

Ultra Rapid dUT1 estimations from e-VLBI Sessions.

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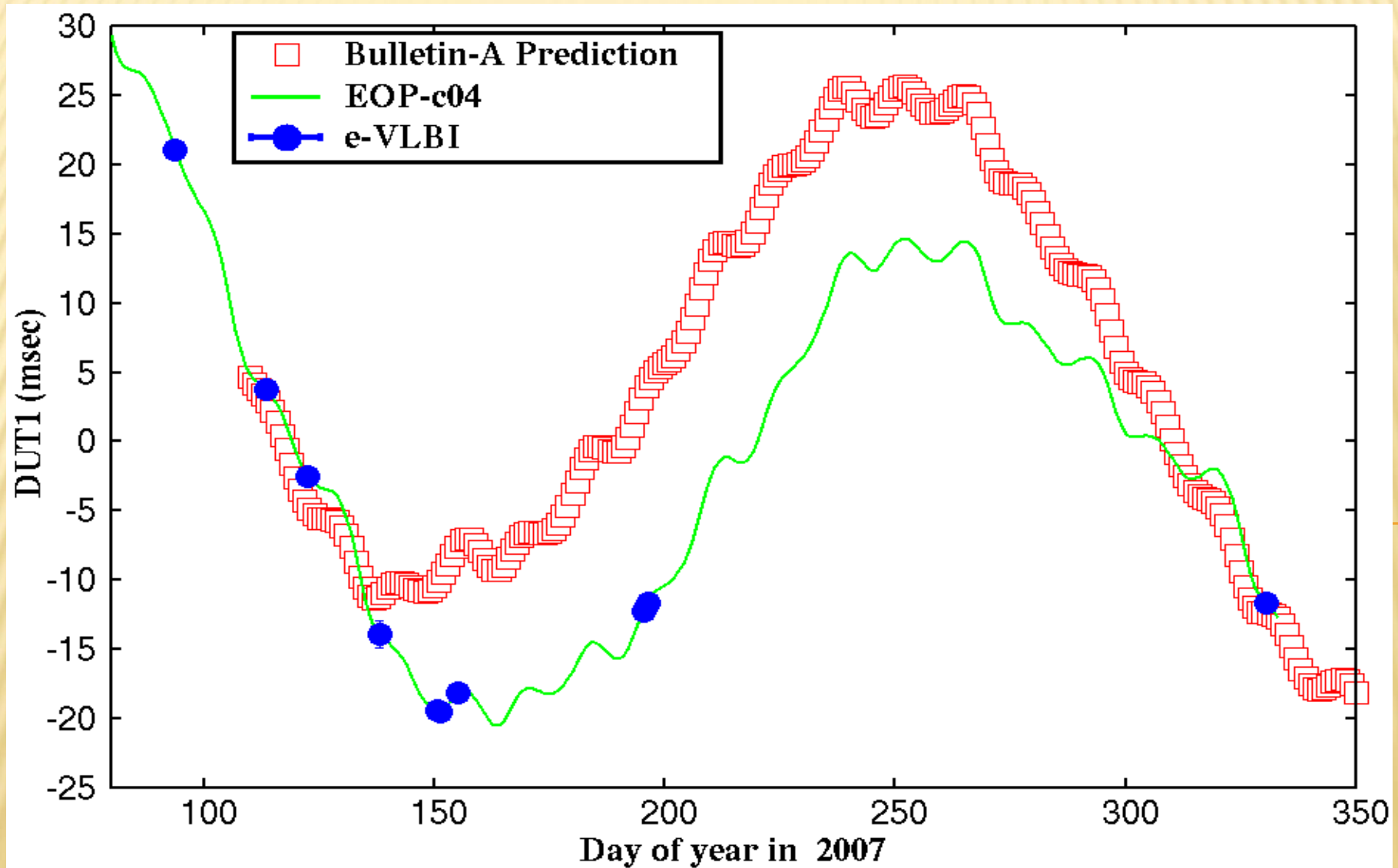
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4 Metsähovi Radio Observatory, Helsinki University of Technology, Finland

Ultra Rapid dUT1 e-VLBI Session

- Intensive type (~1 hour) R&D sessions optimally scheduled for dUT1 measurements
- Stations
 - ◆ Kashima (34m)
 - ◆ Tsukuba (32m)
 - ◆ Onsala (20m)
 - ◆ Metsähovi (14m)
 - ◆ plus Wettzell (20m) if INT2 session is used
- Realtime data transfer and quasi-realtime correlation for rapid dUT1 estimation
- Two independent baselines to investigate consistency, to show robustness, to compare scheduling strategies, ...etc.

