

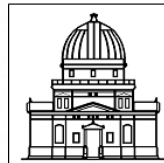
# Radio data and the VO

- thoughts of an astronomer -

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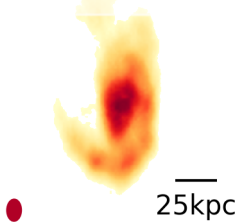




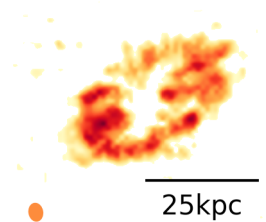
# My background

- HI in local galaxies
- Targeted observations and archival observations
- Mostly ATCA

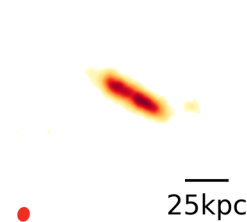
ESO378-G003



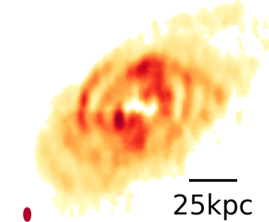
ESO121-G026



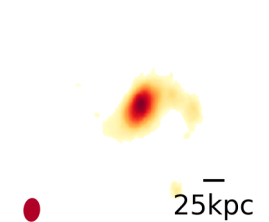
ESO287-G013



NGC0289



ESO381-G005







# Radio astronomy so far

- For those who applied for observations:
  - Observe
  - Retrieve
  - Reduce
  - Use and Publish

- For everyone else:







# Future





# □ An astronomer's questions for archives

- I. Has an object been observed in a particular telescope set-up?
- II. How can I access the data?
- III. In which state is the data?
  - Data cubes: has the data been reduced in a way that is useful for my science goals?
  - Visibilities: how do I turn the visibilities into science ready data products?



# Has an object been observed?

- Options: Tables or potentially MOC
- Important informations for me:
  - Exposure time
  - Array configuration
  - Correlator (Detector) Set-up
  - “Field of View”
- Table should be easy to query



# Demo THINGS HiPS

- Already super useful
- BUT only Moment maps and not entire cubes  
→ probably because different central frequencies?
- What is still needed:
  - Deal with different central frequencies
  - Be able to show frequency or velocity of current plane





# THINGS moment 0 maps in Aladin







# Add moment 1 maps



# Overlay on optical images







# HI contours on optical images





# HIPASS on the VO

The screenshot displays the Aladin v10.0 web interface. At the top, the system status shows 'Thu 28 Feb, 14:17' and 'Aladin v10.0'. The main menu includes 'File', 'Edit', 'Image', 'Catalog', 'Overlay', 'Coverage', 'Tool', 'View', 'Interop', and 'Help'. The left sidebar shows a tree view of data collections, with 'Optical' selected. The central panel displays a star field labeled 'CDS/C/HIPASS' with a red crosshair and a zoom level of 'x202 / 1024'. The right sidebar contains a toolbar with icons for 'select', 'pan', 'dist', 'phot', 'draw', 'tag', 'moc', 'spec', 'filter', 'cross', 'xy', 'rgb', 'assoc', 'crop', 'cont', 'pivel', 'prop', and 'del'. Below the toolbar, there are sliders for 'epoch', 'size', 'dens.', 'opac.', and 'zoom'. A small inset map in the bottom right corner shows the location of 'NGC 1679' with coordinates '03:47:38.57 -49:03:28.5' and '48.66° x 33.57°'. The bottom status bar indicates '0 sel / 0 src 57fps / 1854Mb'.





# How to access the data?

- Download from an online query form through a webpage?
- Get from an ftp service?
- Use of VO tools/ services?
- Send an email?
- Do I need an account?
- Where are calibration/auxiliary files?



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e.g. load data into Jupyter Notebook with standard Python VO packages, reduce data there





# Accessing science ready data

- It seems that (many/some?) fellow radio astronomers do not trust data that they did not reduce themselves...
- Provenance and published reduction pipelines are very important!
- Some set-ups might provide e.g. emission line and continuum observations at the same time, would need to provide both.



# Accessing science ready data

- Great for colleagues from other wavelengths, makes data more accessible for everyone :)
- Interesting for data mining experiments.





# Accessing raw visibilities

- Usually not an option for astronomers without a radio background.
- Requirements for computing power and storage increase, starting to be beyond what average astronomer can access.
- If an astronomer is familiar with radio data, they might be able to optimise the data for their science use case (also true for calibrated visibilities).



# My dream archive



- Reduced data cubes accessible through VO protocols.
- Public reduction pipeline so that researchers can understand what happened to the data.
- Raw data but considering future large data sets rather “code to data” approach than vice versa.