ASKAP Source Finding and Quality Evaluation

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Credit: Alex Cherney/terrastro.com

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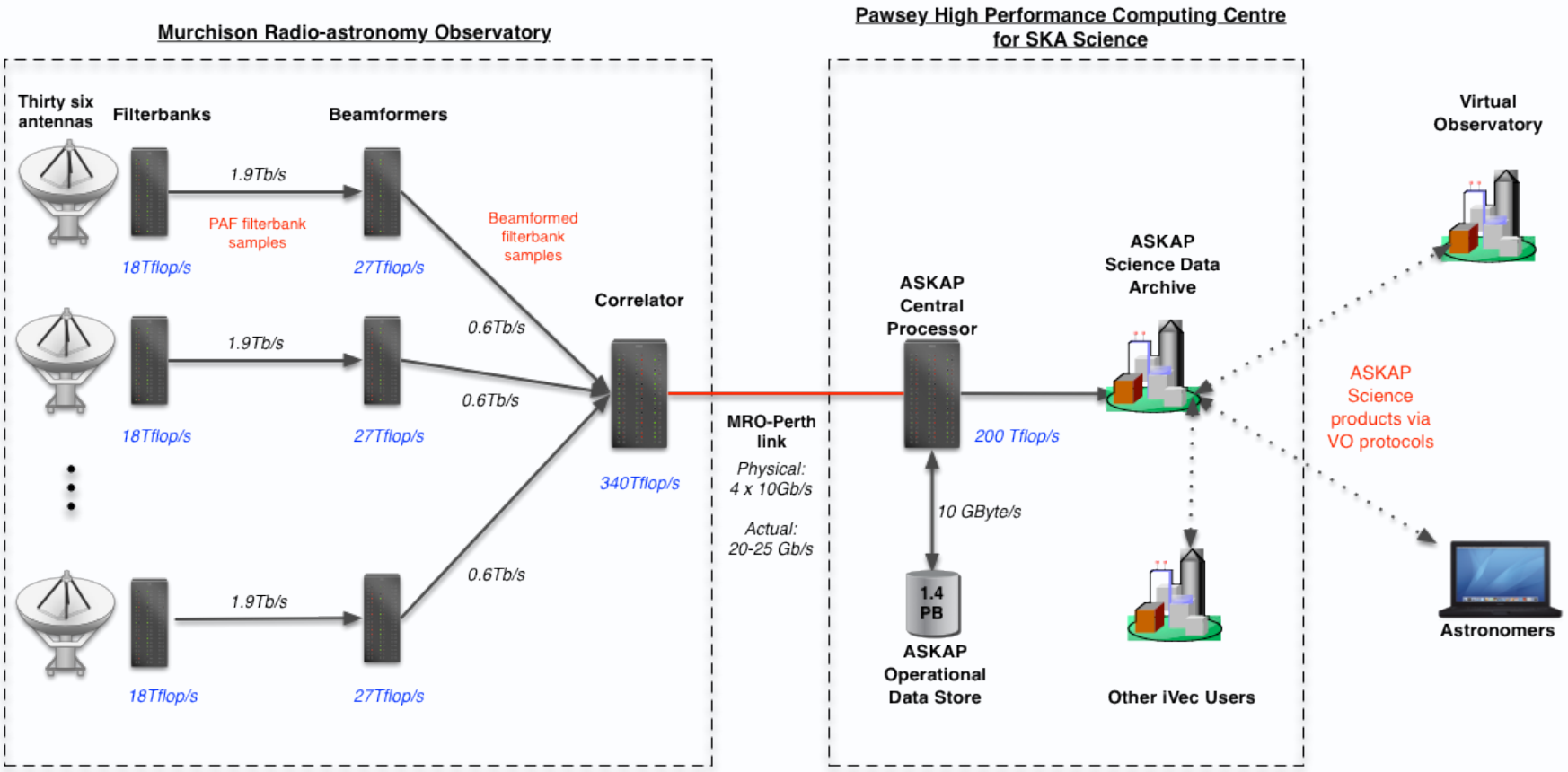
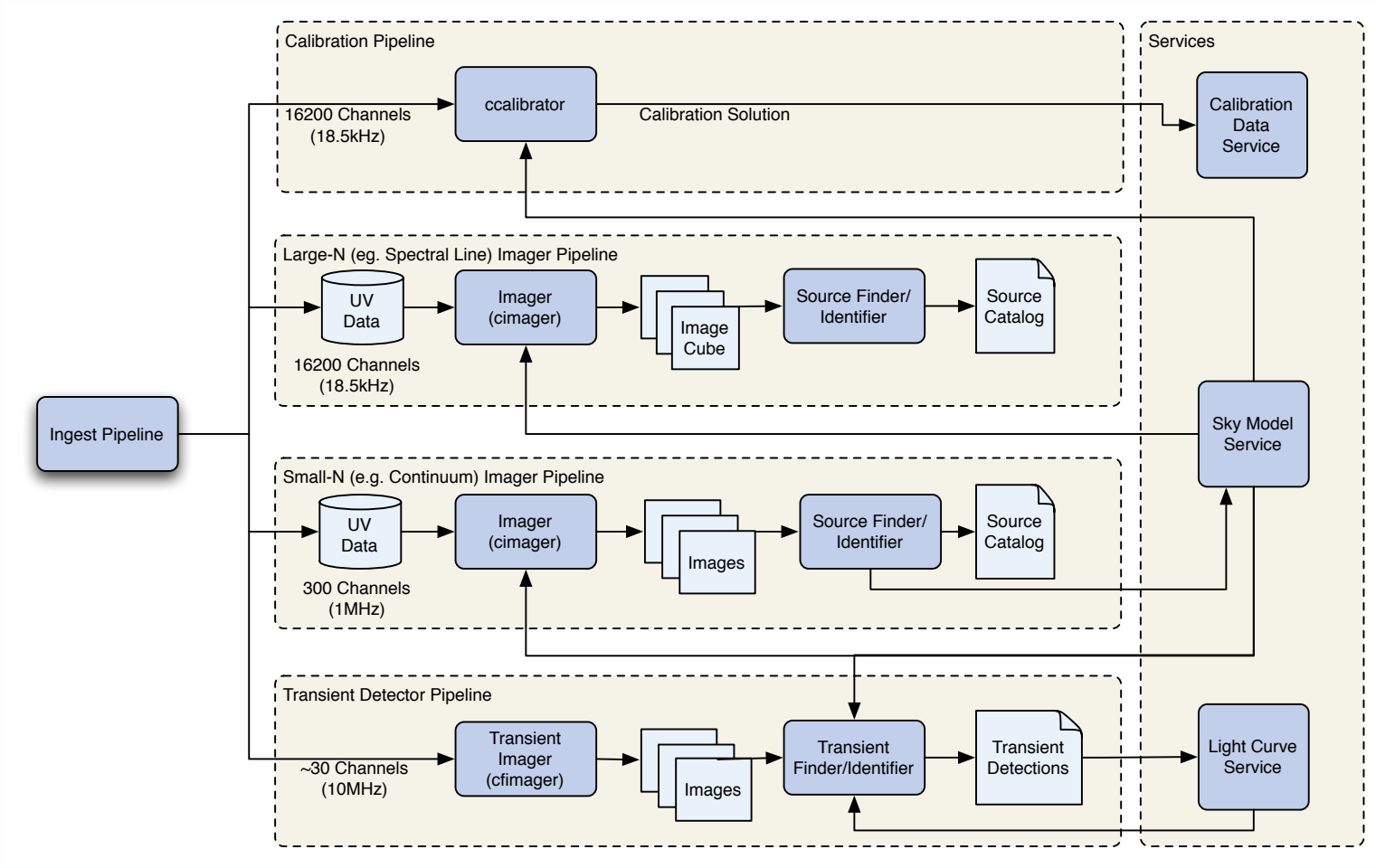
Data Flow in the ASKAP System



