IGS

SESSION 11:

POSTER ABSTRACTS

The IGS Global Data Center at the CDDIS – an Update

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Abstract

The Crustal Dynamics Data Information System (CDDIS) has served as a global data center for the International GPS Service (IGS) since its start in June 1992, providing on-line access to data from nearly 200 sites on a daily basis. This paper will present information about the GPS and GLONASS data and products archive at the CDDIS. General information about the system and its support of other international space geodesy services (the ILRS, IVS, and future IDS) will also be discussed.

The Crustal Dynamics Data Information System (CDDIS) is a dedicated data center supporting the international space geodesy community, providing easy and ready access to a variety of data sets, products, and information about these data. The data center was established in 1982 as a dedicated data bank to archive and distribute all Crustal Dynamics Project-acquired data and information about these data. Today, the CDDIS continues to serve as the NASA archive and distribution center for space geodesy data, particularly GPS, GLONASS, laser ranging, DORIS and VLBI data. The specialized nature of the CDDIS lends itself well to enhancement to accommodate diverse data sets and user requirements. The CDDIS is operational on a UNIX server with over 550 Gbytes of on-line disk storage. A majority of the archive is devoted to GPS data and products.

The CDDIS serves as one of the primary data centers for the following International Association of Geodesy (IAG) services: the International GPS Service (IGS), the International Laser Ranging Service (ILRS), the International VLBI Service for Geodesy and Astrometry (IVS), the International Earth Rotation Service (IERS), and the International DORIS Service (IDS).

The CDDIS has served as a global data center for the IGS since its start in June 1992, providing on-line access to GPS data from nearly 200 GPS and 50 GLONASS sites on a daily basis as well as the products derived by the IGS Analysis Centers from these data. The CDDIS supports a majority of the working groups and pilot projects within the IGS.

In May 2001, the CDDIS began supporting the IGS Low Earth Orbiter Pilot Project (LEO-PP) by archiving data from a network of approximately forty sites operating at a one-second sampling rate (typically). These data are available in files containing fifteen minutes of data stored in subdirectories by GPS day, hour, and data type. Starting in January 2002, the CDDIS LEO-PP archive expanded to include data from GPS receivers on-board the LEO satellites; currently data from SAC-C and CHAMP are stored in daily files, Hatanaka-compressed RINEX format, in subdirectories by satellite and day. In 2002, this satellite archive will be expanded to include data from ICESat and Jason. The CDDIS is also archiving CHAMP orbit products from associate analysis centers participating in a LEO-PP comparison project.

The CDDIS supported the Ionosphere Working Group's HIRAC/SolarMax campaign in April 2001. This weeklong activity was organized to study the effects of the solar maximum on the Earth's ionosphere using a dense, high-rate GPS tracking network. Data from 104 sites in thirty countries totaling thirteen Gbytes in size were collected and archived.

CODE – Current Issues Relevant to the IGS

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The two posters presented at the IGS 2002 Workshop in Ottawa put a few flashlights on some new results from CODE and on several issues which require discussions within the IGS.

The first poster shows up-to-date results of global ionosphere mapping. The Earth's ionosphere is still very active as shown by the development of the mean vertical electron content over a period of more than seven years, a plot which is updated daily on http://www.aiub.unibe.ch/ionosphere.html. CODE IONEX maps are now resulting from the middle day of a 72-hour analysis to avoid discontinuities at the day boundaries. RMS maps give a clear indication of the station distribution, with high RMS patches in particular in regions in the southern hemisphere or over the oceans which are sparsely populated by IGS stations. The generation of a mixed ionosphere product containing observations from GPS as well as from TOPEX is planned and needs discussion concerning to the IGS policy.

Maps indicating the average availability of tracking data for the rapid and the final analysis at CODE show, in particular for the rapid analysis, that data from large regions on Earth do not arrive in time to be processed. This concerns especially interesting regions such as Siberia, Africa, and Southern America where the station density is low. The picture basically gives a map of the reliability of communication links. A number of stations at very remote locations and islands do not even provide data in time for the final analysis. Several of these sites are collocated with tide gauge stations. Data from such stations would significantly help to improve e.g. IGS ionosphere products.

