CALL FOR PARTICIPATION
in the
IERS COMBINATION PILOT PROJECT

Background

Today the various products of the IERS, especially the International Terrestrial Reference Frame (ITRF), the International Celestial Reference Frame (ICRF) and the Earth Orientation Parameter (EOP) series, are still combined independently. With the exception of the ITRF and the IGS products neither intra-technique nor inter-technique combinations are correctly performed including the full variance-covariance information. In this way neither the consistency of the products can be guaranteed nor can the different strengths of the individual space geodetic techniques be exploited to improve the products. This means that there are clear deficiencies in the present IERS product generation. To achieve the highest accuracy and consistency, it is crucial to proceed towards a fully rigorous combination of all the parameters common to more than one space geodetic technique. Especially in view of the challenges that the IERS is facing with the new satellite missions (gravity, altimetry, astrometry), with the International Global Geodetic Observing System (IGGOS) project of the International Association of Geodesy (IAG), and with many other applications, we have to strive for reaching this goal.
At the IERS Retreat in Paris in April 2003 it was decided (among other), that

(1) an IERS Working Group (WG) on Combination should be set up and that
(2) the IERS SINEX Combination Campaign should be converted into a pilot project, namely the IERS Combination Pilot Project (CPP), to be started in spring 2004.

The IERS WG on Combination (IERS WG3) has recently been established by the IERS DB. This WG3 is responsible to coordinate the IERS CPP.

IERS Combination Pilot Project

The IERS Combination Pilot Project should be a major step towards more consistent, routinely generated IERS products. “Weekly” SINEX solutions made available by the various Technique Services and containing site coordinates, EOPs, and, possibly, quasar coordinates, shall be rigorously and routinely combined into consistent weekly IERS products (SINEX files). Therefore, the combination procedure will consist of the three major steps shown in Figure 1:

Step 1: The computation of combined “weekly” SINEX files by the Technique Centers starting from SINEX files of the individual Analysis Centers of the service (intra-technique combination)
Step 2: The computation of combined weekly SINEX files by so-called IERS Combination Centers based on the “weekly” intra-technique SINEX files and local tie information.
Step 3: Validation of the combined inter-technique solutions through comparisons, repeatability studies, and use of external information (geophysical fluids, models, ...).

With this procedure, time series of site coordinates (1-week resolution), EOPs (1-day resolution, and possibly quasar coordinates (1-week resolution) will become available. The

combined inter-technique series of SINEX files might also be the basis for future ITRF (and ICRF) realizations.
The major goal of the CPP will be to study and develop optimum strategies for a rigorous combination (including weighting schemes, datum definition, use of local ties, treatment of systematic biases, …) to ensure consistent and highly accurate IERS weekly solutions.
The new products resulting from these combination procedures are expected to replace a considerable part of the present IERS products in the future, if the IERS CPP proves to be successful. The CPP has an initial duration of 1.5 years, i.e., from spring 2004 to October 2005. In October 2005, the CPP will be evaluated and it will be decided whether the pilot phase should be continued or discontinued etc.