ASKAP Science Processing Pipelines



The *Duchamp* astronomical source finder

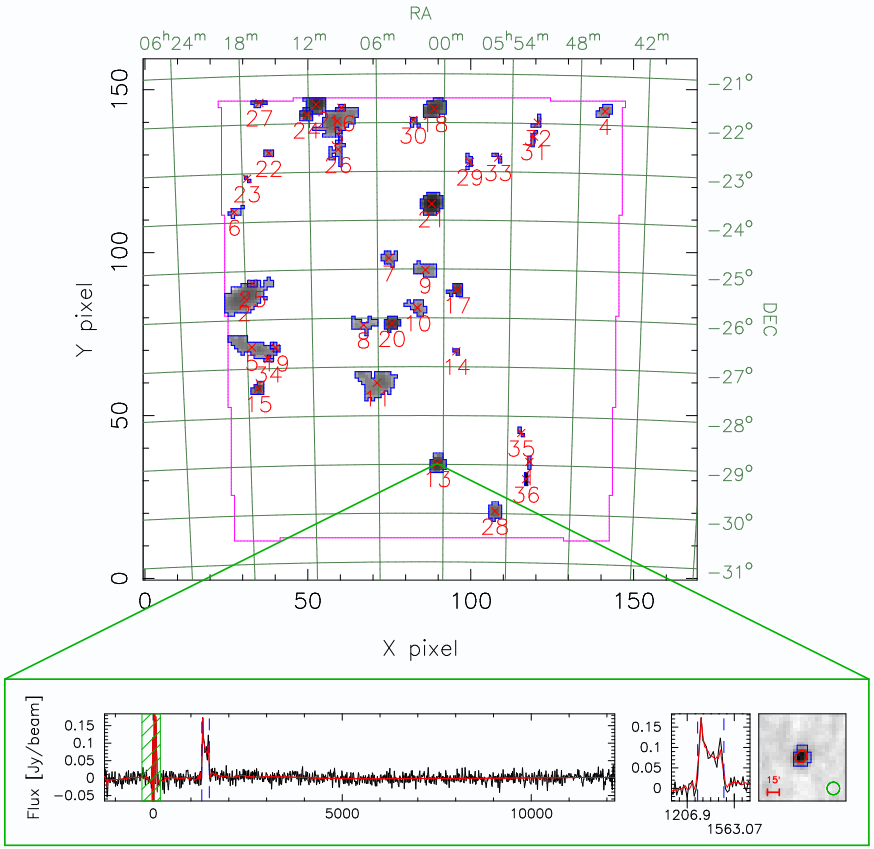
Whiting (2012), MNRAS 421, 3242

Duchamp created to provide a publicly-available source-finder capable of searching three-dimensional data

www.atnf.csiro.au/computing/software/duchamp

Aim of *Duchamp*:

- Provide a generic source finding tool capable of searching 3D astronomical data
- Emphasis on HI data, although more widely applicable
- Deal with low signal-to-noise
- Provide plenty of catalogue and graphical feedback
- Various preprocessing techniques



Selavy – a source-finder for ASKAP

Whiting & Humphreys (2012) PASA 29, 371

ASKAP source finding challenges

- Large data sizes, especially spectral-line: 1TB cubes
- Large source counts in continuum: >60,000 sources per image
- Survey science, so as reliable and complete as possible across entire survey

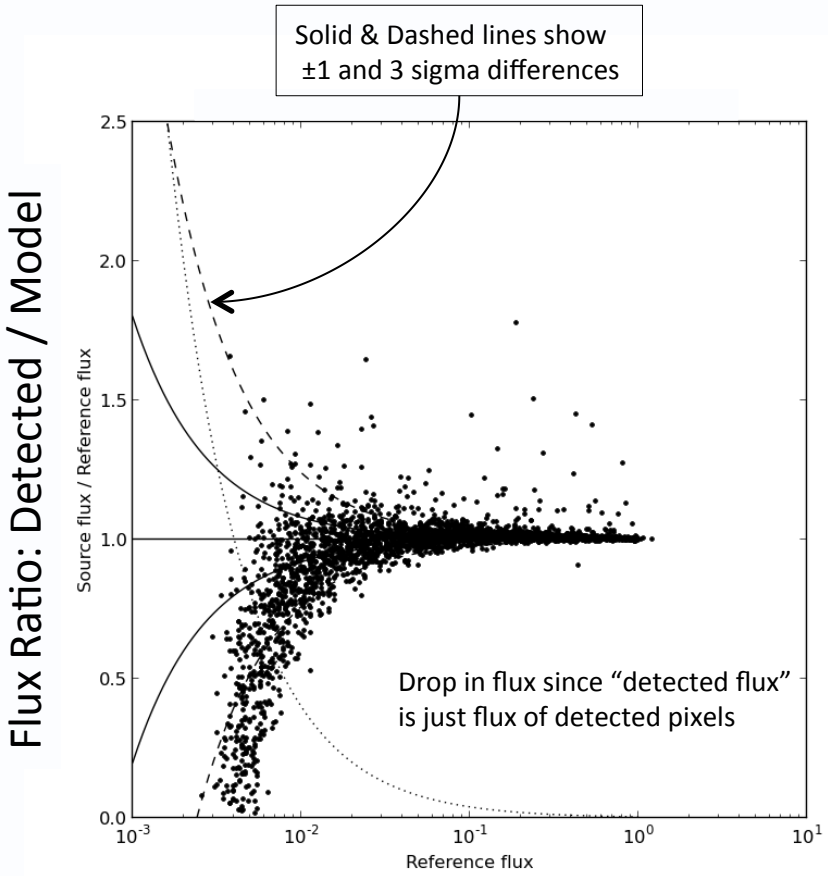
Source finding pipelines largely developed, building on Duchamp library with extra functionality

