Distributed Quality Control at ESO

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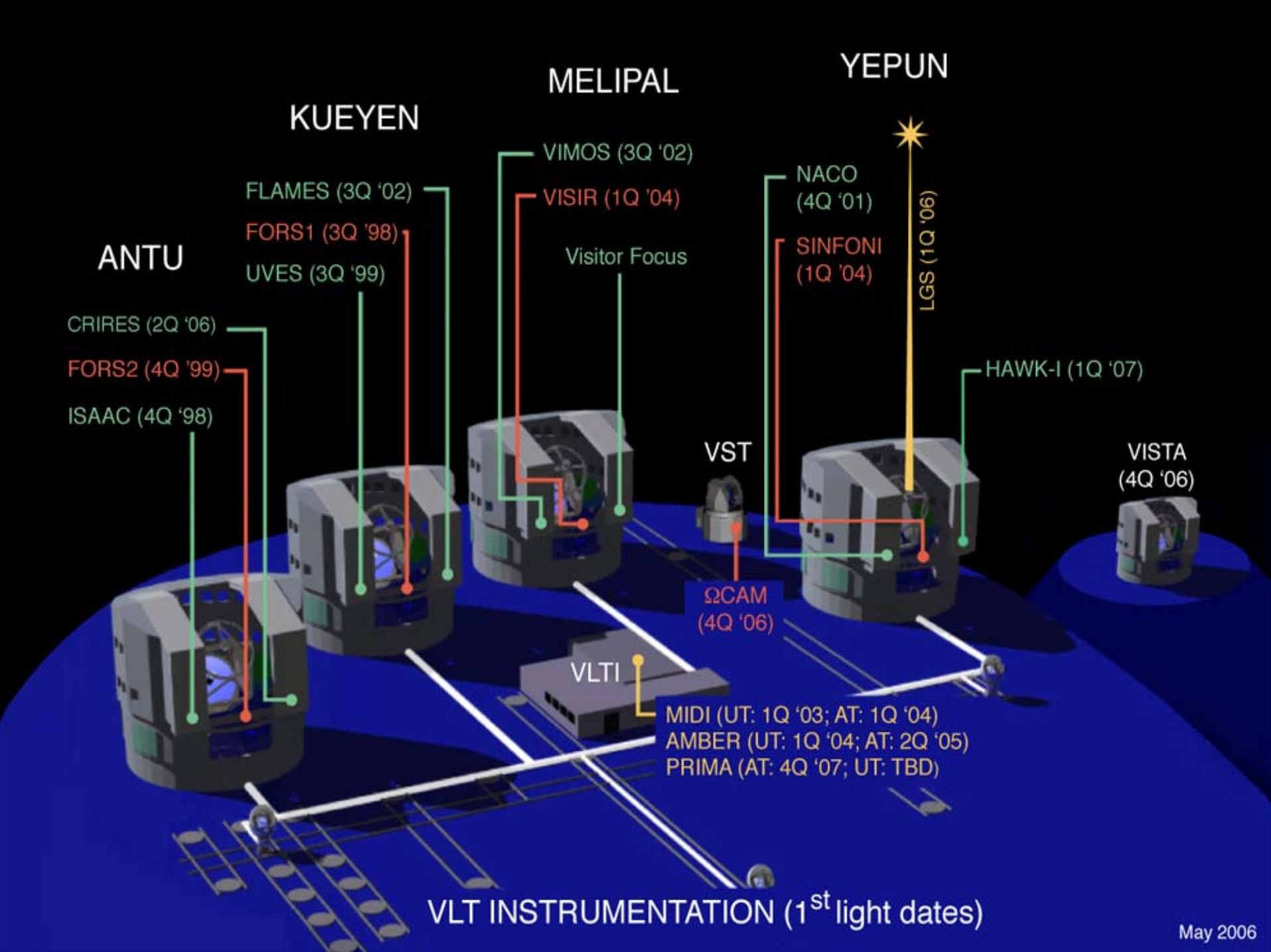
1. Data at ESO
2. Data quality
3. From QA to QC
4. Critical components

1. Data at ESO

- VLT Cerro Paranal/Chile:
  - 9 instruments on 4 UTs (8.2m each)
  - VLT-interferometer: 2 instruments
  - survey telescopes


