



Leibniz-Institut für
Astrophysik Potsdam



Muse-WISE

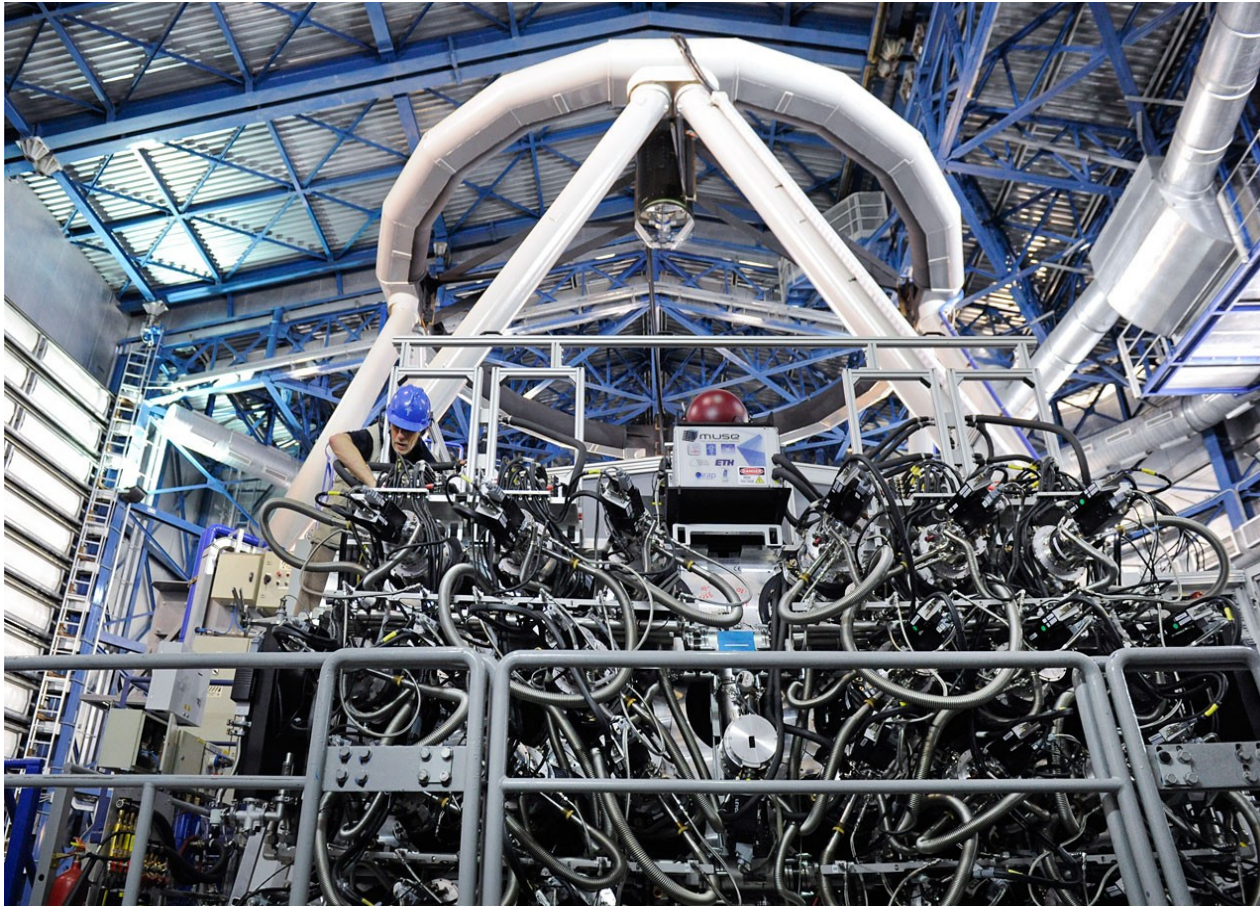
Design and Status of the MUSE Data
Management System

Ole Streicher (AIP Potsdam)

MUSE data management team:

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J. Brinchmann, T. Martinsson (Leiden),
N. Bouche, G. Soucail, M. Larrieu (Toulouse),
R. Williams, W-J. Vriend (Groningen)