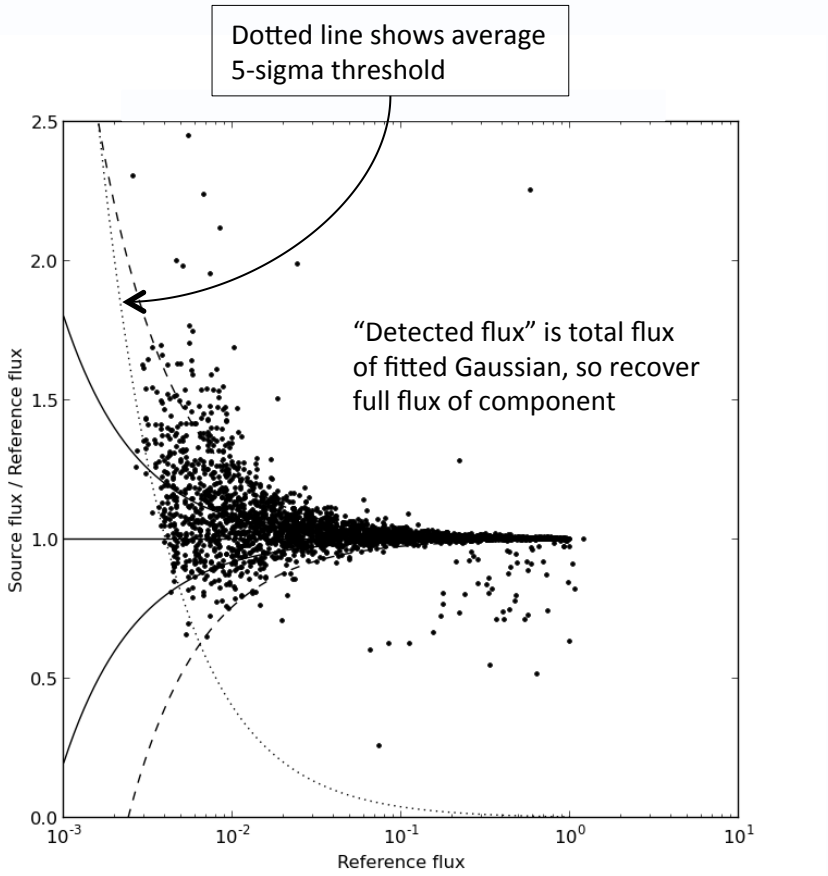
- Distributed processing
- Gaussian fitting for 2D images
- More flexible threshold determination, responding to changes in sensitivity

ASKAP Source finding working group

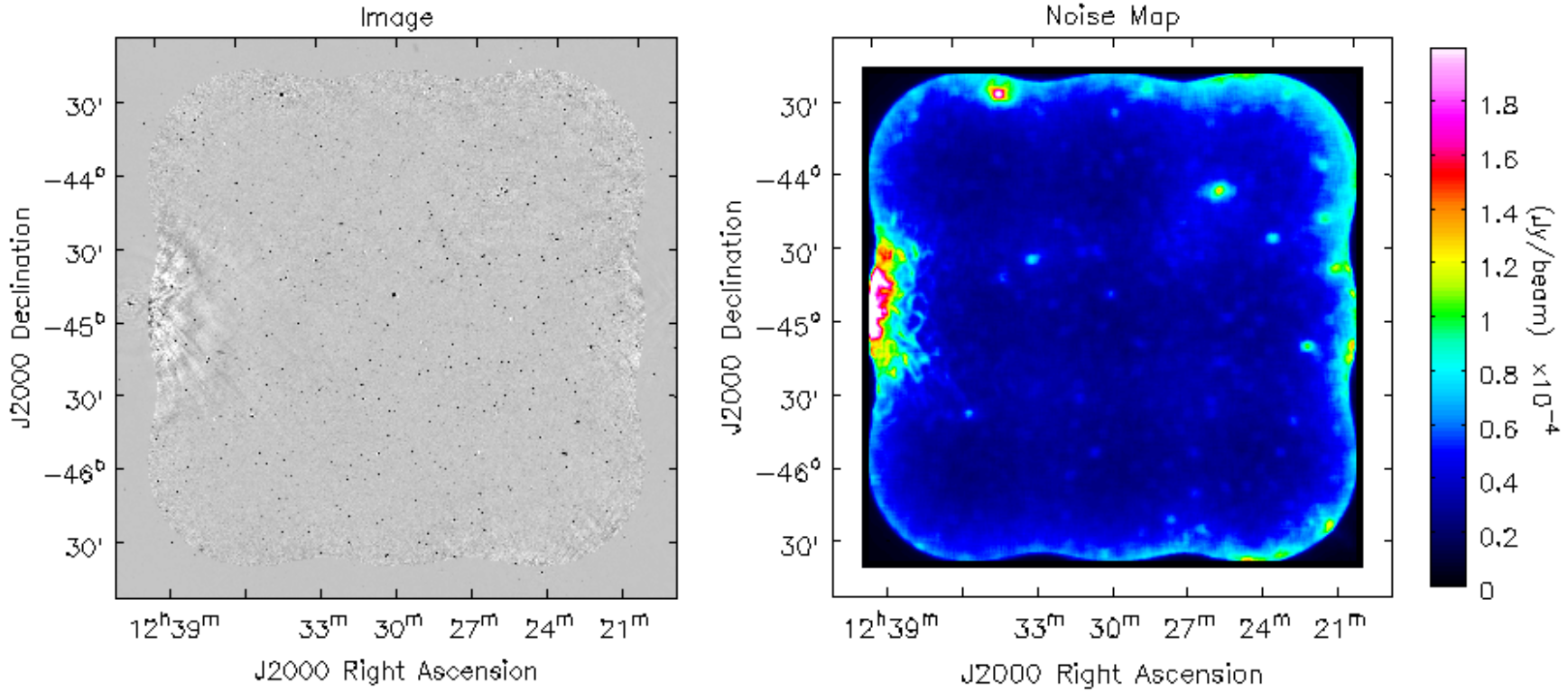
- Coordination of research effort across Science Teams
- Provide feedback to ASKAP Computing on source-finding requirements
- Provide specifications of desired algorithms

