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Oral
Determination of precise orbits of artificial Earth satellites is a complex and challenging task. The accuracy of precise orbits of altimetry satellites depends on many factors, such as diverse models
and algorithms, the reference frame realization, various corrections and tracking data, the applied parameterization and some minor effects. Since the orbits of altimetry satellites are of altitudes between 700 and 1400 km, the motion of these satellites is strongly effected by the inhomogeneous structure of the Earth gravity field. In this paper we present the results of the investigation of the influence of the recent time variable geopotential models EIGEN-6S and EIGEN-6S2 on altimetry satellite orbits. Furthermore two modified versions of EIGEN-6S2 (EIGEN-6S2A and EIGEN-6S2B), a static version of EIGEN-6S and the static model EIGEN-GL04S were included in our investigations. All these models have been jointly developed by GFZ German Research Centre for Geosciences and Space Geodesy Research
Group (GRGS) Toulouse. We computed precise orbits of the altimetry satellites ERS-1, ERS-2, Envisat, and TOPEX/Poseidon over 20 years time between 1991 and 2011 using Satellite Laser Ranging (SLR), single satellite altimeter crossover and Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) data. We evaluated in particular the influence of the different geopotential models on the root-mean-square (RMS) fits of the observation data as well as on two-day orbital arc overlaps in radial direction, RMS and mean of single satellite altimeter crossover differences, geographically correlated errors, range biases, center-of-origin realization, stochastic properties of radial errors, global and regional mean sea level trends. A key aspect is the consistency of the derived orbits over the full length of the altimetry series. From our detailed study, we conclude, that EIGEN-6S2A time variable geopotential model performs best for all four satellites tested. This model provides, besides the geopotential coefficients up to degree and order 260, also a yearly time series of the drifts of the geopotential coefficients for degrees 2 to 50 for the Gravity Recovery And Climate Experiment (GRACE) period (2003 - 2012) and a yearly time series of the drift of three geopotential coefficients of degree 2 from 1985 till 2003 computed using LAGEOS-1 and LAGEOS-2 SLR observations and zero drift before 1985 and after 2012. This model includes also annual and semiannual variations of the geopotential coefficients for degrees 2 to 50 over the whole possible time span (1950 - 2050).
We recommend this model also as a background geopotential model for precise orbit determination to compute individual solutions to be used for the generation of a new realization of the International Terrestrial Reference Frame ITRF2013.
OSTS session
Precision Orbit Determination