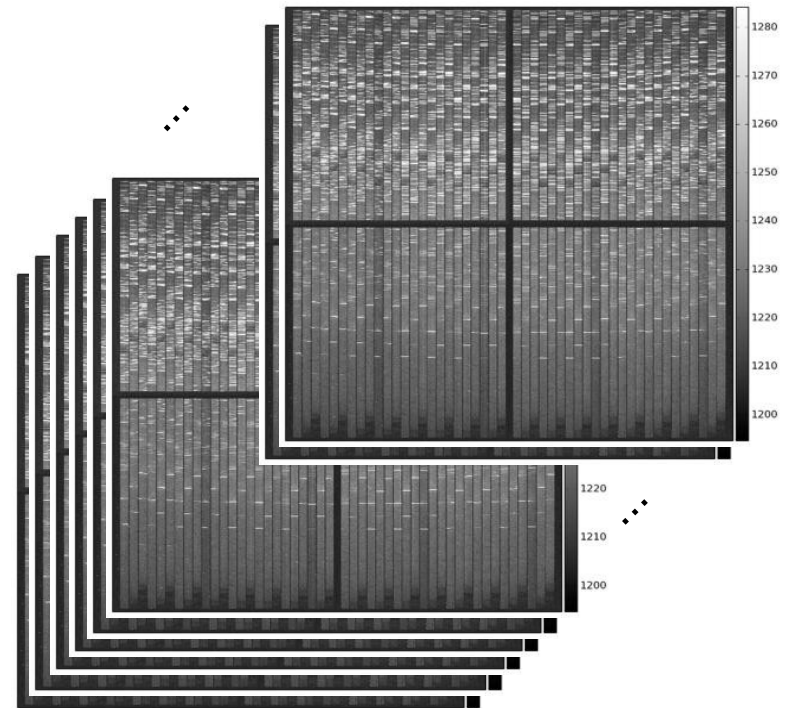
MUSE on the VLT



First light February 2014, GTO start October 2014
Total 250 GTO nights, 2014-2019

Multi-Unit Spectroscopic Explorer

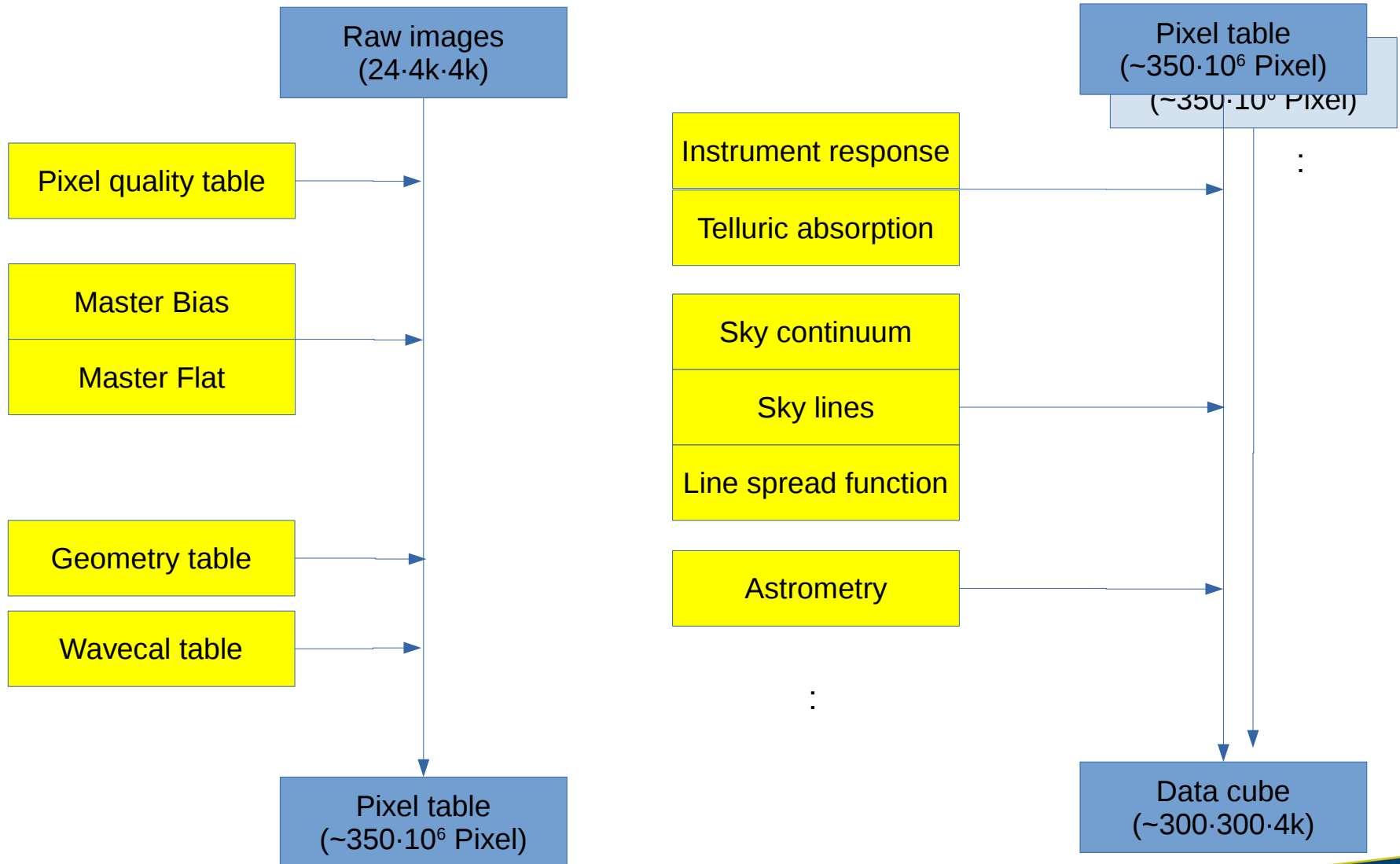
- 24 IFUs, 48 „mini-slits“ (clices) per IFU
- Spectroscopic range: 4650Å-9300Å, R ~ 1750-3500
- Field of View:
WFM 1'x1', sampled at 0.2"
NFM sampling 0.025"
- AO mode planned
- 90,000 spectra
(300x300 pixel)



MUSE science examples

- Deep field (up to 80 h): Ly- α emitters, quasars, ...
- Galaxy evolution,
- Globular clusters,
- Planetary nebulae, extended objects, ...