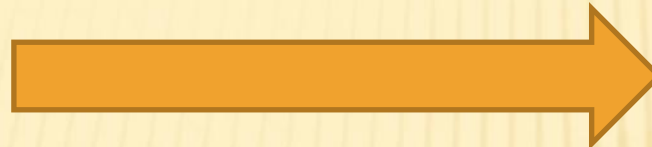
Prediction(BulletinA), EOPc04, e-VLBI



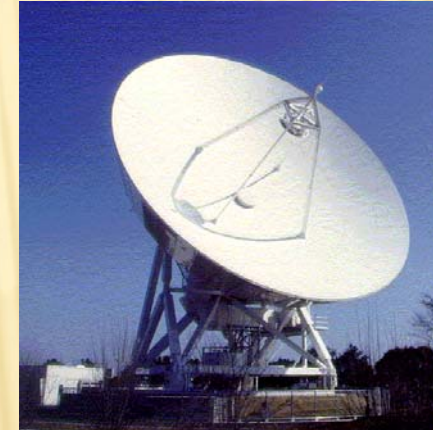
How



Metsahovi (14m)



Tsunami (UDP)
Data transfer in real-time



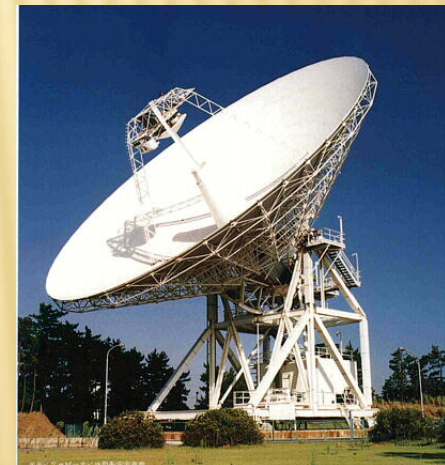
Tsukuba (32m)



Onsala (20m)



Tsunami (UDP)
Data transfer in real-time



Kashima (34m)

Global e-VLBI : Historical Record

Rapid dUT1 Estimation – 2004.6.29 –



Kashima 34m



Westford 18m

- Estimated dUT1 in 4.5 hours.
- Software Correlation (20 CPUs).
- Observed data were recorded on hard disks and then transferred.
- K5 system was used at Kashima and Mark5 system was used at Westford.
- It has become routine operation for IVS (International VLBI Service) sessions.

Global e-VLBI : Historical Record

Rapid dUT1 Estimation – 2004.6.29 –



Kashima 34m

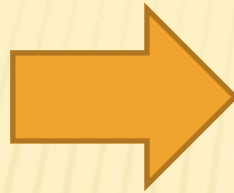


Westford 18m

- Time Sequence (JST)
 - 4:00 Observing Started
 - 5:00 Observing Finished
 - 5:13 Data Transfer Started (from Haystack to Kashima)
 - 6:28 Data Transfer Finished (~30Mbps)
 - 9:16 Correlation Processing Completed (used 20 CPUs)
 - 9:30 Data Analysis Completed

(1) Improvements of K5 System

K5/VSSP : based on PCI Boards
(~16Msample/ch·sec, ~4ch, ~8bits)



K5/VSSP32 : based on USB2.0
(~64Msample/ch·sec, ~4ch, ~8bits)



K5/VSSP32 System (16ch System)

The diagram shows the components of the K5/VSSP32 system. It includes a 16 CH MODULE (16ch System) with FRONT and REAR panels, a UNIT, and a USB Interface. The system is shown in a rack configuration with a monitor and keyboard.

