

Civil GPS Service Interface Committee

30th Meeting Agenda, Renaissance Nashville Hotel, Sunday, 13 September 1998

Timing Subcommittee

Chair: Wlodek Lewandowski, BIPM

Co-Chair: Lisa Nelson, NIST

- 14:30 Introduction- Wlodek Lewandowski, BIPM**
- 14:45 Report from NIST- Lisa Nelson, NIST**
- 15:00 Report from USNO- Francine Vannicola, USNO**
- 15:15 GPS carrier phase time measurements, Calibration facilities at the NRL- Ron Beard, NRL**
- 15:30 USNO Time Scale, Master Clock, and USNO Prediction of UTC- Demetrios Matsakis, USNO**
- 15:45 GLONASS P-code time transfer – Wlodek Lewandowski, BIPM**
- 16:00 Break**
- 16:20 The new TTR12 Receivers, Common View GPS, and NTP- Mihran Miranian, USNO**
- 16:35 Telecommunications Concerns with the Global Positioning System - Ed Butterline, Telecom Solutions**
- 16:50 Open Discussion**
- 17:30 Session end**

AREAS BEING SERVED

- **International Atomic Time (TAI) and UTC**
 - **International Timing Centers**
 - **Primary Frequency Standards**
 - **Telecommunications Industries**
 - **NASA/JPL Deep Space Network**
 - **NIST Global Time Service**
 - **Power Grids and other Industries**
 - **As Research and Comparison Tool**
 - **Other**
-

Challenges facing timing community

- **New Primary Frequency Standards**
 10^{-15} stability for one day
- **Need for their comparisons**
- **Possible solutions**
 - **GPS carrier phase**
 - **GLONASS P-code + Multichannel + TSA**
 - **GPS + GLONASS C/A-code + Multichannel + TSA**

FORMAL BODIES FOR GPS STANDARDIZATION

- **Subcommittee on Time of the Civil GPS Service Interface Committee (CGSIC)**

Forum for the exchange of information between military and civilian

- **CCTF Sub-group on GPS and GLONASS Time Transfer Standards (CGGTTS)**

Group of experts on GPS and GLONASS time-transfer standardization, can take formal actions

NEW TYPE OF TIME RECEIVERS

- **multi-channel**
- **double-system: GPS and GLONASS**
- **multi-code: GPS C/A-code, GLONASS C/A-code and P-code**
- **upgradable**

Laboratories observing GLONASS in common-view and showing interest

Laboratory	Equipment	Estim. uncert. of GLONASS ant. coord. in the ITRF /m
<u>1. Laboratories observing GLONASS in common-view:</u>		
BIPM (Sevres, France)	R-100/10 R-100/30 GPS opt.	0,3
USNO (Washington D.C., USA)	R-100/10	0,1
NIST (Boulder, Colorado, USA)	R-100/30 GPS opt.	
3S (California, USA)	R-100/10 R-100/30 GPS opt.	10,0
RIRT (St. Petersburg, Russia)	ASN-16-01	10,0
VSL (Delft, Netherlands)	R-100/40 GPS opt.	4,0
DLR (Oberpfaffenhofen, Germ.)	R-100/30 GPS opt.	3,0
BIRM (Beijing, China)	ASN-16-02 R-100/30 GPS opt.	
LDS (Leeds, UK)	Spot	
CRL (Tokyo, Japan)	R-100/40 GPS opt.	
<u>2. Laboratories in preparation or showing interest:</u>		
VNIIFTRI (Mendeleevo, Russia)	ASN-16-02	
TL (Chung-Li, Taiwan)	R-100/30	
NPLI (New Delhi, India)	R-100/10	
IFAG (Wetzell, Germany)	R-100	
CSIR (Pretoria, South Africa)	R-100/30	
ORRORAL (Austarlia)	R-100/30	
NPL (Teddington, UK)	R-100/30	

PS DATA FORMAT VERSION = 01

Z = 1995-11-01

3s NAVIGATION 3S R-101 CE #X/P-CODE 3029 rev C 1992 729o/R101_R24,R101_R24

0

S NAVIGATION 3S R-101 CE #X/P-CODE 3029 rev C 1992 729o/R101_R24,R101_R24

IPM

03643.46m(GPS) +4203643.46m(GLO)

