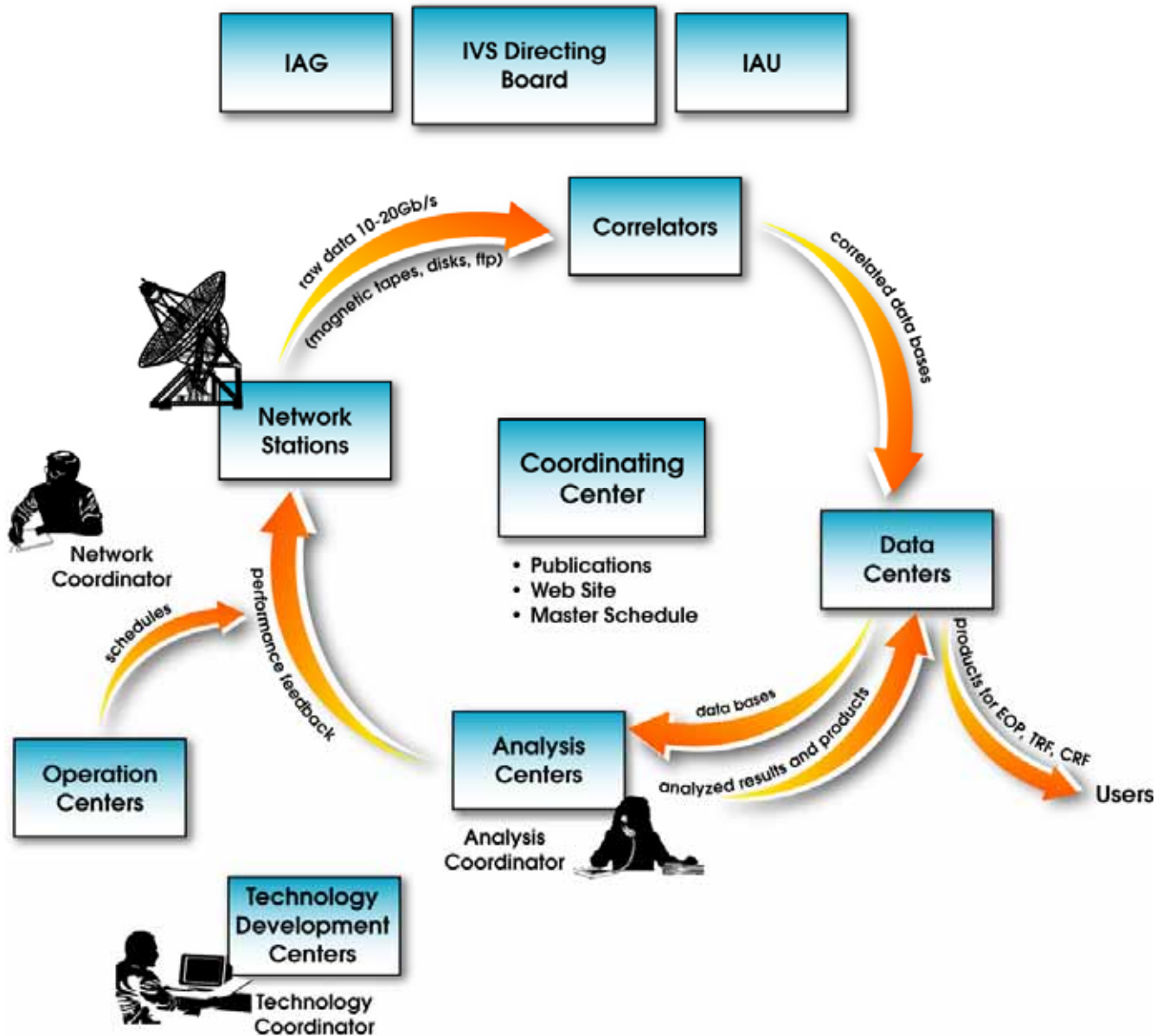




# 国際測地VLBI

NICT鹿島宇宙通信研究センター  
小山泰弘

# ORGANIZATION OF INTERNATIONAL VLBI SERVICE





# Contributions from Japan

- Participating Organizations from Japan
  - GSI
  - NAO
  - NICT
  - NIPR
- Network Stations in Japan
  - Kashima (34m, 11m)
  - Koganei (11m)
  - Mizusawa (10m)
  - Syowa (10m)
  - Tsukuba (32m)