Specifications/Unit	
Max Sampling Freq.	64 MHz
# of CH	1, 4
AD bit#	1, 2, 4, 8
Max Data Rate	256 Mbps

4 units for 16ch geodetic VLBI

NICT

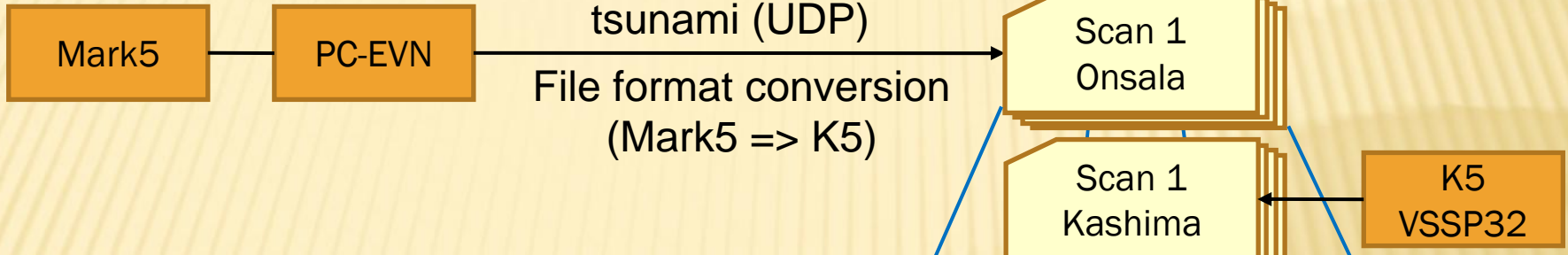


K5/VSSP32 system enabled data access to the recorded files during observations.

