MIDI at DMD-ESO :

Calibrations, data reduction, quality control, instrument monitoring and distribution of the data to the community

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Outline

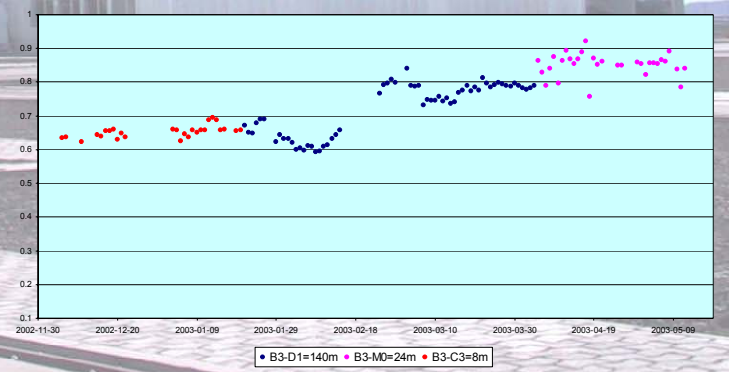
- **How to choose a calibrator :** lessons learned from P73.
- **Data Flow operations**
  - Data processing,
  - Quality control,
  - Instrument health check,
  - Instrument monitoring,
  - Distribution of the data to the community.

Astronomical Calibration:
Specific Requirements for Interferometry

- The instantaneous Instrumental Transfer Function is calculated with the astronomical calibrator and is applied to the science data to obtain a calibrated visibility:
  - *choice of a calibrator suitable to the scientific target.*

- The evolution of the instrumental transfer function has to be monitored frequently during each night.
  - *choice of calibrators to be observed routinely to measure the performance of the instrument*

VINCI TF



Astronomical Calibrators

Characteristics of a calibrator:

- single source, unresolved or with a well known diameter,
- angular distance,
- magnitude,
- spectral type , luminosity class,
- no Infrared excess and compact atmosphere,
- no photometric variability.

Choose the calibrator from:

- already measured diameters,
- estimated diameters lists (Cohen et al, Bordé et al),
- interferometers lists (NPOI, PTI, FLUOR),
- Surveys.

Astronomical Calibrators : different approaches

ESO approach:

- filtering of lists of measured diameters:
  - *CHARM2 (including measured and estimated diameters) accepted by A&A*
- estimated diameters of objects observed in spectro-photometry:
  - *MIDI consortium lists : potential calibrators (B. Stecklum et al) and spectro-photometric calibrators (O. Chesneau)*

➢ CalVIn : www.eso.org/observing/etc

Other approaches:

- Select already measured calibrators when possible
  - ➢ *Interferometers (FLUOR, GI2T, NPOI…)*
- Filtering of data from surveys to find potential calibrators matching required characteristics
  - ➢ *Catalog of calibration sources JMMC: http://mariotti.ujf-grenoble.fr*

Astronomical Calibrators :
In the world

Summary of Resources

Group	Wavelengths	Calibrator Catalog	Software Tools	Documentation
CHARA	H,K	None	NA	NA
COAST	V,H	None	mfit	Data Exchange format
FLUOR	K	URL, ASCII, Excel, readme	NA	Software and Manual
GI2T	V	Java	Java	HTML
IONIC	H	NA	NA	NA
IOTA	V	NA	NA	NA
ISI	N	None	NA	NA
Keck	K	NA	getCal	KI Support
MIDI	L	Calvin	MIDISOFT	NA
MIRA	V	NA	NA	NA
NPOI	V	ASCII	STARWHEEL (Oyster)	Oyster
PTI	K	NA	getCal	KI Support
SUSI	V	None	NA	NA
VLTI	K,N	Calibrators/CALVIN	VisCalc (Previews)	SimVLTI
FRINGE	-	NA	MC3D	Download site
JMMC	-	NA	ASPRO	Download site
MSC	-	NA	MSC Software	Download site
J. Monnier	-	NA	IDL Routines	Data Exchange Format

Extracted from http://olbin.jpl.nasa.gov

CalVIn

(Calibrators VLTI Interface)

