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This document presents work package progress by CASU during Q1 2006.
For further details of group activities over the past month and quarter see
http://www.ast.cam.ac.uk/vdfs/diary.html. For the minutes of all group meetings see
http://www.ast.cam.ac.uk/vdfs/docs/minutes

Early Data Release
EGS generated assorted stacked DXS data and catalogues as part of the EDR. Though
there was some confusion about how this fitted in with what WFAU were doing.

Processing WFCAM 05B
This was finished at the beginning of March. Steady state processing was attained
midway through the semester with data processed and checked within 4 weeks of it
being taken (including the wait time for tapes to arrive). There was a minor hiccup
with 3 nights at the end of the semester when one of the detector controllers (#3) and
the spare went walkabout. The complete absence of ANY #3 data required a
workaround.

Reprocessing WFCAM 05A
Reprocessing of the 05A data has begun. The main changes are an improved sky
correction strategy and applying the cross-talk correction algorithm that was
developed and used for 05B data.

PSF fitting
The split PSF measurer is working well and a baseline PSF fitting programme using
this has been written. However, this latter software does not give optimum results.
There is no point adding PSF measures to the catalogues until this software performs
satisfactorily. As a test, data covering M17 were analysed to compare the
performance of the PSF and standard pipeline photometry. For frames with good
seeing, there was, as expected, negligible difference between the two methods.
However, for poorer seeing the aperture fluxes were better. An improved PSF fitting
is being developed in which the microstep interleave components are analysed in
parallel to fix this problem. Work on this is still in progress and has delayed
incorporating PSF measures into the catalogues.

UKIDSS EDR, Survey and CASU papers
CASU contributed several parts of the EDR (Dye et al.) and Survey (Lawrence et al.)
papers. A first draft of the CASU technical paper has been produced based on an
updated SV report and the earlier WFCAM commissioning report. The SV report was
udpated to include a diagram to "explain" the cross-talk pattern. In addition colour-
colour and colour-magnitude diagrams of IC4665, M17 and an LAS tile were
produced and included, along with a brief howto, as examples of the quality of data
that the pipeline is generating. The SV report can be found at
http://www.ast.cam.ac.uk/vdfs/docs/reports/sv

Raw WFCAM archives

All of the relevant raw WFCAM 05A and 05B (ie. UKIDSS + calibration data) Internet transfers to ESO are complete. The raw WFCAM data archive is up to date and typically lags about 2-3 weeks behind the observations being taken.

WFCAM photometric calibration

CASU have recommended (in conjunction with the calibration working group) a new strategy for observing standards. CASU have demonstrated that 2MASS can be used to calibrate WFCAM JHK to better than 2% (tested against UKIRT FS). Issues for Y and Z have not been fully resolved yet. Further investigation of the Z-band calibration are in hand using SDSS comparison and both Y and Z measures will be further compared with updated Z and Y pseudo-standards from Sandy Leggett when available. Observing of standard fields has been recommended to be every 2 hours, in all broad bands but on photometric nights only. Among other things this will provide useful diagnostic measures and external verification. The report is available at
http://www.ast.cam.ac.uk/vdfs/docs/reports/2masscal.pdf

The updated WFCAM calibration is using a restricted 2MASS J-Ks colour range of 0 < J-Ks < 1 to help exclude late-type giants, weird objects and heavily reddened stars. This should produce a more stable calibration for the Y and Z bands (but have little impact on the JHK calibration). The new calibration will be applied to the 05A data together with the addition of derived extra information regarding the photometric quality of the night and of the individual fits.

VISTA public survey proposals

Various members of CASU attended some of the VISTA public survey meetings and contributed, in particular, to the data management and processing aspects. Several CASU members are on the science teams for the proposals.