MUSE data reduction system



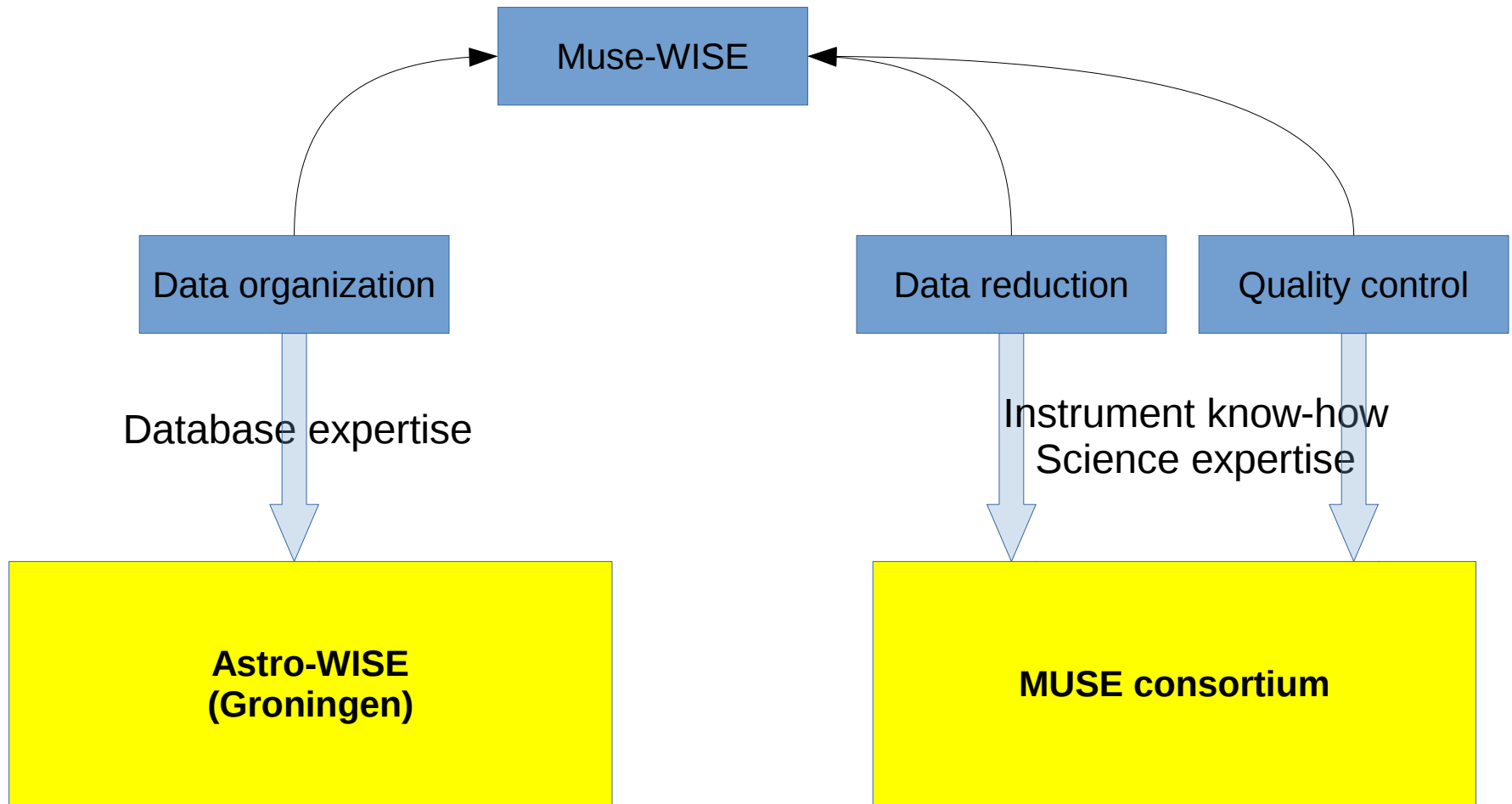
Data handling requirements

- Complex data reduction scheme
- Multiple uses of the same data
- Coordinated, reproducible data reduction
- Reference reduced data set
- Science at the detection limit
- Distributed system (7 sites)
- Complex quality control
- Ongoing evolution of data reduction software

