IGS Workshop 2008 – Reprocessing Sessions

15 minutes talks + 5 minutes discussion

Reanalysis campaign — Status of test periods

1) Report of Repro WG on current AC status
P. Steigenberger, R. Ferland, G. Gendt, I. Romero

In order to generate a set of homogeneous and state-of-the-art IGS products covering the time period 1994 till nowadays, the IGS initiated a reanalysis campaign. This contribution summarizes the current status of this reprocessing effort. An overview on the analysis centers (ACs) and their products (e.g., clocks) generated up to know will be given. The reprocessed AC submissions as well as the combined IGS products are made available at the IGS data centers CDDIS and IGN. The file naming conventions as well the file archiving will be discussed. Finally, the updated plans and the schedule projection will be presented.

2) Examination of test network coverage & completeness
I. Romero

A detail examination of the networks of stations used by each AC in the submitted reprocessed products to date is presented. The aim is to analyze the recommendations from the 2006 IGS Workshop http://nng.esoc.esa.de/ws2006/programme.html (REPR1, REPR2) with the 2007 reprocessing results. All the different station lists have been consolidated into three general lists: REFERENCE, PROJECT, and NGA. Due to large station overlaps the Clock, Doris and ITRF stations are together in the REFERENCE list. The PROJECT list contains the Tiga and Collocated sites, and the NGA is so far optional.

One of the benefits of the reprocessing campaign is to cover as many stations as possible from the station lists. Ideally 3 or more AC solutions are needed for good combination results for a station. An analysis of the stations used for the 2007 reprocessing will be presented. Normally an increase in the number stations processed is not practical for many ACs. Therefore recommendations will be made on stations that may be 'on the verge' of reaching the 3 AC minimum so that they can be considered as candidates for inclusion.

3) Report on SINEX results to date
R. Ferland

A test campaign using data from 1999/12/26 to 2000/05/06 (GPW weeks 1042 -1060) was processed by 5 analysis centers (esa, mit, ngs, pdr, sio). The original combination included the station coordinates, the Earth Rotation parameters (ERPs) and the implicit apparent geocenter. In a first part, a summary of the analysis of the test campaign will be presented. The results showed that some ACs do include unremovable constraints. This had also been observed and accounted for in the combination of the weekly SINEX products.

In a second part, the results of the combination of the first IGS reprocessing starting at 2007/12/28 (GPS week 1459) and going backward in time will be presented. Very recently, 5 ACs (es1, gf1, mi1, ng1, pd1) have started contributing their solutions. The results of the weekly combination of

the contributing ACs available at the time and for as many weeks as possible will be presented. Those will include the station coordinates, ERPs and geocenter estimates and residuals. Comparisons between the contributing ACs and with respect to the IGS official products will also be presented.

4) Report on orbit/EOP results to date
G. Gendt

Reanalysis campaign — Next steps & consequences

1) Lessons learned from the Potsdam/Dresden Reprocessing (PDR)
M. Fritsche, R. Dietrich, A. Rülke, P. Steigenberger, M. Rothacher

A reprocessing of a global GPS network has been carried out at TU Dresden and TU Munich. Up to now 14 years of data have been processed in a joint effort. Latest a priori models for the observation reduction and a refined processing strategy have been applied in the data analysis in order to obtain homogeneous and consistent parameter time series.
Implemented model refinements and improved a priori models are discussed according to their impact on the derived parameter estimates. Based on the estimated long-term trends of station coordinates, low-degree spherical harmonics of surface loads and homogeneous time series of station positions remarks on the stability of a GPS only reference frame will be addressed. Finally, a comparison with other recent terrestrial reference system realizations will show the potential of reprocessed GPS observations.

