III.2 GPS Coordination Centre

General

The primary objective of the IGS is to provide a Reference System for a wide variety of GPS applications. To fulfil this role the IGS produces a large number of different combined products which constitute the practical realization of the IGS Reference System. Table 1 gives a brief overview of the estimated quality of these different IGS Reference Frame products at the begin of the year 2001.

Table 1: Quality of the IGS Reference Frame products as of March 2001 (for details see <http://igscb.jpl.nasa.gov/components/prods.html>)

Products Delay	Predicted Real Time	Ultra-Rapid Real Time	Rapid 17 hours	Final 13 days	Units
Orbit	50.0	25.0	5.0	< 5.0	cm
Clock	150.0	5.0	0.2	0.1	ns
Polar Motion	(note: delivery		0.2	0.1	mas
LOD	of IGP products		30.0	20.0	µs/d
Stations h/v	terminated in			3.0/6.0	mm
Troposphere	March 2001)			4.0	mm ZPD

Orbit Quality, New Products

Table 2 as well as Figure 1 demonstrate the quality improvement of the IGS orbits since 1994. Figure 1 shows the weighted orbit RMS (WRMS) for the final Analysis Centre solutions with respect to the combined IGS final orbit products. Several Analysis Centres and also the IGS rapid orbit products have reached the 3 centimeter orbit precision level, also indicated by the IGS 7-day arc orbit analysis.

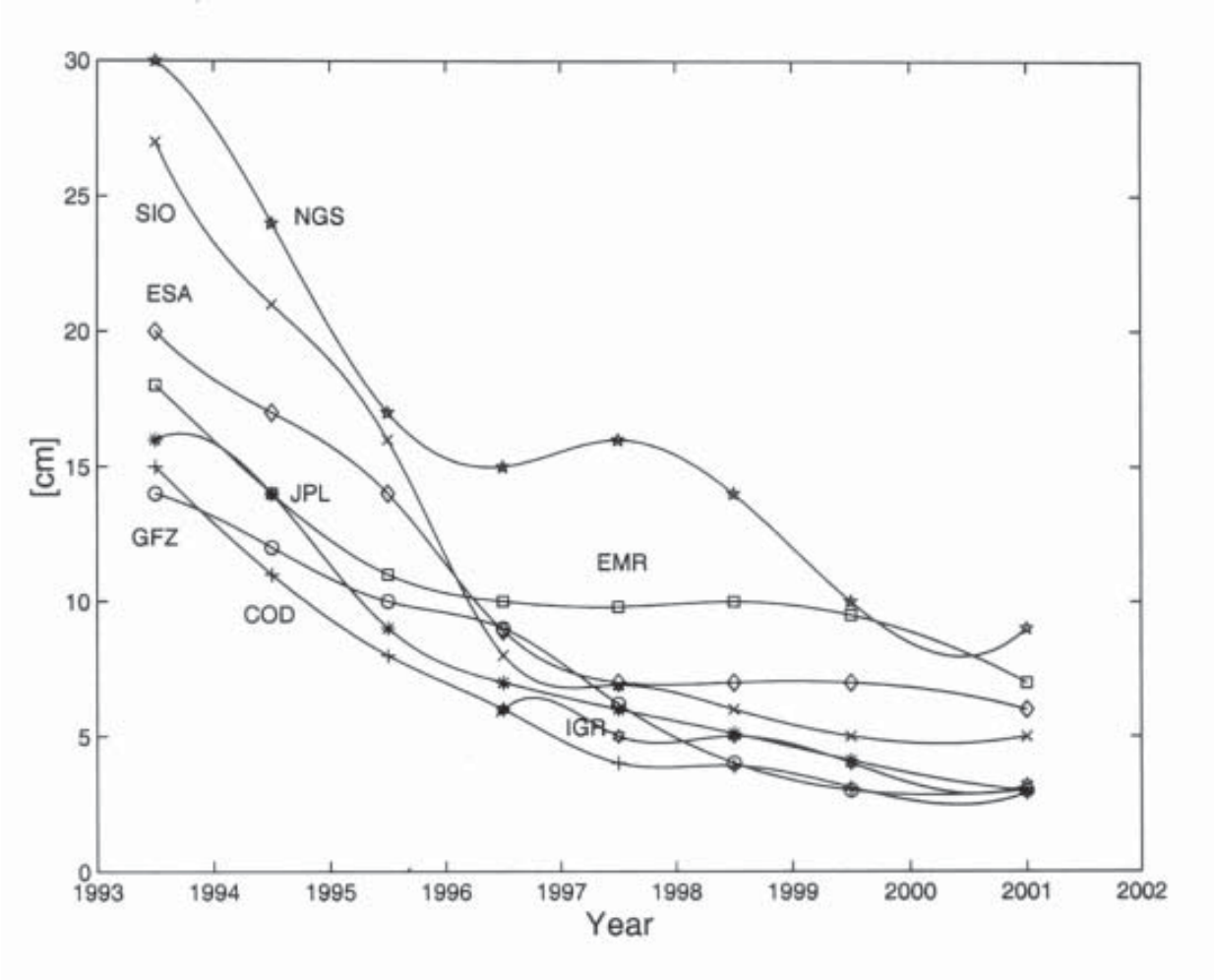
Table 2: Yearly average weighted orbit RMS (cm) of the Analysis Center and the IGS Rapid (IGR) orbit solutions with respect to the IGS final orbits.