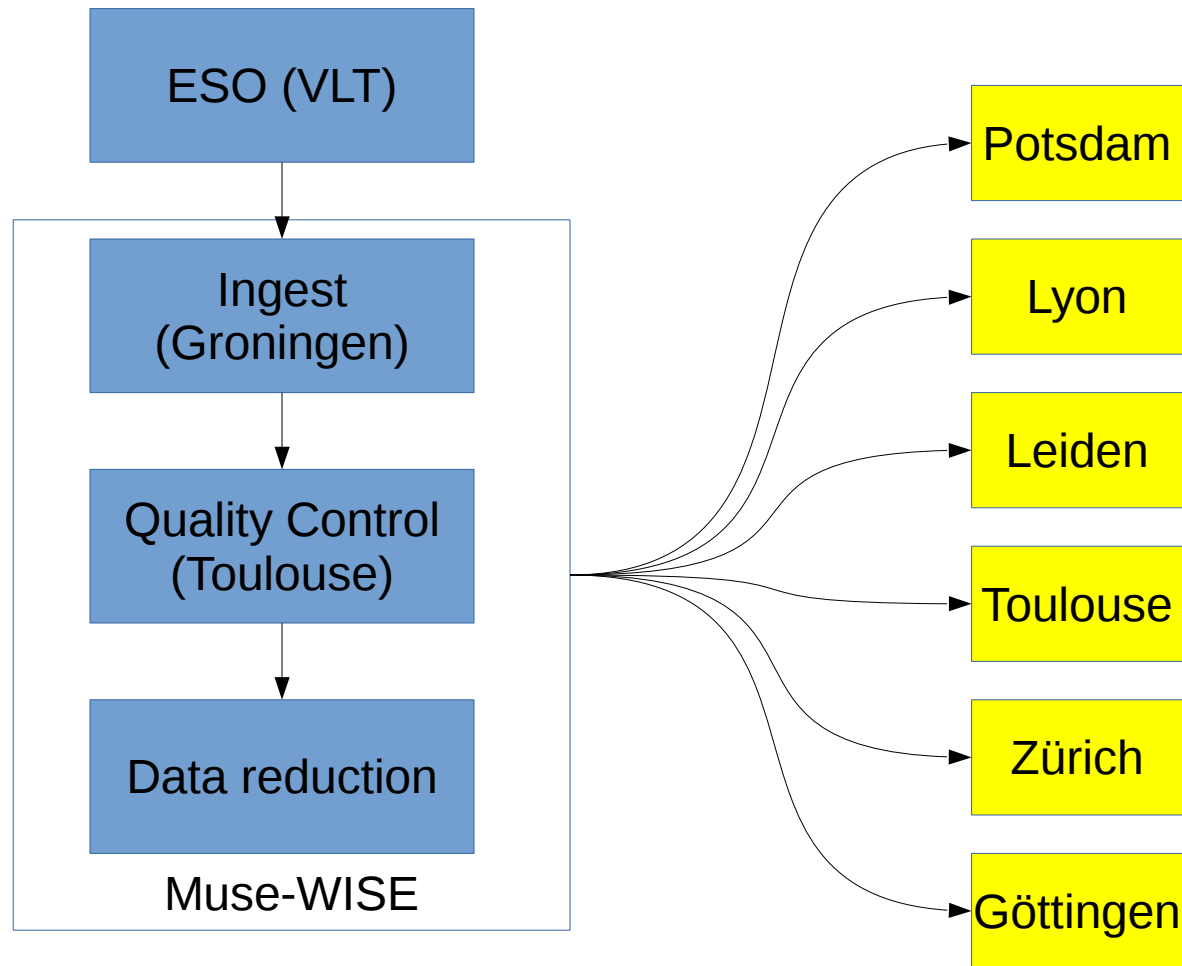
Data rates

- Data size:
 - Raw ~2 GB/exposure
 - Pixel table ~10 GB/exposure
 - Reduced data cube ~3 GB/exposure
- Data rate: ~100 GB/night, incl. calibration data
- Total data for GTO: >~150 TB