At CODE, P1-P2 and P1-C1 code biases are determined routinely. The poster gives average values for the full satellite constellation as well as time series for selected satellites. CODE P1-C1 results are used as official IGS values. A method was developed to firmly determine the code tracking technology of a GPS receiver.

Finally it is shown in an impressive manner that the resolution of carrier phase ambiguities to integer numbers is essential also for the estimation of orbital parameters. At CODE, ambiguity resolution is now attempted for baselines up to 6000 km length.

The second poster is dominated by color coded time series of SP3-type accuracy codes for all satellites as well as corresponding statistical information and detailed time series for selected satellites. Time series of GPS satellite orbit accuracies as obtained from 3-day fits are given for the CODE final orbits and compared to corresponding series as extracted from the IGS final and ultra-rapid SP3 files. Apart from the significant improvement of the orbit quality over the years, it is striking to see that prominent patterns for some satellites do not show up in the IGS accuracy code time series indicating that effort should be put into the refinement of the estimation of accuracy information in the IGS orbit files.

In particular for the IGS ultra rapid orbits, many gaps can be observed in the time series stemming from satellites missing in the published orbit files. It should be the goal of the IGS to provide information for all satellites to the users accompanied with reliable accuracy information. In parallel, the users of IGS orbits should be urged to use this information.

Time series of geocenter coordinates extracted from weekly SINEX files from CODE and from GFZ match each other reasonably well. The reconstruction of geocenter information should be possible with any SINEX file. Technical problems related with SINEX have to be sorted out. Tests indicate that the fact that IGS orbits are referred to a coordinate frame which is displaced from the ITRF by the geocenter offset may have an effect on station repeatability in large GPS networks such as the EUREF.

With a plot of polar motion, the question of continuous representation of time variable parameters is addressed. As pole parameters, troposphere zenith delays parameters and coefficients of global ionosphere maps should be represented by piece-wise linear functions without discontinuities every n hours. Information should be provided to the users of these products on how to interpolate the tabular values provided by the IGS.

The IGS Ultra-Rapid Orbits in the COST–716 Campaign 2001

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1 IGU orbits and COST–716 NRT campaign

The COST–716 (http://www.oso.chalmers.se/geo/cost716.html) is the European action for the exploitation of ground based GPS for climate and numerical weather prediction applications. The near real-time (NRT) demonstration campaign for the monitoring of the troposphere was started in February 2001 and the Geodetic observatory Pecný (GOP) has been operating as one of the GPS analysis centers. Our contribution in 2001 was based on the fixed IGS ultra-rapid (IGU) orbits. The monitoring of the IGU product during 2001 confirmed its high quality: 8/10 cm median/mean RMS for fitted and 18/50 for predicted portion, respectively. Only a single solution was missing during the whole period (doy 310) and other 2–4 were hardly usable for our application (doys: 059, 064, 079 and 112). All these cases were successfully handled by the prolonging of previous IGU orbits.

2 Results from the GOP tropospheric monitoring

We use the Bernese GPS software and the network approach for the NRT tropospheric estimation. Applying the subdaily IGU orbits, we could simplify our routine procedure for fixing the orbits. Nevertheless, we have implemented the satellite checking procedure based on the residual testing: a) very bad orbit cases resulted in the total PRN exclusion (already seldom during 2001 since they have been excluded usually during the IGS combination) and b) in other cases of the orbit unstability the PRN was excluded for every single baseline whenever disturbed the solution. The NRT solution was performed every hour, based on hourly pre-processing step and the last 12 normal equations stacking procedure. Hourly ZTD values were estimated keeping the coordinates fixed on the values solved for separately from the last 7 days. The network has consisted of the EPN sites located mostly in the central and eastern part of Europe. Additionally, the sites from UK Met Office and the sites from Belgium and Netherlands were included. The NRT ZTD product latency was usually 1 hour. Besides this solution, we provided also routine post-processed solution (PP, latency 1–2 days) based on a daily processing and IGS rapid orbits. The internal GPS consistency is presented in Fig. 1 by the ZTD comparison between the GOP NRT and PP solutions. The standard deviations are in most cases between 4-6 mm of ZTD (6-7.5 mm for a few sites on the margin of our network with baselines longer than 2000 km). The mean bias is bellow 1 mm. In addition, for the sites with nearby radiosondes available (< 80 km), we compared our ZTD NRT results (converted into the precipitable water vapor, PWV) with the values directly integrated from the radiosonde observations. The monthly (Fig. 2) and cumulated (Table 1) comparisons show the mean standard deviations between 1.2–2.1 mm in PWV and mean positive bias for GPS about 0.4 mm. The