Onsala side

Kashima side

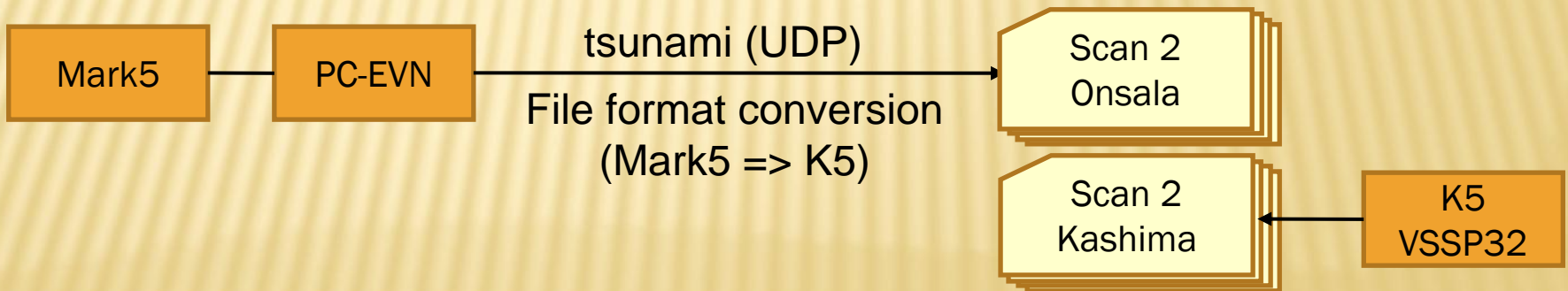
Scan 1

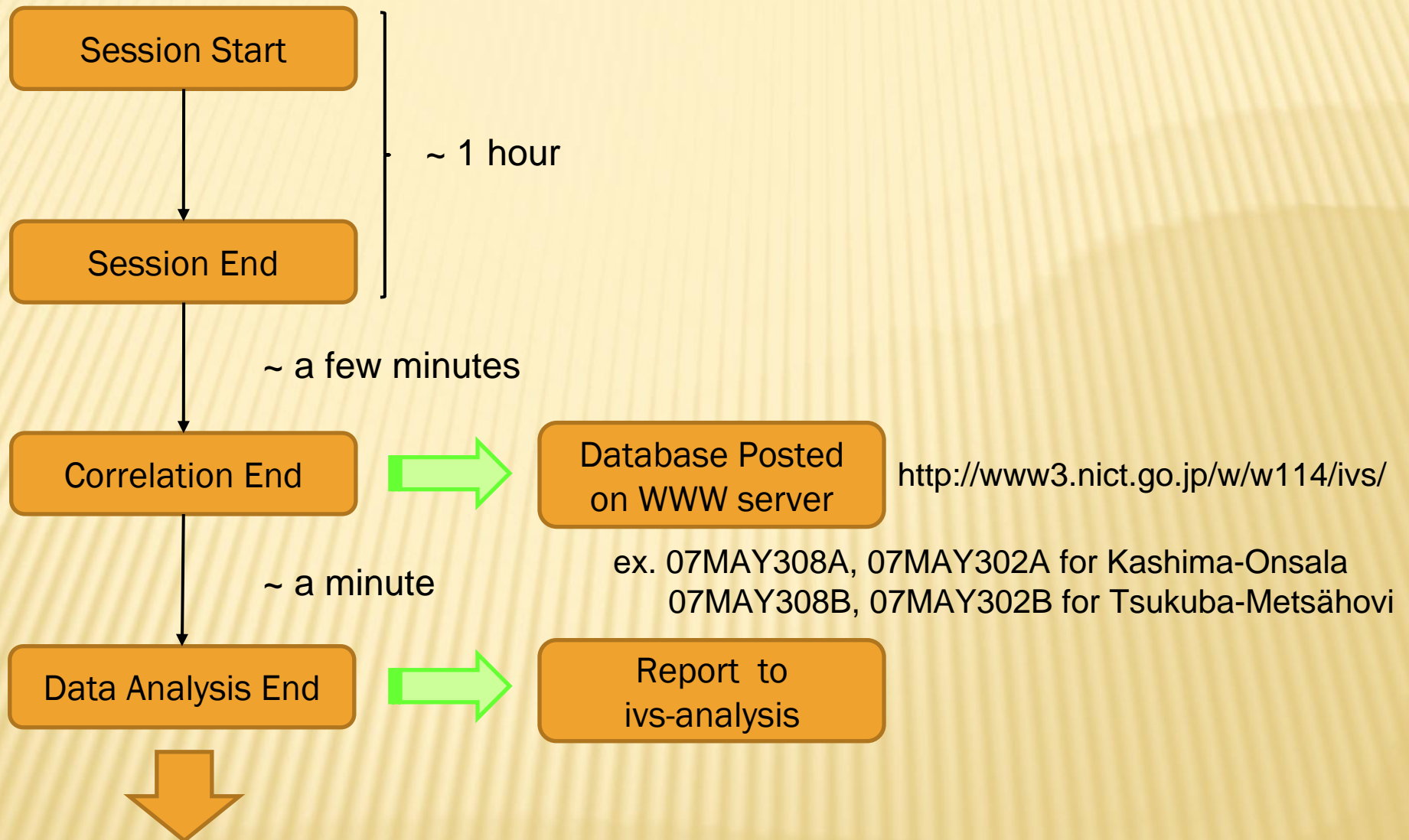


Scan Gap (Slewing)

