Complex Datasets: Use-cases for Provenance DM

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Provenance DM

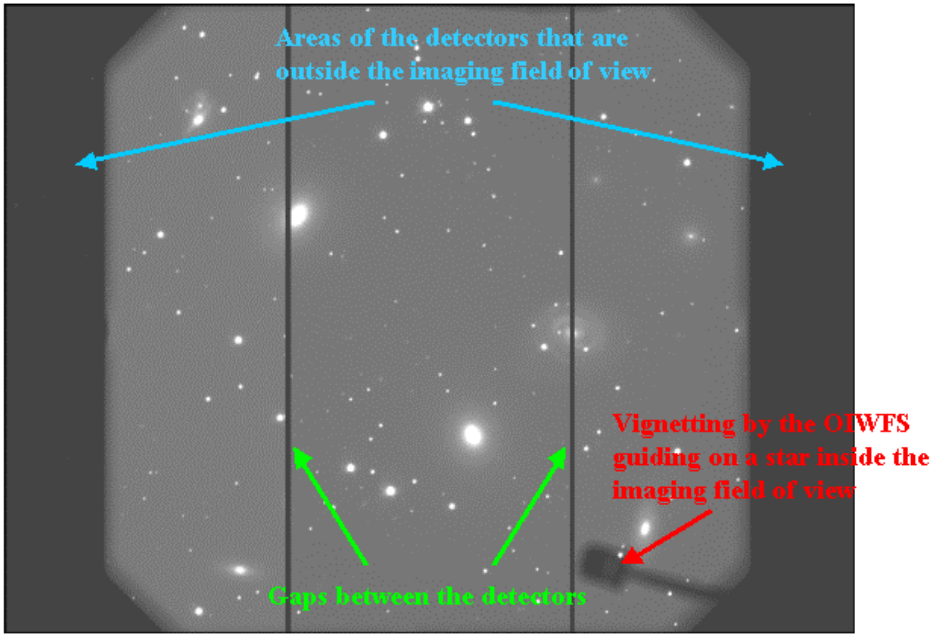
- An important block of the Observation DM
- Is supposed to describe the way an original dataset produced by the instrument was transformed/processed/reduced into the science ready form
- This may be very important, i.e. to be able to compute correctly the statistical properties of the data: error-bars, distributions, etc.

Complex datasets: examples

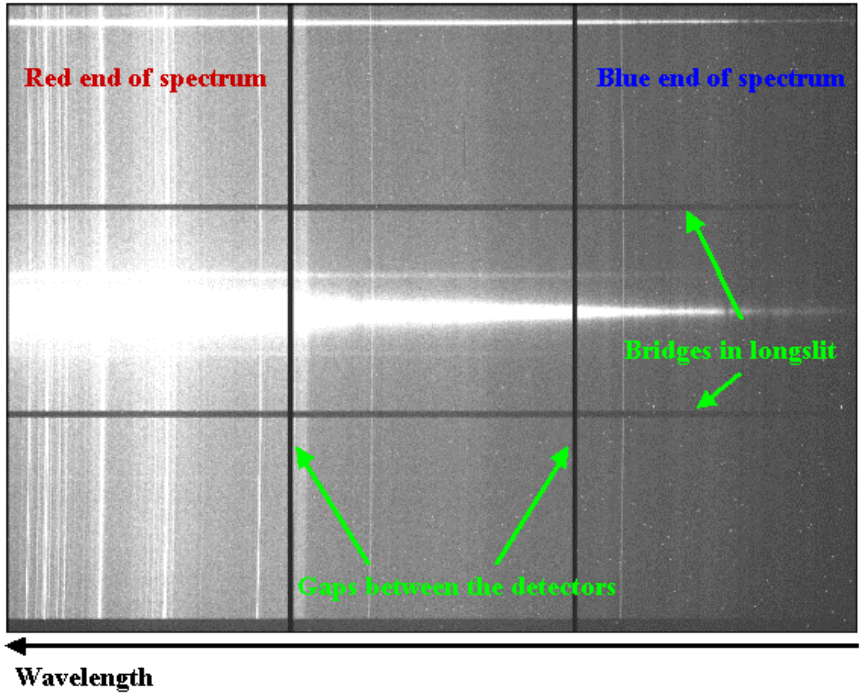
- GMOS (Gemini Multi-Object Spectrograph) – a multi-mode instrument:
  - imaging
  - long-slit spectroscopy
  - multi-slit spectroscopy
  - IFU spectroscopy
- Complex configuration:
  - 3 separate CCD chips forming a mosaic
    - all figures on the following slides were stolen from the instrument web-pages at http://www.gemini.edu/