# Mark 5 + K5 Usage Plan

NRV last updated 040208

	2003					2004									
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
<b>Correlator</b>															
Bonn	4	8	8	8	8	8	8	8	8	8	8	8	8	8	
Haystack	2	2	2	4	4	4	4	6	6	6	6	6	6	6	
Washington	2	2	2	4	4	6	6	8	8	8	8	8	8	8	

	2003					2004									
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	
<b>Station</b>															
Algonquin	thin tape					thin tape		Mk5 partial			Mk5 only				
Fortaleza	thin tape					thin tape			Mk5 partial		Mk5 only				
Gilmore Creek	thin tape					thin tape			Mk5 partial		Mk5 only				
GGAO	thin tape					thin tape			Mk5 partial		Mk5 only				
HartRAO	thin tape					thin tape			Mk5 partial		Mk5 only				
Hobart	thin tape					thin tape			Mk5 partial		Mk5 only				
Kashima34	thin tape		K5 partial			K5 partial					Mk5 only				
Kokee Park	thin tape					thin tape			Mk5 partial		Mk5 only				
Matera	thin tape					thin tape			Mk5 partial		Mk5 only				
Medicina	thin tape					thin tape			Mk5 partial		Mk5 only				
Noto	thin tape					thin tape			Mk5 partial		Mk5 only				
Ny Alesund	thin tape			thin tape		thin tape			Mk5 partial		Mk5 only				
O'Higgins	thin tape			thin tape		thin tape			Mk5 partial		Mk5 only				
Onsala	thin tape			thin tape		thin tape			Mk5 partial		Mk5 only				
Seshan	thin tape			thin tape		thin tape			Mk5 partial		Mk5 only				
Simeiz	thin tape					thin tape			Mk5 partial		Mk5 only				
Svetloe	thin tape					thin tape			Mk5 partial		Mk5 only				
TIGO	thin tape			thin tape		thin tape			Mk5 partial		Mk5 only				
Tsukuba	thin tape					thin tape			Mk5 partial		Mk5 only				
Urumqi	thin tape					thin tape			Mk5 partial		Mk5 only				
Westford	thin tape					thin tape			Mk5 partial		Mk5 only				
Wetzell	thin tape					thin tape			Mk5 partial		Mk5 only				
Yebe	thin tape					thin tape			Mk5 partial		Mk5 only				
Yellowknife	thin tape					thin tape			Mk5 partial		Mk5 only				

- Mk5 only
- Mk5 partial
- K5 partial
- thin tape
- thick tape



# IVS Working Groups

- IVS Working Group 1 (Feb.2000~Sep.2000)
  - GPS Phase Center Mapping
    - Examined feasibility to measure Phase Center of GPS Satellites with VLBI
- IVS Working Group 2 (Feb.2001~Feb.2002)
  - Product Specification and Observing Programs
    - Defined IVS's Purposes and Observing Strategies
- IVS Working Group 3 (Sep.2003~ )
  - VLBI2010
    - Consider VLBI system in 2010 and beyond



# WG2 on Product Specification and Observing Programs

## Products

## Status

## Goals(2002-2005)

○ polar motion	accuracy latency resolution freq. of sessions	$x_p \sim 100 \mu\text{s}$ , $y_p \sim 200 \mu\text{s}$ 1-4 weeks... 4 months 1 day ~3 d/week	$x_p, y_p$ : 50 ... 25 $\mu\text{s}$ 4 - 3 days...1day 1 day...1h... 10min .....7d/week
○ UT1	accuracy latency resolution	5... 20 $\mu\text{s}$ 1 week 1 day	3..... 2 $\mu\text{s}$ 4 - 3 days .... 1day 1 day ..... 10min
○ $\Delta\varepsilon, \Delta\psi$	accuracy latency resolution freq. of sessions	100... 400 $\mu\text{arcsec}$ 1-4 weeks... 4 months 1 day ~3 d/week	50...25 $\mu\text{arcsec}$ 4 - 3days... 1 day 1 day ..... 7 d/week
○ TRF (x,x,z)	accuracy ....	5-20 mm ....	5 ..... 2 mm ....
○ CRF	accuracy  freq. of solution latency	0.25-3 mas  1 y 3-6 months	0.25 mas (improved distribution)  1 y 3 ..... 1 month(s)
○ .....	.....	.....	.....