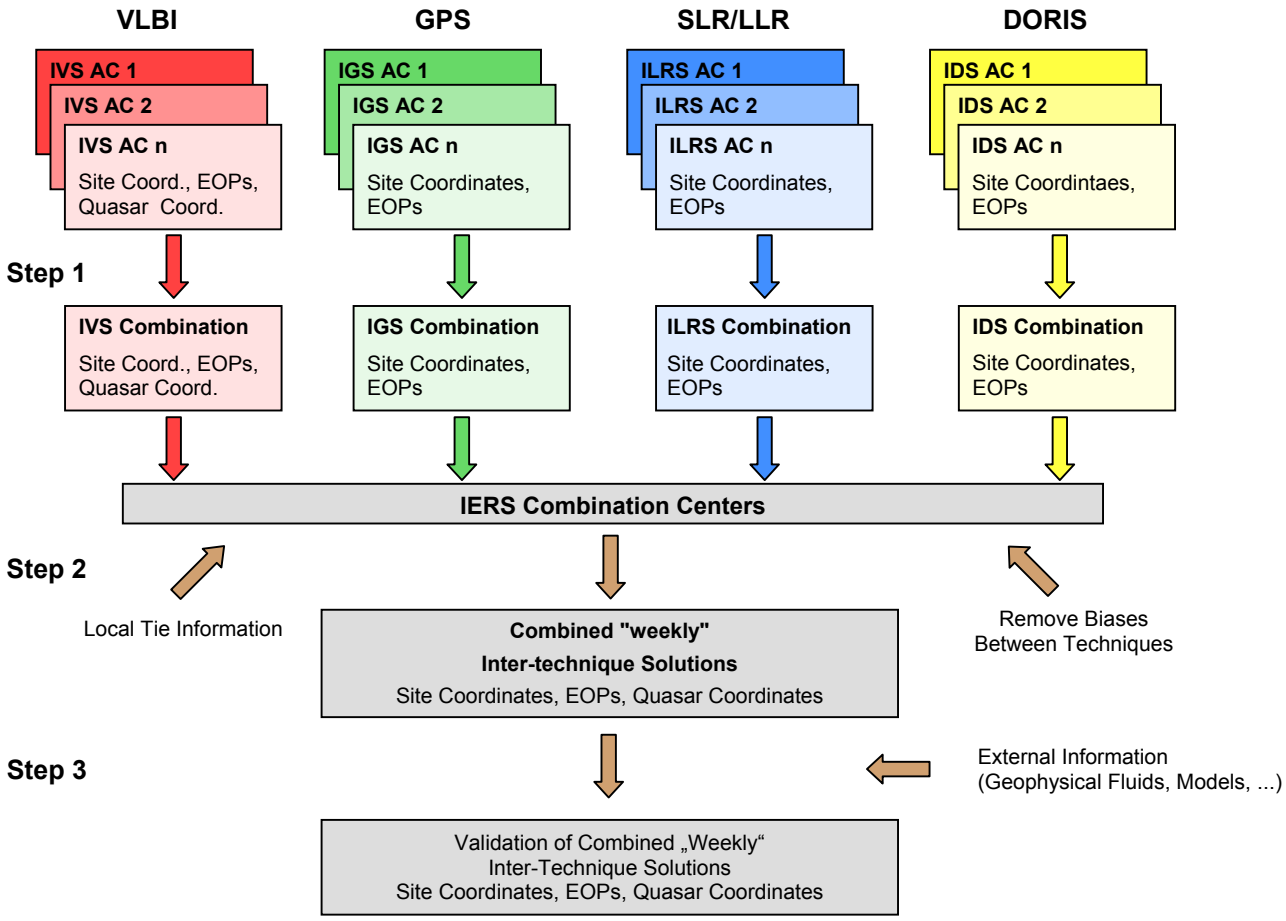

Figure 1: Combination and validation of "weekly" SINEX solutions in the framework of the IERS Combination Pilot Project (CPP).

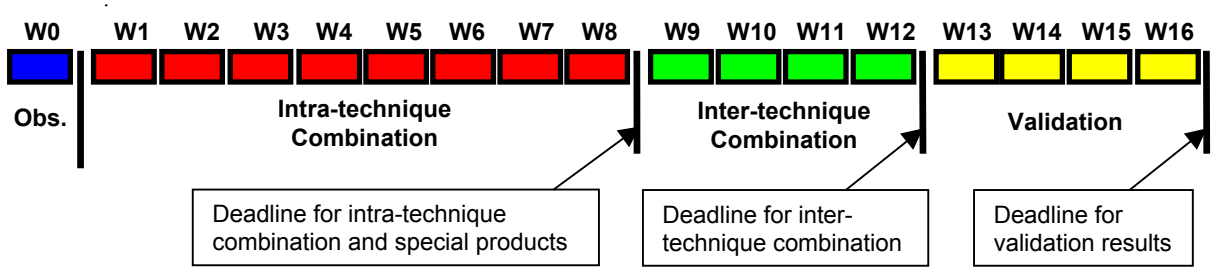

Figure 2: Time table of combination steps and deadlines.

Call for Participation

On behalf of the IERS the IERS WG on Combination solicits proposals for the following four components necessary to perform the work envisaged in the IERS Combination Pilot Project (CPP):

(1) Generation of "Weekly" Intra-Technique SINEX Files (Step 1):

This part of the CfP is mainly, but not exclusively, addressed to the Technique Services (IGS, IVS, ILRS, and IDS). The intention is that each of the 4 Technique Services combines the weekly solutions of its individual Analysis Centers (ACs) into a combined (and official) technique-specific "weekly" product (SINEX file containing at least station coordinates and Earth orientation parameters, and, if possibly, quasar coordinates). The combination procedure is shown in the upper part of Figure 1.
"Weekly" is written in quotes here, because for VLBI, session-specific SINEX files might be more appropriate, whereas the other services are supposed to contribute with weekly solutions to the CPP. In case that one of the services is not yet ready to contribute with a mature combined SINEX product, it may also consider to contribute with SINEX products of its individual ACs.
In addition to the Technique Services, also institutions that perform a combination on the *observation level* may answer this CfP, if they are ready to routinely submit weekly solutions, where the data of at least two of the space geodetic techniques have been combined.
The SINEX files have to follow the SINEX Version 2.0 format standard and should contain for one week (Sunday to Saturday) — a session in the case of VLBI — site coordinates, a set of EOPs for each day (offsets and rates fitted over 24-hr intervals for polar motion, UT1-UTC, and nutation, where only VLBI provides UT1-UTC and nutation offsets), and, if possible, quasar coordinates. Although a delivery of free normal equations would be ideal, any submission compatible with SINEX Version 2.0 is accepted. If the SINEX files contain the variance-covariance matrix, all constraints applied to the solution should be given in the a priori variance-covariance matrix.
The "weekly" SINEX files have to be delivered at the latest 8 weeks after the epoch of the last observation contributing to the week (see Figure 2).
Submissions for all earlier weeks are also sought, where feasible.