2) ESOC IGS Reprocessing
T.A. Springer, F. Dilssner, E. Schoenemann, I. Romero, J. Tegedor, F. Pereira, J. Dow

Early in 2008 ESOC has replaced its old GNSS analysis software with its new software, called Napeos. One of the key design criteria of this new ESOC GNSS analysis software has been short processing times! The now fully operation software allows to generate an IGS final solution using 100 stations within 30 minutes on a Linux PC with the Intel Fortran compiler. A network of 150 stations takes around 60 minutes to process. On a "quad-core" CPU four jobs can be run simultaneously without any performance loss. Thus on a single quad-core PC we are able to process 96 days (24 hours x 4 Cores) of IGS data per day! With such a performance rapid reprocessing decades of IGS data becomes feasible. On a single PC reprocessing a full year of IGS data takes less then 4 days. So reprocessing 10 years of data will take about 40 days on a single PC and even less when using multiple PC nodes.

This opens up a great potential for scientific research. New models can be incorporated into the software, tested, and validated. After that an N-year reprocessing can be started to study the effect of the new model and compare to previous reprocessed results. The scientific value of such and efficient tool is tremendous!

In this presentation we will show some selected results from our first reprocessing effort using the year 2007. We have reprocessed this year twice to study the effect of the Earth albedo and infra-red radiation model in our software. The reprocessed results are also compared to the original IGS products for 2007. Using the obtained orbit, clock, and ERP products we will look at internal and external consistencies of the results. We also look at a "fast Fourier transformation" (FFT) of the obtained time series and will show some interesting results. Last but not least we will use the SLR observations of the two GPS satellites carrying SLR reflectors to study the quality of the different

05/14/08

IGS orbits.

Since the results are too much for the (short) presentation we will also generate a poster which will contain additional results.

3) Regional re-analysis: expectations and experiences within the EPN
     A. Kenyeres, J. Legrand, C.   Bruyninx, H. Habrich, M. Figurszki

4) TIGA (TBD)
     G. Woppelmann,...

Posters:

PDR GPS Satellite Orbits
P. Steigenberger, M. Rothacher, M. Fritsche, A. Rülke, R. Dietrich

High-precision GPS satellite orbits are one of the core products of the International GNSS Service (IGS). Since the establishment of the IGS in 1994, the quality and consistency of the IGS orbits has steadily been improved by advances in the modeling of GPS observations. However, due to these model improvements, the time series of operational orbits are inhomogeneous and inconsistent. This problem can only be overcome by a complete and homogeneous reprocessing starting with the raw observation data. Therefore, Technische Universität München (TUM), Technische Universität Dresden (TUD) and GeoForschungsZentrum Potsdam (GFZ) reprocessed a global GPS network of 202 stations in a joint effort. The quality of reprocessed GPS satellite orbits for the time period 1994-2005 will be assessed in this poster. Orbit fits show that the internal consistency of the orbits could be improved by a factor of about two in the early years. The independent validation with Satellite Laser Ranging (SLR) residuals shows an improvement of up to 30%.

Water vapour estimates over Antarctica from 12 years of globally reprocessed GPS solutions
I. Thomas, M. King, P. Clarke

The GPS data Reanalysis Campaign at the National Geodetic Survey
J.R. Rohde, M. Cline, W.H. Dillinger, R.L. Dulaney, J. Griffiths, S. Hilla, B. Kass, J. Ray, G. Sella, R. Snay

The National Geodetic Survey (NGS) has begun a GPS data reanalysis campaign in cooperation with the International GNSS Service (IGS). The NGS is using its own Program for the Adjustment of GPS EphemerideS (PAGES) as the heart of its data processing. Institut Geographique National's Combination and Analysis of Terrestrial REference Frames (CATREF) software will be used to form a long-term combined frame from weekly positional solutions. In addition to computing global frame, orbit and Earth rotation solutions for submission to the IGS, the NGS is reanalyzing GPS data from the U.S. Continuously Operating Reference Stations (CORS) network. CORS consists of 1187 stations, most located within the United States. These stations are owned and operated by 192 organizations. The results of the reanalysis campaign will make the reference frame of the United States consistent with the IGS reference frame, IGS05, and ultimately ITRF. The results will also be combined with the results of other organizations to form an updated North American REference Frame (NAREF). This poster is a review of NGS's progress to date.

05/14/08