62933.53m(GPS) +162933.53m(GLO)

78193.65m(GPS) +4778193.65m(GLO)

WGS84(GPS) WGS84(GLO)

S = For GLONASS, thr satellite position in WGS84.(WGS84->PZ90 TX param: 0.0 0.0 2.0 0.0 0.0 0.0 -0.000002)

= 1366.0ns(GPS), 1312.0ns(GLO)

= 102.0ns, GPS DLY = 0.0ns, GLO DLY = 0.0ns

= 13.1ns, 0.0ps/s AT 5072200:00:00

XXX

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MJD	STTIME	TRKL	ELV	AZTH	REFSV	SRSV	REFGPS	SRGPS	DSG	IOE	MDTR	SMDT	MDIO	SMDI	HSIO	SMSI	ISG	CR			
	hhmmss	s	.ldg	.ldg	.lns	.lps/s	.lns	.lps/s	.lns		.lns.lps/s	.lns.lps/s	.lns.lps/s	.lns.lps/s	.lns.lps/s	.lns					
50776	165800	780	408	3174	-1792982	-96	-6853	-87	74	79	123	-21	98	-15	74	-32	1	48	22	C 1P	
50776	165600	760	761	977	-1603505	-21	-7049	-49	43	79	83	+1	74	+0	9999	9999	999	B1	4	0	1C
50776	165800	780	179	1659	t425791	t635	-19104	+583	511	78	261	+98	204	t32	9999	9999	999	41	26	1	1C
50776	165800	780	689	1017	+176282	+446	-19289	+432	388	190	86	+3	79	to	9999	9999	999	04	9	3	1C
50776	165800	780	311	2423	t98896	-1254	-19292	-1275	502	22	156	-31	141	-27	9999	9999	999	3E	30	4	1C
50776	165800	780	778	2446	-1255544	t217	-18699	+232	285	15	82	-2	77	-4	9999	9999	999	FF	5	5	1C
50776	165800	780	212	433	-7632148	t1546	-19022	t1557	384	64	222	t51	137	+5	9999	9999	999	01	7	6	1C
50776	165800	780	312	2003	-1201102	-0	-7035	+64	98	79	156	-40	141	-35	9999	9999	999	DB	10	7	1C
50776	165800	780	408	3174	-1793033	-94	-6904	-85	112	79	123	-21	98	-15	9999	9999	999	E3	22	9	1C
50776	165800	780	778	1108	+128009	+50	-6943	t23	44	79	82	-1	73	-3	9999	9999	999	BO	24	A	1C
50776	171400	780	755	707	+128006	+43	-6979	t15	15	81	83	t2	70	-2	93	-5	0	BF	24	C	1P
50776	171400	780	691	1199	-1003418	+97	-6999	+61	38	81	86	+4	74	+0	9999	9999	999	CF	4	0	1C
50776	171400	780	620	1095	t176159	-2612	-19426	-2627	456	190	91	t6	80	+1	9999	9999	999	OD	9	3	1C
50776	171400	780	377	2467	+99633	-3736	-18576	-3758	587	22	131	-20	118	-21	9999	9999	999	56	30	4	1C
50776	171400	780	847	2686	-1255386	-402	-18527	-387	614	15	81	+0	73	-3	9999	9999	999	F2	5	5	1C
50776	171400	780	399	2035	-1201151	-63	-7026	+1	66	81	125	-23	112	-25	9999	9999	999	DA	10	7	1C
50776	171400	780	490	3197	-1792976	+118	-6845	t127	125	81	107	-14	85	-12	9999	9999	999	39	22	9	1C
50776	171400	780	755	707	+128005	+33	-6980	t6	42	81	83	t2	70	-2	9999	9999	999	5A	24	A	1C