Duchamp vs Selavy – Gaussian fitting





Mapping the noise across the field



Source Catalogue Quality

ASKAP observations will be calibrated with a Global Sky Model

- Distribution of known sources to some (bright) limit
- Used for starting point of imaging

Should be able to do direct comparison of source catalogue with sky model and compare sources & parameters

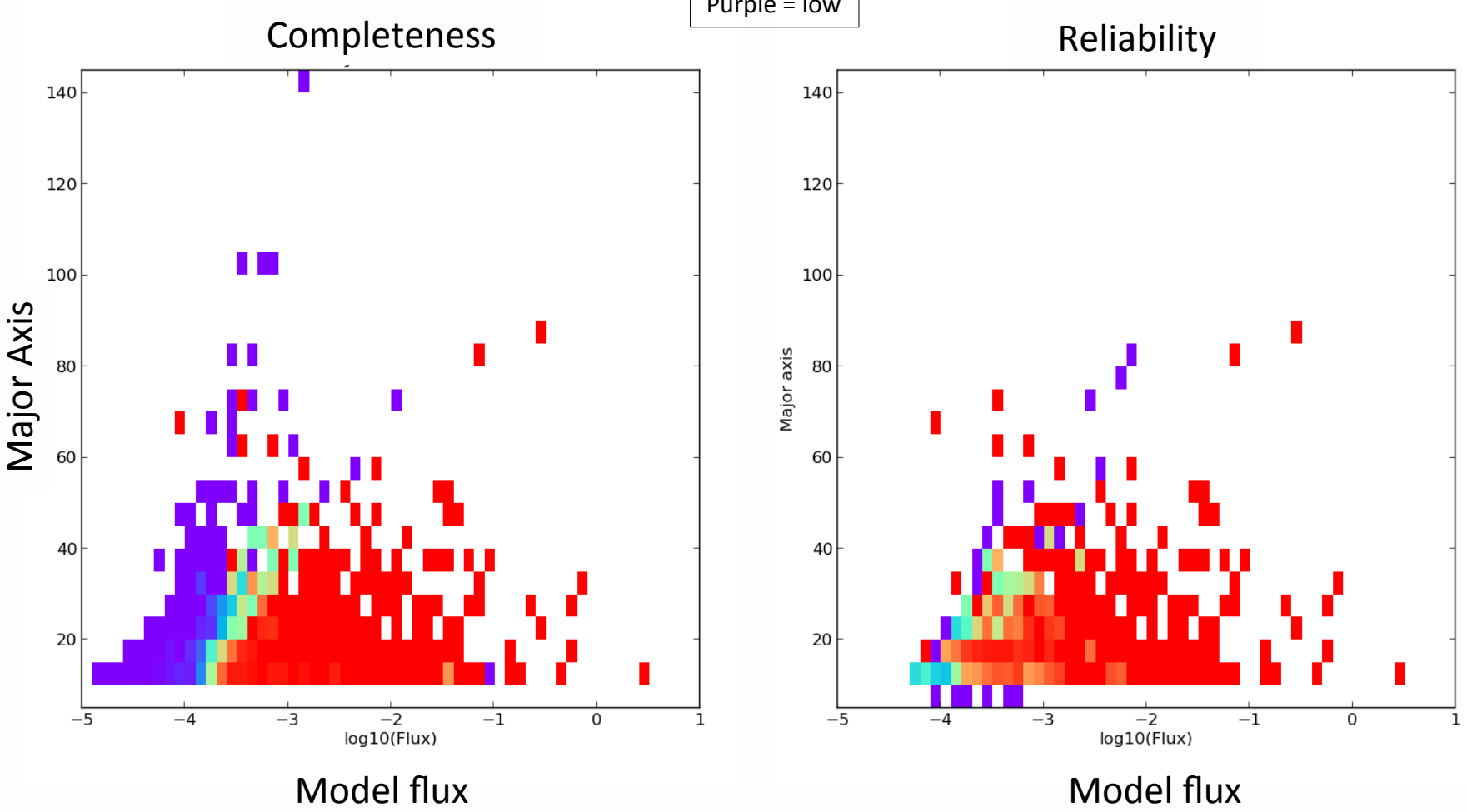
Similar application in simulations, where entire input sky is known

