International Association of Geodesy IAG (2015 – 2019 term)

JWG 1.1.x: Tropospheric ties (joint with IAG SC 1.1 and SC 4.3)

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Terms of Reference (preliminary, to be approved)

Since many years tropospheric parameters have been determined by space geodetic techniques, by other measurement techniques, such as water vapor radiometers, and, more recently, from model data, e.g. from numerical weather models. As tropospheric parameters we designate the hydrostatic and wet or total zenith delays and the horizontal gradients. Many comparative studies have revealed that besides statistical deviations the tropospheric parameters partly exhibit systematic differences. Such systematic differences might be caused by

(i) general differences, e.g. the different locations of the sensors, the different epochs of the observations and other e.g. meteorological ambient conditions,
(ii) effects due to hardware and hardware changes, e.g. change of the type of the GNSS antenna or effect of a radome at a station,
(iii) the inter-technique systematics, for example due to different correlations among groups of parameters and / or due to the different sampling and geometry of observations,
(iv) the application of different analysis models, such as the mapping functions, the different parameterizations used to represent the troposphere and the application of constraints during the adjustment, and, in addition,
(v) the post-processing methods of data handling for the comparison, e.g. the application of synchronization methods, such as interpolation, filtering, smoothing.

The terrestrial reference frame (TRF) is commonly realized by a combination of space geodetic techniques. For the combination of the techniques 'global ties', i.e. common global parameters, like the Earth Orientation Parameters (EOP), can be directly used, while 'local ties', i.e. common coordinates at co-location sites, have to consider the distances between the reference points of the various devices. The distances between the reference points are usually surveyed at site, but can also be indirectly assessed through the comparison of the positions determined by the various space geodetic techniques. The ground-based space geodetic techniques all observe targets in or above the atmosphere and consequently common atmospheric parameters might be used to link the techniques as well. The systematics between tropospheric parameters obtained by different sensors have to be considered to reasonably perform this combination approach. With 'tropospheric ties' we designate the systematics that enable a combination of tropospheric parameters if they are appropriately considered.

Objectives:

The main objective of the working group is (i) to assess the systematics between tropospheric parameters obtained at different locations, times, and by different measurement techniques: tropospheric ties. The other focus is (ii) to test the application of tropospheric ties for the combination of the space geodetic techniques. Accordingly, the group will work on

- extensive comparisons of tropospheric parameters,
- theoretical modeling based on hydrostatic equilibrium and comparable assumptions,
- numerical modelling involving numerical weather models, and
- testing the combination with the application of the tropospheric ties.