

Name of research institute or organization:

**Bundesamt für Landestopographie / Swiss Federal Office of
Topography (swisstopo)**

Title of project:

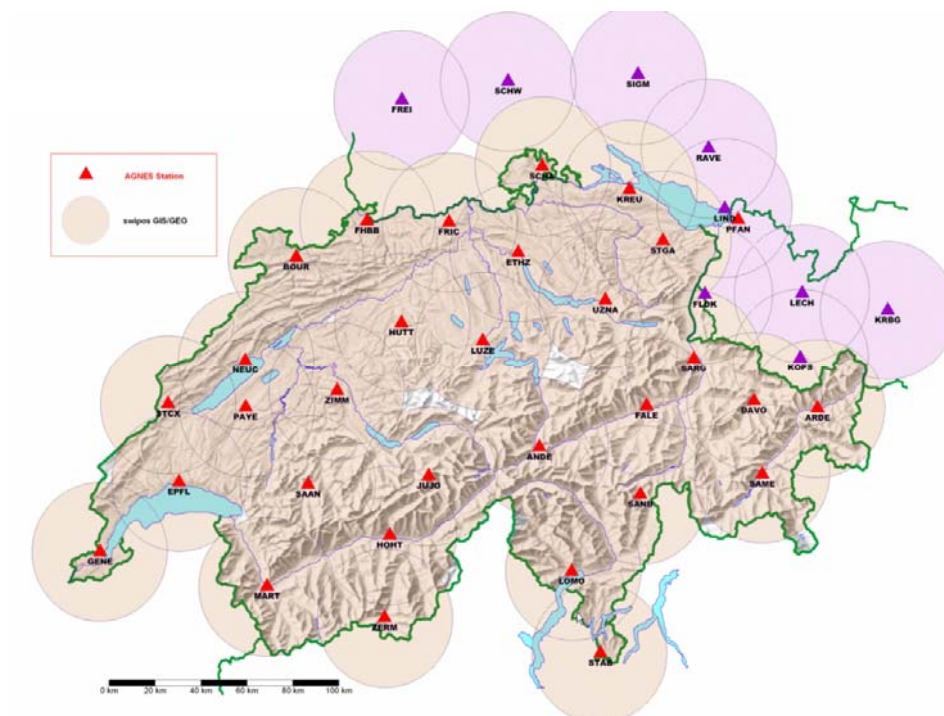
Automated GPS Network Switzerland (AGNES)

Project leader and team

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Project description:

The permanently observing GPS (Global Positioning System) station at Jungfrauoch has been operating since autumn 1998. The station is part of the Automated GPS Network of Switzerland (AGNES) consisting presently of 30 sites. AGNES is a multipurpose network which serves as reference for surveying, real-time positioning services (swipos GIS/GEO) and for scientific applications (geotectonics and meteorology).

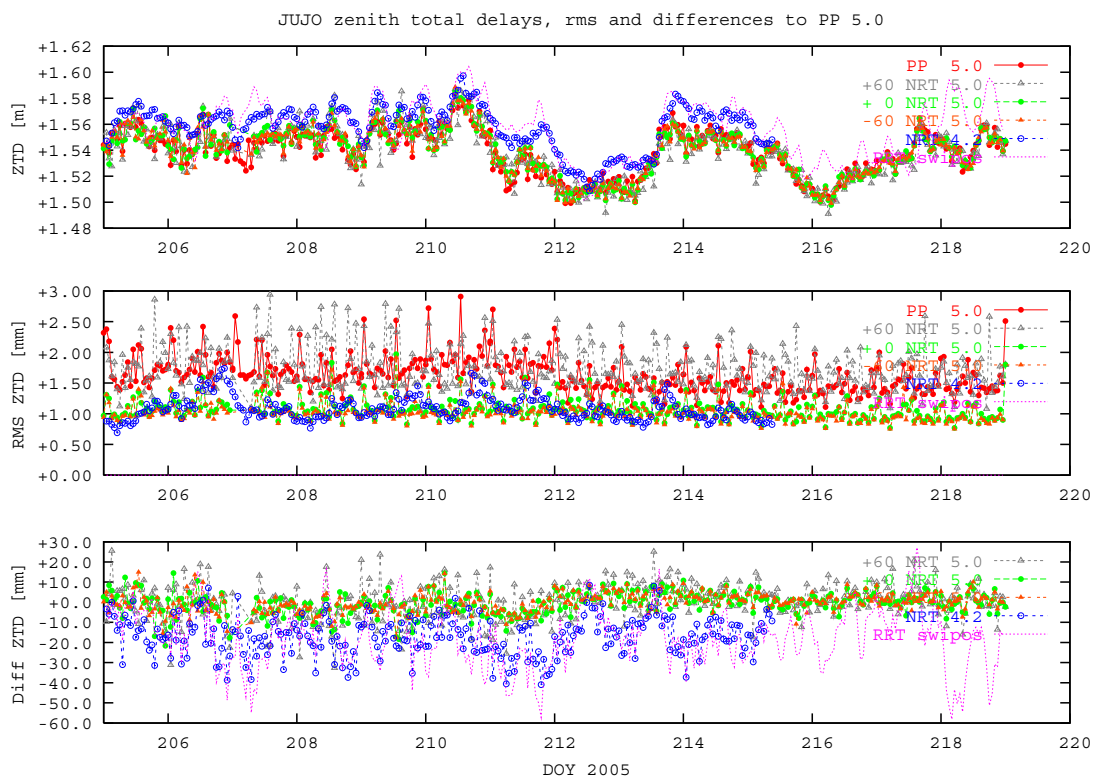


Due to the extreme altitude, the station is not optimal for real-time positioning applications. Nevertheless, the station is monitored on a daily basis for reference frame purposes on a sub-cm accuracy level.

