

CORE Operation Center Report

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Abstract

This report gives a synopsis of the activities of the CORE Operation Center from January 2005 to December 2005. The report forecasts activities planned for the year 2006.

1. Changes to the CORE Operation Center's Program

The Earth orientation parameter goal of the IVS program is to attain precision at least as good as $3.5 \mu\text{s}$ for UT1 and $100 \mu\text{as}$ in pole position.

The IVS program was started in 2002 and used the Mark IV recording mode for each session. The IVS program began using the Mark 5 recording mode in mid 2003. Most stations were using the Mark 5 recording mode by the end of 2004. This change resulted in the 2004 sessions being processed more efficiently and freeing up correlator time. As a result, the program became station and media dependent rather than correlator dependent. The following are the network configurations for the sessions for which the CORE Operation Center was responsible:

CONT-05: 15 sessions, scheduled consecutively, 11 station network

IVS-R1: 52 sessions, scheduled weekly on Mondays, seven station network

RDV: 6 sessions, scheduled evenly throughout the year, 18 to 20 station network

IVS-R&D: 10 sessions, scheduled monthly, seven station networks

2. IVS Sessions January 2005 to December 2005

This section displays the purpose of the IVS sessions for which the CORE Operations Center is responsible.

- CONT-05: The CONT05 Campaign was a continuous 15 day session with 11 stations which was observed during September 2005. The CONT05 sessions are the follow-on to the spectacularly successful CONT94 observed in January 1994 and the follow-up CONT95 (August 1995), CONT96 (fall 1996), and CONT02 (October 2002). Tsukuba recorded with e-vlbi and the other participating stations recorded with Mark 5.
- IVS-R1: In 2005, the IVS-R1s were scheduled weekly with a seven station network. There was a core network for each day plus three other stations until early September. Westford did not participate after September 7 due to budget problems. Fortunately, Matera became operational in July 2005 after being down for 1.5 years. Fortaleza was scheduled to join the IVS-R1 sessions in July 2005 after receiving their Mark 5. Fortaleza did receive their Mark 5 in 2005 but Fortaleza only participated in two IVS-R1 sessions.

The purpose of the IVS-R1 sessions is to provide weekly EOP results on a timely basis. These sessions provide continuity with the previous CORE series. The "R" stands for rapid turnaround because the stations, correlators, and analysts have a commitment to make the the time delay from the end of recording to results as short as possible. The time delay goal

is a maximum of 15 days. Participating stations are requested to ship discs to the correlator as rapidly as possible. The “1” indicates that the sessions are on Mondays.

- RDV: There are six bi-monthly coordinated astrometric/geodetic experiments each year that use the full 10-station VLBA plus up to 10 geodetic stations.

These sessions are being coordinated by the geodetic VLBI programs of three agencies: 1. USNO will perform repeated imaging and correction for source structure; 2. NASA will analyze this data to determine a high accuracy terrestrial reference frame; and 3. NRAO will use these sessions to provide a service to users who require high quality positions for a small number of sources. NASA (the CORE Operation Center) prepares the schedules for the RDV sessions.

- R&D: The purpose of the 10 R&D sessions in 2005, as decided by the IVS Program Committee, was to record at 1 Gbit/s data rate to evaluate the geodetic results. Those experiments also tested the entire data flow from scheduling through analysis for the higher data rate. There were seven regular stations that participating in the R&D sessions during 2005.

3. Current Analysis of the CORE Operation Center’s IVS Sessions

Table 1 gives the average formal errors for the R1, R4, RDV and CONT05 sessions from 2005. The R4 and T2 sessions have significantly better formal uncertainties in 2005 compared with 2004. The CONT05 formal errors are better than for previous CONT series by 20-30%. R1 and RDV formal uncertainties are worse than in 2004. For R1s this is probably due to problems with Gilcreek. We are currently investigating the cause of the degradation in RDV uncertainties in the last 2-3 years.

Table 2 shows the EOP differences relative to IGS for the different series. The level of agreement in 2005 is about the same for the R1 and R4s as in 2004. WRMS differences for the RDVs are significantly less in 2005, but with only 5 sessions it is not clear that one can make statistically significant conclusions. One of the 4 T2 sessions is dominating the large differences seen for 2005, but it is not obvious why this session is a large outlier. The CONT05 sessions have significantly better agreement with IGS than the R1 and R4s. This is likely due to the larger size and better global distribution of sites of the CONT05 network.

Table 1. Average EOP Formal Uncertainties for 2005

Session Type	Num	X-pole (μ as)	Y-pole (μ as)	UT1 (μ s)	DPSI (μ as)	DEPS (μ as)
R1	50	73(61)	72(62)	3.0(2.4)	157(138)	62(56)
R4	49	68(90)	65(78)	2.5(3.2)	149(177)	60(71)
CONT05	15	37	37	1.5	76	28
T2	5	70(98)	68(85)	3.1(3.9)	165(215)	66(79)
RDV	5	44(37)	51(40)	2.6(1.9)	89(76)	35(30)

Values for 2004 are shown in parenthesis

Table 2. Offset and WRMS Differences (2005) Relative to the IGS Combined Series

Session Type	Num	X-pole		Y-pole		LOD	
		Offset (μ as)	WRMS (μ as)	Offset (μ as)	WRMS (μ as)	Offset (μ s/d)	WRMS (μ s/d)
R1	50	27(2)	101(94)	-192(-246)	103(101)	-3(-1)	17(16)
R4	49	-71(-130)	101(104)	-262(-273)	101(104)	0(3)	19(21)
C0NT05	15	1	57	-236	40	17	17
T2	4	251(-9)	413(176)	-330(-224)	154(129)	14(-2)	29(20)
T2	3	34	191	-226	35	0	29
RDV	5	-27(30)	32(101)	-153(192)	43(103)	5(-3)	20(17)

Values for 2004 are shown in parenthesis

4. The CORE Operations Staff

Table 3 lists the key technical personnel and their responsibilities so that everyone reading this report will know whom to contact about their particular question.

Table 3. Key Technical Staff of the CORE Operations Center

Name	Responsibility	Agency
Dirk Behrend	Organizer of CORE program	NVI, Inc./GSFC
Steve Bailey	Procurement of materials necessary for CORE operations	GSFC/NASA
Brian Corey	Analysis	Haystack
Irv Diegel	Maser maintenance	Honeywell
John Gipson	SKED program support and development	NVI, Inc./GSFC
Frank Gomez	Software engineer for the Web site	Raytheon/GSFC
David Gordon	Analysis	Raytheon/GSFC
Ed Himwich	Network Coordinator	NVI, Inc./GSFC
Chuck Kodak	Receiver maintenance	Honeywell
Dan MacMillan	Analysis	NVI, Inc./GSFC
Leonid Petrov	Analysis	NVI, Inc./GSFC
Dan Smythe	Tape recorder maintenance	Haystack
Cynthia Thomas	Coordinate master observing schedule and prepare observing schedules	NVI, Inc./GSFC

5. Planned Activities during 2006

The CORE Operation Center will continue to be responsible for the following IVS sessions during 2006.

- The IVS-R1 sessions will be observed weekly and recorded in a Mark IV mode.
- The IVS-R&D sessions will be observed 10 times during the year. The purpose of the R&D sessions in 2006 as determined by the IVS Observing Program Committee is to continue studying how to use Gb/s data rate for geodesy. Phase delay will be attempted and the SNRs will be set high.
- The RDV sessions will be observed 6 times during the year.