Geophysical Research Abstracts
Vol. 14, EGU2012-10504, 2012
EGU General Assembly 2012

Geocenter motion from space geodetic observation

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The Earth's center of mass (CM) is defined in the satellite orbit dynamics as the center of mass of the entire Earth system, including the solid earth, oceans, cryosphere and atmosphere. Satellite Laser Ranging (SLR) provides accurate and unambiguous range measurements to geodetic satellites to direct estimate the variations of the vector from the origin of the ITRF to the CM. We operationally determine monthly estimates for monthly J2 and geocenter motion for GRACE science application. The geocenter variations are mainly due to the degree one mass loading. The high degree (>1) loading induced the surface displacements could affect the estimates of geocenter variation from space geodetic data. These high degree-loading effects were accounted by simultaneously estimating of the 5x5 (degree and order 5) portion of the gravity field from analysis of SLR tracking of five geodetic satellites. A unified theory of geocenter motion will be presented for comparison of SLR and Global inversion. The results presented here show good agreement in the amplitude and phase of the Y-and Z- components of the annual geocenter motion as determined from unconstrained monthly SLR solutions and from the global inversion of GPS/OBP/GRACE measurements. The rate estimate of geocenter variations will be discussed as well.