Generating precise and homogeneous orbits for ERS-1, ERS-2, Envisat, Cryosat-2, Jason-1 and Jason-2.

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Driven by the GMES (Global Monitoring for Environment and Security) and GGOS (Global Geodetic Observing System) initiatives the user community has a strong demand for high-quality altimetry products. In order to derive such high-quality altimetry products precise orbits for the altimetry satellites are needed. Satellite altimetry missions meanwhile span over several decades, in which our understanding of the Earth has increased significantly. As also the models used for orbit determination have improved, the satellite orbits of the altimetry satellites are not available in a uniform reference system. Homogeneously determined orbits referring to the same global reference system are, however, needed to improve our understanding of the Earth system.

The Navigation Support Office at ESA/ESOC (OPS-GN) provides precise orbits for the ESA Earth observation missions ERS-1, ERS-2, Envisat and Cryosat-2. In 2008 ESA initiated the re-processing of the altimetry data of ERS-1, ERS-2 and Envisat, including the reprocessing of the orbit determination for these satellites. But also other altimetry satellites, as Jason-1 and Jason-2, would benefit from re-processing. OPS-GN has with its NAPEOS software package the capability to process all three satellite geodetic tracking techniques (SLR, DORIS and GNSS). Therefore, we are in the unique position to do orbit determination by combining different types of data, and by using one single software system for different satellites, which matches the most recent improvements in orbit and observation modeling and IERS conventions. Thus we are able to generate a homogeneous set of precise orbits referring to the same reference frame for the various altimetry missions. Furthermore we are able to quickly re-process all solution allowing us to continuously upgrade the various solutions for all satellites (for example: ITRF2008, IERS2010).

This presentation focuses on the latest results from the re-processing efforts carried out by ESA/ESOC for the generation of precise and homogeneous orbits for ERS-1, ERS-2, Envisat, Cryosat-2, Jason-1, and Jason-2. For ERS-1 and ERS-2 SLR data are combined with altimeter data whereas for Envisat and Cryosat-2 DORIS and SLR data are combined, and for the Jason satellites GPS observations are used in addition to DORIS and SLR. In particular the modeling of the surface forces will be addressed. We will present the orbit determination results and evaluate the orbit accuracy by comparing our orbits with external orbits generated by other analysis centers and will highlight some of the improvements obtained from our most recent upgrades like ITRF2008.