MELIPAL
YEPUN
KUEYEN
VIMOS (3Q '02)
VISIR (1Q '04)
NACO
(4Q '01)
SINFONI
(1Q '04)
LGS (1Q '06)
FLAMES (3Q '02)
FORS1 (3Q '98)
UVES (3Q '99)
Visitor Focus
ANTU
CRIRES (2Q '06)
FORS2 (4Q '99)
ISAAC (4Q '98)
HAWK-I (1Q '07)
VST
VISTA
(4Q '06)
ΩCAM
(4Q '06)
VLTI
MIDI (UT: 1Q '03; AT: 1Q '04)
AMBER (UT: 1Q '04; AT: 2Q '05)
PRIMA (AT: 4Q '07; UT: TBD)
VLT INSTRUMENTATION (1st light dates)
May 2006

- all instruments have data processing pipelines enabled for automatic mode

- pipeline processing:
  - on-site (automatic, background; staff and visiting astronomers)
  - off-line (supervised, optimized; Garching headquarters, QC group)

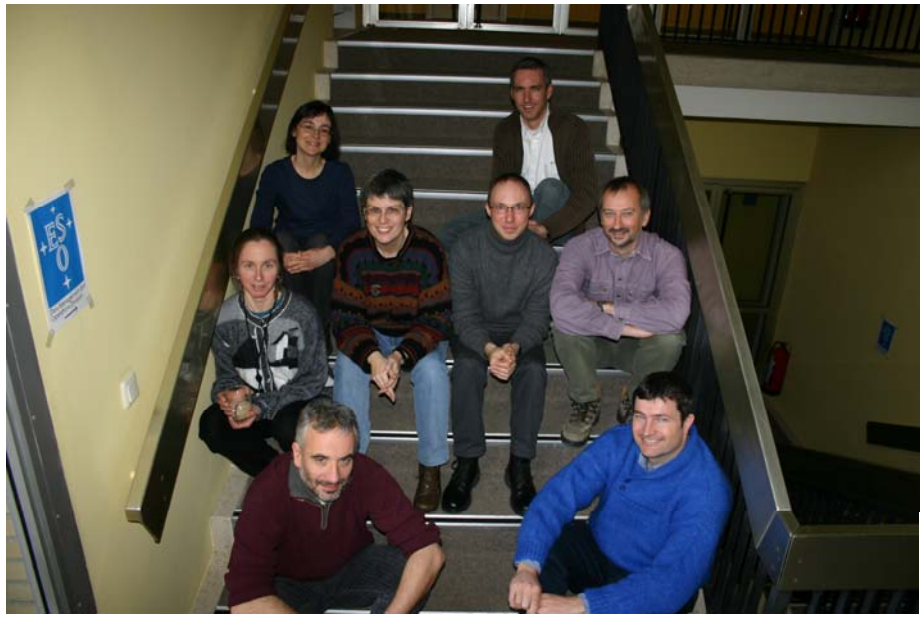
- goals:
  - quality control, instrument status
  - data reduction

2. Data quality

- good data?
  - good science data: best possible performance (ambient conditions, S/N, resolution, background etc.)
  - good calibration data: record of instrument and atmosphere conditions, no degradation of science quality

- good calibrations:
  - sufficiently accurate
    (e.g. no increased noise after flattening)
  - close to observing conditions (close in time)

- challenges on the ground:
  - atmosphere challenging (rapid variations)
  - calibrate instrument ⇔ calibrate science
  - calibration plan required (Service Mode)



- QC group:
  - 8 astronomers
  - data processing
  - data QC
  - data packages
  - located at ESO headquarters (Garching, Germany)

- The task
  - per month: roughly 400 GB raw data
  - 11,500 processing jobs
  - 80 data packages to Service Mode P.I.s
- http://www.eso.org/qc

3. From QA to QC

- QA: quality measure and assessment
- QC: quality control

- QC: shared process between Paranal and HQ
- requires to close the loop
- provides feedback to enable corrections

- Components:
  - pipelines (QC parameters → QC database)
  - on-site QC
  - Health Check monitor:
    comparison new data ⇔ old data

  - QC group
  - QC processing and certification
  - trending

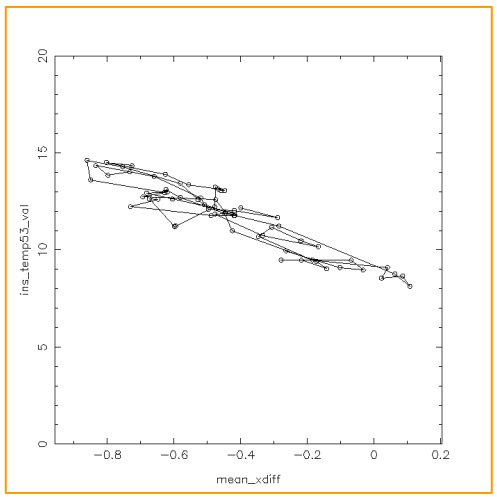
- QC aspects on-site:
  - formal compliance of file format
  - compliance with user constraints (OB grading)
  - check against reference files
    ("check if different from yesterday")

