



**COMBINATION OF ILRS STATION COORDINATES
AND ERP SOLUTIONS
AT UNIVERSITY OF NEWCASTLE
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Introduction

The **TANYA** software, developed for the IGS Global Network Associate Analysis Centre (GNAAC) at University of Newcastle upon Tyne, UK, allows to check, compare and combine the IGS AC SINEX solutions (A-networks) for *station coordinates*.

It has been updated to be able to combine *Earth Rotation Parameters* (ERP – Xp, Yp, LOD) obtained from IGS and ILRS ACs. NCL GNAAC submits combined GPS ERP starting May 2002.

Input data

1. The ILRS OPS project's 7-days solutions (with loose constraints) from ASI, DGF, GFZ, NERC, JCET obtained from observations on the interval starting GPS week 1244 (9 Nov 2003) to 1266 (17 April 2004).
2. ILRS CB Sinex files for SITE/ID and SITE/ECCENTRICITY blocks (to create SLR catalogue file).

Analysis procedure

1. **Validation** - SINEX V1.0, 2.0; (<http://ucscgi2.ncl.ac.uk/~nkn3> - on-line Sinex checker).
2. **Deconstraining** to get AC's loose solutions AC(loo).
3. **Estimating** (exclusion of stations, rescaling, combination) **GNET-solution** - loose combined solution (full covariance matrix used).
4. **Helmert transformation AC(loo) - GNET** to get postresiduals.
5. **Outlier removal** (from analysis of postresiduals).
6. **Variance component estimation** - to balance influence of ACs, to calibrate the outlier hypothesis test; iterate steps 3-4-5-6, if necessary.
7. **Product generation** : constrained solution **G**; summary file; Helmert parameters between AC(loo), GNET, CORE (ITRF2000) solutions.
8. **Reporting** to CDDIS or to ILRS AWG.

Combination results

1. **ERP** – daily Xp, Yp, LOD for whole the interval.
2. **Coordinates** of stations (from 10 to 20 on each of 7-days intervals).

Comparisons

1. **Station coordinates**. Helmert parameters have been computed between combined NCL, AC(loo) solutions and ITRF-2000 and shown in the first 6 figures below. RMS of combined Tx, Ty, Tz is on 10 mm level (spoiled by unstable solutions from JCET). RMS for combined rotational parameters are on the $7 \cdot 10^{-8}$ radians (45 cm) level for Rx, Ry and $25 \cdot 10^{-8}$ radians (150 cm) for Rz. Scale is stable on the $0.8 \cdot 10^{-9}$ (5 mm) level. Weighted RMS between solutions is 30-40 mm in comparisons wrt ITRF-2000 and 4-15 mm in comparisons wrt NCL.
2. **ERP**. Combined NCL and other ACs solutions have been compared with combined IGS (IGS03P) weekly solutions for ERP. The horizontal axes on figures for ERP represent day numbers counted from 9 Nov 2003. Seven weeks of ERP data have been used to create the figures. In the expressions of the kind $(Xp(AC) - \text{mean}(AC)) - (Xp(IGS) - \text{mean}(IGS))$ the mean values are computed for the each individual GPS week



















