EUREF Study Group on alternatives to ETRS89

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The European Terrestrial Reference System 89 (ETRS89) was adopted in 1990 in Firenze, Italy, following the EUREF Resolution 1. It is defined in such a way that it coincides with ITRS at epoch 1989.0 and is fixed to the stable part of the Eurasian tectonic plate. This means that ETRS89 differs from ITRS by a time varying orientation change (Altamimi and Collilieux, 2024). ETRS89 was adopted by European countries in areas within its geographical scope according to the Directive 2007/2/EC of the European Parliament and of the Council. 12 realizations have been published so far, the most recent being ETRF2020. Since then, European countries have aligned their national reference frame with respect to an ETRS89 realization. Most of the countries have chosen ETRF2000 but at various epochs. The most recent version, ETRF2020, has coordinate differences of around 7 cm with ETRF2000 which is known to be affected by artificial drifts in the vertical component. However, only a few countries have adopted the recent unbiased updates, which led Lidberg (2024) to propose a new frame derived from ETRF2020 by applying a static rotation so that coordinates in this new frame stay close to ETRF2000. While this solution is interesting from an operational point of view, it questions the definition of ETRS89. In addition, the reference epoch of the ETRS89 is now 35 years out of date, so that the ETRS89 coordinates differ from those in ITRS by about 90 cm. Finally, some areas in Europe undergo significant deformations from different origin (tectonic, post-glacial rebound etc…) with various spatio-temporal patterns that cause coordinate variations in ETRS89.

The objective of this study group is to investigate if ETRS89 is still in line with user needs and to propose an alternative definition of the system if it is relevant.

Proposed Tasks:

- list advantages and drawbacks of current ETRS89 and its realizations with respect to user needs
- make an inventory of the strategies adopted in other regions of the world
- List alternatives to ETRS89 as well as their strength and weaknesses
- Evaluate the order of magnitude of coordinate differences in these systems and the impact on national realizations.

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