- off-line (QC Garching):
  - check pipeline products
  - optimized association, optimized processing
  - measure quality: extract QC parameters
  - compare to similar data (trending)

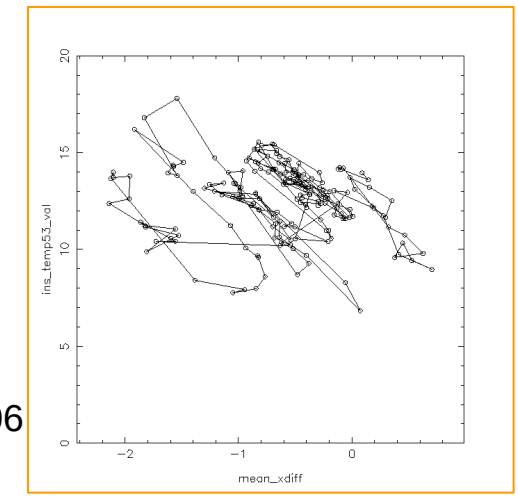
- Health Check monitor
  - on-site pipelines: measure QC parameters
  - fed into database, transferred to HQ
  - compared to previous data: trending
  - web-based trending reports

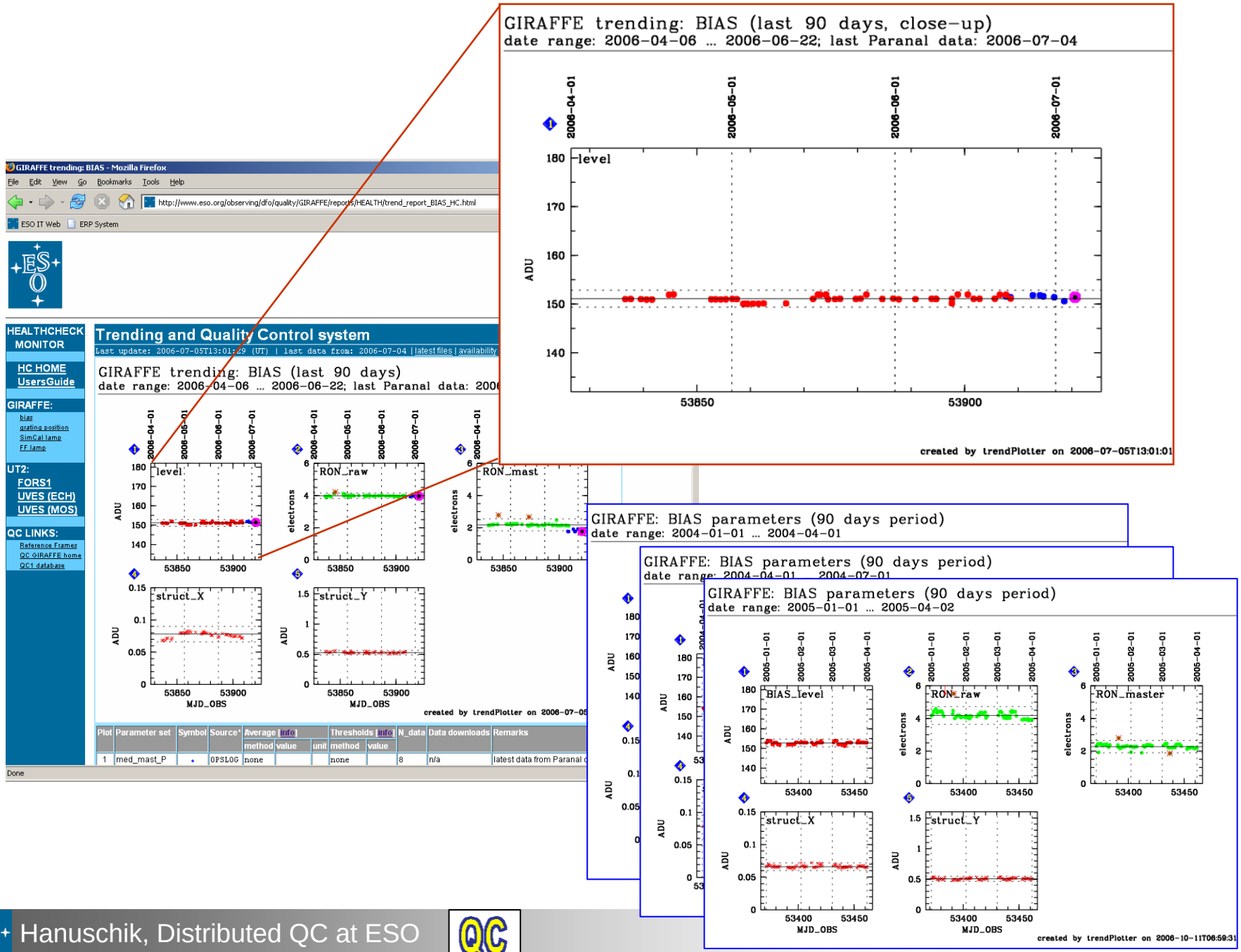
  - main QC interface between the mountain and QC