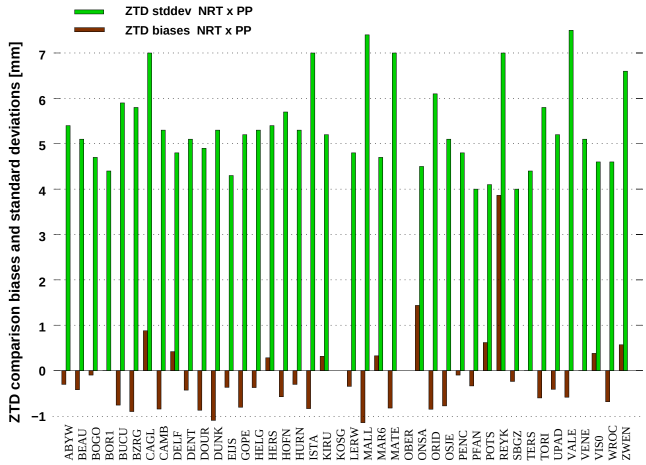

Fig. 1. ZTD comparison for NRT×PP GOP solution.

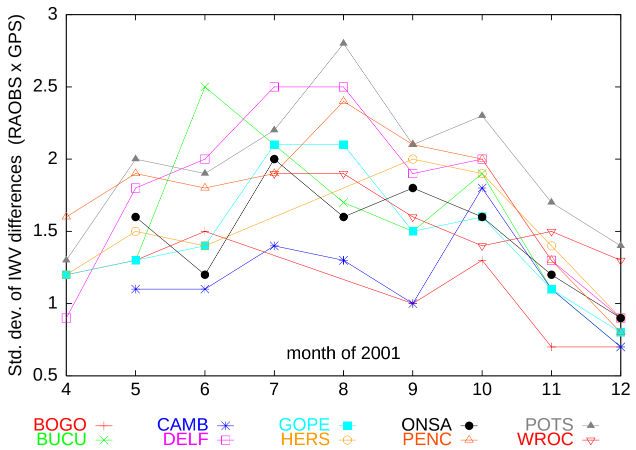

Fig. 2. Monthly GPS and radiosonde PWV comparisons.

PWV comparison strongly depends on the quality of the reduced radiosonde profiles, as well as on the other missing information about the mutual GPS and radiosonde localizations, the radiosonde special problems, and many other factors.

Acknowledgements. The radiosondes data were provided by the British Atmospheric Data Center (BADC), the conversion of ZTD to PWV was done by Siebren de Haan (KNMI, the Netherlands) within the COST–716 monitoring activity. This work was supported by the Ministry of Education, Youth and Sports of the Czech Republic (OC 716.001) and Grant Agency of the Czech Republic (103/00/P028).

Table 1. PWV comparisons

site	bias [mm]	sdev [mm]	#	site	bias [mm]	sdev [mm]	#
BOGO	0.8	1.2	*228*	HERS	0.5	1.6	*257*
BUCU	0.6	1.8	*279*	ONSA	0.9	1.6	*277*
CAMB	0.9	1.3	*666*	PENC	-0.4	1.9	*350*
DELF	-0.1	2.0	*670*	POTS	-0.1	2.1	*847*
GOPE	0.5	1.6	*788*	WROC	0.7	1.6	*91*

Study of Different Analyzing Schemes for the Ultra-Rapid Orbit Determination Using the Bernese GPS Software

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1 Description of variants

We have searched an optimal aproach for the Bernese GPS software between two extremes: a) a sliding window processing, b) a short-time data pre-processing with stacking the normal equations (NEQ). The period of 18 days was selected in the year 2001 (052-069), where 3 satellites (PRNs 6, 13, 18) were manoeuvered. These events were considered as unknown and were identified by the processing. Except for the unhealthy PRN 15 the orbits of all satellites were determined.

Table 1. Summarized setup for compared variants.

