

Discussion and recommendations for future realizations of ETRS89

- Since its first realization in 1989, with the EUREF89 campaign, numerous improvements and densifications to the realization of ETRS89 have been made by dedicated campaigns and the realization of permanent GNSS networks.
- Nowadays, permanent GNSS networks have become the mainstay in the realization of ETRS89, both by means of the EPN, as well as national permanent networks operated by NMA's, with ever increasing precision.
- Considering the increasing precision of the realizations and developments at the global level in ITRS, the definition of ETRS89 and /or ETRFyy, or its interpretation, may need to be revised or improved in order to fulfill the same role in the future.

For this discussion alternative views on the realization of a regional reference frame for Europe are welcomed.

This discussion is not limited to only this session (TWG activities, permanent GNSS networks, Systematic errors all play a role).

It is also a good opportunity to ask questions.

Discussion and recommendations for future realizations of ETRS89

Some initial considerations...

1. The EUREF Permanent Network should be our primary instrument of realization of the ETRS89; it is both a means and opportunity to best fulfill the original resolution and user needs
2. The realization of ITRS and ETRS89 reference frames should be separate processes, because they have different rules (either explicitly or implicitly) and they have different user needs
 - ITRF is a global reference frame whereby the geocenter, scale and orientation are defined by measurements, and the velocity field and plate motions are determined from global considerations
 - ETRF basically has to provide stable and durable coordinates and velocities
3. Assuming we have an ETRF, then the transformation parameters between ETRF_label and ITRF_{yy} (max 14) must be determined using permanent stations available from both reference frames.

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4. Until now transformation parameters from ITRF_{yy} to ETRF_{yy} were estimated from ITRF (using a global dataset) and applied to the European plate. I.e. ETRF and ITRF have a fixed relation, and the transformation parameters ad 3) followed from this
 - This means that global reference frame effects (geocenter, orientation and plate motion based on velocity field) were carried to some extent into the ETRF, and therefore the ETRF did not provide stable and durable velocities and coordinates.
 - However, until the advent of the EPN this was the only way to go.
5. The procedure selected for ITRF2005 contains a new element, in which an extra transformation is applied, to correct for ITRF_{yy}→ITRF2000, resulting in a direct transformation of ITRF_{yy}→ETRF2000
 - This is an improvement to the former situation, but does not necessarily fulfill the requirement in 2)
 - is no guarantee that in future we will not run into similar problems as in the past, as in 4).
 - and it does not use the full potential of the EPN

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The EUREF Permanent Network with over 200 stations should be our primary instrument of realization of the ETRS89; it is both a means and opportunity to best fulfill the original resolution and user needs.

How? To be solved by a working group. Some initial thoughts...

- First establish a European velocity field (station velocities), which according to well defined rules, is linked to the European plate. This field will be updated by every new realization, but the rules remain the same. This takes care of the "stable part of Europe" in the resolution. This task very much depends on the definition of stable points.
- Provide continuity in the coordinates between realizations, i.e jumps in the timeseries should be minimum. This is the fulfillment of the user needs of NMA's.
- Reprocessed solution could be important starting point.
- Some well defined elements (e.g. scale?) could be taken over from ITRF.
- For the initial alignment ETRF2000 may be used, and through this the "coincident with ITRS at the Epoch 1989.0" part may be fulfilled.
- For conventional coordinates, e.g. those used by mapping agencies, it may be better to use a reference epoch in the future. The mention of "Epoch 1989.0" in the original resolution only refers to the initial alignment, not to the epoch for the reference coordinates.
- Once a new ETRF is obtained, the transformation parameters with ITRFyy can be computed using common points.