Geometrical Reference Systems

Abstract:
Geometrical reference systems are the basis for the observation and quantification of processes in the Earth's system, the study of Earth rotation, and the computation of satellite orbits, positioning, navigation, time realization, land surveying, and engineering. The reference systems applied today are the International Terrestrial Reference System (ITRS) co-rotating with the Earth and the International Celestial Reference System (ICRS), an inertial system. Both systems are defined and realized by the International Earth Rotation and Reference Systems Service (IERS). The systems are realized by reference frames constituted by physical points, i.e., the reference points of observation instruments fixed to the Earth's crust or the reference points of radio sources, respectively. The reference frames are computed from the observations of VLBI in case of ICRS and by a combination of VLBI, SLR, GNSS, and DORIS data in case of ITRS. Each of the techniques provides an individual sensitivity regarding the frame parameters and contributes in a unique way to the ITRS realization. The ITRS realization is performed by two or more so-called IERS Combination Centres today. The combination of the space
techniques by the centers is performed at different levels of the Gauß-Markov model, the normal equation, and the parameter level. Therefore, the strategies differ with respect to rigorousness and hence their dependence on operator decisions. The most rigorous combination method is the combination at the observation level, but the softwares able to handle all four observation techniques are still under development so that this strategy is not yet applied for IERS product generation. Due to the low regional density of observing stations, the ITRS realizations has to be densified by regional reference frames, to allow for precise applications on a regional basis. The regional frames are based on GNSS stations only. The strategies applied for the realization of reference systems are continuously refined in the recent years. Anyway, further efforts are necessary to improve the strategies with respect to their rigorousness in order to meet the accuracy requirements of applications related to the quantification of the global change, which are about 1 mm for positions and 1 mm/year for long-term trends.
TUM Einrichtung:
Deutsches Geodätisches Forschungsinstitut (DGFI-TUM)

Format:
Text

Occurences:
· Einrichtungen > Fakultäten > Ingenieurfakultät Bau Geo Umwelt > Lehrstühle > Deutsches Geodätisches Forschungsinstitut der TUM (Prof. Seitz) > Publikationen > 2015

entries: