

# IERS Working Group on Combination at the Observation Level

## Charter

The IERS WG on Combination has led so far to that products such as for instance the International Terrestrial Reference Frame (ITRF), the International Celestial Reference Frame (ICRF) and the Earth Orientation Parameter (EOP) series, can be combined using the full variance-covariance information produced by all individual Analysis Centers which process only one space geodetic technique (GPS, SLR, VLBI or DORIS). Presently the approach is very technique dependent insofar as such combinations are made first by technique (inside IGS, ILRS, IVS, IDS). The technique dependent SINEX files produced result hence from the Technique Combination Centers without any guaranty on homogeneity neither consistency between space geodetic techniques.

The inter-technique approach at the level of the observations would probably overcome this problem. Consistency and homogeneity between techniques can be studied and clarified more directly if they are processed together in a same run or at least with consistent software packages and a priori models. Space geodetic techniques have different strengths and weaknesses for recovering geodetic parameters which makes their combination useful. But they may have also some systematic behaviour which can easier and more efficiently be detected and reduced at the observation level.

The Working Group on Combination at the Observation Level (COL-WG) will not simply continue the work of the former WG on Combination but will strive towards a very consistent, highly accurate set of IERS products and will be a forum for the discussion of all relevant combination aspects.

Its major task will be to study methods and advantages of combining techniques at the observation level, searching for an optimal strategy to solve for geodetic parameters. Demonstration should be based on weekly combined SINEX files (containing unconstrained normal equations of station coordinates, EOPs, nutation parameters and eventually quasar coordinates) from all space geodetic techniques together. The new products resulting from these combination procedures should be compared to the current IERS products routinely produced.

## Activities

Based on former activities of the Combination Research Centres (CRC) the COL-WG will review the interest in combining techniques at the observation level for EOP and reference frames. Its main goal is to bring together groups capable to do combinations on observation level and to improve the homogeneity, precision and resolution of the products. The following tasks are foreseen:

*1) review the approach of the various groups*  
and their capability to process two or more techniques.

*2) establishing common processing standards*  
for all techniques in order to guarantee homogeneity and consistency.

*3) studying the appropriate weighting between techniques*  
and the use of local ties or identical satellites tracked by several techniques.

*4) optimizing and unifying parameterization*

for instance for tropospheric parameters in order to minimize globally the degree of freedom of the whole inverse system.

*5) elaborating benchmarks*

to intercompare results between groups from the same data set.

*6) insuring SINEX compatibility*

between techniques and with the international technique services and IERS.

*7) studying stabilization methods*

and looking for high temporal resolution of parameters.

*8) evaluating and comparing results*

to search for compatibility between groups.

*9) organizing routine operations*

for a new TRF realization, either in the framework of the next ITRF or as ITRF assessment.