3.4 Technique Centres
3.4.1 International GPS Service (IGS)

General Since 1994, the International GPS Service is committed to provide the highest quality data and products as the standard for global navigation satellite systems (GNSS) in support of Earth science research, multidisciplinary applications, and education. Based on GPS+GLONASS observation data, the IGS offers a large number of consistent products which constitute the practical realization of the International Reference System and allow for an easy access to the most recent ITRF (ITRF2000 since end of December 2001-GPSWeek 1143).

Table 1 gives an brief overview of the estimated quality of these data sets at the end of the year 2002.

Table 1: Quality of the IGS Reference Frame products as of December 2002 (for details see <http://igscb.jpl.nasa.gov/components/prods.html>)

Products / Delay	Ultra-Rapid/ Real Time	Rapid/ 17 hours	Final/ 13 days	Units
Orbit (GPS)	15.0	5.0	3.0	cm
SatelliteClocks	5.0 (predicted)	0.1	0.05	ns
Station Clocks		0.1	0.05	ns
Polar Motion		0.1	0.05	mas
LOD		30.0	20.0	μ s/d
Stations h/v			3.0/6.0	mm
Troposphere			4.0	mm ZPD

To ensure enhanced reliability all products are outcome of a combination of the individual IGS Analysis Center (AC) solutions.

Tracking Network In support of the GLONASS stations and to improve the geophysical information available in the site logs, the IGS switched to a new GNSS site log format in June 2002. At the same time, combined GPS/GLONASS stations have become an integral part of the IGS network.

IGS Working Groups/Pilot Projects Within IGS a number of Working Groups focus on selected topics related to the IGS components. Furthermore Pilot Projects have been launched to develop new products and services. A few of them are briefly presented below. For a complete list and descriptions see <http://igscb.jpl.nasa.gov/projects/projindex.html>.

Time Transfer Pilot Project The Time Transfer Pilot Project has further refined its internally realized IGS time scale (IGST; loosely steered to GPS-time). At the end of 2002, the WG was terminated and a new "Clock Product
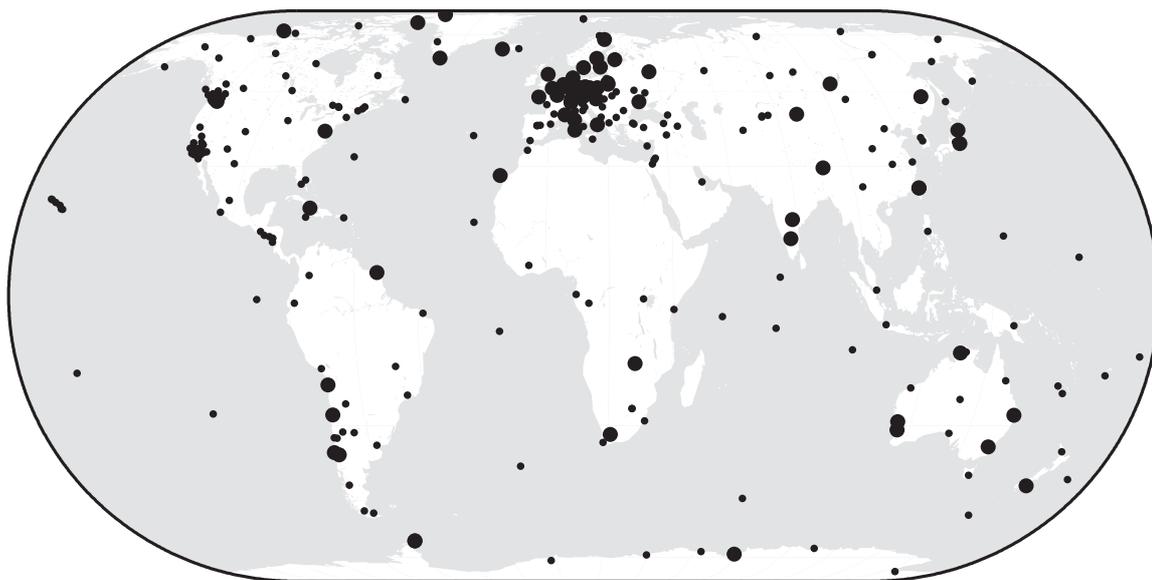
Figure 1: The IGS tracking network as of January 2003

Centre" was set up. This is in recognition of the IGST and IGRT (Rapid) time products as one of the IGS core products next to the orbits.