IGS/BIPM Pilot Project

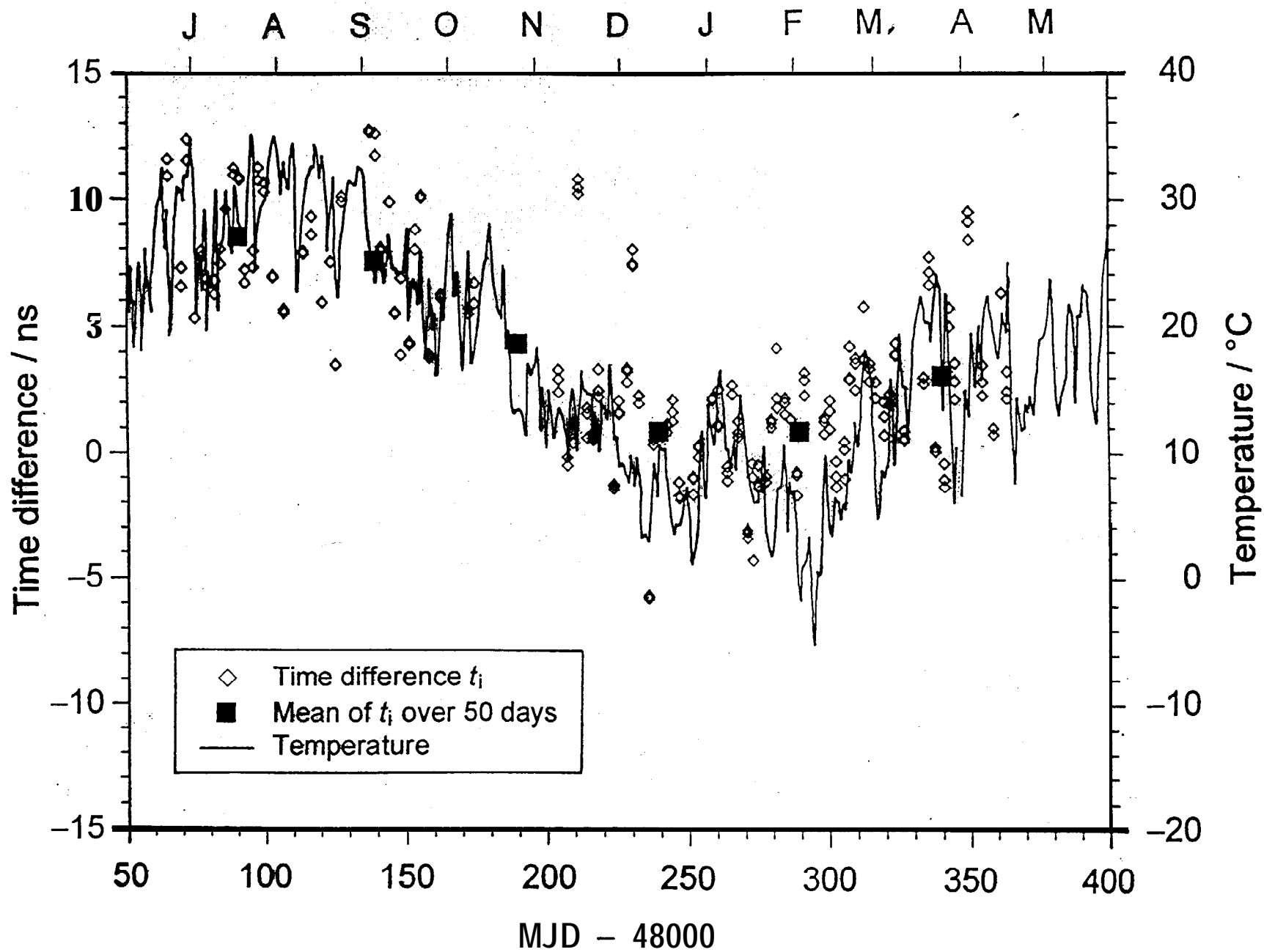
To Study

**Accurate Time and Frequency Comparisons Using
GPS Phase and Code Measurements**

CCTF WORKING GROUP ON TWO-WAY SATELLITE TIME TRANSFER

