ASKAP Early Science Public Data Release

10-07-2017: In this update, we announce the first public release of ASKAP early science data via the CSIRO ASKAP Science Data Archive (CASDA). This document provides an overview of the released observations, along with some important notes for users.

The ASKAP early science program

ASKAP early science involves a series of observations made with a sub-array of nominally 12 antennas equipped with Mk II phased array feeds. It occurs while installation and commissioning of additional hardware is ongoing. These observations are designed to verify all components of the system including the science data pipeline and public archive. As experience is gained, early science observations will evolve into precursor surveys that have the potential to make new scientific discoveries.

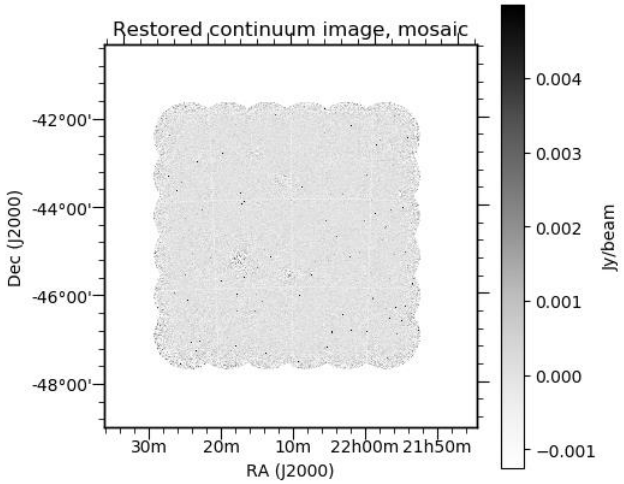
Observations began in October 2016. Since then, members of the ASKAP Commissioning and Early Science (ACES) team and the Survey Science Teams (SSTs) have been busy tuning the ASKAPsoft imaging pipeline to produce the best possible output.

We have defined a suitable set of quality metrics to assess the data and are now satisfied that any major issues have either been solved or documented, with work-arounds provided where appropriate.

NGC7232 observations

The first data release consists of several observations of the interacting galaxy pair NGC7232/3 and other sources in the surrounding field. ASKAP was configured with 48 MHz of bandwidth at a centre frequency of 1.4 GHz using 36 beams in a 6x6 square configuration with 0.9-degree beam spacing. Visibilities were recorded with 18.5 kHz frequency resolution and 10 second time resolution, but this release has been averaged to 1 MHz.

Observations typically ran overnight, for periods of up to 12 hours. To better sample the field of view, we observed using two different field centres (labelled A and B) on different nights. Note that although we observed "interleaved" positions (beam centres from the B-field footprint placed on the inter-beam positions of the A-field footprint), these field centres were observed on different nights using different scheduling blocks. We have released mosaiced images from each block individually and combining the interleaved blocks is left to the user.



An example Stokes-I continuum image of the observed field.

Accessing the data archive

Released ASKAP data can be obtained from the CSIRO Data Access Portal. While the number of scheduling blocks remains small, users can feasibly browse the collection by performing a null search for all released data. It is also possible to access the archive via a Virtual Observatory Table Access Protocol interface. Some quick instructions are given below and more detailed documentation is available in the CASDA Users Guide.

Web interface instructions

Once a search query has returned, tabs at the top of the listing page can be selected to view different types of data products. The list currently includes *catalogues* created by the Selavy source finding software, *continuum images* in FITS format and tar archives of calibrated *visibilities* stored as CASA measurement sets (one file per beam).

The CASDA index can be viewed by anyone but users must obtain an OPAL account to download files.

Hovering over the rows in the list will cause an entire row to highlight – clicking anywhere within the row will open a summary page for that data product, with a more extensive description that includes FITS headers and an image preview where available.

Users can select data products of interest using the check boxes on the left of the table and scroll down to see an estimate of the total data size and a download link.

Aside from the data products listed above, the summary page of each image allows the user to download a tar file of additional information that includes log files, parameter files, validation output and other information that should be sufficient to reproduce all operations performed on the original measurement set.

Database access using Virtual Observatory tools

CASDA has been designed to support Virtual Observatory Table Access Protocols and is tested using TOPCAT. Users can search for CASDA in the table access protocol query dialogue, which should find the service CSIRO ASKAP TAP.

Scheduling blocks and early science project codes

All observations are assigned a Scheduling Block ID (SBID) when first created. This identifier is associated with everything from the observing parameters through to the processing parameters and final output. Each SBID is associated with an OPAL project code. The current release started out under AS033 and later transitioned to AS035.

Validation and quality metrics

CASDA uses a three-state model (good, bad or uncertain) to rate data quality. Products marked as good have passed all our internal validation metrics. Data that are classified as bad will not be released.

Products that are free of obvious problems but receive one or more quality metric scores outside the expected range may be released under the uncertain classification. These data may be suitable for some science goals but not others. It is up to the user to consider the validation metrics in more detail or perform their own analysis and use the data at their own risk.

Most early science data will fall into the uncertain category while we are in the process of developing the ASKAP pipelines and characterising the telescope itself.

Known issues with the data

The most significant issue encountered during internal testing is a source position offset with respect to existing surveys such as SUMMS or NVSS. These offsets seem to be similar within a single observation, but can change slightly from day to day. Since we are yet to fully understand the underlying cause, we have chosen to reference our data products to existing surveys. The released images therefore do not contain independent source positions.

Another issue is the high variance of flux ratios when compared to existing surveys, even though the mean ratio is close to unity. This is likely a result of using a fixed Gaussian primary beam model that does not account for known variations in beam shape across the footprint.

Finally, our quality metrics show that we seem to be resolving more sources than expected. This is likely due to an underestimate of the restoring beam size.

Data ownership and publication policy

All ASKAP data taken during the early science period are owned by CSIRO and will be made public as soon as they pass quality control. Data products released on CASDA may be used for any purpose, including publication.

In accordance with the ASKAP publication policy, we ask that any publications resulting from these data include the statement of acknowledgement as written in the policy.

Collaboration opportunities

We welcome opportunities to collaborate with and receive feedback from the science community. Enquiries can be directed to the ASKAP project scientist atnf-askap-ps@csiro.au or the science team lead investigators. Science team members are encouraged to attend monthly early science forum teleconferences hosted by CASS.

Future data releases

The 48 MHz bandwidth data in this first release proved to be most compatible with the current state of the imaging pipeline. We are working through some challenges with imaging and primary beam correction of broad-band data and hope to release 192 MHz observations soon.

We are also intending to provide additional data products, including spectral line cubes and (in some cases) full-Stokes images. These will be added to CASDA alongside the existing deposits as they become available.

Further releases will likely occur in groups related to individual target fields over the next few months.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e csiroenquiries@csiro.au
w www.csiro.au

FOR FURTHER INFORMATION

CSIRO Astronomy and Space Science
Aidan Hotan
t +61 8 6436 8543
e aidan.hotan@csiro.au
w www.csiro.au/askap