List of Calibrators

6 calibrators found

ASCII file format - the first column is the universal time

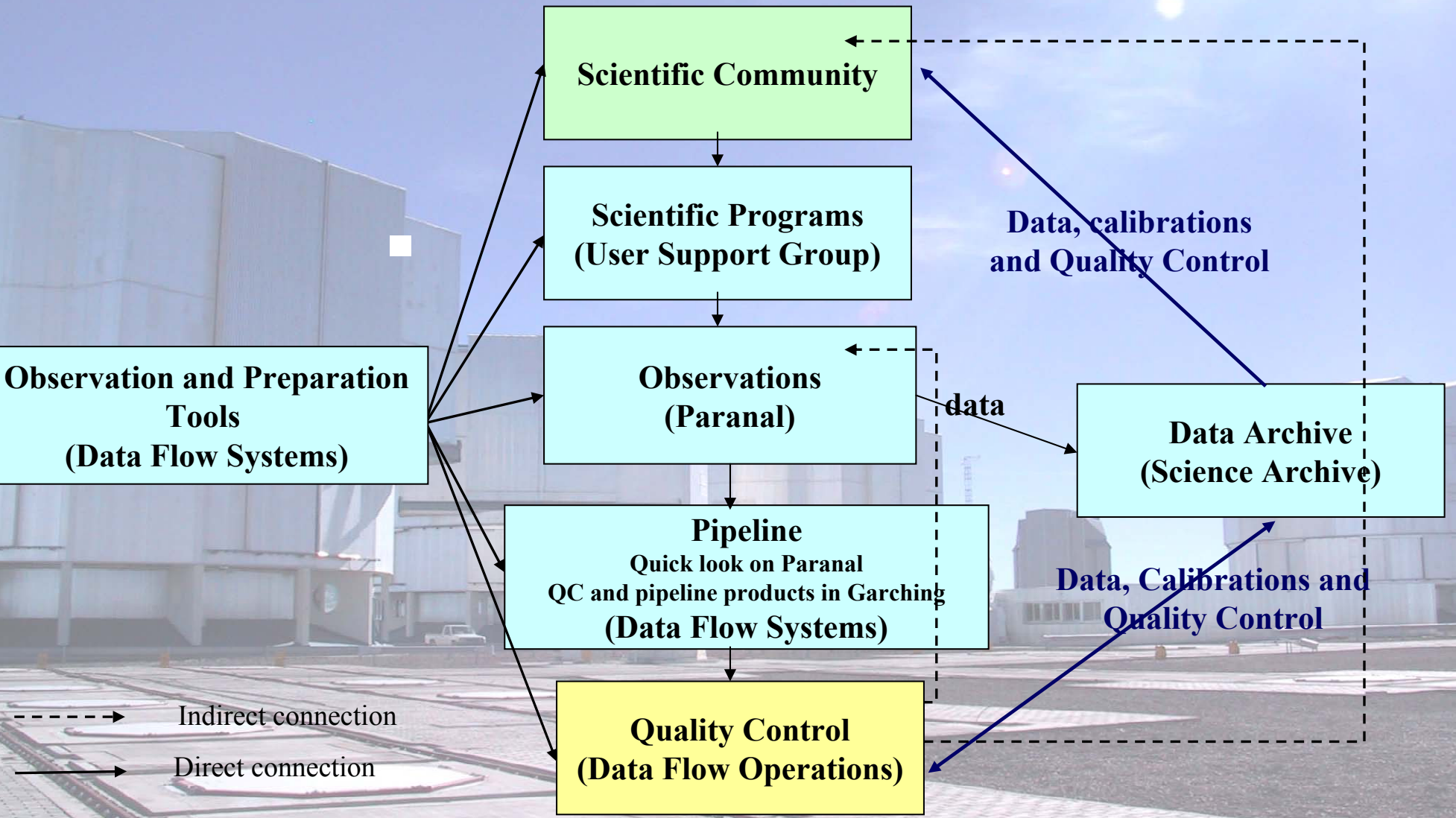
Comparative graphs for *Target* vs. 7 calibrators:- Normalized Visibilities Loss of Correlated Magnitudes Target Altitudes Shadow

No.	Name	R.A. (h,m,s)	Dec. (d,m,s)	Ang. Dist. (deg°)	Ang. Diam. (mas)	Mag_N	Spec. Type	Lum. Class	Qual. Flag	Normalized Visibility ave ± err range	Loss of Correlated Magnitude ave ± err range	RiseTime SetTime Duration	Culmination MaxAltitude	Shadowing
1 (0)	*Target*	5 55 10.30	7 24 25.40	0.0	40.00 ± 0.00					0.45 ± 0.000 0.30-0.69 graph ascii	1.72 ± -0.00 2.62-0.82 graph ascii	25.25UT 33.75UT 8.50hrs	29.75 UT max = 57° graph ascii	max = 1% graph ascii
2 (195)	hd50778	6 54 11.40	-12 2 19.10	24.4	3.95 ± 0.22	0.67	K4III	III	1	0.99 ± 0.001 0.99-0.99 graph ascii	0.02 ± 0.00 0.02-0.01 graph ascii	25.75UT 33.75UT 8.00hrs	30.75 UT max = 77° graph ascii	max = 0% graph ascii
3 (197)	hd61421	7 39 18.12	5 13 30.00	26.0	5.25 ± 0.21	-0.58	F5IV-V	IV-V	1	0.99 ± 0.001 0.98-0.99 graph ascii	0.03 ± 0.00 0.04-0.01 graph ascii	27.00UT 33.75UT 6.75hrs	31.50 UT max = 60° graph ascii	max = 0% graph ascii
4 (193)	hd48915	6 45 8.92	-16 42 58.00	27.1	6.06 ± 0.13	-1.23	A1	V	1	0.98 ± 0.001 0.98-0.98 graph ascii	0.04 ± 0.00 0.05-0.04 graph ascii	25.50UT 33.75UT 8.25hrs	30.75 UT max = 81° graph ascii	max = 0% graph ascii
5 (182)	hd29503	4 38 10.82	-14 18 14.50	28.9	2.58 ± 0.12	1.30	K1III	III	2	1.00 ± 0.000 1.00-1.00 graph ascii	0.01 ± 0.00 0.01-0.00 graph ascii	23.25UT 33.75UT 10.50hrs	28.50 UT max = 79° graph ascii	max = 1% graph ascii
6 (198)	hd36079	5 28 14.72	-20 45 34.00	28.9	2.97 ± 0.16	0.90	G5II	II	2	1.00 ± 0.001 0.99-1.00 graph ascii	0.01 ± 0.00 0.01-0.01 graph ascii	24.00UT 33.75UT 9.75hrs	29.25 UT max = 85° graph ascii	max = 0% graph ascii
7 (200)	hd65953	8 1 13.33	-1 23 33.40	32.6	3.05 ± 0.59	1.07	K4III	III	2	1.00 ± 0.002 0.99-1.00 graph ascii	0.01 ± 0.00 0.01-0.01 graph ascii	27.00UT 33.75UT 6.75hrs	32.00 UT max = 66° graph ascii	max = 0% graph ascii