Distributed software correlation starts during scan gap

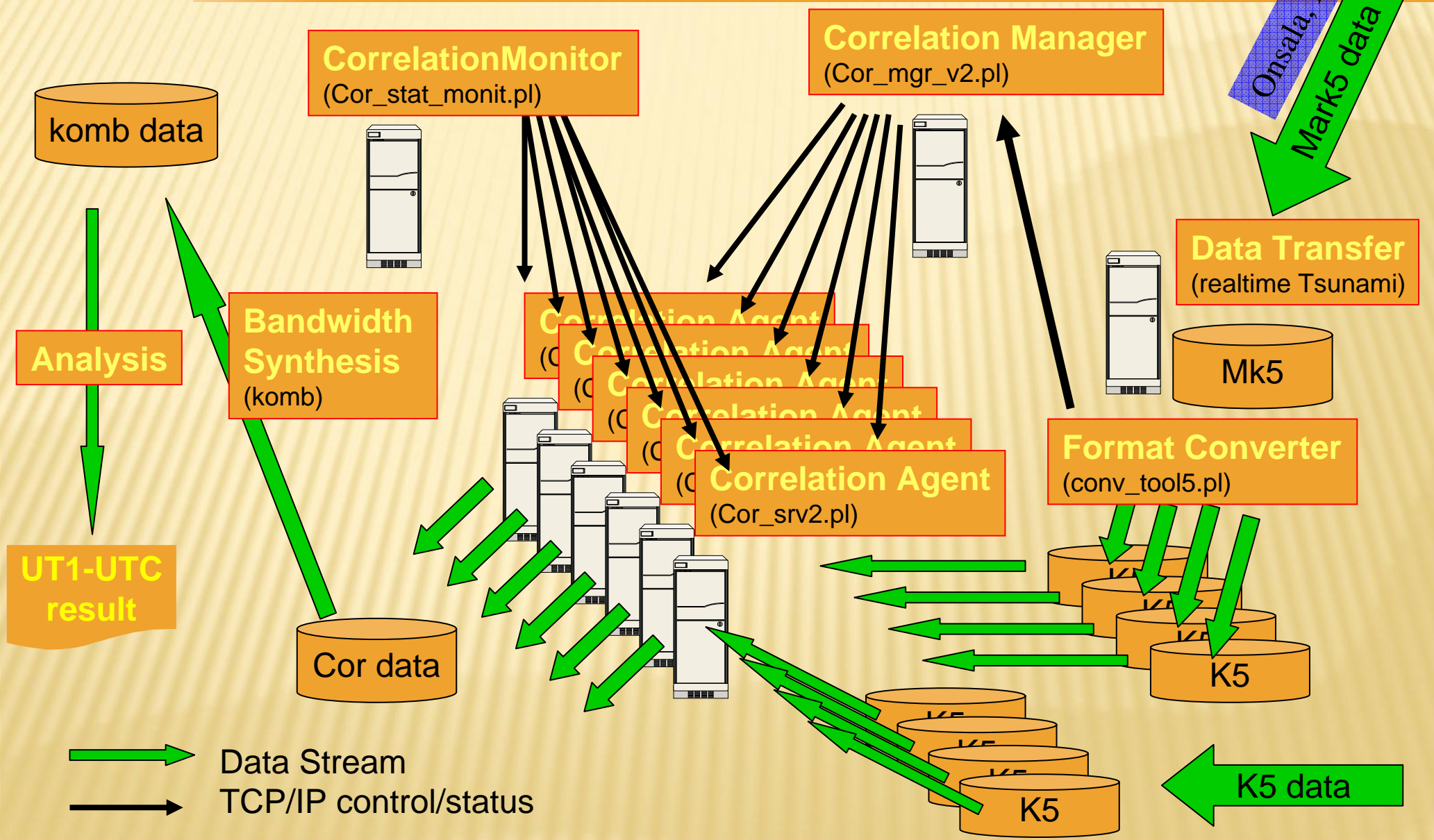
Scan 2

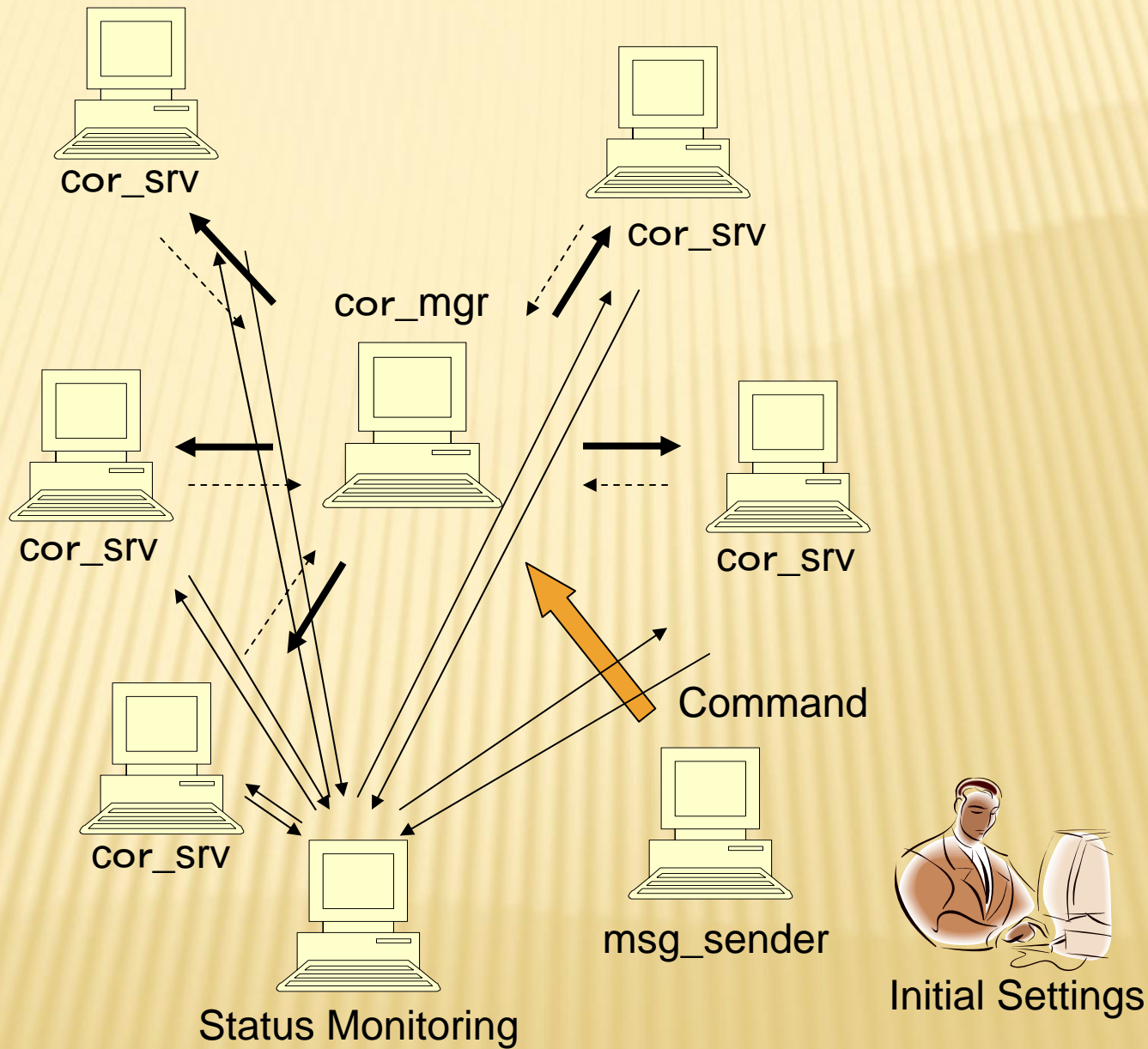




Remaining 4 baselines are correlated after the session off-line, and the database files will be posted on the server at NICT.