Look at variation in position, flux, size of components, as a function of position, flux, size, etc

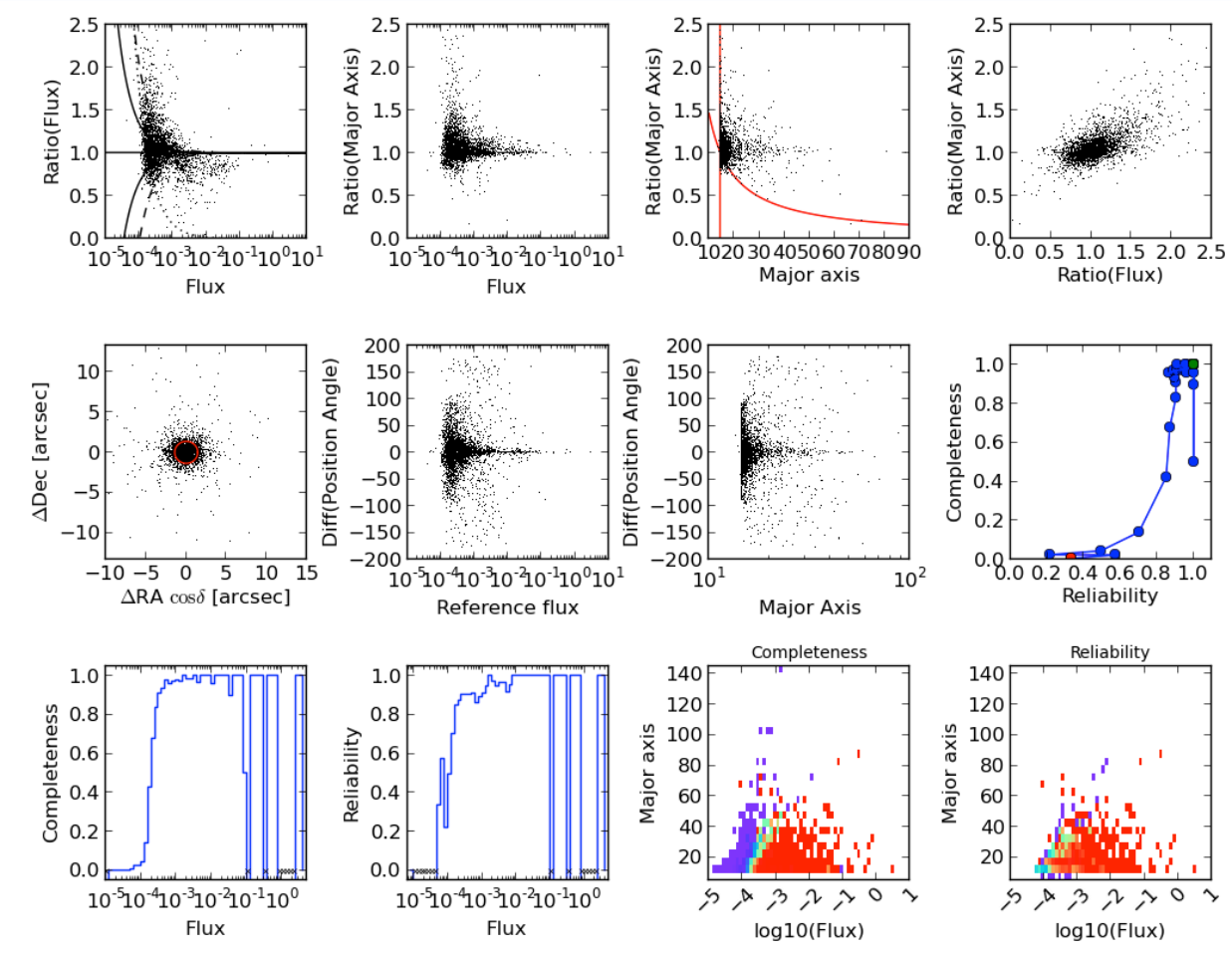
Look at completeness and reliability (easier with simulations)