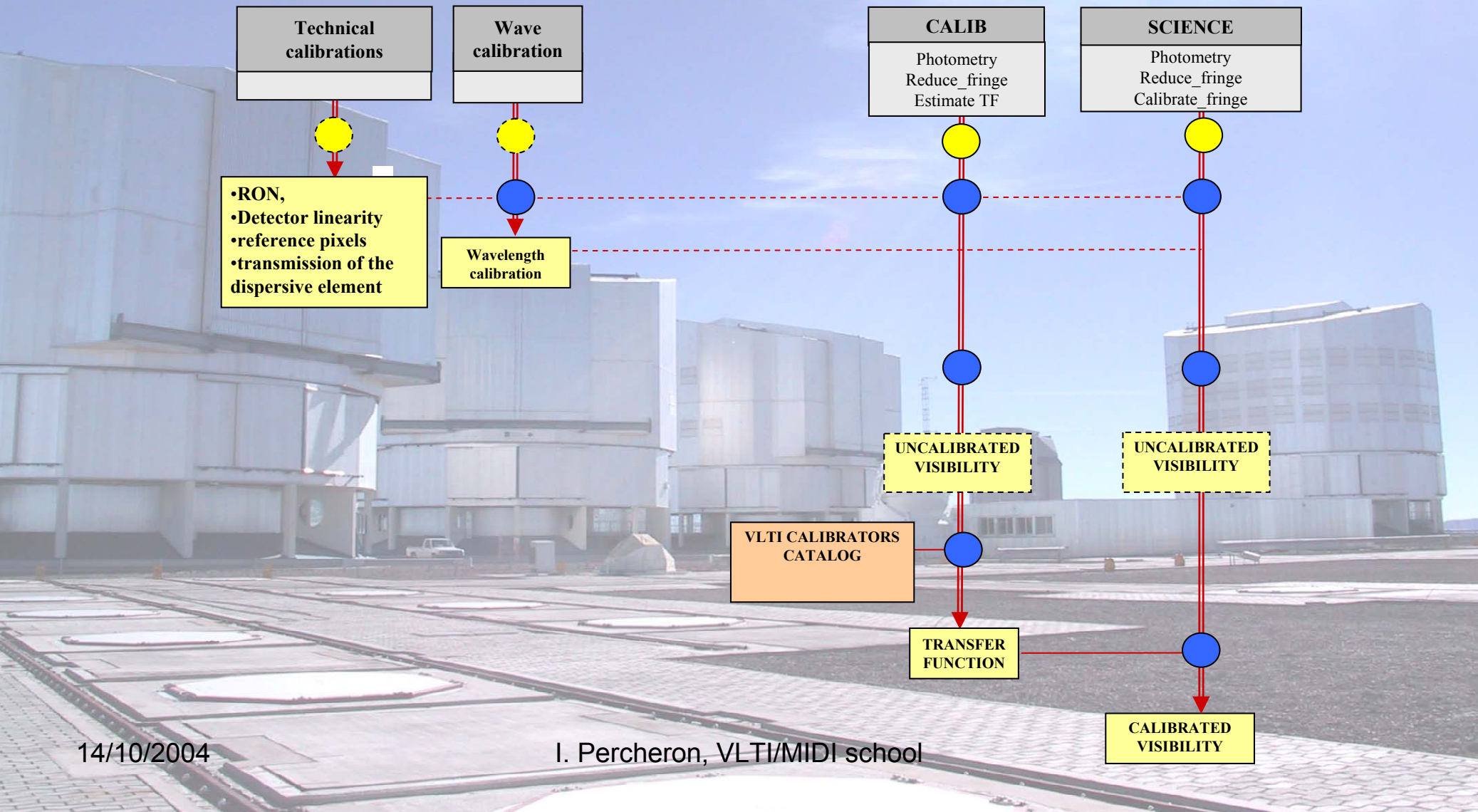
Calibrators:
lessons learned from P73

- Some diameter provided by the user were larger than expected
- Position of the calibrator non suitable for observation
  - *it will be possible to enter 2 calibrators for each science object (only one of them will be observed)*
  - *if none of them could be observed, the calibrator will be chosen from CALVIN*