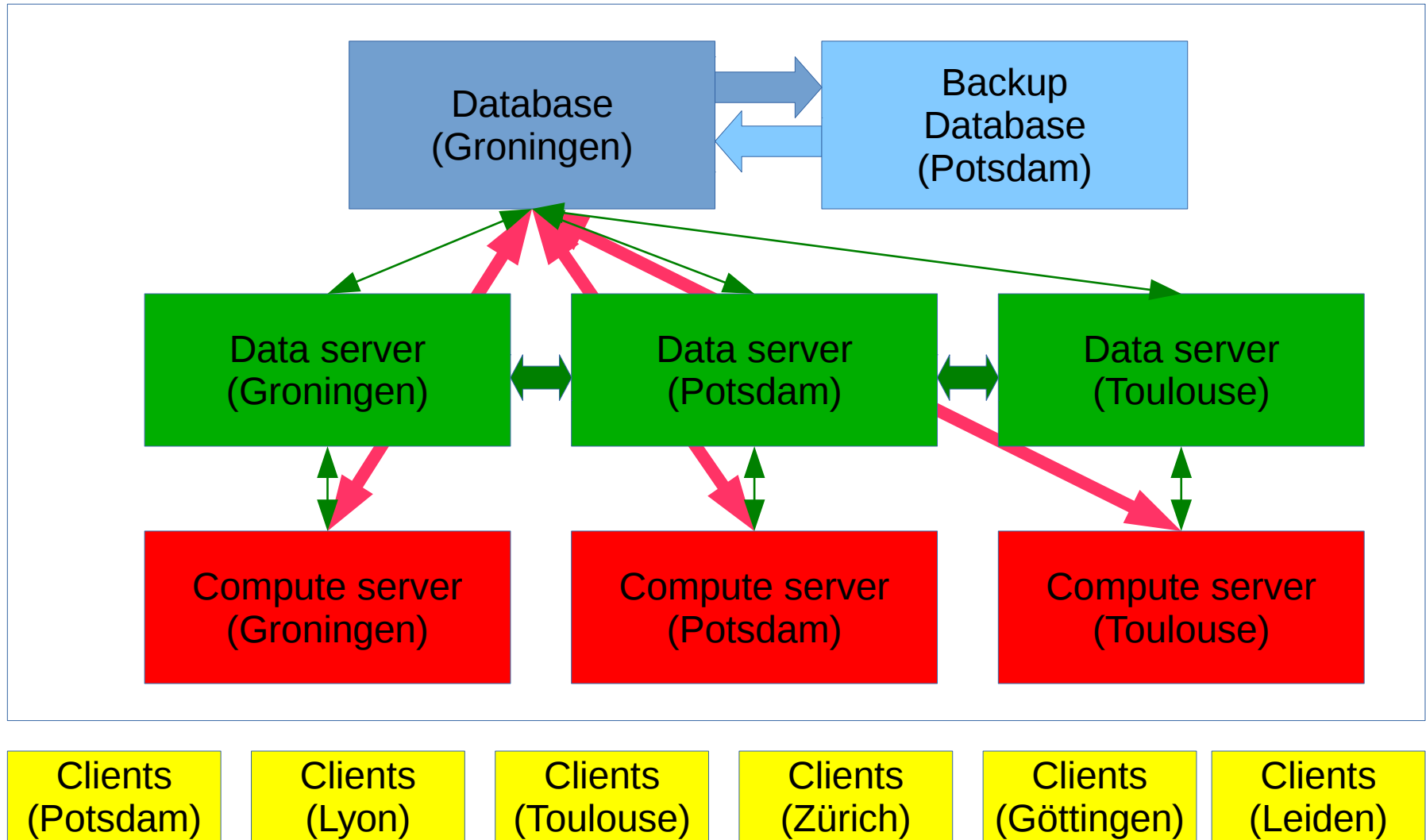
Collecting expertise for Muse-WISE



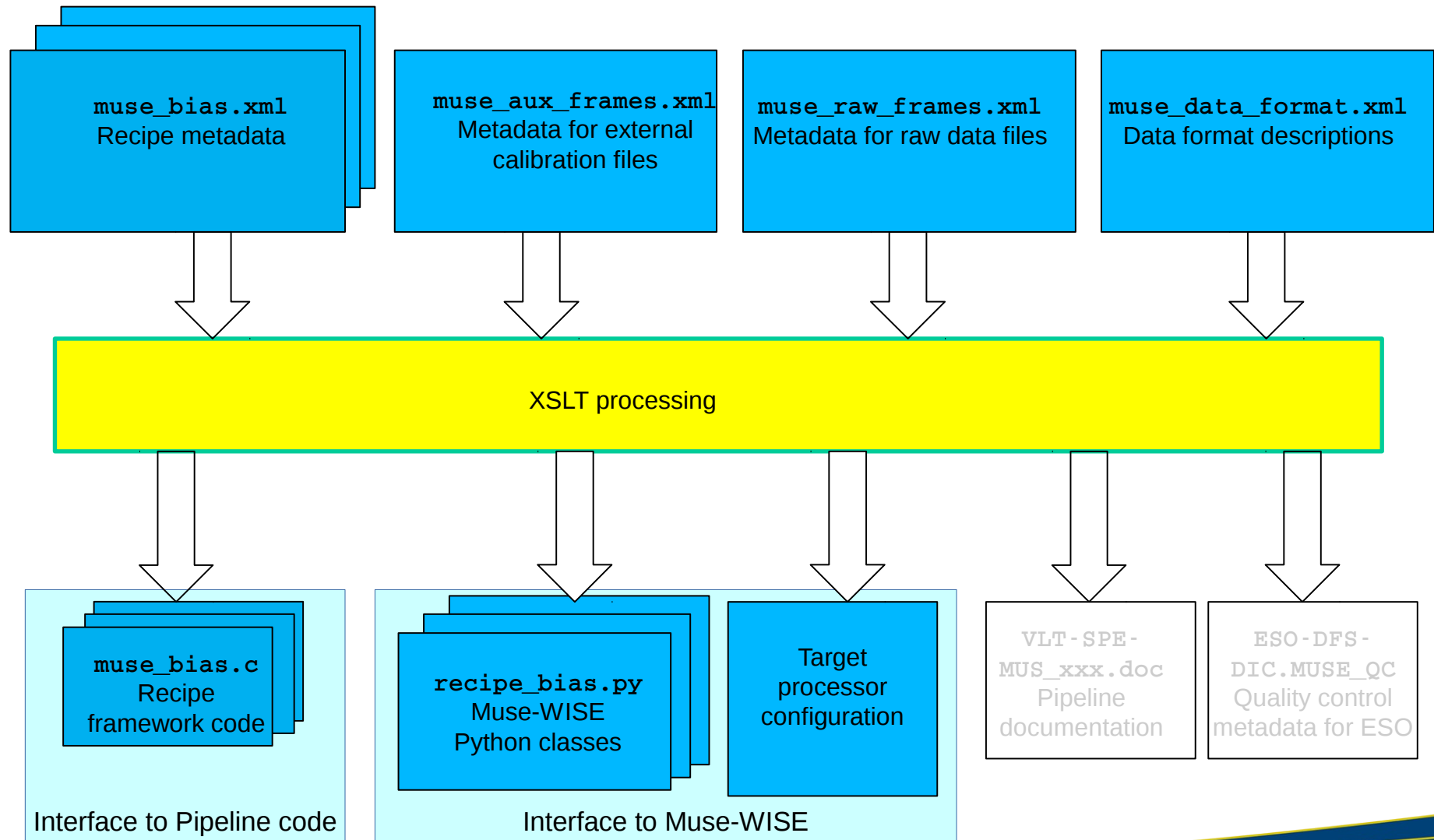
Muse-WISE data flow



Muse-WISE server structure



Muse-WISE pipeline integration



Muse-WISE client access

- Access
 - via Python API (interactively or from a script)
 - Web user interface
- Data organized by projects
 - Commissioning, Science verification,
 - GTO,
 - Various technical and testing projects
- Fine graded access rights per project

Muse-WISE Python interface

Python integrated in command line client

Query the Muse-WISE database for (raw) BIAS files

```
query = BIAS.DATE_OBS == datetime(2014,1,31)
for bias in query:
    print bias.filename
```

Create a data cube with specific cosmic ray parameters

```
pars = { 'crtype':'median', 'crsigma':20 }