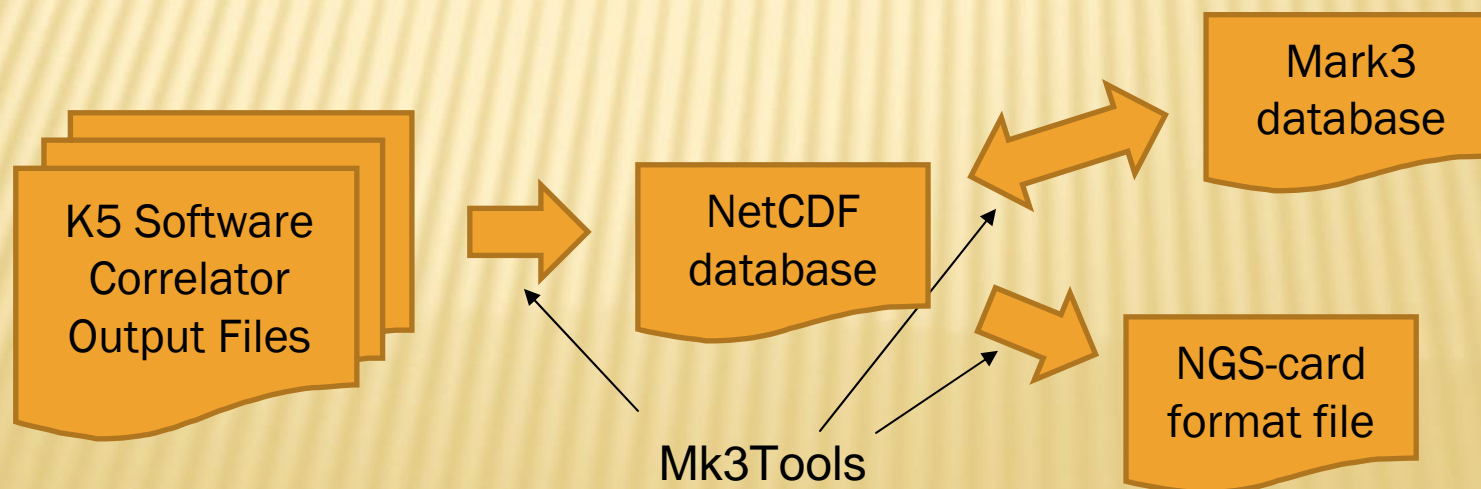
(2) Automated Correlation Processing



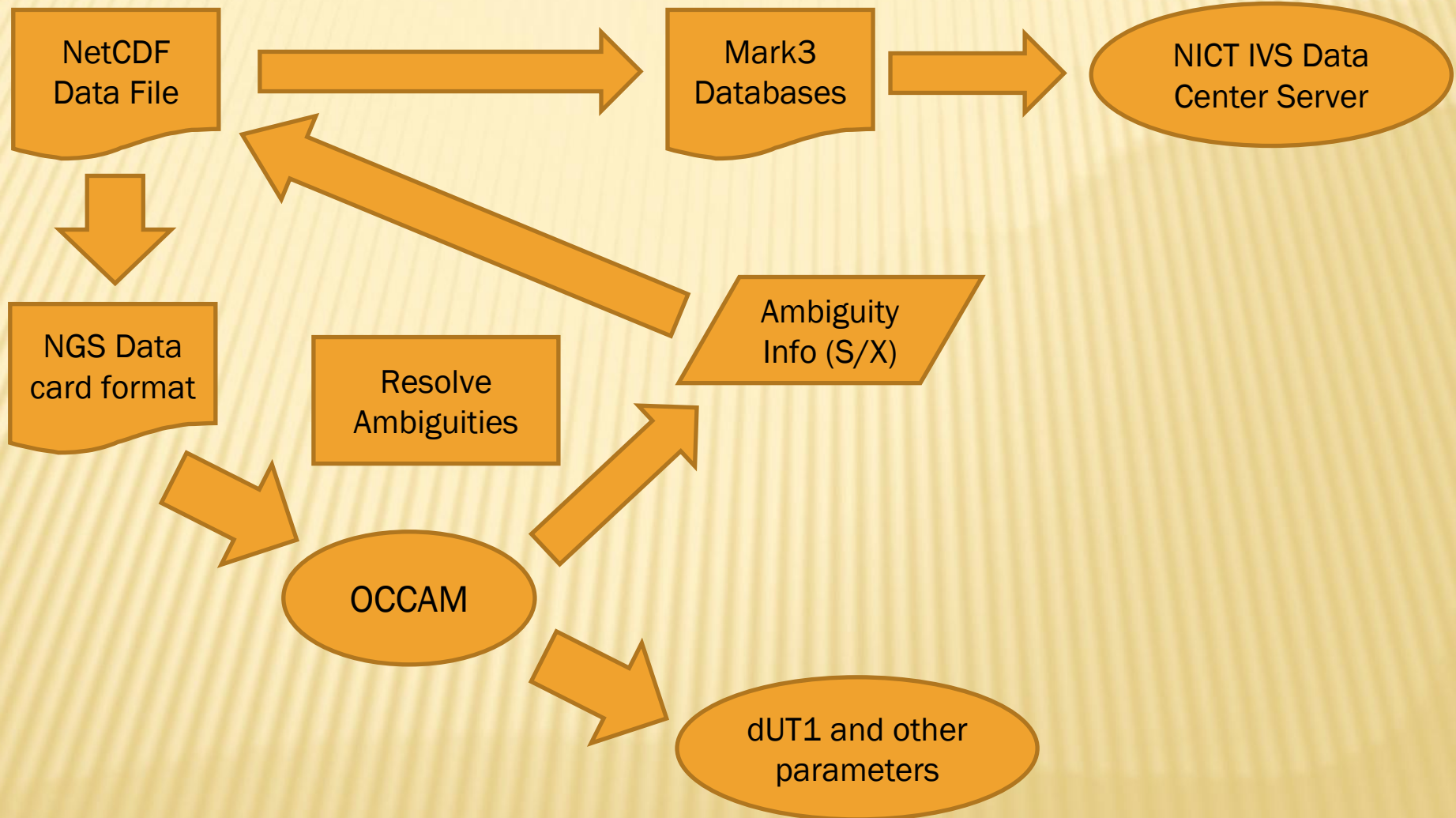


(3) Tools for Automated Data Analysis

- A new VLBI database based on NetCDF (CDF=Common Data Format)
 - ◆ Plat-home independent transportable common data file
 - ◆ Standard libraries are available on many plat-homes (Linux, HP-UX, Windows, Mac-OS, etc.)
- Mk3Tools
 - ◆ C++ programs to generate and read from NetCDF files