Ident	arcs	data	# NEQ	ambig par.	erp par.	stoch par.	# sites	arc split.
24H	72h	24h	3	no	no	no	51	diff
12H	72h	12h	6	no	no	no	51	diff
6H	72h	6h	12	no	no	no	51	diff
4H	72h	4h	18	no	no	no	51	diff
2H	72h	2h	36	no	no	no	51	diff
COD	72h	24h	3	yes	yes	yes	120	resd

Five variants have been set up for the estimation of ultra-rapid orbits, see Table 1. The common general strategy was designed as close as possible to the CODE rapid solution, but taking into account the aspects of the subdaily solutions with pre-processing windows ranging from 2 to 24 hours. Finally, the strategy was simplified in order to separate the following influences: fixing the ambiguities, introducing the stochastic orbit parameters and estimating the ERPs. An automatic arc splitting procedure is applied in the case of problems with the long-arc modeling (last column in the table). The 'resd' stands here for the residual checking after fitting the positions of two consecutive daily orbit arcs into a single one, while the 'diff' means checking the differences between the long-arc orbits (3 days) and the short-arc orbits (6×12 hours).

2 Comparisons and results

The comparison was based on two criteria: 1) an efficiency of the procedure expressed in processing time, 2) an accuracy of the fitted and predicted orbit arcs. The latter was derived from the residuals of Helmert transformation (3 rotations) between estimated satellite positions and the final IGS orbits. Daily arcs were compared in case of fitted portions, while predicted parts were divided into 4 intervals (0-6h, 6-12h, 12-18h, 18-24h). Although the subdaily solutions were updated several times per day, the comparisons were evaluated only for the last one of the day. No satellites were excluded from the comparison except those actually manoeuvered.

Figure 1A) indicates that variant 6H (6-hour pre-processing, 12 NEQ stacking) is a reasonable compromise among all others tested. The solutions based on the shorter NEQs (2H, 4H) are unstable due to a problem with ambiguity estimation, Fig. 1B. Consequently, some orbits were biased in the along-track component and an additional Z-rotation in the Helmert transformation decreased the comparison quality for all other satellites. The efficiency of both shortest variants was even not significantly higher since the number of parameters (tropospheric and ambiguities) was not much reduced. The solutions using a longer NEQs (12H, 24H) consumed 1,5-2,5× more processing time, achieving an accuracy equivalent to that of the 6H solution.

Finally, the new automatic procedure for long-arc splitting was successfully set up and tested. It does not require any a priori information and Fig. 1C) shows how the introducing a reasonable arc-splittings over the 3-day orbit solution is useful after 2-3 iterations. The procedure is efficient and general enough to accomplish the tasks for a subdaily orbit product with arbitrary update rate.

Acknowledgements. This project was supported by the Swiss National Science Foundation (20-57168.99) and by the Ministry of Education, Youth and Sports of the Czech Republic (OC 716.001, LN00A005).

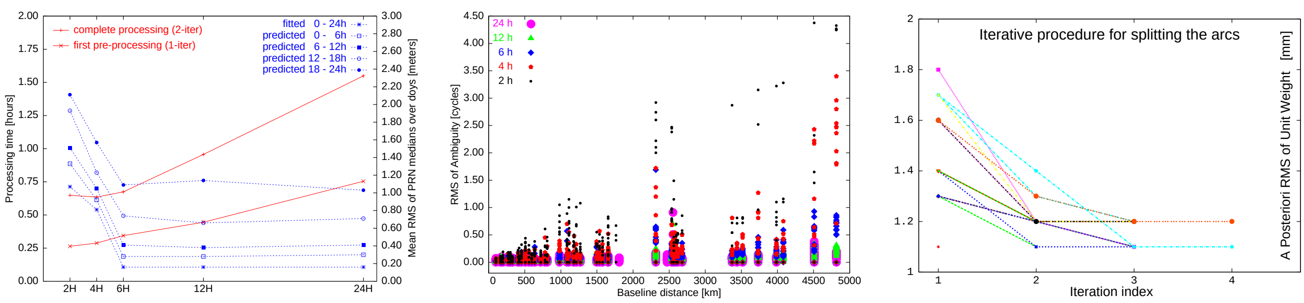

Fig. 1. A) The x-axis corresponds to the data NEQ lengths, y-axis shows the processing time, y2-axis gives the mean RMS of the comparison of the orbits with respect to the IGS final orbits. B) RMS values of baseline-wise estimated ambiguities for the strategies 2H, . . . , 24H as a function of baseline length. C) The improvement of the solution when iterative arc-splitting procedure for selected orbit has been applied.