dpu.run('scipost', date=date, commit=True, p=pars)
```

Muse-WISE web interface

DATAcube_FINAL_scipost

- Order by ☒ descending ☐ ascending
- 2nd Order by ☒ descending ☐ ascending
- Maximum number of rows
- Show only data within project: ☒ yes ☐ no
- Show expanded attributes: ☐ yes ☒ no [much faster]
- Use checkboxes: ☐ yes ☒ no
- Export options

Submit

expand all attributes

DATAcube_FINAL_scipost

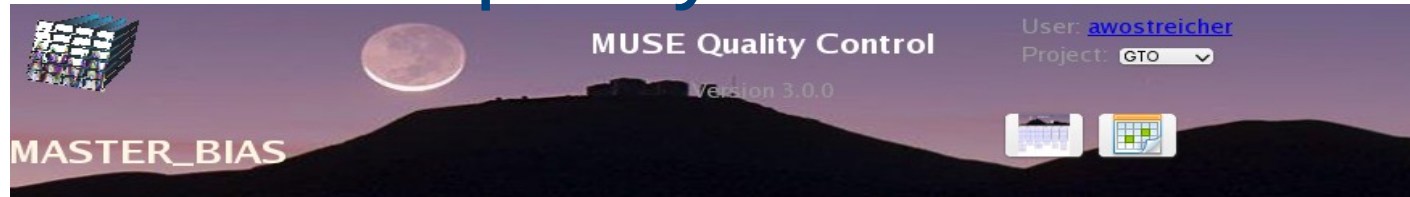
- creation_date
- DATE_OBS
- DEC
- ESO_DET_READ_CURID
- ESO_INS_DROT_POSANG
- ESO_INS_MODE
- ESO_INS_TEMP11_VAL
- ESO_OBS_ID
- ESO_OBS_NAME
- ESO_OBS_PROG_ID
- ESO_OBS_START
- ESO_OBS_TARG_NAME
- ESO_TEL_AIRM_END

Query results for table DATAcube_FINAL_scipost

Shown: 100 rows out of 612 entries, from project 'GTO'