Year	COD	EMR	ESA	GFZ	JPL	NGS	SIO	IGR
1994	11	14	17	12	14	32	21	-
1995	8	10	14	10	9	17	16	-
1996	6	10	9	9	7	15	8	6
1997	4	10	7	6	6	16	7	5
1998	4	10	7	4	5	14	6	5
1999	3	10	7	3	4	9	5	4
2000	3	7	6	3	3	9	5	3

Concerning new products the IGS Analysis Center Workshop 2000, hold at the U.S. Naval Observatory in Washington D.C., discussed as a major topic the quality of the recently implemented Ultra-Rapid products as well as their applications, e.g. for the derivation of ground-based GPS meteorological parameters used in numerical weather

prediction. These products, which are delivered every 12 hours (two times per day), contain a 48 hour orbit arc from which 24 hours are real orbit estimates and 24 hours are orbit predictions. The latency of this product is 3 hours. The generation of a combined 'ultra-rapid' product (IGU) has started in March 2000 based on contributions from up to five different Analysis Centres. This product has been made available for real-time usage, like the IGS predicted orbits (IGP), but the quality is significantly better because the average age of the predictions is reduced from 36 to 9 hours. The next months the quality and the reliability of the IGS Ultra rapid (IGU) orbits was assessed against the IGS Predicted (IGP) and the IGS Rapid (IGR) products. During the second half-year of 2000 the individual orbit submissions reached a consistency of about 25 cm. In November 2000 the IGU products became an official IGS product and subsequently the submission of predicted orbits (IGP) could be terminated in March 2001 (Week 1105). Currently seven different Analysis Centres deliver contributions to the Ultra-Rapid products.

Figure 1: Weighted orbit RMS (WRMS) of the Analysis Center and the IGS Rapid (IGR) orbit solutions with respect to the IGS final orbits. WRMS values were smoothed for graphical representation.



A new station and satellite clock combination, which is based on the RINEX clock format, has been implemented in November 2000. This combination provides the normal combined satellite clocks in the orbit (SP3) format and it also provides both satellite and station clocks in the RINEX clock format. These clock products have a sampling rate of 5 minutes, compared to the 15 minutes in SP3. Some Analysis Centres even provide higher sampled clock products, e.g., JPL provides clocks with a sampling rate of 30 sec. The new clock combination distinguishes by a high quality of the provided clocks and it has improved the robustness of the combination process tremendously.

Outlook

The presently active and the upcoming LEO missions have the potential to fundamentally change the IGS as we know it today. It is therefore necessary that the IGS takes an active role in this field if it does not want to loose its position as the service which delivers the reference system for all GPS applications. In this context the generation of more frequent IGS products for near real-time use is an urgent need. Therefore the next IGS Analysis workshop in Ottawa is dedicated to real-time requirements and IGS real-time products. Also the potential interactions between the IGS and various GNSS systems (GPS, GLONASS, Galileo) and the remarkable progress achieved by the various IGS Project groups within the past year have to be considered.

At the end of 2001 IGS will implement the IGS Reference Frame 2000 (IGS 2000) realization. Similar to IGS 1997, the combined orbits will be made consistent to the combined IGS SINEX solution by using the combined ERPs and applying the same transformation parameters as used in the SINEX combination.

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