Global NRT Solution from Geodetic Observatory Pecný AC

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1 NRT GPS tropospheric monitoring, NRT orbits

Monitoring of the troposphere is the main topic at the Geodetic Observatory Pecný (GOP) in the field of near real-time (NRT) analyses. The quality of NRT orbits and the GPS geometry are the most crucial factors in this case. From March 2000, the IGS ultra-rapid orbits (IGU) are available beeing well suited for the operational GPS meteorology. It was proved in the GOP analysis for the COST–716 NRT demonstration campaign 2001 (see the independent contribution). Nevertheless, the improvements can be still expected because of two reasons:

1) from 2 to 6 satellites are generally missing in the current IGU product which weakens the GPS geometry,
2) applicable NRT IGU orbits are predictions for 3-15 hours causing the errors for some satellites up to the meters (exceptionally even tens of meters).

2 GOP processing system

Our aim is to share the effort in the precise NRT orbit determination. We tend to benefits from the use of the most reliable and stable combined IGS product prior to the individual orbit relaxation. Already at the end of 2000, the GOP tested the operational analysis of a global NRT network. Since October 2001, our analyses has been running continuously with a processing system based on early Bernese GPS software V5.0. The GOP global NRT solution is based on the effective procedure of stacking the normal equations (NEQs): after 6 hours iterative GPS data pre-analysis, the final 3 day orbits are determined with pure NEQ combination. The NRT analysis cycle is 3 hours and the orbit and tropospheric products are available 8× per day (2 hours after last observed GPS epoch). The final orbits are checked for the arc overlap consistencies and the orbits exceeding the criteria are automatically excluded. All the GPS observations (about 70 global sites) are downloaded through the GOP NRT data center.

3 NRT products from GOP

During 5 months (November 2001 – March 2002), the performance of the GOP orbits shows the significant improvements from the start of 2001, and later on from the beginning of March (i.e. the last 30 days). The following changes have caused the improvements: the careful network reconfiguration, optimized station checking method, a new backup system for uninterrupted internet connection and some additional fine-tunings.

Only a few satellites are usually missing in our orbit product – generally less than by the IGU product, see Fig. 1. Together with checking the differences between the GOP NRT and IGS rapid orbits during the last 30 days (Fig. 2), we can demonstrate the potential improvements of the IGU combined product. The comparison of GOP orbits in last 5 months results in the mean median RMS of satellite positions of 13 cm and 24 cm for the fitted and 6-hour predicted portion, respectively. The same results give the comparison between the IGU and GOP orbits.

Additionally, the hourly tropospheric estimates are produced in the final steps of our NRT procedure using a final GOP orbits already fixed. The processing consists in the combination of last two 6-hour NEQs. Since February 2002 our tropospheric product has been regularly delivered to the NRT IGS trial combination. The simple cosistency ZTD checking with the combined product shows the mean standard deviation of 3.9 mm and mean absolute bias of 2.5 mm based on 350 pairs in average.

Acknowledgements. The author would like to thank for the possibility of sharing the experience with the Bernese GPS group, as well as the opportunity to take advantage of preparing Bernese software V5.0. Special thanks are given to Urs Hugentobler for the work on the NRT orbit determination and to Leoš Mervart for the hard work on the new version 5.0, for ADDNEQ2 combination program extensively used in our solution and for a new MENU support. This project was supported by the Grant Agency of the Czech Republic (103/00/P028) and by the Ministry of Education, Youth and Sports of the Czech Republic (LN00A005).