Example 1

- Mosaic imaging
- 3 CCD chips:
  - mosaicing
    - offsets
    - rotations
  - different bias levels
  - different gain values
  - different spectral sensitivity curves => slightly different calibration solutions



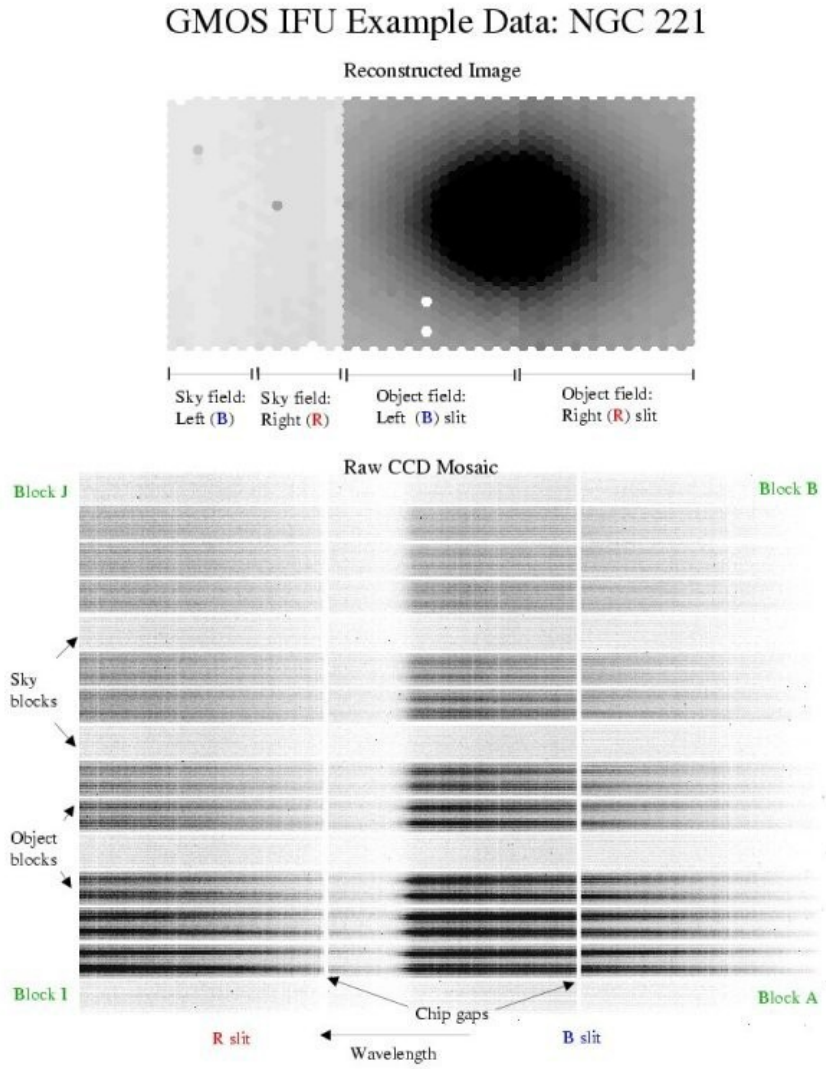
Example 2



- Long-slit spectra
- In addition
  - slit is curved
    - CCD gaps are projected to different wavelengths at different slit positions
  - different response along the slit
    - dust, slightly variable slit width => affects the resolution

Example 3

- IFU spectroscopy
  - fiber traces as 1D-spectra
    - field-to-slit mapping
  - 1-slit mode
  - 2-slit mode: 2 pseudo-slits projected onto 3 CCD chips
    - different parts of the FoV in the reconstructed datacube contain data originally coming from different CCDs
    - non-trivial flux calibration



Other examples:

- Multi-CCD HST Imagers (WFPC2, ACS) and mosaic wide-field imagers (e.g. **MEGACAM@CFHT**) widely available
- **VIMOS@VLT**
  - 4 independent spectral units (different gratings, CCDs, optical distortions, etc.) for 4 quadrants of the FoV. Will be even worse for MUSE: 24 units
- **X-shooter@VLT**
  - Different types of detectors for different wavelength from optical to NIR