ESOC contributions to the realisation of the ITRF2008 and beyond.

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The ITRF2005 solution constituted a significant improvement over all earlier ITRF solutions. Nevertheless significant issues surfaced when the different services, IDS, IGS, ILRS and IVS, started to use the ITRF2005. The most noticeable issue being the scale difference between the SLR and VLBI solution, leading to a special "rescaled" version of the ITRF2005. Within each individual technique service, IDS, IGS, ILRS, and IVS, the reference frame issues are relatively well understood and a very good agreement between the technique specific analysis centres reference frame realisations is achieved. However, the scale discrepancy of the ITRF2005 demonstrated that across the different techniques significant systematic differences still exist. The origin of these systematic differences between the techniques dependent reference frame realisations is unknown, not understood, and seems to be very difficult to resolve. One possible way to resolve these "inter technique" biases is to analyse the observations from the different techniques using one single software. The large benefit of this approach is that it generally rules out the effects of incorrect models and/or software implementations of the models causing differences between the technique results since all techniques will use the same software and thus the same models. At ESOC we have endeavoured to make progress on this path. For the ITRF2008 realisation we will contribute fully reprocessed solutions to the IDS, IGS, and ILRS. Thus we contribute to 3 out of the 4 space geodetic technique services, a unique achievement! In our presentation we will present the most interesting results from these reprocessing efforts.

The single software analysis approach allows an interesting enhancement compared to the current reference frame combination practice. At the moment the different techniques are processed separately and only the resulting reference frame parts of the solutions are combined. This combination is based solely on the local site ties of stations equipped with more than one of the contributing techniques. Besides possible errors and inaccuracies in the local site ties, this approach also suffers from the fact that the SLR and VLBI technique both offer very few stations with a far from global homogeneous distribution. With the single software approach the techniques can be combined on the observation level using all parameters common to the techniques. Prime targets for this approach are of course satellites like Topex-Poseidon and Jason-1 and -2 which all offer observations from DORIS, GPS, and SLR. The data from these targets offers the unique possibility to "tie" the techniques in a much stronger way than just through terrestrial local site ties, I.e., we can tie these techniques together "in space". Unfortunately, a truly combined analysis of the tracking data of these satellites is non-trivial and very demanding. However, the SLR observations of the GPS and GLONASS satellites also offers to make this "tie in space". This is a very interesting possibility to strengthen the ties between the observation techniques. Our presentation will conclude by showing some first results and our further plans of using space based ties.