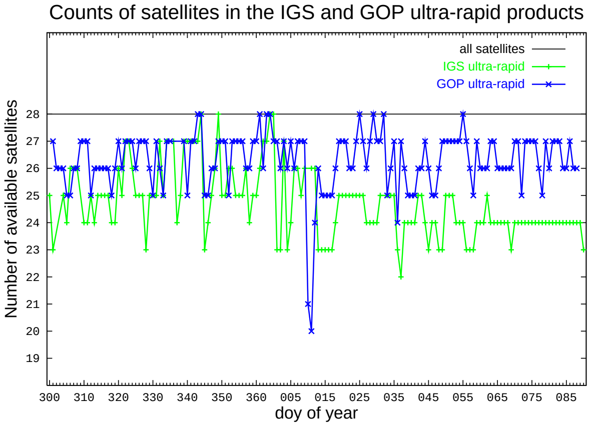

Fig. 1. The counts the satellites in the GOP and IGU products.

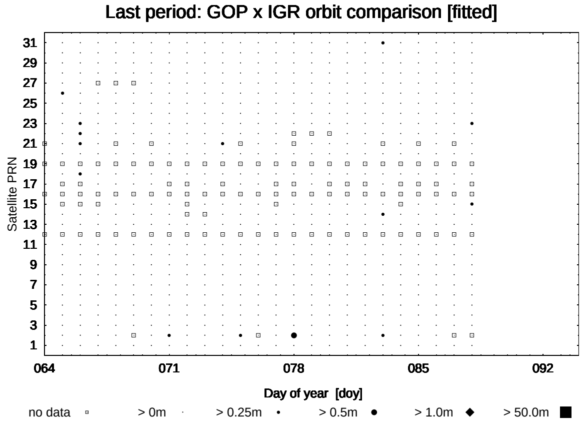

Fig. 2. The bullet-graph affirms the quality of the GOP fitted orbits.

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Geoscience Australia Activities Related to the International GPS Service

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Abstract

The International GPS Service (IGS) and Geoscience Australia continue to have a strong relationship. Geoscience Australia (formerly the Australian Surveying and Land Information Group, AUSLIG) currently provides data from 15 permanently tracking GPS stations to the IGS, these stations are known as the Australian Regional GPS Network (ARGN). Future development of the ARGN will focus on the availability of near real time data and the augmentation of precise clocks and meteorological equipment at selected stations. Additionally Geoscience Australia has been an IGS Regional Network Associate Analysis Centre (RNAAC), contributing an Australian regional GPS solution, for almost six years. Apart from these contributions to the IGS, NMD is currently making use of IGS products, including precise GPS trajectories, Earth Orientation Parameters (EOP) and station coordinates and velocities in the delivery of an Internet based precise GPS processing service (AUSPOS) widely used by both the Australian and International GPS communities.

Developments in Absolute Field Calibration of GPS Antennas and Absolute Site Dependent Multipath

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Antenna phase variations (PCV) and multipath (MP) are site dependent errors on GPS stations, which can have a magnitude of several centimeters. Neglecting these errors can cause severe problems in ambiguity resolution, but also for estimation of distance dependent errors (e.g. troposphere) and coordinates.

Geo++® and IfE have developed an operational procedure to determine the absolute PCV of an antenna in a field calibration completely independent from any multipath effects. Subsequently, it is now possible to separate between PCV and MP error components. The separation of the two error components is important as the error characteristics are different. PCV has a systematic antenna dependent impact on coordinate estimation as MP has a site dependent influence with a zero mean over an adequate time period. Currently, a procedure is under investigation, which gives absolute carrier phase multipath and can be used for absolute site multipath calibration.

The basic concepts of absolute carrier phase multipath calibration are the separation of PCV / MP and the separation of MP from a second station involved in differential GPS. Therefore, in a first step MP and PCV are separated while introducing absolute PCV for the used antennas. Secondly, the absolute MP for one single station is obtained through fast and pseudo-random movements of one antenna on a temporary reference station by a robot. The MP on the robot station is “randomized” or “noisified” through the movement and hence a decorrelation of MP between stations is possible. The systematic behavior of MP for the robot station is turned into noise. The single difference between a static station and the moving robot station contains the original MP of the static station and the decorrelated MP of the moving robot. Finally, a low-pass filtering gives the MP of the static station.

The initial testing of the absolut multipath calibration uses spherical harmonics for the multipath adjustment and a tabulated correction file, which utilizes the correction in the same way as PCV corrections. Both approaches are currently changed to achieve a better performance of the MP calibration. However, generally low MP frequencies are already reduced as high frequencies remain.