WFCAM persistence investigation

A practical robust scheme to directly correct the image data does not seem possible. The error on the correction is similar to the size of the correction. The source of the scatter may be systematic in some way rather than random but is proving difficult to measure and hence quantify. For interleaved and deeper stacked surveys the impact of persistence is minimal - persistence images are not generally detected as objects by the cataloging software. Post-pipeline processing flagging options are a viable alternative eg. using 2MASS stars and a simple persistence model as a predictor of possibly suspicious images. However, it is felt that this issue should be science requirement-driven ie. is persistence causing problems in doing the science? The persistence report, including some examples, is available at
http://www.ast.cam.ac.uk/vdfs/docs/reports/persistence/

WFCAM pipeline issues

RGM reported some deblending problems identified from outliers in the LAS. Some were caused by seeing variations, and are a fact of life. A few others were tracked down to a low-level bug in the pipeline catalogue software that was not present in the development version. This bug was fixed prior to commencing 05A reprocessing. Although multiple comparisons are routinely carried out between the development toolkit software and the pipeline version, this bug had slipped through due to its

unusual nature. Weird science outliers are, of course, a good way of finding pathological problems.

There have also been some problems related to deep stacking. The usual CASU pipeline output produces 32-bit integer FITS. Given enough files in a stack quantisation noise can become an issue. The post-pipeline processing stacking software has an option to produce real*4 output if required and should resolve this problem already. The other aspect was caused by a software limit in the supplied pipeline catalogue software. A simple workaround for this was suggested at the time and a more robust solution is under development.

VST survey management plans
A draft of the VST public surveys Survey Management Plan for the 2 UK-led VST surveys has been written. The VPHAS+ plan was finished and submitted before the end of March and is being used as a starting point for the ATLAS plan which is due mid-April.

VISTA Data Reduction Library
The VISTA Quality-Control Pipeline Data-Reduction Library version 0.1 was delivered to ESO on 23rd December 2005. This fulfilled the commitment made at the FDR to deliver by the end of the year. Four complete functional recipes were included, along with artificially-generated test data, a test script, and the doxygen-based user manual. The corresponding DRLD was signed off in February, with the other documents to follow. Feedback from ESO suggest that the modules built cleanly, installed without problems, ran under ESO infrastructure and produced the right answers from the test data.

At the time of writing, there is still no AIT data from the real camera of sufficient "correctness" to test any elements of the pipeline; however, we have examined a small number of early frames using standard interactive methods, and helped to identify and evaluate some problems including chip coordinate transformations, and the FITS extension-ordering problem.

Development continues, with rationalisation and improvement of the original recipes, and at this time the development of two more complete ones (dome flats and linearity), and testing continues to check completeness, robustness and accuracy. The DRLD draft is being updated correspondingly. The next minor version delivery is expected to be in time to incorporate into the dry run at ESO in June, at which time DMD hope to perform an end-to-end pipeline test using VISTA modules and test data within their new Condor-based reduction-scheduling environment.

Exposure Time Calculator
Emergency enhancements to the VISTA Exposure Time Calculator demonstration prototype were made in time for the (early) deadline for VISTA Survey Proposals from ESO. Approximations to the reflectance of optical surfaces were produced by hand-digitizing pdf documents, a typical detector QE curve was incorporated and witness-sample curves were used for the four existing filters. All this was hacked into code to produce a working web service in time for the Jan 15 announcement.

ESO has recently assigned a programmer to produce the production ETC, raising the priority of the Characteristic Data deliverables. The ETC C software modules, current versions of the characteristic data tables and v1.1 of the ETC document were delivered to Jakob Vinther, who is in charge of implementing ESO ETCs.

Pending VDFS documents
There are still several VDFS documents requiring signing off (list available on request). The number of pending VDFS documents has gone up by one. The newly found document is called "VDFS Requirements for VISTA Data Information" and is a QMU-led document which we discovered after acquiring the VISTA technical specification documents. Presciently, CASU had already compiled and forwarded a list of requested observations for technical tests to RAL to be carried out either during AIT or during all-up testing prior to shipping VIRCAM out of the country - see
http://www.ast.cam.ac.uk/vdfs/docs/vista/cambridge_ait_request.txt

SPR for FITS extension ordering
After much internal discussion CASU compiled a detailed case outlining why they felt a fixed FITS file extension order was needed for VIRCAM. ESO DMD DFS agreed and posted a request for a software enhancement to achieve it in time for commissioning. PSB is writing a script to order any AIT FITS files before letting them loose here.