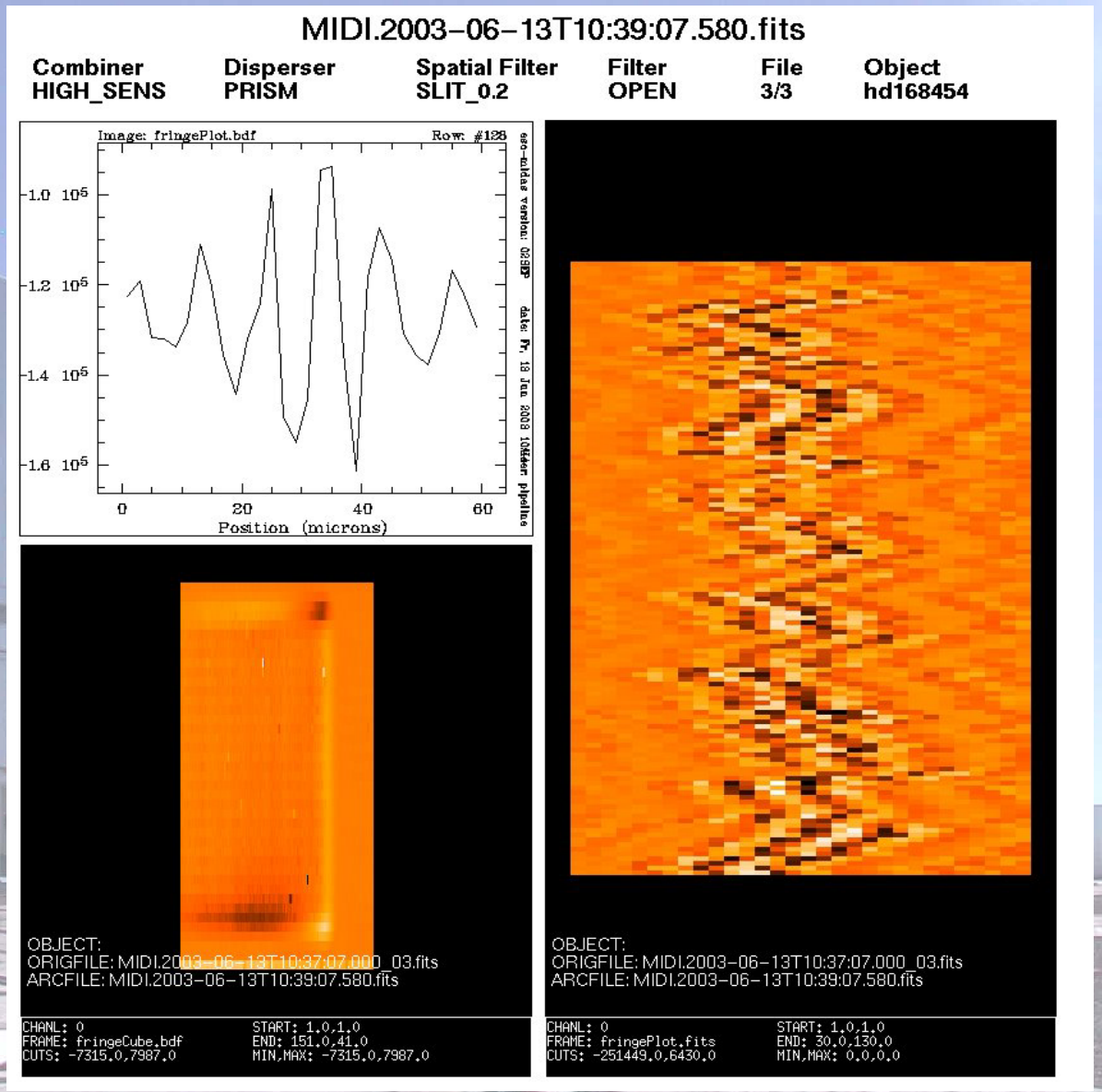
VLTI Data Flow



Association Map:
Calibration and processing cascades



Pipeline Processing: Display



Pipeline processing

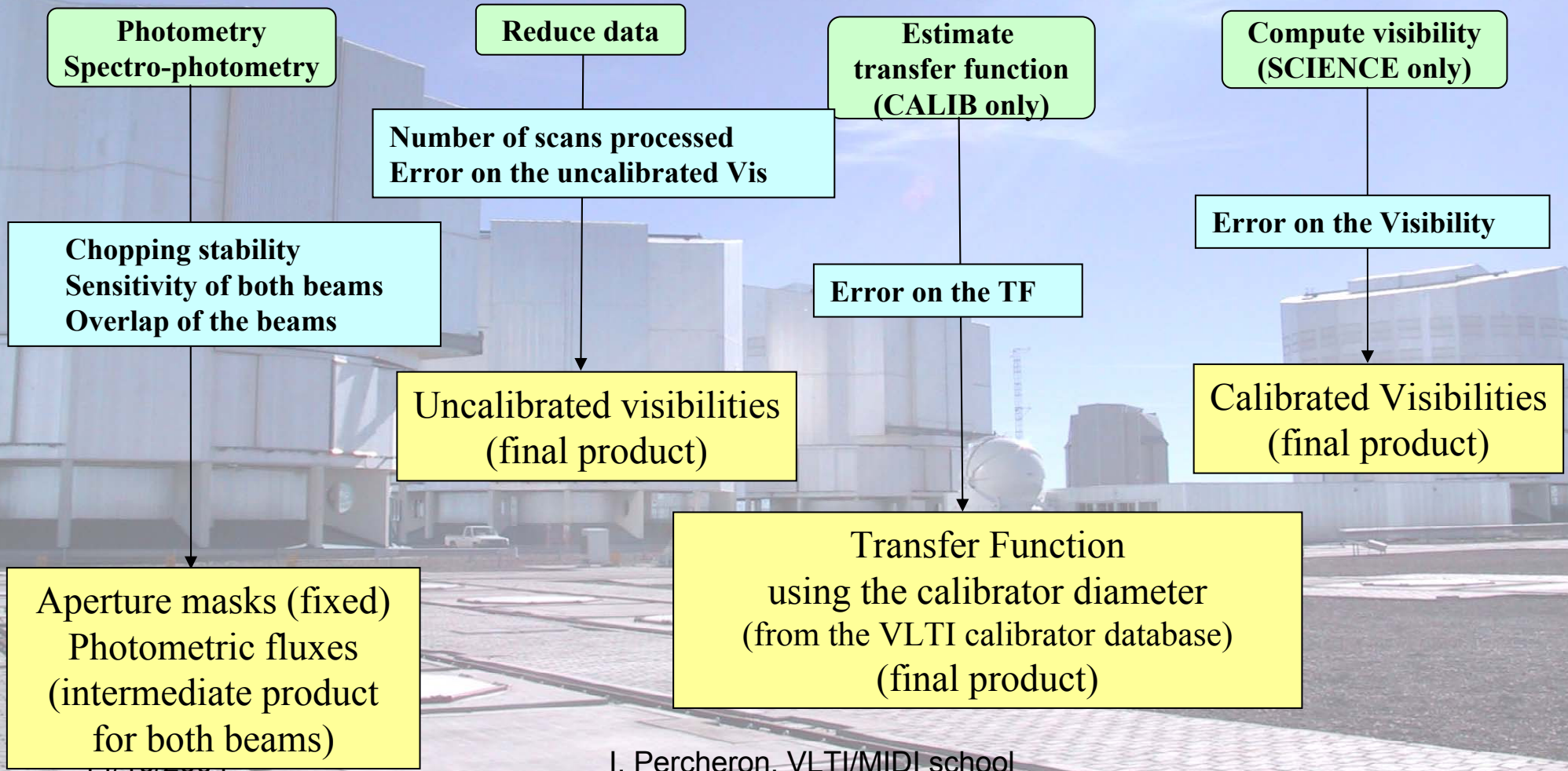
The algorithms and some code are provided by the MIDI consortium (Jeff Meisner). The description of the algorithms is the subject of his talk.

- Rules are used to associate raw data and assign a pipeline recipe for these files,
- The dispersed data are processed in an undispersed way
