Summary of contributions from the Czech republic groups

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Czech contributions to WG1 activities

- ✓ Support for processing new data, establishing new analysis centers (NEW)
- ✓ Real-time GPS+GLONASS troposphere monitoring campaign (2013-present)
- ✓ Software development:
  - ✓ G-Nut/Shu – NWM-based tropospheric model
  - ✓ G-Nut/Tefnut – offline/real-time GNSS troposphere products
  - ✓ G-Nut/Geb – GNSS PPP positioning (study on using external troposphere models)
  - ✓ G-Nut/Anubis – multi-GNSS QC tool for GPS+GLO+GAL+BDS+SBAS+QZSS
  - ✓ G-Nut/Apep – time-series analysis tool, QC
- ✓ Improved concept of troposphere modeling (theory + model + paper)
- ✓ Online service for tropo/meteo parameters (site-specific model)
- ✓ Developments of GOP blind model based on new concept (several variants)

Czech contributions to WG2 activities

- ✓ Processing the WRF outputs
  - ✓ Observation operator for ZTD
- ✓ Preparation of NWP data field for geodetic application
- ✓ Development of the new ensemble assimilation method
  - ✓ Spectral diagonal ensemble Kalman filter
  - ✓ Initial twin experiment of assimilation of ZTD into the WRF model

Czech contributions to WG3 activities

- ✓ EUREF GNSS Network official reprocessing – 1996-2014
- ✓ GOP-TropDB tool development:
  - ✓ Long-term evaluations of various tropospheric products & observations
  - ✓ New ZWD vertical ties for inter-technique comparisons
  - ✓ Developments towards possible user support (different scenarios/levels)
- ✓ Standards & Methods
  - ✓ G-Nut/Shu SW + ERA Interim – various method assessments
  - ✓ Online service for tropospheric parameter conversion, tropospheric ties, …
- ✓ Software development:
  - ✓ G-Nut/Apep SW – time-series analysis tool (shortly initiated activity)

Related activities

- ✓ Other services:
  - ✓ GNSS ultra-rapid orbits – operational product + new development of multi-GNSS
  - ✓ IGS orbit monitoring, IGS product real-time stream monitoring
  - ✓ Operational contributions to E-GVAP + ongoing developments for BSW update

- ✓ Selected collaborations within COST:
  - ✓ ROB – dense network solution for asymmetry monitoring with G-Nut/Tefnut
  - ✓ GFZ – MF and gradient estimations from NWM, contribution to software
  - ✓ Uni Luxembourgh – real-time ZTD estimate demonstration
  - ✓ Uni Sofia – Repro products, GNSS data processing
  - ✓ KTU + AUT – establishing new AC
  - ✓ Swisstopo – G-Nut/Anubis multi-GNSS quality check (MGEX, EUREF v3)

Projects and Publications

- ✓ Publications:
  - ✓ Douša J, Eliaš M (2014) An improved model for calculating tropospheric wet delay, Geoph. Res. Lett. 41,doi:10.1002/2014GL060271
  - ✓ Douša J, Václavovic P (2014) Real-time zenith tropospheric delays in support of numerical weather prediction applications. Advances in Space Research (2014), Vol 53, No 9, pp 1347-1358, doi:10.1016/j.asr.2014.02.021
  - ✓ Zus F, Dick G, Douša J, Wickert J (2014), Systematic errors of mapping functions which are based on the VMF1 concept, GPS solut., doi:10.1007/s10291-014-0386-4
  - ✓ Zus F, Dick G, Heise S, Douša J, Wickert J (2014), The rapid and precise computation of GPS slant total delays and mapping factors utilizing a numerical weather model, Radio Sci, 49(3): 207-216, doi:10.1002/2013RS005280
  - ✓ Györi G, Douša J (2014), GOP-TropDB developments for tropospheric product evaluation and monitoring – design, functionality and initial results, In: IAG Symposia Series, Springer Vol. 143
  - ✓ Douša J, Václavovic P (2014), Evaluation of ground-based GNSS tropospheric products at Geodetic Observatory Pecny, In: IAG Symposia Series, Springer, Vol. 143
  - ✓ Václavovic P, Douša J (2014), G-Nut/Anubis - open-source tool for multi-GNSS data monitoring, In: IAG Symposia Series, Springer, Vol. 143,
- ✓ Related projects (troposphere related):
  - ✓ Czech-US project (GOP-TropDB), GNSS4SWEC-CZ (MEYS), Trop4LAS + DARTMA (ESA)