- Trending
  - provided and maintained by QC group
    - set of current and history trending plots
    - customized for each product type and instrument component
  - memory about the instrument performance

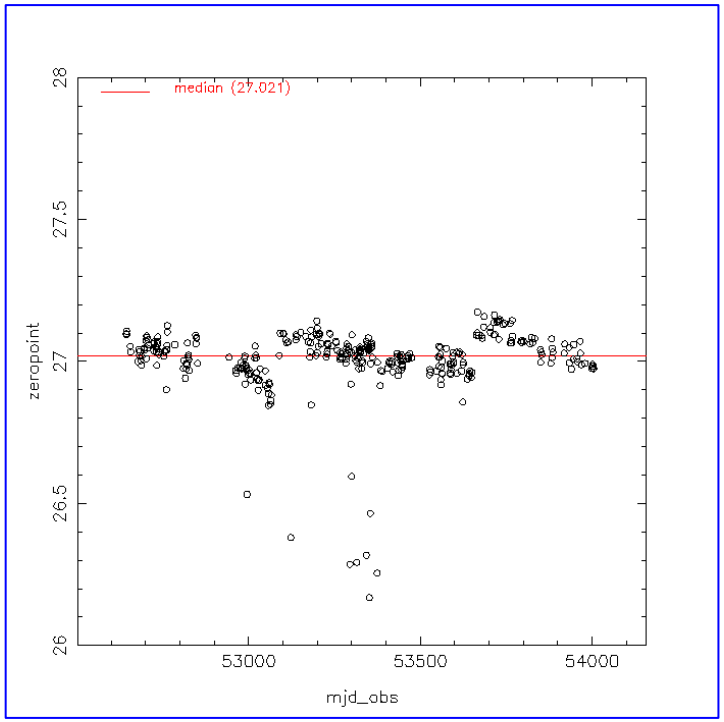


FLAMES/Giraffe,
grating shifts 2005/2006




GIRAFFE trending: BIAS (last 90 days, close-up)
date range: 2006-04-06 ... 2006-06-22; last Paranal data: 2006-07-04
level
ADU
created by trendPlotter on 2006-07-05T13:01:01
GIRAFFE trending: BIAS - Mozilla Firefox
Trending and Quality Control system
HEALTHCHECK MONITOR
HC HOME
UsersGuide
GIRAFFE:
bias
grating position
SimCal lamp
FF lamp
UT2:
FORS1
UVES (ECH)
UVES (MOS)
QC LINKS:
Reference Frames
QC GIRAFFE home
QC1 database
GIRAFFE trending: BIAS (last 90 days)
RON_raw
RON_mast
struct_X
struct_Y
electrons
MJD_OBS
GIRAFFE: BIAS parameters (90 days period)
date range: 2004-01-01 ... 2004-04-01
GIRAFFE: BIAS parameters (90 days period)
GIRAFFE: BIAS parameters (90 days period)
date range: 2005-01-01 ... 2005-04-02
BIAS_level
RON_master

- QC database
  - interfaces to browse and plot QC parameters
  - dynamic plots for research
    - http://archive/bin/qc1_cgi



zeropoints VIMOS 2003-2006

4. Critical components, challenges

- information exchange
  - setup procedures for information exchange
  - instrument operating teams
  - Health Check monitor
- control complexity
  - automatic evaluation whenever possible
  - flag outliers, set alerts, trigger actions
  - TBD: provide automatic assessment, scoring