ROWNUM	project_id	+PRIVILEGES	object_id	creation_d
1	11	2	object view	2015-08-17 15:50:0
2	11	2	object view	2015-08-17 15:20:4
3	11	2	object view	2015-08-17 15:52:5
4	11	2	object view	2015-08-17 14:54:0
5	11	2	object view	2015-08-17 14:27:4
6	11	2	object view	2015-08-17 14:28:0
7	11	2	object view	2015-08-17 13:40:0
8	11	2	object view	2015-08-17 13:36:0
9	11	2	object view	2015-08-17 13:13:4
10	11	2	object view	2015-08-17 13:09:5
11	11	2	object view	2015-08-17 12:24:4
12	11	2	object view	2015-08-17 12:24:0
13	11	2	object view	2015-08-17 11:53:4
14	11	2	object view	2015-08-17 11:53:4
15	11	2	object view	2015-08-14 16:18:0
16	11	2	object view	2015-08-14 16:13:5
17	11	2	object view	2015-08-14 15:58:0
18	11	2	object view	2015-08-14 16:00:5
19	11	2	object view	2015-06-26 10:01:0
20	11	2	object view	2015-06-17 23:37:0
21	11	2	object view	2015-06-17 22:51:0
22	11	2	object view	2015-08-17 11:03:5
23	11	2	object view	2015-08-17 11:04:0
24	11	2	object view	2015-08-14 15:20:0
25	11	2	object view	2015-08-14 15:10:5
26	11	2	object view	2015-08-14 15:06:0
27	11	2	object view	2015-08-14 14:46:0
28	11	2	object view	2015-06-17 22:05:4
29	11	2	object view	2015-06-17 21:20:0
30	11	2	object view	2015-06-17 20:34:0
31	11	2	object view	2015-06-17 19:48:0
32	11	2	object view	2015-06-17 19:02:4
33	11	2	object view	2015-08-17 10:20:0
34	11	2	object view	2015-08-17 10:20:0
35	11	2	object view	2015-08-17 09:38:0
36	11	2	object view	2015-08-17 09:38:0
37	11	2	object view	2015-08-14 11:35:0
38	11	2	object view	2015-08-14 11:32:0
39	11	2	object view	2015-08-14 11:16:0
40	11	2	object view	2015-08-14 11:16:0

Muse-WISE quality control interface



Observation details		Processing details		Graph details		Warnings
DATE_OBS	2014-09-13 19:42:19	CREATION_DATE	2014-10-14 19:23:17	CATEGORY	QC_ALL	SUM(A.NR_WARNINGS) 1
OBJECT	MASTER_BIAS	CREATOR	AWTURRUTIA	CREATION DATE	2014-10-14 19:24:14	SUM(A.NR_ERRORS) 0
MODE	WFM-NOAO-N	PRIVILEGES	2	PRIVILEGES	2	SUM(A.NR_CRITICALS) 0
		REFERENCE_NAME	None			Show warnings
		MUSEWISE VERSION	0.07.01			Get log files

Quality_flags ?

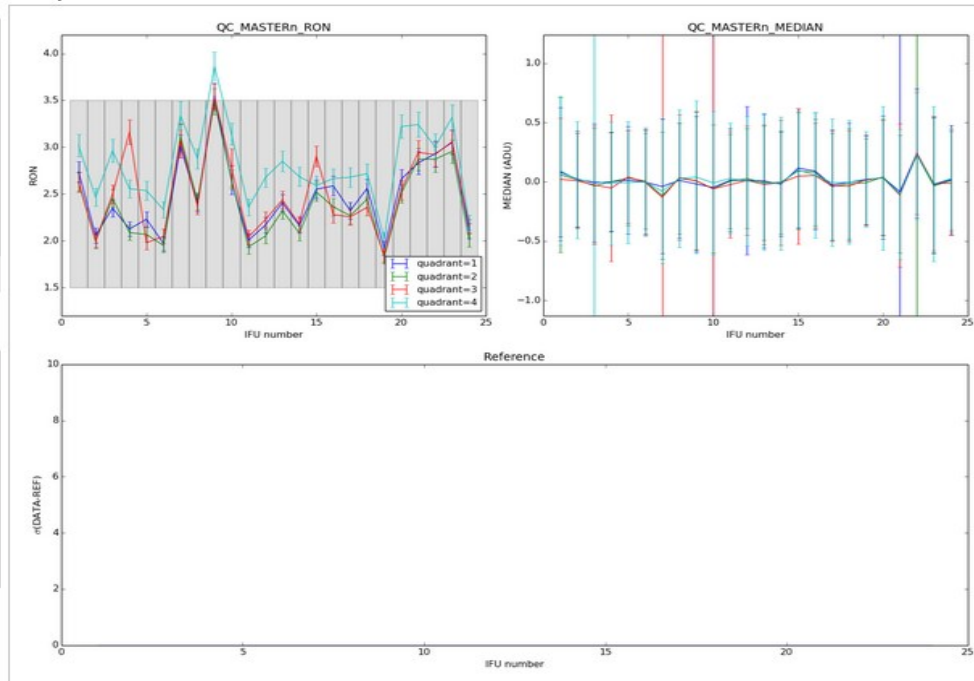
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24