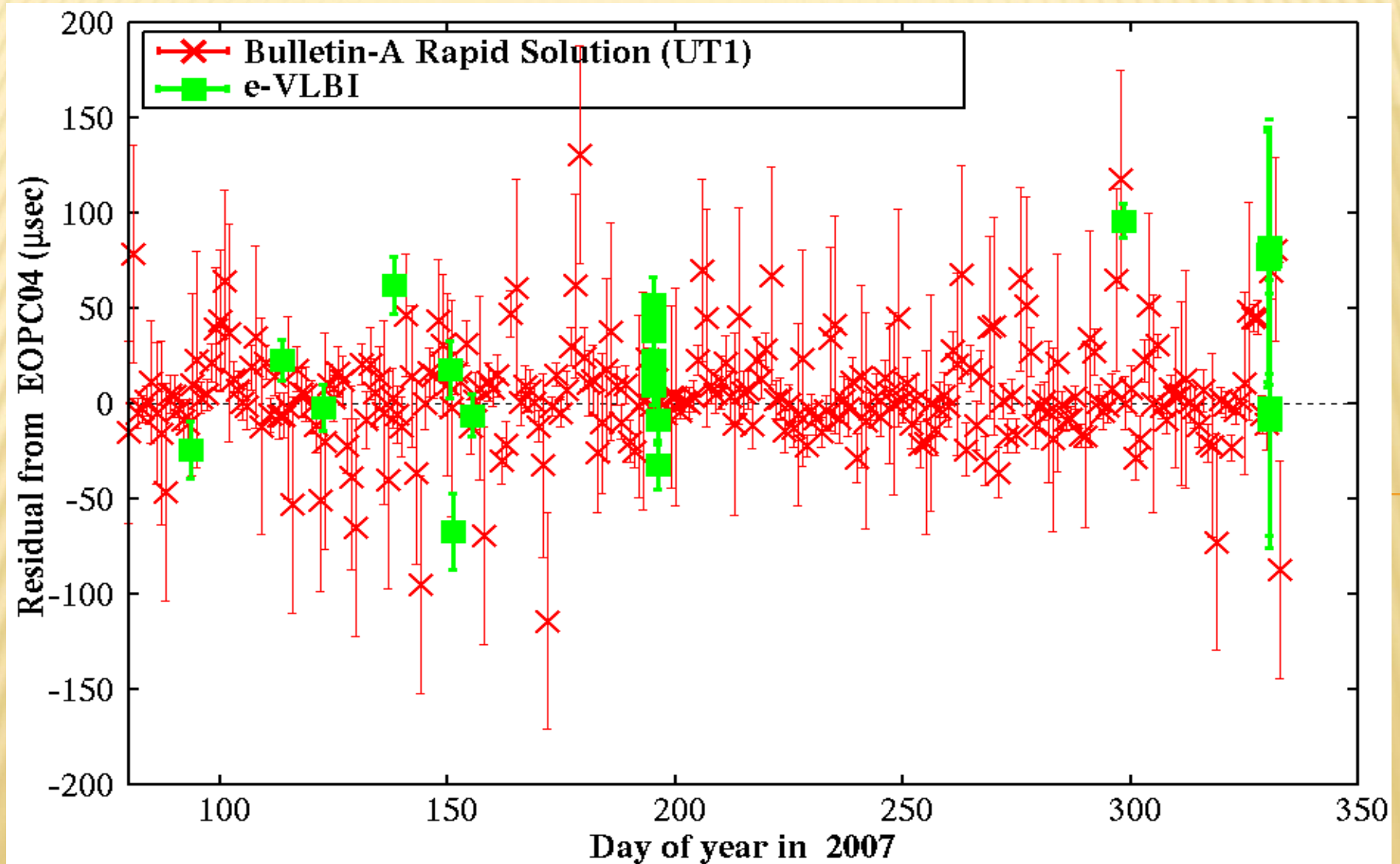
Automated Data Analysis



Tsukuba-Kashima-Onsala experiment

- Feb 21, 2008
 - ◆ Data Rate : 256Mbps
 - ◆ 10 Sessions : 5 Tsukuba-Onsala sessions & 5 Kashima-Onsala sessions
 - ◆ Duration : 1 hour / session
 - ◆ got dUT1 estimate in 3 minutes 45 seconds after the session (the best case)

Rapid Solution (Bulletin-A) and e-VLBI compared with EOPc04



Short term future plan

- complete software developments
 - ◆ log file handling, automated initial settings, etc.
- further tests
 - ◆ Onsala-Kashima baseline + Metsähovi-Tsukuba baseline.
- towards routine operation
 - ◆ apply to INT2 (Wettzell-Tsukuba baseline)

Conclusions

- Ultra-rapid dUT1 estimation in near real-time after the session was successfully demonstrated.
- Continued developments of software programs will be necessary to make the automated data processing robust and smooth, but it seems the work is straight forward.