# After WG2 Report

- IVS Observing Program Committee established in Sept. 2001
  - Members : OPC members : W. Himwich, K. Kingham, A. Searle, C. Ma, A. Niell, A. Nothnagel, K. Takashima, Y. Koyama, C. Thomas, N. Vandenberg
  - Discuss observing programs and review proposals
- Observing program 2002: geodetic VLBI observations increased by about 30% from 2001
- Goal: future increase by ~100% till 2005





# VLBI2010 : Motivations and Aims

## ○ Motivations :

- Many aged VLBI stations
- RFI, especially in S-band
- Un-even distribution of VLBI stations
- High operational costs
- Long processing time

## ○ Aims at :

- Better geodetic and astrometric data
- Low cost construction and operation
- Fast turn-around of results



# VLBI2010 : Discussion Items

- Modernization of VLBI data-acquisition systems for higher stability and reliability, wider bandwidth, lower cost
- Small, low-cost, fast-moving antennas
- New observing strategies
- Optimum and practical observing frequencies
- Fully automated observations; remote monitoring
- Transmission of data via high-speed network (e-VLBI)
- Possible correlator upgrades
- Fast turnaround of results by full pipelining of data from antennas to correlator to final analysis



# VLBI2010 : Schedule

- Establishment : Sep. 28, 2003 (IVS Directing Board Meeting)
- Discussions : Feb., 2004 (IVS General Meeting)
- 1st. Draft : April, 2004
- Discussions : October 5, 2004 (e-VLBI Workshop)
- Final Report : Fall, 2004 (?)



# VLBI2010 : Members

- |                    |  |
|--------------------|--|
| Brian Corey        | – antennas, RF/IF systems, calibration                 |
| Hayo Hase          | – antenna systems                                      |
| Ed Himwich         | – control, data management                             |
| Hans Hinteregger   | – digital backend systems, correlators                 |
| Tetsuro Kondo      | – data systems, data transport, real-time              |
| Yasuhiro Koyama    | – data systems, data transport                         |
| Chopo Ma           | – post-correlation analysis; data management           |
| Zinovy Malkin      | – post-correlation analysis                            |
| Arthur Niell       | – atmospheric calibration, analysis                    |
| Bill Petrachenko   | – antenna arrays, multi-beam VLBI, frequency standards |
| Wolfgang Schlueter | – antennas, observing strategies, frequency standards  |
| Harald Schuh       | – post-correlation analysis, cross-technique use       |
| Dave Shaffer       | - observing strategies, systems, analysis              |
| Gino Tuccari       | – digital backend systems                              |
| Nancy Vandenberg   | – scheduling, observing strategies                     |
| Alan Whitney       | - data systems, data transport, correlators            |



# VLBI2010 : Sub-groups

- Observing strategies (Chair : Bill Petrachenko)
- RF/IF, frequency and time (Chair : Hayo Hase)
- Backend systems (Chair : Gino Tuccari)
- Data acquisition and transport (Chair : Alan Whitney)
- Correlation and fringe-finding (Chair : Yasuhiro Koyama)
- Data analysis (Chair : Harald Schuh)
- Data archiving and management (Chair : Chopo Ma)



# Current Ideas

- Develop a few sets of global networks with 6~8 20-m class antennas surrounding the Earth.
- Small dish phased array antennas at multiple sites.
- Higher frequencies, software distributed correlation, digital BBCs, fringe rotation at sites, etc.



# Items for Discussions

- VLBI2010
  - How to summarize?
  - How to realize?
- Participation of VERA station(s) to the IVS sessions?
- Participation of KVN station(s) to the IVS sessions?