Galileo/GNSS Working Group

In response to the emerging GALILEO system and the upcoming GPS modernization a Galileo/GNSS Working Group was set up at the end of 2002. The Terms of Reference highlight the objectives of this WG which are, among others, to explore potential contributions of the IGS to reference frame establishment and maintenance for Galileo and to prepare a consolidated feedback for Galileo developments based on relevant IGS experience.

Real-time Working Group

The Real-Time working group has been steadily developing data format, routing, compression, and 1Hz data collection software in support of the growing real-time applications.

LEO Working Group

The LEO working group focuses on demonstrating the impact of processing LEO data on IGS-like products of individual analysis centres as well as on IGS combination products. Currently 4 IGS and 3 special LEO centres process data from the CHAMP and JASON missions under the umbrella of this WG. It is planned to issue the first combined LEO orbits for research purposes mid of 2003. The inclusion of GRACE and ICESAT data, as soon as released, will certainly enhance the overall quality of the analysis centre products. The WG maintains a website at <http://nng.esoc.esa.de/gps/igsleo.html>.

3.4.1 International GPS Service (IGS)

TIGA Working Group

The TIGA network, consisting of IGS receivers collocated with tide gauges is steadily growing and comprises now 26 observing stations. Addressing the height component in routine computation and establishing and maintaining new geodetic ties to tide gauge systems will be further an important contribution to climate change studies. Several analysis centres process the data and the preparations for a combined solution is under way. (<http://op.gfz-potsdam.de/tiga/>)

Data Center Working Group

A new Data Center working group has been set up in 2002. Among the topics to be addressed by this group are an effective data flow redundancy/backup plan, reliability, security and consistency issues at data centres, and the timely archive and dissemination of data as the IGS moves into a real-time mode for selected products. (<http://cddisa.gsfc.nasa.gov/igsdc/>)

Data and Analysis Center Workshop, April 8-11, Ottawa

This IGS workshop was organized around the central theme "Towards Real Time". A variety of applications including weather prediction, ionospheric weather monitoring, satellite and terrestrial navigation, earthquake and volcano monitoring, positioning of structures, surveying, timing and earth orientation would benefit from the availability of Real-Time (RT) GPS raw data products and from RT or Near Real-Time (NRT) products computed from them. In view of this trend workshop participants decided to go ahead with the development of:

- the infrastructure needed to transfer in real time raw GPS data

- the software needed to generate, quality check and disseminate in RT and NRT orbit and clock information and further products like Global Ionospheric Maps (GIM) or Total Zenith Delay estimates

Strategies to implement the upcoming GPS modernization were also discussed at this workshop as the combination of regional network solutions with the IGS global network solutions and the application of absolute antenna phase centre values.

Concerning the IGS products the participants agreed on the following recommendations:

- Time Scale
  Adopt a new time scale for IGS Final and Rapid Products to achieve continuity at day boundaries and allow for a direct link to UTC.

- SP3 Format
  Review and adopt a new version of the SP3 format. To serve the user community keep both the old and the new

format in parallel for a period of at least 1 year. *As recommended the new format, labelled SP3c, has been established in December 2002. The format offers a significant enhanced flexibility e.g. in characterizing the variable accuracy of the given data points within the IGU orbits.*

- GLONASS data processing
  Intensify the ability to process data from combined GPS/GLONASS tracking sites. ACs and AACs are encouraged to provide orbit and clock submissions in order to ensure a reliable combined IGS/GLONASS orbit and clock product.

- IGS Ultra Rapid products
  In view of upcoming NRT- needs explore and implement a more frequent update of the IGU Ultra Rapid Products. An update cycle of 3 hours (currently 12 hours) for IGU products is envisaged. Investigate the option of different update cycles for orbits (6 hours) and clocks (3 hours). In addition, explore the possibility of decreasing the latency of IGU products from currently 3 hours to 2.5 hours as well as the submission of 5-minutes RINEX clock files.

Summary In 2002, as in previous years, the IGS contributed significantly to a number of core activities of the IERS like the maintenance and extension of the International Terrestrial Reference Frame or in establishing highly accurate Earth Rotation Parameter series. For a more detailed information on further activities of the IGS, please refer to IGS Annual and Technical Reports as well as to the IGS Strategic Plan issued by the Central Bureau at JPL.

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