First results applying the MP corrections show a reduction of the noise level of L1 double differences (DD) in the order of ~20 % and of ~66 % for a 60 s moving average of the L1 DD. Comparisons of short-term coordinate estimations reveal similar improvements. L1 coordinate estimations of 60 s with the MP corrected observations give a reduction of ~50 % of the standard deviation in each coordinate component compared to a known reference position.

Hard- and software of the absolute MP calibration will be improved to enable faster and more effective measurements. Alternative models are investigated to substitute the spherical harmonics and to consider variation of multipath under changing environmental conditions (e.g. humidity on reflectors, SV orbit, snow). The absolute calibration of station dependent GPS error components will lead to improved global, regional and local reference station and RTK network services (e.g. IGS, SAPOS) as well as for precise GPS applications.

Recent Results and Activies of the IGS Analysis Center at JPL

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ABSTRACT

JPL has contributed regularly to the International GPS Service (IGS) as an Analysis Center since June, 1992. Over time, the IGS ground station network and GPS constellation has grown in size and quality and allowed us to achieve the best estimates of satellite orbits and other parameters to date. Concurrently, implementing new processing strategies and data models, as well as using late-model hardware, have augmented the realization of our most abundant and accurate GPS processing results ever, while keeping and surpassing product delivery deadline requirements. Presented in this workshop poster is an overview of what products we provide, a history of of strategy and processing improvements, and the current state of our operations and product accuracy.

Continental Plate Rotations Derived from International GPS Service Station Coordinates and Velocities, 1996-2002

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International GPS Service (IGS) Analysis Centres (ACs) currently compute daily precise station coordinates and Earth Rotation Parameters (ERPs). From these, weekly results are computed and forwarded to three Global Network Associate Analysis Centres (GNAACs) in an established ASCII format known as Solution Independent Exchange (**SINEX**). The GNAACs then combine these results on a weekly basis. On behalf of IGS, Natural Resources Canada (NRCan) combines all weekly SINEX files from the ACs to form a weekly and a cumulative solution and compares the results with those obtained by the GNAACs. Since GPS week 1143, all the solutions have been aligned to an IGS realization of **ITRF 2000**, the Year 2000 International Terrestrial Reference Frame (**IGS00**, 54 stations). The **weekly solution** contains estimates of station coordinates and ERPs pertaining to the GPS week, and the **cumulative solution** contains station coordinates and velocities at epoch Jan. 1, 1998. **IGS00** is a subset of the cumulative solution for GPS week 1131, itself aligned to **ITRF 2000**. Before GPS week 1143, NRCan's weekly and cumulative solutions were aligned to an IGS realization of **ITRF 2000**'s precursor, **ITRF97,** called **IGS97**. The latter is a 51-station subset of the cumulative solution for GPS week 1046 transformed to **ITRF97**.

Using the cumulative solution from any given week, we estimate rotation components (**Euler vectors**) of any continental plate represented and compare them statistically with results from published literature and two known plate motion models**: NNR NUVEL 1** and **NNR NUVEL 1A**. As of week 1162, some 215 stations and 19 plates are represented. Mean residual velocities are also computed with respect to each plate, thus providing net residual velocities over all stations with respect to both plate motion models.

Statistical tests from the cumulative solution for GPS week 1162 (labeled **IGS02P16** for the **16th** week of the year 20**02)** indicate that motions derived from IGS results for the Eurasian, Pacific and Australian Plates differ significantly from predictions of either model. (The Philippine, Cocos, Juan-de-Fuca, Scotia and Rivera Plates are not analyzed.) For Eastern and South-East Asia, some significant differences are shown to exist between station velocities observed from **IGS02P16** and those expected from the computed plate rotation for Eurasia (without China) derived from **IGS02P16**. The mean misfit between recorded horizontal velocities on plates with two or more stations and those predicted from appropriate Euler vectors for **IGS02P16** is approximately 1.5 mm/yr. Major plates such as North American, South American, Eurasian, Pacific, Australian and Caribbean show horizontal misfits of 1 mm/yr or less. Mean vertical misfit for **IGS02P16** is approximately 6 mm/yr.

