Comparison of GOCE-GPS gravity fields derived by different approaches

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Summary

Several approaches have been proposed to extract gravity field information from the GPS-derived kinematic GOCE (Gravity field and steady-state Ocean Circulation Explorer) orbits. Although there is a general consensus that, except for energy balance, these methods theoretically provide equivalent results, GOCE-GPS solutions based on real data have never been compared with each other within a consistent data processing environment so far. This contribution strives to close this gap. The gravity field solutions considered here make use of the

CMA	Celestial Mechanics Approach [1]	computed at AIUB (U Bern)
SAA	Short-Arc Approach [2]	computed at ITSG (TU Graz)
AAA	Averaged Acceleration Approach [3]	computed at DEOS (TU Delft)
PAA	Point-wise Acceleration Approach [4]	computed at GIS/IWF (U Stuttgart/Austrian Acad. of Sciences)
EBA	Energy Balance Approach [5]	computed at INAS (TU Graz)

Processing details

<table>
<tr><th></th><th>CMA</th><th>SAA</th><th>AAA</th><th>PAA</th><th>EBA</th></tr>
<tr><td>Orbit data</td><td colspan="5">ESA SST_PKI product (reprocessed kinematic GOCE orbit)</td></tr>
<tr><td>Variance-covariance data</td><td colspan="2">ESA SST_PCV product</td><td>no</td><td colspan="2">ESA SST_PCV product</td></tr>
<tr><td>Period</td><td colspan="5">1.11.2009-11.1.2010 (R1)</td></tr>
<tr><td>Spectral resolution</td><td colspan="3">130</td><td>120</td><td>100</td></tr>
<tr><td>Regularization</td><td colspan="5">no</td></tr>
<tr><td>A priori information</td><td colspan="3">EGM96</td><td colspan="2">no</td></tr>
<tr><td>Background models</td><td colspan="5">according to IERS Conventions 2003/2010</td></tr>
<tr><td>Non-gravitational accel.</td><td colspan="2">yes</td><td colspan="2">no</td><td>yes</td></tr>
<tr><td>Empirical accelerations</td><td colspan="2">yes</td><td colspan="3">no</td></tr>
</table>

Formal errors; empirical errors & geoid height differences (w.r.t. ITG-Grace2010s)

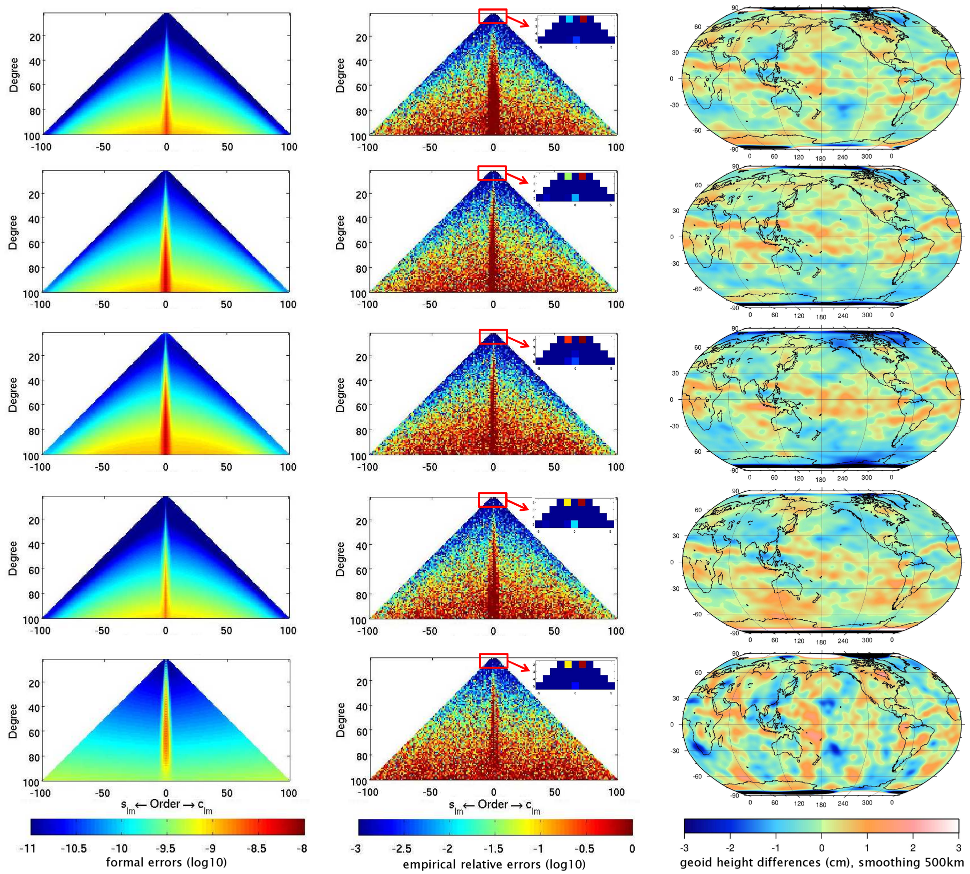
CMA

SAA

AAA

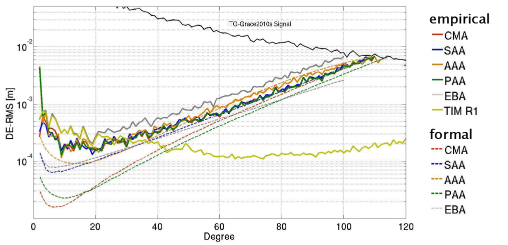
PAA

EBA

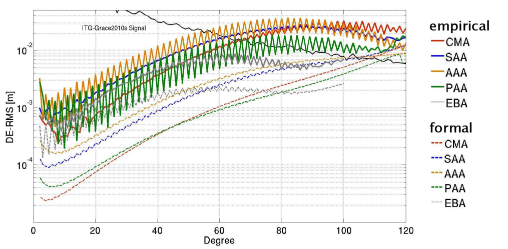


Degree-error RMS; geoid error

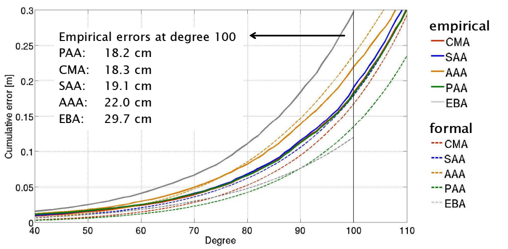
Orders $\leq |0.5\pi - I| l$ (inclination I in rad) omitted [6]



All orders considered



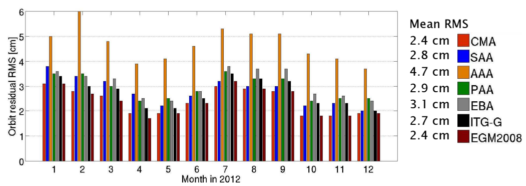
Accumulated geoid height errors



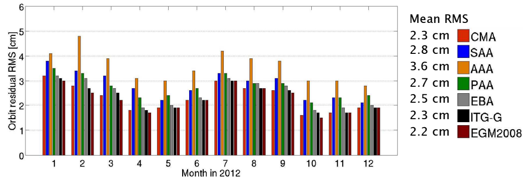
SLR tracking residuals (obs.-comp.)

Parameterization: monthly arcs
Estimated parameters: state vectors (1/arc), station coordinates (1/arc), drag coefficients (1/day), constant empirical accelerations (1/day), measurement biases (1/station and arc)

Lageos1 (up to degree and order 20)



c20 coefficient replaced by SLR-derived value



Acknowledgements & References

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