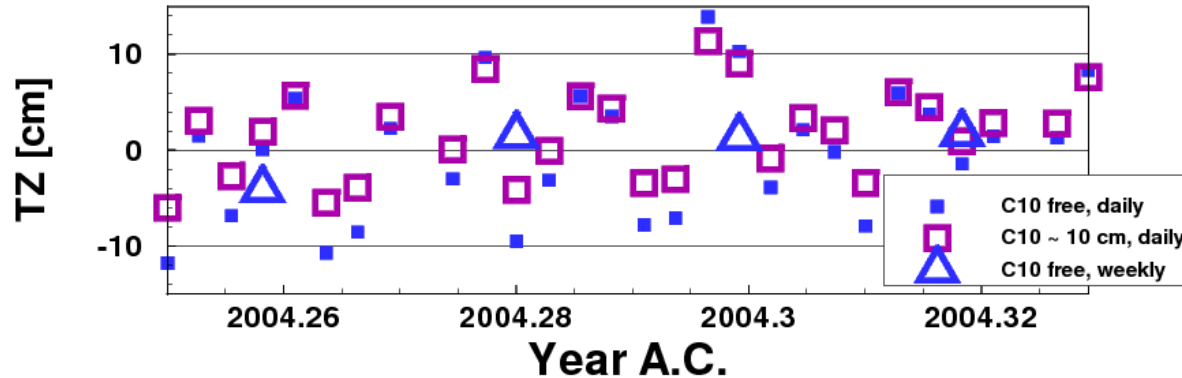
Recovery of the Geometric Origin



C10	Resolution	RMS [cm]
free	daily	0.024
~ 10 cm	daily	0.023
free	weekly	0.008



C10	Resolution	RMS [cm]
free	daily	0.023
~ 10 cm	daily	0.023
free	weekly	0.009



C10	Resolution	RMS [cm]
free	daily	6.742
~ 10 cm	daily	4.907
free	weekly	2.455

Conclusions

- The integrated approach can deliver the geocenter from a GPS-LEO constellation with daily resolution with sub-millimeter accuracy in the x- and y-component
- The z-component is uncertain in the centimeters
- Accuracy increases with sampling time
- Dynamic and geometric components are separable
- No a priori constraining of parameters needed
- Much more details in the publication to come:
 - Proceedings of the VII Hotine-Marussi Symposium 2009