Completeness & Reliability

Red = high
Purple = low



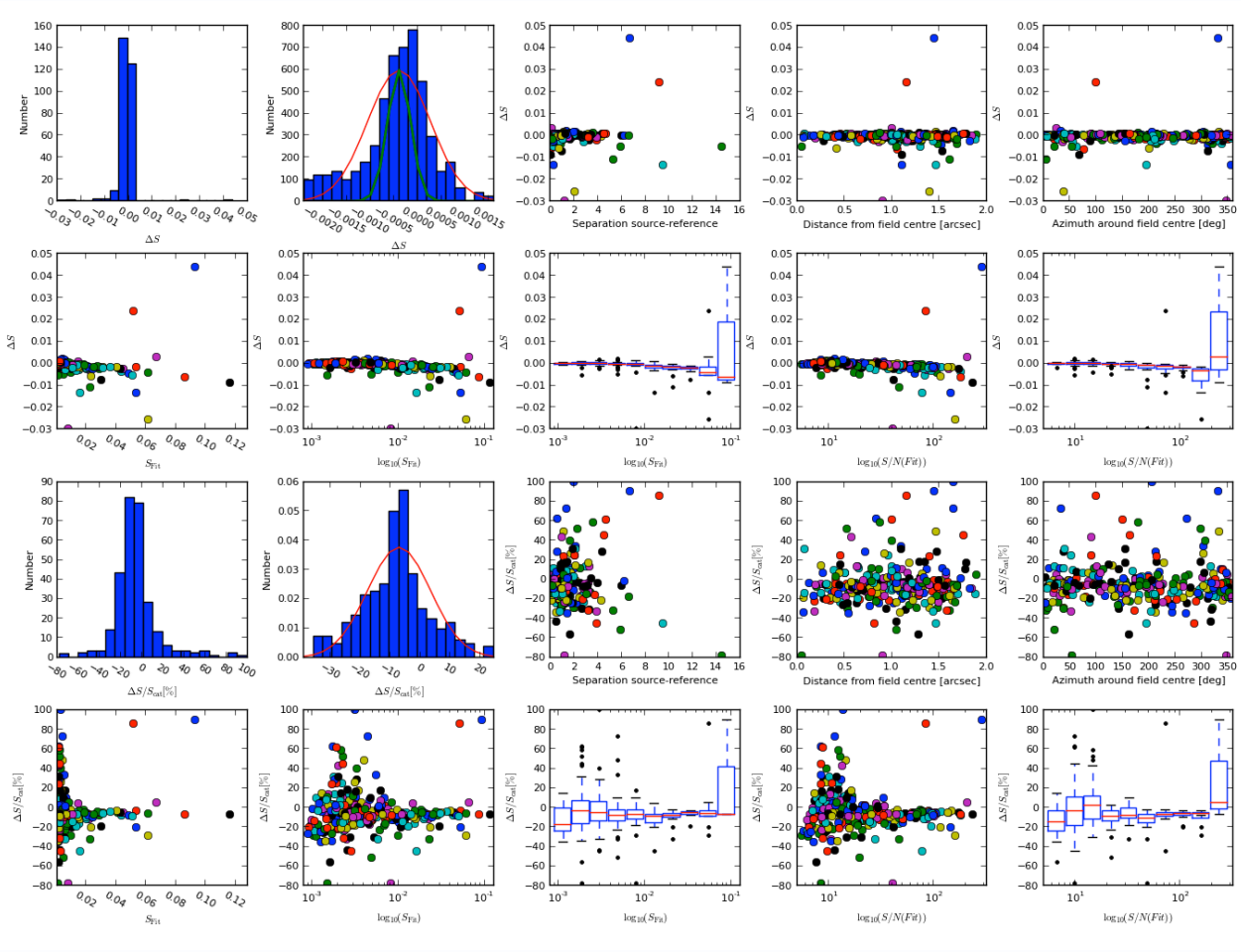
Source-finder evaluation



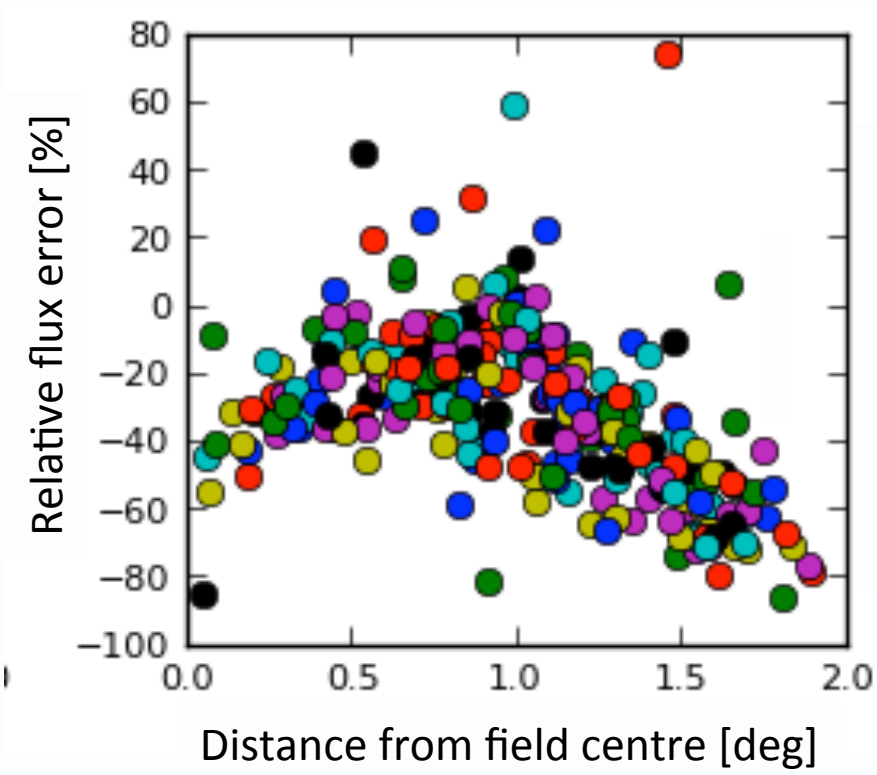
Alternative flux error analysis

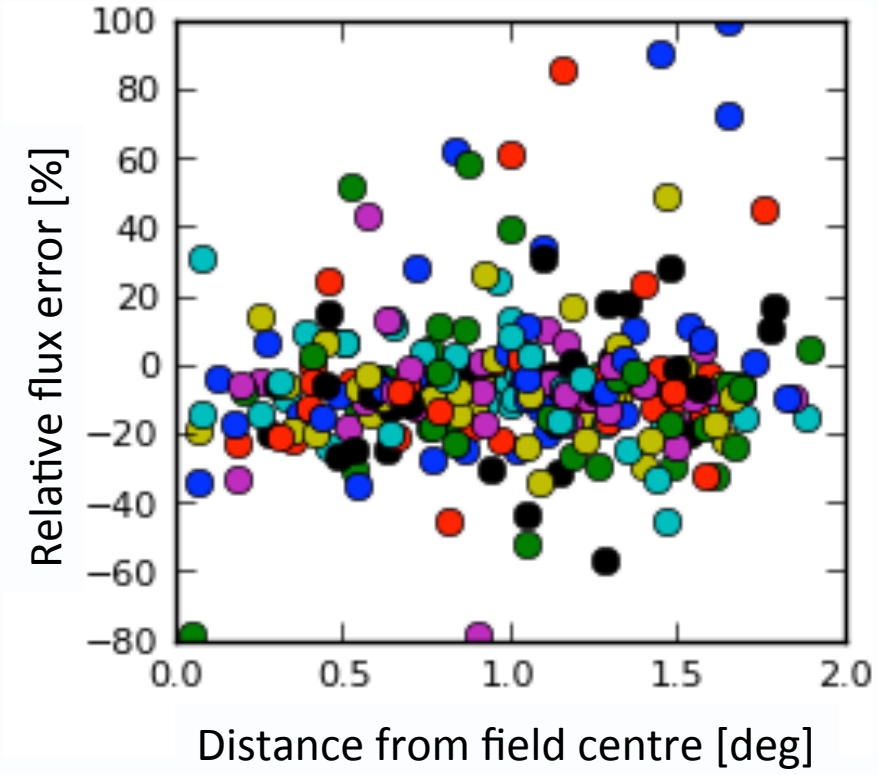
Flux error

Relative flux error [%]



Diagnosing problems





Distinctive pattern in left plot due to use of “equalised noise” image for parameterisation, where fluxes decrease towards edge of beams

We acknowledge the Wajarri Yamatji people as the traditional owners of the Observatory site.

Thank you

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