(2) Generation of Combined Weekly Inter-Technique Solutions (Step 2):

The IERS is also looking for combination centers that are ready to routinely combine the "weekly" technique-specific SINEX files (generated by contributors to step 1 above) into an inter-technique combined solution. As a result, these centers deliver weekly SINEX files to the IERS CPP (see lower part of Figure 1).
The SINEX files have to follow the SINEX Version 2.0 format standard and should contain site coordinates, a set of combined EOPs for each day, and, if possible, quasar coordinates for one week (Sunday to Saturday). In general, SINEX files containing the combined solution and the corresponding variance-covariance matrix should be submitted, that allow an easy retrieval of the combined parameter values for the subsequent validation step (see (3) below). All constraints applied to the solution have to be given in the a priori variance-covariance matrix. In addition to these combined SINEX solutions, the delivery of free normal equations is also encouraged for further combination steps. If additional parameters had to be set up for the combination, e.g. to deal with systematic effects (scale, geocenter coordinates, ...), these parameters should be included into the resulting SINEX files to the extent possible. Any reference datum used should be clearly stated in the SINEX file and should be removable.

The SINEX files have to be delivered at the latest 12 weeks after the observations (4 weeks after the submission deadline for the technique-specific SINEX files, see Figure 2).
The weekly submissions of the combination centers will be compared and validated in the next step.

(3) Validation of Combined Weekly Inter-Technique Solutions (Step 3):

So-called Validation Centers may also answer the CfP. They will routinely validate the combined inter-technique solutions (generated by the contributors to step 2 above) or parts thereof. Possible validation criteria might be comparisons between solutions of different combination centers, repeatability studies, use of products as an a priori information in data reduction procedures, and validation with external information, e.g. from geophysical fluids. A validation report should be submitted within 4 weeks after the submission deadline for the weekly inter-technique combinations.

(4) Generation of Special Combined Inter-Technique Products:

The IERS is also looking for so-called Associate Combination Centers that routinely generate a special product that results from the combination of at least one parameter type relevant for the IERS. The combined product has to be based on more than one space geodetic technique. Examples for such products are troposphere zenith delays from GPS, VLBI and DORIS; global ionosphere maps from VLBI, GPS, and DORIS; nutation corrections from VLBI and GPS; subdaily Earth rotation parameters from VLBI, GPS, and other techniques, etc. Special combined products have to be submitted to the IERS not later than 8 weeks after the observations. These combination efforts are not expected to be rigorous and will be based on corresponding products of the individual Technique Services. The generation of such special products is of importance, because (1) the CPP will profit from additional knowledge about systematic biases (e.g., biases between troposphere zenith delays of different techniques), (2) successful combination methods — e.g. for the combination of satellite-derived LOD (and nutation rates) with VLBI-derived UT1 (and nutation offsets) — may be useful for the Combination Centers, and (3) new potential future IERS products may be studied and initiated in this way. Although these special products are not crucial for the CPP, they allow additional groups to participate in the CPP effort and to contribute to the CPP with valuable complementary information.

All the SINEX files, products, and reports of the IERS CPP will be made freely available at the IERS CB database and will also be archived there. Naming conventions will be considered and made available soon.

Proposal Instructions

The IERS has no proper financial resources. Proposers must provide their own financial resources to support their proposal. From the proposal it should become clear that the proposing institution has the expertise and capabilities to perform the proposed task on a routine basis.
Proposals for the four types of contributions mentioned above should be submitted by **February 22, 2004** (although proposals submitted at a later stage will also be welcome and evaluated), to:

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with a copy to:

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A proposal form to be filled in by the participating institution is attached to this CfP or may be downloaded from the web pages of the IERS Central Bureau (http://www.iers.org/iers/).

CPP Schedule:

January 26, 2004:	Dissemination of the Call for Participation
February 22, 2004:	Due date for proposals
February 27, 2004:	Information to participants about proposal acceptance
February 29, 2004:	Start of IERS Combination Pilot Project with GPS Week 1260 (first intra-technique combinations due 8 weeks later, i.e. end of April 2004; first inter-technique solutions due 12 weeks later, i.e. end of May).
April 25, 2004:	Meeting of IERS WG3 (before the EGU Meeting in Nice)
October 2004:	Progress Meeting of the IERS CPP at the IERS Workshop 2004
October 2005:	Evaluation of the CPP and discussions concerning the transitions to new IERS products

Proposal Review

The IERS Working Group on Combination (IERS WG3) will review the proposals. All proposers will be notified by February 27, 2004.