CORE Operation Center Report

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Abstract

This report gives a synopsis of the activities of the CORE Operation Center from January 2011 to December 2011. The report forecasts activities planned for the year 2012.

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 2011:

IVS-R1: 50 sessions, scheduled weekly and mainly on Mondays, six to eleven station networks

RDV: Six sessions, scheduled evenly throughout the year, 13 to 19 station networks

IVS-R&D: Seven sessions, scheduled monthly, eight to eleven station networks

2. IVS Sessions from January 2011 to December 2011

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

- IVS-R1: In 2011, the IVS-R1s were scheduled weekly with six to eleven station networks. During the year, 21 different stations participated in the IVS-R1 network, but there were only eight stations that participated in at least half of the scheduled sessions—Wettzell (50), Ny-Ålesund (45), Tsukuba (44), Tigo (42), Westford (36), Hobart-12m (27), Kokee (27), and HartRAO (26). Several new stations were added to the IVS-R1s during 2011, Katherine (9), Kashima-11m (9), Warkworth (9), and Yarragadee (8).

  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 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 disks to the correlator as rapidly as possible or to transfer the data electronically to the correlator using e-VLBI. 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 nine geodetic stations.

  These sessions are being coordinated by the geodetic VLBI programs of three agencies: 1. USNO performs repeated imaging and correction for source structure; 2. NASA analyzes this data to determine a high accuracy terrestrial reference frame; and 3. NRAO uses 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 seven R&D sessions in 2011, as decided by the IVS Observing Program Committee, was to test the 512 Mbps recording mode for CONT11 for the first five sessions. The purpose of the last two sessions was to support observations close to the Sun.

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 2011. The R1 session formal uncertainties are not significantly different from the 2009-2010 errors. The R4 uncertainties for 2011 sessions are better than for 2010. This improvement is likely due to the improved network geometry since several stations were not available in 2010. Specifically, Fortaleza, Katherine, and Yarragadee were not available in 2010. RDV uncertainties are not significantly different among the three years from 2009 to 2011. Clearly the RDV formal errors are significantly better than any of the other experiment series. This is due to the larger number of RDV stations as well as better global geometry.

Table 2 shows the EOP differences with respect to the IGS series for the R1, R4, RDV, and T2 series. The WRMS differences were computed after removing a bias, but estimating rates did not affect the residual WRMS significantly. Both the R1 and R4 series show worse WRMS agreement in x-pole and y-pole for 2011 than for the R1 and R4 series since 2000. This is consistent with the formal error trend for the R4s, but it is not clear why the agreement is worse for the R1s. There are some significant biases greater than 100 μas between the VLBI and GPS series that should be investigated. Formal uncertainties of the bias estimates are not shown, but the polar motion biases are all several sigma. Of all the series, the RDV series has the best WRMS agreement of x-pole and y-pole with IGS in 2011 as well as for all sessions since 2000. However, there are really too few RDV and T2 sessions to give significance to the WRMS differences for 2011 compared with the full series from 2000-2011.

Table 1. Average EOP Formal Uncertainties for 2011.

Session Type	Num	X-pole (μas)	Y-pole (μas)	UT1 (μs)	DPSI (μas)	DEPS (μas)
R1	51	65(60,61)	64(58,61)	3.0(3.0,2.4)	112(116,128)	45(47,51)
R4	5l	85(96,72)	76(84,77)	3.2(3.2,2.9)	163(172,189)	66(71,72)
RDV	3	42(42,40)	44(43,40)	2.0(2.0,1.7)	71(68,68)	26(28,27)
T2	3	113(93,79)	125(100,89)	5.5(5.2,4.1)	255(192,171)	90(75,69)

Values in parentheses are for 2010 and then 2009.

Table 2. Offset and WRMS Differences (2011) Relative to the IGS Combined Series.

Session Type	Num	X-pole Offset (μas)	X-pole WRMS (μas)	Y-pole Offset (μas)	Y-pole WRMS (μas)	LOD Offset (μs/d)	LOD WRMS (μs/d)
R1	51(510)	-102(-43)	108(95)	105(67)	109(87)	0.6(0.2)	17(17)
R4	51(507)	-92(-77)	128(112)	85(62)	129(112)	0.4(1.5)	16(18)
RDV	3(69)	-96(12)	92(78)	127(68)	8(70)	-5.1(-0.3)	9(15)
T2	3(76)	-85(-44)	100(140)	139(47)	253(124)	21.2(1.4)	23(20)

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

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
Brian Corey	Analysis	Haystack
Ricky Figueroa	Receiver maintenance	ITT Exelis
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
Katie Pazamickas	Maser maintenance	ITT Exelis
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 2012

The CORE Operation Center will continue to be responsible for the following IVS sessions during 2012.

- The IVS-R1 sessions will be observed weekly and recorded in a Mark 5 mode.

- The IVS-R&D sessions will be observed ten times during the year.
- The RDV sessions will be observed six times during the year.