For meteorological application the permanent operation at Jungfrauoch gives very interesting results, as shown in the last annual activity report. swisstopo contributes to the European project TOUGH (Targeting Optimal Use of GPS Humidity) since 2002, which ends at the January 31, 2006. The goal is to use GPS-derived humidity information for numerical weather prediction.

Results are shown and updated hourly at <http://www.swisstopo.ch> (in the geodesy section, subsection permanent networks and analysis center PNAC).

In 2005, rigorous changes were made to the analysis of the data processing. The processing software was changed from Bernese 4.2 to Bernese 5.0. Furthermore, model improvements were introduced which lead to an improvement of the quality of the hourly zenith total delay (ZTD) estimates compared to the ZTD estimates derived on a daily basis. The differences for a 2-week period, in which the "old" and the "new" processing was done in parallel, show the following behaviour for Jungfraujoch (upper diagram: different ZTD estimates based on different processing strategies; center diagram: formal rms estimates of the ZTD estimates; lower diagram: Differences of the ZTD estimates with respect to the post-processed (PP 5.0) solution based on daily observations):



The differences of the new hourly ZTD estimates with the post-processed solution are almost bias-free and show an agreement of the order of 4.8 mm ZTD (standard deviation).

The results achieved every hour with a time delay of maximally 1 hour and 45 minutes (solution type "+0 NRT 5.0") are continuously submitted to EGVAP (<http://egvap.dmi.dk/>), which is a project of EUMETNET (The Network of European Meteorological Services) started in March 2005 with the goal to make the GPS ZTD estimates operationally available for numerical weather prediction. This server collects the results of more than 400 sites all over Europe stemming from a dozen GPS analysis centers.

Key words:

GPS, Meteorology, Positioning, Intergrated Water Vapour, Zenith Path Delay, GPS Tomography

Internet data bases:

<http://www.swisstopo.ch>; <http://egvap.dmi.dk/>

Collaborating partners/networks:

Astronomical Institute (AIUB), University of Berne

MeteoSwiss, Zurich and Payerne

Institute of Applied Physics (IAP), University of Berne

Scientific publications and public outreach 2005:

Refereed journal articles

Brockmann E., D. Ineichen und A. Wiget (2005): Neumessung und Auswertung des GPS-Landesnetzes der Schweiz LV95. Geomatik Schweiz 08/05, August 2005.

Grünig S. und U. Wild (2005): swipos über Internet. Neue Entwicklungen bei der Echtzeit-Positionierung. Geomatik Schweiz 02/2005, März 2005.

Guerova G., J.-M. Bettems, E. Brockmann and Ch. Mätzler (2005): Assimilation of COST-716 Near-Real Time GPS data in the nonhydrostatic area model used at MeteoSwiss. Meteorol. Atmos. Phys. (MAP), June 30, 2005.

Guerova G., E. Brockmann, F. Schubiger, J. Morand and C. Mätzler (2005): An Integrated Assessment of Measured and Modeled Integrated Water Vapor in Switzerland for the Period 2001–03, Journal of Applied Meteorology, Vol. 44, No. 7, pages 1033–1044.

Troller M., E. Brockmann, D. Ineichen, S. Lutz, A. Geiger and H.-G. Kahle (2005): Determination of the 3D Water Vapor Distribution in the Troposphere on a Continuous Basis Using GPS. Geophysical Research Abstracts, Vol. 7.

Conference papers

Brockmann E., D. Ineichen, U. Marti, A. Schlatter (2005): Results of the 3rd observation of the Swiss GPS Reference Network LV95 and status of the Swiss Combined Geodetic Network CH-CGN. In: Torres, J.A. and H. Hornik (Eds): Subcommission for the European Reference Frame (EUREF), Vienna 2005, EUREF Publication in preparation.

Brockmann E. and D. Ineichen (2005): TOUGH activities at swisstopo (LPT). TOUGH annual meeting, L'Aquila, January 27-28, 2005.

Brockmann E. and D. Ineichen (2005): TOUGH activities at swisstopo (LPT). TOUGH semi-annual meeting, Exeter, September 29-30, 2005.

Schaer S., D. Ineichen and E. Brockmann (2005): EUREF LAC Analysis at swisstopo/CODE Using Bernese Software V5.0. In: Torres, J.A. and H. Hornik (Eds): Subcommission for the European Reference Frame (EUREF), Vienna 2005, EUREF Publication in preparation.

Schneider D., B. Vogel, A. Wiget, U. Wild, E. Brockmann, U. Marti and A. Schlatter (2005): EUREF'05: National Report of Switzerland: New Developments in Swiss National Geodetic Surveying. In: Torres, J.A. and H. Hornik (Eds): Subcommission for the European Reference Frame (EUREF), Vienna 2005, EUREF Publication No. in preparation.

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