NRCan Analysis Centre Contributions to the IGS

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Abstract
As part of Natural Resources Canada (NRCan), the primary role of the Geodetic Survey Division (GSD) is to maintain, continuously improve, and facilitate efficient access to what is now known as the Canadian Spatial Reference System (CSRS). The CSRS serves as a reference for all positioning, mapping, charting, navigation, boundary demarcation, crustal deformation, and other georeferencing needs within Canada. While continuing to serve ongoing requirements for survey control, the growing demands of GPS users in particular have resulted in a new focus for the Division, a focus on supporting positioning from space. The Canadian Active Control System (CACS) was established during the 1990's to facilitate GPS user access to the CSRS. NRCan participation in IGS is an efficient way of providing for Canada a positioning and navigation infrastructure based on modern technologies and international standards. NRCan has been an IGS Analysis Center (EMR) since the 1992 initial IGS pilot phase. The poster lists some of NRCan current contributions to IGS and describes recent modifications, innovations as well as on-going and up-coming developments.

IGS97 to IGS00 Discontinuities in NRCan Rapid Products for GPS Week 1157

Solutions **DUT1**	**RX(mas) -Pmy**	**RY(mas) -PMx**	**RZ(mas)**	**Sc(ppb)**	**TX(cm)**	**TY(cm)**	**TZ(cm)**
NRCan Orbits	0.020	0.034	-0.141		-0.059	-0.003	0.848
Sigma	0.021	0.029	0.027		0.045	0.098	0.165
NRCan EOP	0.010	0.022	-0.202				
Sigma	0.021	0.028	0.054				
NRCan Stations	-0.023	-0.037	-0.173	-0.957	-0.286	-0.276	2.648
Sigma	0.019	0.019	0.039	0.113	0.050	0.065	0.101
IGS Realization	-0.024	-0.004	-0.159	-1.451	-0.45	-0.24	2.60
Sigma	0.092	0.099	0.076	0.270	0.41	0.50	0.75

NRCan Ultra-Rapid Orbit Products (EMU)

NRCan's Internet Global Positioning System Data Relay (iGPSDR)

S. Delahunt, K. MacLeod, M. Caissy, K. Lochhead

The poster session consists of two parts, one was a poster showing the Canadian Real Time Active Control Network (CRTACS) and a description of the Wide Area Network (WAN), the iGPSDR and the Canada-Wide Differential Global Positioning System (CDGPS) service. The second part was a real-time demonstration of the iGPSDR and CRTACS products.

The real-time demonstration used the iGPSDR to relay GPS observation data (Winnepeg) and GPS wide area corrections over the open Internet from NRCan's office in Ottawa to the conference hotel. The wide area corrections were localized for Winnipeg. The Winnipeg observation data, together with the localized GPS corrections were used to do real-time point positioning.

A COMPARISON OF GPS RADIATION FORCE MODELS

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Figures updated 2002 May 3 to include LM-IIR model predictions.

Abstract

The following models have been proposed to model the radiation force on GPS Block IIR satellites:

- The "CODE 1998" model reported by Springer(1998);
- JPL's GSPM_XYZ.1 model from Bar-Sever(1998a);
- The T30 model from Fliegel and Gallini(1996);
- The (Lockheed Martin Corp.) Block IIR model "LM-IIR" reported by Bar-Sever(1998b);
- CODE/VJS-01 model based on the author's recommended changes to some mathematical expressions in the CODE 1998 model.

We compare the secular perturbation rates predicted by the models, as a function of Sun angle from the orbit plane, with the observed values for a Block IIA and Block IIR spacecraft. The Block IIA comparison illustrates the accuracy of the CODE 1998 and the GSPM_XYZ.1 models in their intended application. The Block IIR comparison shows that the CODE/VJS-01 model gives the best accuracy of all models tested.

On-Line GPS Processing Using Bernese and IGS Products

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ABSTRACT

We would like to highlight a new project which has been started in our Institute. This is a service which enables users to process automatically their own GPS data through our Internet Web site. The user is requested to fill out the form and send RINEX file to our computer. Then our system begins to start. It downloads all necessary things to make processing, process data and afterwards sends results back to the user. System has been based on Bernese GPS Processing Software v.4.2. The poster presents brief description of the service as well as some first tests performed using it. However due to some technical problems it is not opened for users for now and it is still in testing mode.