  - *"white light" uncalibrated visibility,*
- For each astronomical calibrator listed in the VLTI Calibrators database, a *Transfer Function* is calculated and applied to the nearest SCIENCE object
  - *calibrated Visibility.*

Pipeline recipes

VLTI products

QC parameters

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DET.NDIT 3560
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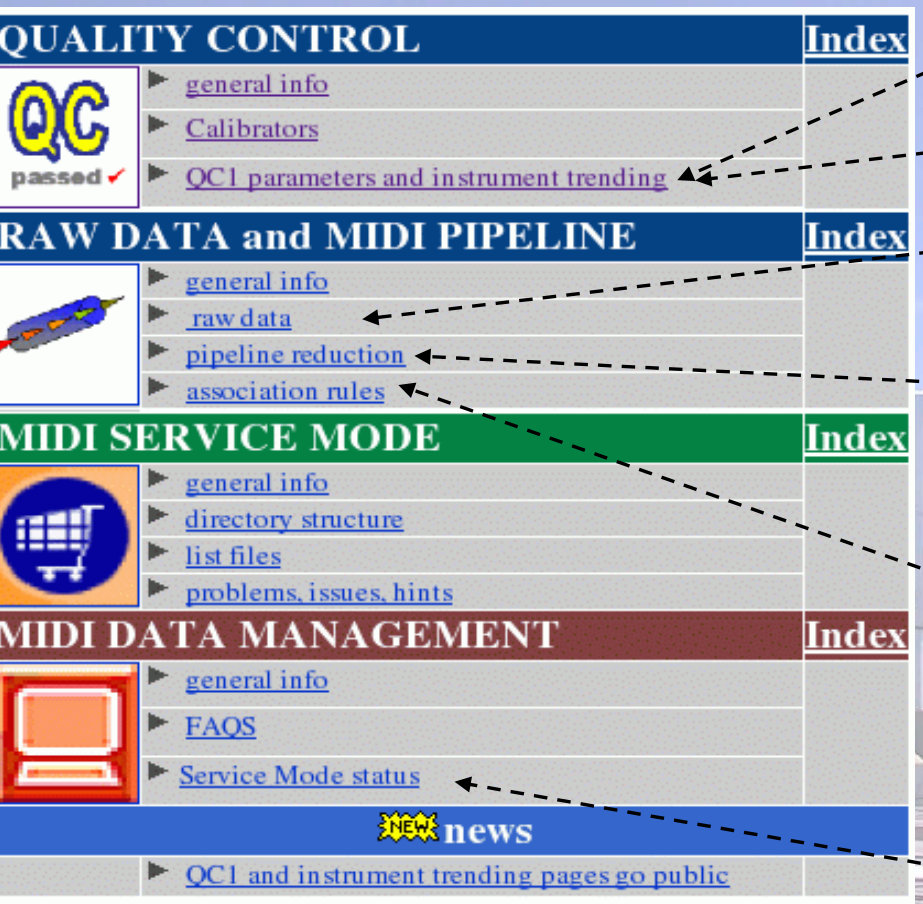
Quality Control

