CORE Operation Center Report

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Abstract

This report gives a synopsis of the activities of the CORE Operation Center from January 2009 to December 2009. The report forecasts activities planned for the year 2010.

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 μs for UT1 and 100 μas for pole position.

The IVS program, which started in 2002, used the Mark IV recording mode for each session. The IVS program began using the Mark 5 recording mode in mid-2003. By the end of 2007, all stations were upgraded to Mark 5. Due to the efficient Mark 5 correlator, the program continues to be dependent on station time and media. The following are the network configurations for the sessions for which the CORE Operation Center was responsible in 2009:

IVS-R1: 52 sessions, scheduled weekly and mainly on Mondays, six to eight station networks

RDV: 6 sessions, scheduled evenly throughout the year, 15 to 16 station networks

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

2. IVS Sessions from January 2009 to December 2009

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

- IVS-R1: In 2009, the IVS-R1s were scheduled weekly with six to eight station networks. There were seven stations that participated in at least half of the scheduled sessions—Ny-Ålesund, Westford, Tigo, Hobart, Kokee, Tsukuba, and Wettzell. Both Badary and Zelenchukskaya were tagged along to all 13 IVS-R1 sessions in which the two stations participated.

  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 the 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 mainly on Mondays.

- RDV: There are six bi-monthly coordinated astrometric/geodetic experiments each year that use the full 10-station VLBA plus up to 8 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 2009, as decided by the IVS Observing Program Committee, was as follows. The purpose of session one and sessions three through six was to determine the positions of some sources that do not have good positions. The purpose of session two was to support the "target of opportunity" observation of the close approach of Saturn to a compact radio source (1125+062). The purpose of sessions seven through ten was to improve the technique used to schedule the Intensive sessions.

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

Table 1 gives the average formal errors for the R1, R4, RDV, and T2 sessions from 2009. The R1 sessions' formal uncertainties appear to be following a trend of becoming worse over the three years 2007-2009. The most likely reason is network differences, but this should be investigated. On the other hand, uncertainties for the 2009 R4 sessions are generally about the same as for 2007-2008.

The RDV uncertainties are better in 2009 than in the preceding two years. This is not explained by network size since there were 15-16 sites in 2007 and 2009 and 17-18 sites in 2008, but it is possible that network geometry has an effect.

Table 2 shows the EOP differences with respect to IGS for the R1, R4, T2, and RDV series. The WRMS differences were computed after removing a bias, but estimating rates does not affect the residual WRMS significantly. The RDV series have the best WRMS agreement with IGS in 2009 as well as for sessions since 2000. The R1 series show worse WRMS agreement (X-pole and Y-pole) for 2009 than for the R1 series since 2000. This is consistent with the formal error trend. For all session types, the level of LOD WRMS agreement in 2009 is better than the LOD WRMS agreement for all sessions of that type since 2000. There are some significant biases greater than 100 μas between the VLBI and the GPS series that should be investigated.

Table 1. Average EOP Formal Uncertainties for 2009

Session Type	Num	X-pole (μas)	Y-pole (μas)	UT1 (μs)	DPSI (μas)	DEPS (μas)
R1	52	59(56,45)	59(51,43)	2.2(2.4,1.9)	124(109,82)	50(42,33)
R4	52	69(72,69)	73(79,73)	2.6(2.8,2.9)	175(176,162)	66(73,68)
RDV	5	38(43,50)	39(45,53)	1.7(2.2,2.8)	71(77,92)	27(30,41)
T2	2	44(53,44)	48(66,49)	2.2(2.7,2.2)	103(127,107)	40(55,36)

Values in parentheses are for 2008 and then 2007

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 2. Offset and WRMS Differences (2009) Relative to the IGS Combined Series

Session Type	Num	X-pole		Y-pole		LOD	
		Offset (μas)	WRMS (μas)	Offset (μas)	WRMS (μas)	Offset (μs/d)	WRMS (μs/d)
R1	52(408)	-49(22)	115(94)	127(88)	104(95)	-2(1)	15(17)
R4	52(407)	-12(-18)	107(109)	86(82)	118(110)	-2(1)	17(19)
RDV	5(77)	-68(73)	85(87)	174(129)	78(89)	-7(1)	7(15)
T2	3(62)	19(36)	68(134)	229(52)	93(124)	12(2)	11(20)

Values in parentheses are for the entire series (since 2000) for each session type

Table 3. Key Technical Staff of the CORE Operations Center

Name	Responsibility	Agency
Dirk Behrend	Organizer of CORE program	NVI, Inc./GSFC
Brian Corey	Analysis	Haystack
Irv Diegel	Maser maintenance	Honeywell
Mark Evangelista	Receiver 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	NVI, Inc./GSFC
Ed Himwich	Network Coordinator	NVI, Inc./GSFC
Dan MacMillan	Analysis	NVI, Inc./GSFC
David Rubincam	Procurement of materials necessary for CORE operations	GSFC/NASA
Braulio Sanchez	Procurement of materials necessary for CORE operations	GSFC/NASA
Dan Smythe	Tape recorder maintenance	Haystack
Cynthia Thomas	Coordination of master observing schedule and preparation of observing schedules	NVI, Inc./GSFC

5. Planned Activities during 2010

The CORE Operation Center will continue to be responsible for the following IVS sessions during 2010.

- The IVS-R1 sessions will be observed weekly and recorded in a Mark 5 mode.
- The IVS-R&D sessions will be observed 10 times during the year.
- The RDV sessions will be observed 6 times during the year.