Last meeting: 9 March 1998 in Warsaw, Poland

Next meeting: October 1998 in San Fernando, Spain



Circular T - TWSTT

$$Y1 = TUG - NIST \quad Y2 = PTB - NIST$$

Cir. T - TWSTT

Δ TUG - NIST

mean = -0.3 μ s

st. dev. = 3.2 μ s



PTB - NIST

mean = -0.7 μ s

st. dev. = 3.2 μ s

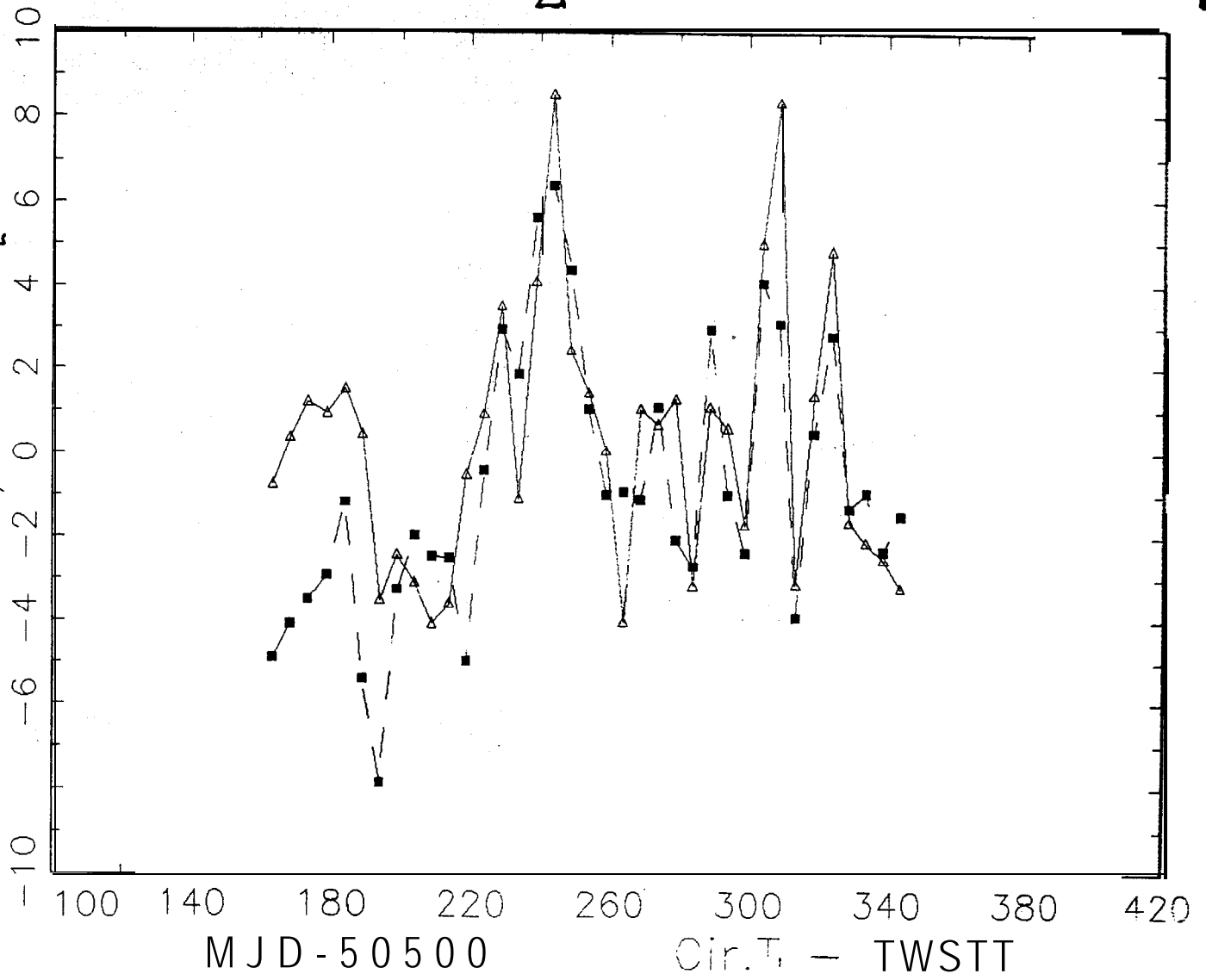
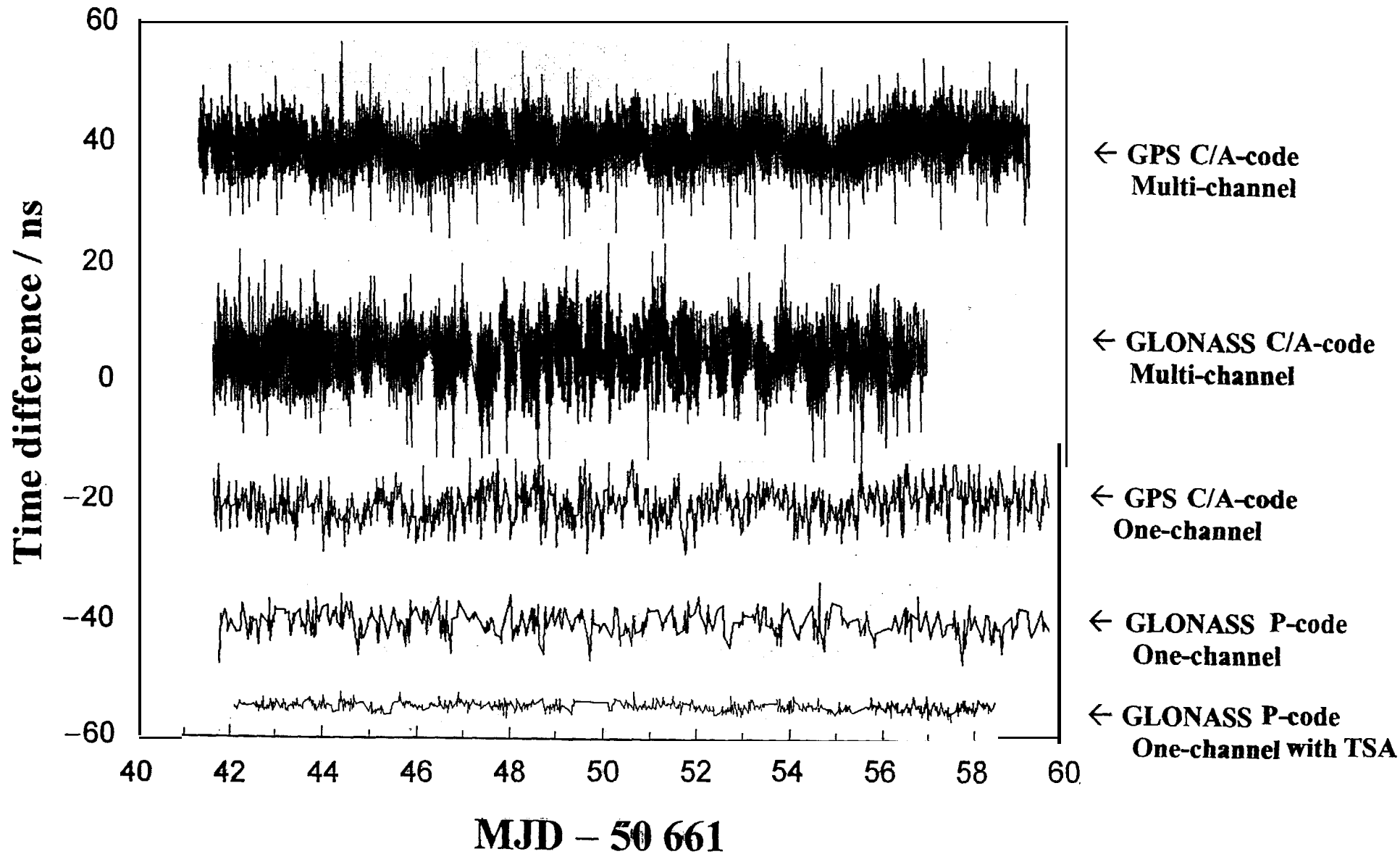