http://www.eso.org/observing/dfo/quality/index_midi.html



Health check and trending of the instrument

Monitoring of the astronomical calibrators

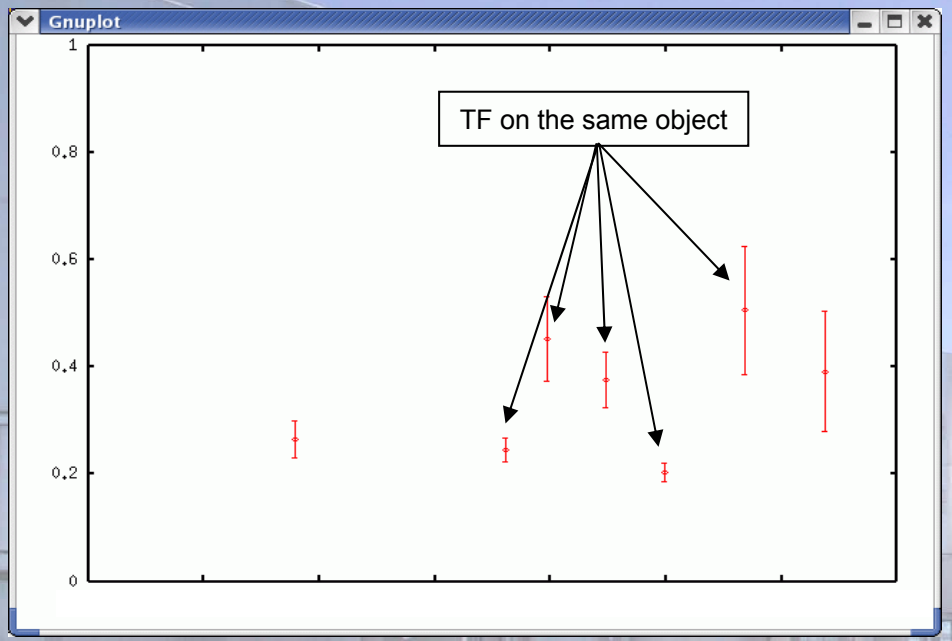
Characteristics of the raw data

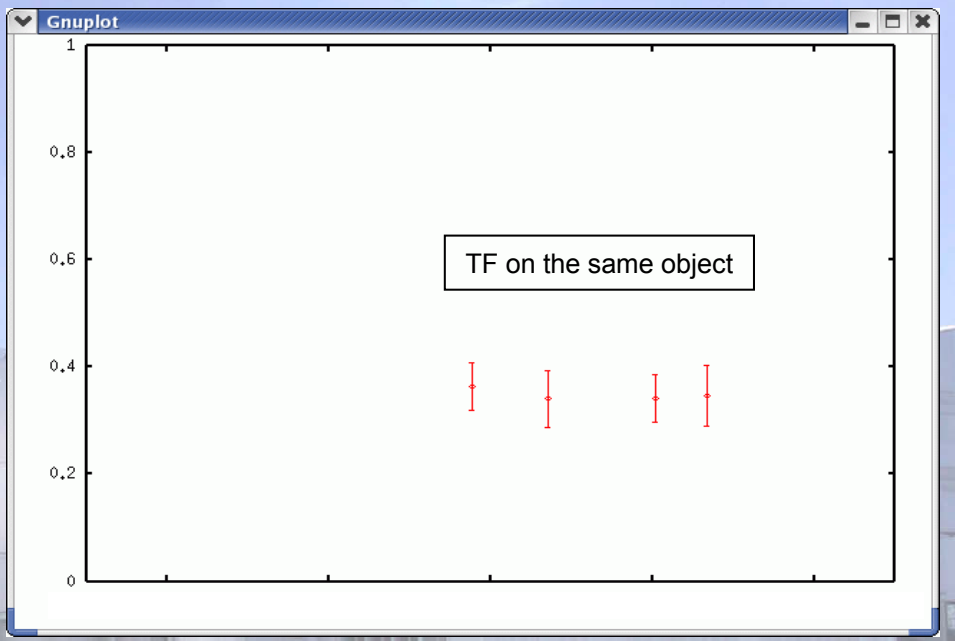
Informations on the pipeline and the products

