E-GVAP plenary meeting, 2010/09/24, Oslo

Swiss E-GVAP Status Report 2010

1 General information

E. Brockmann (swisstopo) will take part to the E-GVAP expert team meeting, Sept 23, 2010, Oslo, and will present the work at swisstopo. No MeteoSwiss expert will attend this meeting. The Swiss representative will not attend the plenary meeting.

2 Research activities at ETH Zürich

D. Perler, GGL, ETH Zurich, donat.perler@geod.baug.ethz.ch
F. Hurter, GGL, ETH Zurich, fabian.hurter@geod.baug.ethz.ch
A. Geiger, GGL, ETH Zurich, alain.geiger@geod.baug.ethz.ch

The Geodesy and Geodynamics Lab at ETH Zurich has two ongoing research projects in the field of GNSS tomography. They focus on GNSS tomography in mountainous region but differ in spatial scale. One of these projects works on a horizontal grid scale of 35-40 km and investigates new algorithms which are suitable to assimilate the tomographic results in numerical weather prediction models. The second project is on a much smaller scale of about 2-3 km grid spacing and investigates high-resolution tomography in the view of local now-casting of rain.

First project

A long-term study with one year's data gathered by the Swiss GPS permanent network AGNES and GPS stations located in adjoining regions of Switzerland was carried out. We developed new parameterizations of the voxels and validated them against measurements from balloon soundings and the analysis of the NWP model COSMO-7. Compared to the classical constantly parameterized voxels, the new parameterizations decrease the rms and the standard deviation by 13.5% and 17.8%, respectively. Improvements are especially observed at low altitudes (below 3000 m) where a decrease of the rms of 30% is observed with respect to the classical parameterization. This project was cofinanced by the Federal Office of the Environment, Switzerland.

Second project

For further validation of the algorithms implemented in the first project, a field campaign was carried out in Zermatt (Switzerland) from the 15th July to the 12th August, 2010. On an area of about 7 km x 10 km, 33 geodetic receivers were placed such as to optimize resolution of the water vapor field. Suitable station locations were selected on the basis of an a priori error analysis of the tomographic solution. For validation of the water vapor retrieval by GNSS, 25 radiosondes were launched. Rain gauge measurements from the hydrology group of ETH Zurich together with the tomographic solution from GNSS will serve as a basis to investigate the devolution of rain events in an alpine region. The study represents part of the research project APUNCH co-funded by the Competence Center Environment and Sustainability of the ETH Domain (CCES).

3 Activities in the Model group (MO) of MeteoSwiss

D. Leuenberger, Model Group (MO) of MeteoSwiss

Currently, MO does not use any GPS observations, neither for model verification nor for assimilation. This is not due to the fact that we believe these observations to be

useless (in fact, I believe that they belong to the most useful observations for the assimilation into high-resolution models) but purely for "lack of resources" / "other priority" reasons. We however have a close look to what is going elsewhere, particularly in the COSMO consortium: DWD has used GPS ZTD in a reanalysis of the COPS period in their high-resolution COSMO model (which is similar to COSMO-2). The results are unknown to me at this time. More important is the change of assimilation system in the COSMO model: An ensemble kalman filter based system for the high-resolution COSMO model is currently being developed which will allow a more easy assimilation of remote-sensing observations, such as radar, lidar etc. In this connection, literature suggests that it is most appropriate to directly assimilate GPS slant delays. COSMO (and thus MeteoSwiss) will investigate the use of GPS data in the future, once the new data assimilation system is ready.

4 Other activities of MeteoSwiss

The operational comparison between GPS IWV and Payerne sounding is going on. The new water vapour sensor of the Payerne radiosonde – introduced mid-2009 – improves the reliability and quality of these measurements. The average radiosonde water vapour columns are approx. 5% higher than the GPS values.

The measurements of water vapour profiles at Payerne have been extended with a radiometer (RPG hatpro) and a tropospheric water vapour Raman Lidar, which provide half-hourly profiles and allow a comprehensive comparison of these systems with the operational radiosonde and “reference” radiosondes. Payerne is now a site of the GCOS Global Reference Upper Air Network (GCOS-GRUAN).

Based on the ZTD (zenith total delay) provided by the GPS network of swisstopo (AGNES), MeteoSwiss is presently extending the IWV calculations to all AGNES stations on its central data system, allowing a wide access to these data.

P. Jeannet / 15.09.2010