◀ ▶ NIFU

Is_Valid -Click IFU to edit- DbView

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24

Graphs



Muse-WISE quality assurance

MUSE Quality Assessment Portal v3.4.0

awostreicher (GTO) Logout

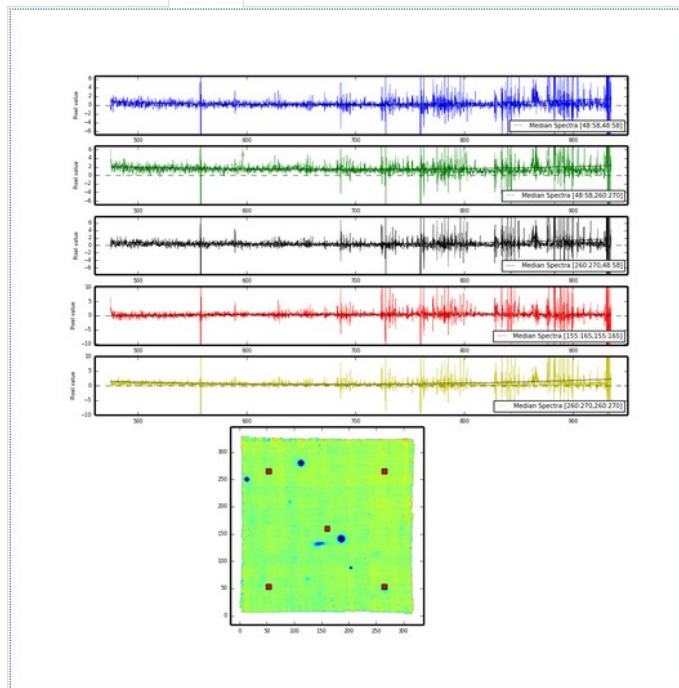
Assess
DATACUBE_FINAL_exp_combine

15F7369739521CA4E053C416A9C3D3D9

New Request

Processing	
Object	15F7369739521CA4E053C416A9C3D3D9
Creation Date	2015-05-13 13:04:18.298829
Is Valid	1
Privileges	2
Filename	DATACUBE_FINAL_exp_combine_20141225T042927_50aaf2de.fits
Creator	AWNBOUCHE (134)
SGS	SGS_20141225T042927_00ae014a77.fits
Reduced Pixtables	8 objects
Observational	
Object Name	SDSSJ080004
PI Col	BOUCHE,SCHROETTER,LILLY,BACON, SCHAYE,CONTINI,WISOTZKI
Observer	UNKNOWN
Date Obs	2014-12-25 04:29:27
Mjd Obs	57016.1871295
Ra	120.020225
Dec	18.82762
Eso Obs Targ Name	SDSSJ080004
Eso Ins Mode	WFM-NOAO-N
Eso Obs Prog Id	094.A-0211(B)
Eso Ins Drot Posang	0.0
Exptime	900.0

RGB PSF SKY WCS



... and 4 other images. (most recent shown)

Created at 2015-05-15 07:56:47.487145.

Automated data processing

- Automatically build data on request
- Automated dependency system, by default based on calibration plan
- Standard calibration data built in advance
- Reprocessing of data if needed
- System keeps track of processing history

Muse-WISE processing interface



[Home](#) | [Help](#) | [Login \(AWOSTREICHER\)](#) | [Project \(GTO\)](#) | [Processing](#)

Object State

The tree below gives the state of the PIXTABLE_OBJECT_scibasic object. Default only IFU 1 is shown, click the "show all ifus" link to show the state of all IFU's.

The query depth can be specified for both calibration and science products. Give -1 to query all the way to the raw objects. To query again click the "re-query" link.

To process the current object click the "process" link. The "file locations" link shows per file at which location the file is stored. Only the files needed for (re)processing are shown, if nothing is to be processed there is no link.

[show all ifus](#) [file locations](#) [re-query](#) [process](#)

Name	Value
DATE-OBS	2015-09-10 03:11:26
Instrument Mode	WFM-NOAO-N
Readout	1
Calibration depth	0
Science depth	-1

- + ifu 01 ▾ 1.0 PIXTABLE_OBJECT_scibasic (to be built)

- 2.1 BADPIX_TABLE
- 2.2 GEOMETRY_TABLE
- 2.3 ILLUM (null)
- 2.4 MASTER_BIAS
- 2.5 MASTER_FLAT
- 2.6 OBJECT
- 2.7 TRACE_TABLE
- 2.8 TWILIGHT_CUBE
- 2.9 WAVECAL_TABLE

Object Details

[Close](#)

Name	Value
type	GEOMETRY_TABLE
object_id	1F92E5B728FB7348E053C416A9C3C3CE
filename	geometry_table_wfm_gto08_10deg_1.0_e9781d4e.fits
creation_date	2015-09-12 19:36:54.200426
ESO_INS_MODE	WFM-NOAO-N
ESO_DET_READ_CURID	1
timestamp_start	2015-09-07 16:00:00
timestamp_end	2015-09-14 16:00:00
is_valid	1
quality_flags	0

Outlook

- Implementation is almost complete
- Do the processing of the GTO data
- Evolution of the data reduction system
 - observation modes (NFM, AO)
- Integration of science ready data
 - Catalogs

Summary

- MUSE (GTO) science will benefit from a centralized data management system
- Cooperation of
 - Astro-WISE Groningen (data management expertise)
 - MUSE consortium (instrument expertise)
- Integration of the MUSE pipeline
- Fine grained access control possible
- Automated data processing

This work is supported by the BMBF-Verbundforschung (grant no. 05A14BAC)