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IGS TROPOSPHERE WORKING GROUP CHARTER

GNSS can make important contributions to meteorology, climatology and other environmental disciplines through its ability to estimate troposphere parameters. Along with the continued contributions made by the collection and analysis of ground-based receiver measurements, the past decade has also seen new contributions made by space-based GNSS receivers, e.g., those on the COSMIC/FORMOSAT mission [1]. The IGS therefore continues to sanction the existence of a Troposphere Working Group (TWG).

The primary goals of the IGS TWG are to:

- Assess/improve the accuracy/precision of IGS GNSS-based troposphere estimates.
- Improve the usability of IGS troposphere estimates.
    - Confer with outside agencies interested in the use of IGS products.
    - Assess which new estimates should be added as "official" IGS products, and which, if any, official troposphere product sets should be discontinued.
- Provide and maintain expertise in troposphere-estimate techniques, issues and applications.

Science background

The primary troposphere products generated from ground-based GNSS data are estimates of total zenith path delay and north/east troposphere gradient. Ancillary measurements of surface pressure and temperature allow the extraction of precipitable water vapor from the total zenith path delay.

Water vapor, a key element in the hydrological cycle, is an important atmosphere greenhouse gas. Monitoring long-term changes in its content and distribution is essential for studying climate change. The inhomogeneous and highly variable distribution of the atmospheric water vapor also makes it a key input to weather forecasting.

Water vapor distribution is incompletely observed by conventional systems such as radiosondes and remote sensing. However, ground- and space-based GNSS techniques provide complementary coverage of this quantity. Ground-based GNSS observations produce continuous estimates of vertically integrated water vapor content with high temporal resolution over a global distribution of land-based locations; coverage is limited over the oceans (where there is no land). Conversely, water vapor can be estimated from space-borne GNSS receivers using ray tracing techniques, in which case solutions with high vertical resolution (laterally integrated over few hundred kilometers) and good oceanic/land coverage are obtained; these solutions however are discontinuous in geographic location and time.

Be it resolved that the IGS troposphere WG will:

- Support those IGS analysis centers providing official IGS troposphere products.
- Increase awareness/usage of IGS troposphere products by members of the atmospheric, meteorology and climate-change communities. Solicit the input and involvement of such agencies.

- Create new IGS troposphere products as needed (as determined by consultation with the potential user community).
- Determine the uncertainty of IGS troposphere estimates through comparison of solutions with those obtained from independent techniques, or through other means as appropriate.
- Promote synergy between space-based and ground-based GNSS techniques through interaction with researchers in both fields.

References:

[1] Schreiner, W., C. Rocken, S. Sokolovskiy, S. Syndergaard and D. Hunt, Estimates of the precision of GPS radio occultations from the COSMIC/FORMOSAT-3 mission, *GRL 34*, L04808, doi:10.1029/2006GL027557, 2007.

[2] Teke, K., J. Böhm, T. Nilsson, H. Schuh, P. Steigenberger, R. Dach, R. Heinkelmann, P. Willis, R. Haas, S. García-Espada, T. Hobiger, R. Ichikawa and S. Shimizu, Multi-technique comparison of troposphere zenith delays and gradients during CONT08, *J Geod 85*:395–413, DOI 10.1007/s00190-010-0434-y, 2011.