The VISTA Data Flow System

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Introduction to CASU

► Small group within the Institute of Astronomy, specialising in survey astronomy.
► Pipeline reduction of imaging data
  - APM (Schmidt Plates 1 x 40k x 40k)
  - INT Wide Field Camera (4 x 2k x 4k)
  - ESO WFI on 2.2m at La Silla (8 x 2k x 4k)
  - MOSAIC-1 on KPNO 4m (8 x 2k x 4k)
  - MOSAIC-2 on Blanco 4m at CTIO (8 x 2k x 4k)
  - AAO WFI on AAT (8 x 2k x 4k)
  - CIRSI on INT (4 x 1k x 1k)
  - INGRID on WHT (1k x 1k)
  - UFTI on UKIRT (1k x 1k)
  - WFCAM on UKIRT (4 x 2k x 2k)
Introduction to VDFS

► PPARC funded facility to provide an end-to-end data-flow system for VISTA and WFCAM.
► Quality control and calibration pipelines
  ▪ Paranal and Garching
► Science pipeline for full calibration of science data.
  ▪ Cambridge
► Science archive acts as the point of access of the reduced data. Plus some further processing.
  ▪ WFAU, Edinburgh
Data Flow

- Raw telescope data is assessed by the summit pipeline (QC1)
- Shipped to Garching (discs)
- Shipped to CASU for science reduction and calibration. (discs)
- Calibrated data shipped to Edinburgh for archiving (ftp)
IR Data Reduction Worries

► IR detectors are currently inherently more unstable than optical CCDs.
  ▪ Some odd electronic effects

► Sky emission > 100x brighter than most objects
  ▪ And it’s variable both spatially and temporally!

► Exposure times are short, so data rates are very high.
  ▪ 200-500 Gb/night expected for VISTA public surveys
  ▪ Rice tile compression can save factors of 3-4 in 32 bit integer data
VDFS Pipeline Recipes

► Create master calibration frames (dark, twilight flats, confidence maps, etc)
► Linearity analysis
► Detector noise & dark current properties
► Persistence and crosstalk analysis
► Illumination correction analysis
► Full reduction recipes for standard star and programme fields
Processing Steps

► Reset correction (debias)
► Linearity correction
► Dark and reset anomaly correction
Reset Anomaly (WFCAM)
Processing Steps

► Reset correction
► Linearity correction
► Dark and reset anomaly correction
► Flat field correction
► Background correction (defringing)
► Destriping
Stripes Close Up (VISTA)
Stripes (VISTA)
Processing Steps

► Reset correction
► Linearity correction
► Dark and reset anomaly correction
► Flat field correction
► Background estimation and subtraction (defringing)
► Destriping
► Image persistence and detector crosstalk removal
Crosstalk (WFCAM)
Processing Steps

► Reset correction
► Linearity correction
► Dark and reset anomaly correction
► Flat field correction
► Background estimation and subtraction (defringing)
► Destriping
► Image persistence and detector crosstalk removal
► Interleaving
► Dithering/Jittering
► Catalogue generation
► Astrometric calibration
► Photometric zeropoint calibration
► (Tiling)
Summit & Garching Pipelines

► QC1 parameters
  - e.g. photometric zeropoints, astrometric fit quality

► Written using ESO qfits/CPL infrastructure
  - Both use the same software modules

► Reduce a pawprint

► Amount of processing can be scaled down

► Calibration images (flats etc) from a master library.
Cambridge Pipeline

- Full reduction
  - Tiling and sky correction
- Catalogue generation is done for both pawprints and tiles
- Results shipped to WFAU
- Some of the same CPL based modules reused. Some additional modules required.
Current Status of VISTA Pipelines

► Version 0.4 ESO pipelines currently being tested

► Version 0.5 to be released end of February
  ▪ Full compliment of recipes (almost!)
  ▪ PAE

► WFCAM pipeline is a prototype for the extra functionality required by Cambridge VISTA pipeline
A Typical Recipe Run…

```bash
jim@dhcpsec56(~){22}> esorex vircam_jitter_microstep_process --ext=0 all.sof

***** ESO Recipe Execution Tool, version 3.6 *****
[ INFO ] vircam_jitter_microstep_process: Beginning work on extension 1
Segmentation violation
jim@dhcpsec56(~){23}> ![image]
```