Off line association of the raw data for calibration and processing

Pack the Service Mode data for the scientific community

Instrument monitoring

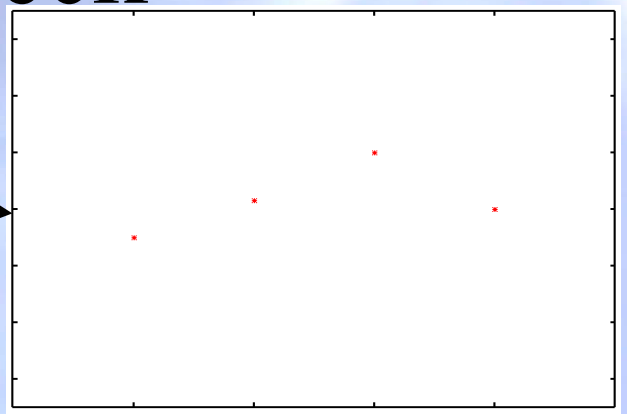


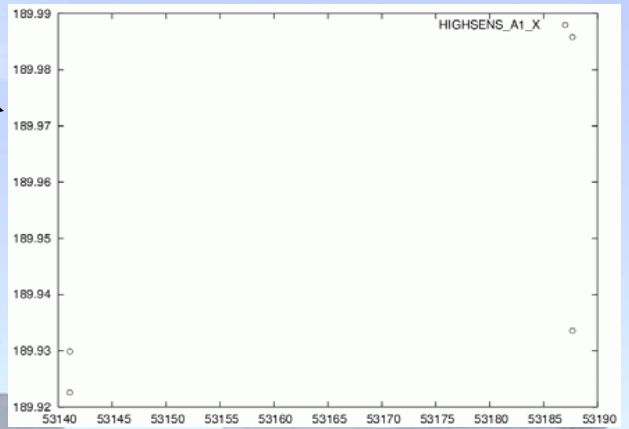


Instrumental transfer function for 2 different nights

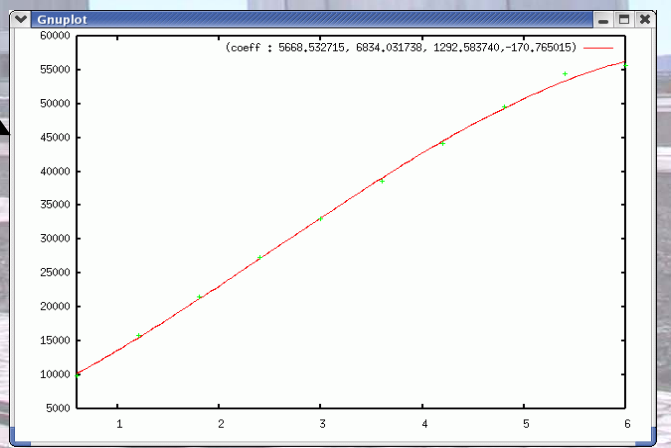
Instrument health check

- Read-Out-Noise
- Position of the reference pixels (quality of the beam overlap)
- Detector linearity
- Transmission of the dispersive elements





