Combination of CHAMP and GRACE satellite data for Earth monitoring
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Introduction:
• Concept of energy balance is applied for gravity field recovery.
• The basic characteristic is the use of GPS derived position and velocity data and the correction for non-gravitational forces.
• Time-wise spherical harmonic analysis on a global scale.
• CHAMP monthly solutions depend on groundtrack coverage
• Combination with GRACE satellite data yields more consistent monthly solutions
• Application in geodesy, geodynamics, geology, hydrology, glaciology, sea level, geophysical prospecting

Method:
• The energy integral approach is connecting position, velocity and accelerometry to the disturbing potential.

\[ T + c = E_{\text{kin}} - U - Z - \int \left( f + \sum_{k} g_{k} \right) dx \]

- \( T \) = disturbing potential
- \( c \) = integration constant
- \( E_{\text{kin}} \) = kinetic energy
- \( U \) = normal gravitational potential
- \( Z \) = centrifugal potential
- \( f \) = dissipative energy
- \( \int g_{k} dx \) = time variable changes
• Spherical harmonic analysis yields spherical harmonic coefficients on a monthly basis

CHAMP-only solutions:
• Recovery of time variable signal from a time variable groundtrack pattern
• Poor groundtrack coverage yields degradation of monthly solutions

Combination with GRACE satellite data
• GRACE system viewed as two single satellite systems

Improvement in monthly solution:
• More measurements and better groundtrack coverage yield more homogeneous and consistent monthly solutions
• Combination needs sophisticated tools, e.g. variance-component estimation

Contribution to Earth Monitoring:

Partner:
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