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ETRS89 Realizations

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AIUB

ETRS89 Definition

- Resolution No 1, Firenze 1990
  - "recommends that the system to be adopted by EUREF will be coincident with ITRS at the epoch 1989.0 and fixed to the stable part of the Eurasian Plate and will be known as European Terrestrial Reference System 89 (ETRS89)"
  - "accepts that … for most applications, the coordinates will have no time variation"
- Resolution No 1, Bern 1992
  - "recommends that this solution *(Bernese solution of EUREF GPS 1989 campaign)* be accepted as the current realiastion of the ETRS89 under the name of EUREF89"

Conclusions from the definition

- "*fixed to the stable part*" implies that the ETRS is rotating "somehow" with the Eurasian plate
- The definition does not say anything about the realizations nor the reference epoch of the realizations nor whether the vertical component has to be considered, too
- The first realization (EUREF89) was based on SLR/VLBI-derived "fiducial stations" given in ITRF89 at epoch 1989.0

General – Realizations of ETRS89 (1)

- **For the sake of simplicity we (EUREF) postulate that all "official" realizations of ETRS89 are based on realizations of the International Terrestrial Reference System, i.e. each ITRFyy is the basis for a corresponding ETRFyy.**

General – Realizations of ETRS89 (2)

- **The TWG proposal (Paris meeting) to remedy the ETRFyy shifts inherited from the ITRFyy solutions is to minimize the transformation between ETRF2000 and future ETRFyy solutions, starting with the ETRF2005 (i.e. zero transformation parameters between ETRF2000 and future ETRFyy)**
- **This is one first option that has to be discussed and modified if necessary.**

General – Realizations of ETRS89 (3)

Basically there are different ways how to realize such an ITRFyy-based ETRFyy described in

(1) Series of Memos by Claude Boucher and Zuheir Altamimi (version 1: 30-09-1993 ... version 6: 27-3-2007, internal version 7: 17-08-2007).

(2) Note on ETRS89 realizations *(Altamimi, March 14, 2008)* **with**

- **a) Approach A by using existing sets of parameters (recommended by ZA)**
- **b) Approach B with 4 variants, partly using existing parameters B1/B2, partly identical points of ETRF2000 and ITRF2005 B3/B4**

General – Realizations of ETRS89 (4)

(3) How will ETRS89 be realized in the future? *(Ihde, Gurtner, Luthardt, March 26, 2008)*

1. **Option (Most simple realization + improvements, Memos)**
2. **Option (Rigorous Solution - with identical points of ETRF2000 and ITRF2005, Note B3,B4)**
3. **Dynamical datum (reprocessing of EPN stations in a consistent global reference system – not mandatory ITRFxx)**

Dynamical Datum

ETRS89 future realization

- The EPN has to be consistently re-processed over a longer time period in an ITRFxx solution (e.g. ITRF2000) or the available reprocessed IGS.
- The time series of the selected EPN stations are used to monitor the rotation parameters and to derive mean values, respectively.
- The three rotations are then used to transform from the respective ITRF into a basic ETRS89/ETRF.
- The other datum parameter shall be derived by a transformation to a ETRF and /or ITRF solution (the decision and convention shall follow later)
- A scale change shall not to be introduced.

Open questions (2)

- Must or should the conventions for the definition and realization of the ETRS89 be changed or modified?
- Do we need recommendations for different user groups of the ETRS89?
- For which EUREF products do we need which transformation forms from ITRFxx into the ITRFyy?
- How do we handle the 2D/3D datum problem?
- Do we have to change the name for coordinate sets in the ETRS, e.g. to ETRS89/ITRF2000?

Open questions (3)

Role of the scale

- In the broad sense, the scale does not belong to the datum definition.
- It is a basic part of the system and, according to the definition, it has to follow the SI units. Although the single solutions (i.e. the global polyhedrons) may show different scales, a true change of the scale (or the introduction of a scale rate) is theoretically and practically unthinkable. I.e. the rate of 0,08 x 10-9 derived for ITRF2005 with regard to ITRF2000 is a pure calculating factor and is in contradiction to the definition of the ITRS.
- An apparent "scale" can or rather should be interpreted as average changes of the stations' altitudes. Introduction of additional reference stations into the parameter estimation (→ densified ITRF → EPN)