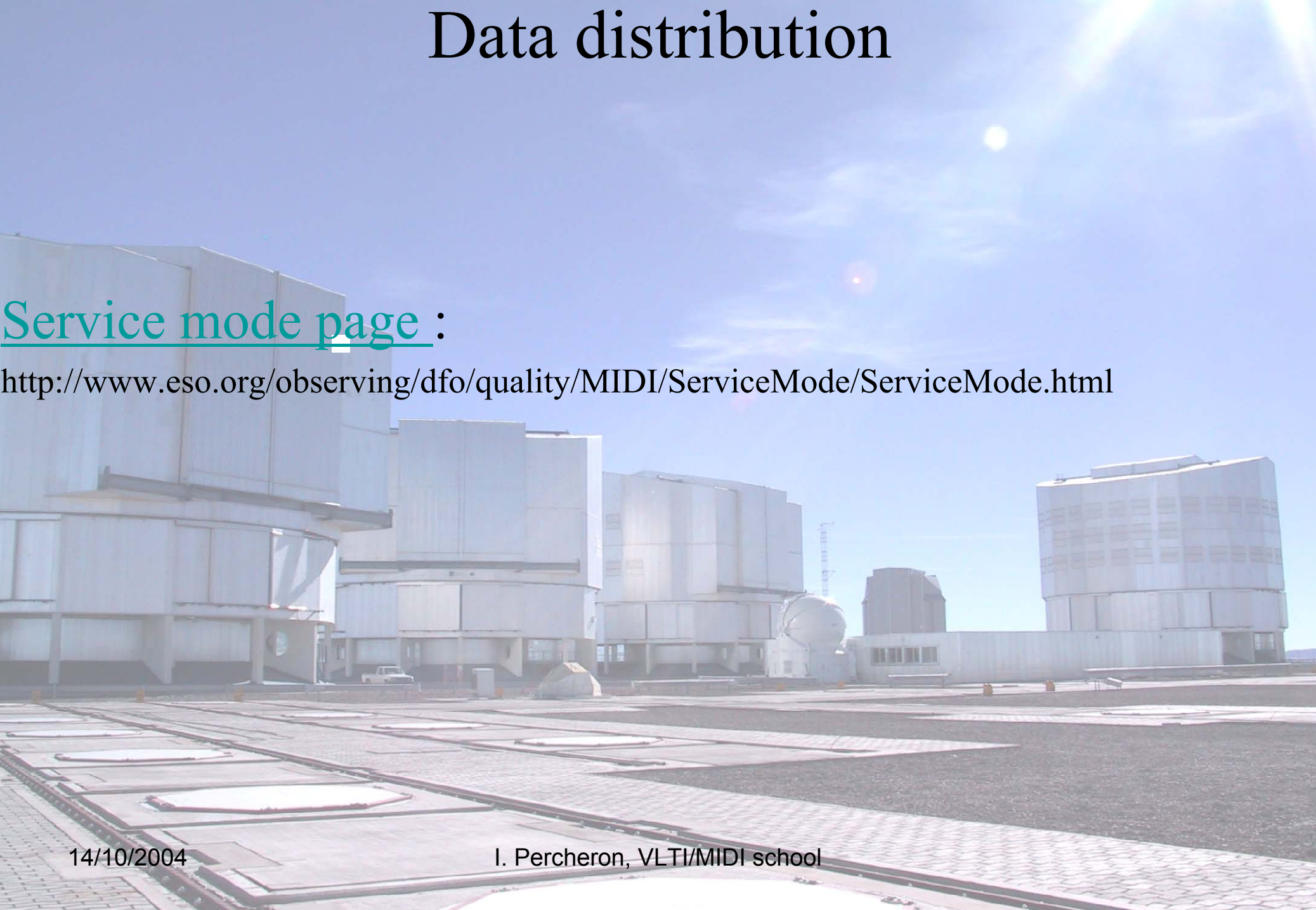
the scale .07 pixel



Data distribution

- Data are processed by nights when they arrived in Garching (typical 10 days delay),
- Data are packed by Run ID,
- Data packages are distributed to the PI after signal from USG (completed, partly feasible, terminated).

Data distribution

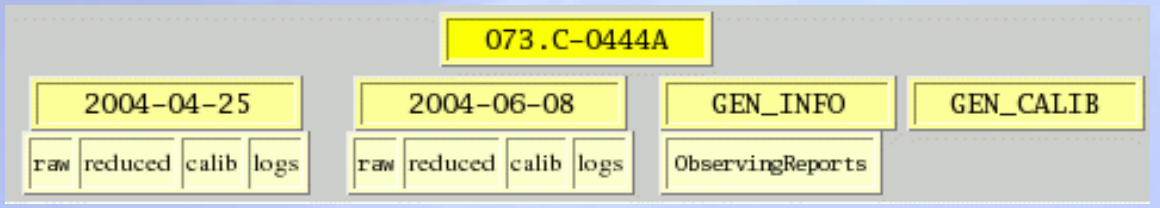


Service mode page :

http://www.eso.org/observing/dfo/quality/MIDI/ServiceMode/ServiceMode.html

Data distribution:

raw and reduced data are packed per night



- raw directory:
  - acquisition,
  - fringe search on all objects,
  - fringe track raw data on science objects.
- calib directory:
  - raw files with a DPR CATG= CALIB (other than fringe_search files).
- reduced directory :
  - pipeline products for processed OBs.
- logs directory:
  - pipeline log files,
  - pipeline products,
  - association blocks.

```
# ============== RB section starts here ============================

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RB_CONTENT      instrument: MIDI
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Data distribution:
Calibration data

- GEN_INFO directory contains:
  - archive_RunID : lists the files as read from the archive,
  - qc0_RunID : lists some of the qc0 parameters (airmass, seeing, moon distance),
  - ObservingRun directory : contains different html files with information about the night contitions and the OB status.

- GEN_CALIB directory contains:
  - technical calibration raw files when available,
  - lists of data obtained on “CALIB” for each night.

PROGID	OBID	ARCFILE	TARGET	CATG	TAU0	R0	TF	errTF	DIAM	errDIAM	VIS^2 ...from V^2..	DVIS(^2)
60.A-9224(A)	-1462580803	MIDI.2004-06-27T23:27:48.000.fits	HD109379	CALIB	0.00682	0.64	0.364	0.124	3.30	0.17	0.341	0.041
073.C-0248(A)	157539	MIDI.2004-06-28T00:43:13.000.fits	hd129456	CALIB	0.00396	0.89	****	****	0.00	0.00	0.406	0.058
073.D-0610(A)	154608	MIDI.2004-06-28T01:43:12.000.fits	hd134505	CALIB	0.00252	0.86	0.341	0.156	2.55	0.13	0.330	0.081
073.C-0720(A)	153883	MIDI.2004-06-28T02:48:50.000.fits	HD139127	CALIB	0.00341	0.87	****	****	2.55	0.13	0.386	0.062
073.D-0610(A)	156169	MIDI.2004-06-28T04:02:08.000.fits	hd165135	CALIB	0.00266	1.03	****	****	0.00	0.00	11.28	16.94
073.C-0248(A)	157541	MIDI.2004-06-28T04:53:27.000.fits	hd129456	CALIB	0.00200	1.18	0.342	0.130	3.39	0.09	0.329	0.089
073.C-0720(A)	153880	MIDI.2004-06-28T05:43:29.000.fits	HD139127	CALIB	0.00190	1.26	****	****	2.55	0.13	0.376	0.127
073.D-0610(A)	156168	MIDI.2004-06-28T06:26:21.000.fits	hd165135	CALIB	0.00135	1.67	0.347	0.162	3.38	0.16	0.327	0.087
073.D-0610(A)	156168	MIDI.2004-06-28T08:47:19.000.fits	hd165135	CALIB	0.00086	2.61	N/A	N/A	3.38	0.16	N/A	N/A

- VISAS: www.eso.org/observing/proposals
- USG: www.eso.org/dmd/usg/index.html, usg-help@eso.org
- Phase 2: www.eso.org/observing/p2pp
- Preparation tools: www.eso.org/observing/etc
- Instrument: www.eso.org/instruments/midi
- Quality Control : www.eso.org/observing/dfo/quality
- Science Archive Facility: archive.eso.org