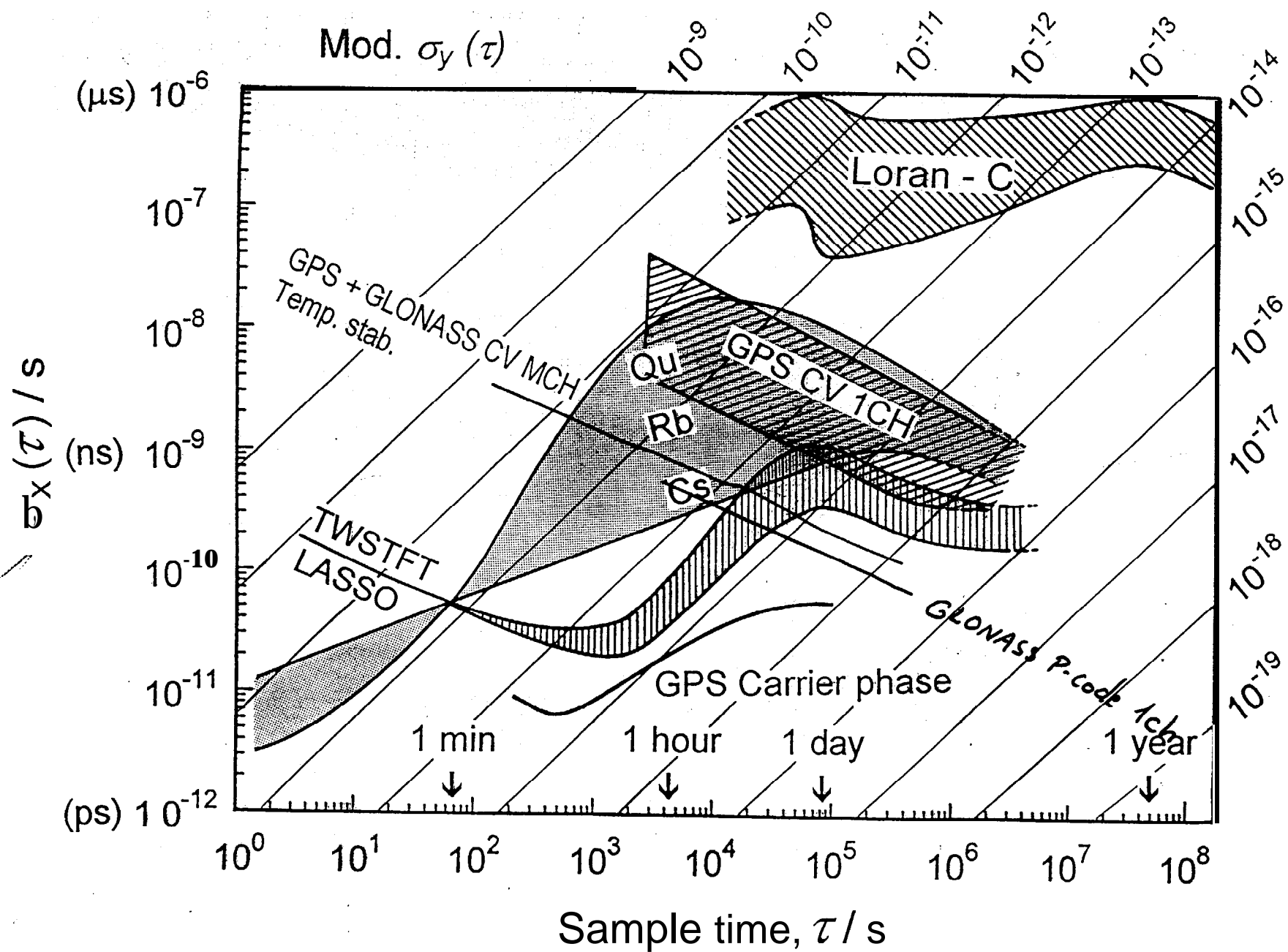
Figure 13

GLONASS P code biases

Freq. N°	BIFM	VSL'	BIPM-VSL
	Ins	/ns.	. /ns
1	-7.8	-7.7	+0.1
4	-5.4	-7.6	-2.2
6	-2.3	-5.1	-2.8
9	-0.2	-1.0	-0.8
10	0	0	0
12	-1.0	+0.9	+1.9
13	-1.1	+1.7	+2.8
21	-1.3	+3.9	+5.2
22	-0.6	+4.1	+4.7
24	-1.6	+2.9	+4.5

ZERO-BASELINE COMPARISON





Scientific Assembly of the International Association of Geodesy

3 -9 September 1997

Rio de Janeiro

IGEX - Internatioma-1 GLONASS Experiment
(GLONASS **precise** ephemerides **in** ITRF at the end of 1998)