ASKAP update for June 2023

This month we report on the status of ongoing survey operations, VAST scheduling, development priorities and the first RACS-mid data release.

Ramping up survey operations

Over the last month we have been running in full survey mode and have recorded 134 scheduling blocks for SSP codes, including 29 for EMU+POSSUM, 13 for WALLABY, 79 for VAST and 13 for FLASH. The CRAFT commensal fast transient systems have also been enabled during most of these observations. We are now using Pawsey's new supercomputer Setonix for most image processing tasks and are working to migrate the remaining auxiliary and diagnostic jobs over to the new environment by the end of June.

Although there is still a processing backlog, we have archived scheduling blocks up to the end of May, roughly two weeks behind the latest observations. Spectral line data remains the most challenging to manage due to its initial size and expansion during processing. To help minimise the backlog, we do not observe spectral line projects when disk space is low.

After some initial tuning, data throughput on Setonix now exceeds that of the previous supercomputer, Galaxy. Experiments with a new scratch storage area available on Setonix show that we might be able to improve throughput further by writing intermediate products to scratch prior to archiving. The next CASDA software release, scheduled for late June, will support direct access to Setonix scratch space.

ASKAP's automatic data manager ensures that scheduling blocks flow through the system relatively smoothly, with completed jobs being cleaned up to make way for new observations. Human intervention is sometimes needed to deal with unexpected situations, but in general the system has been performing well. SST validation efforts are mostly keeping up with data deposits, although we are working with the POSSUM team to improve the performance of their validation code and have extended the validation timeout period for another month while work is ongoing.

Scheduling transient survey epochs

Previous observations for the Galactic component of the VAST SSP have used a strict epoch-based approach in which a group of fields are observed on a regular cadence. To ensure that all fields in the survey region can be observed during the epoch window, this approach locked out other survey observations, reducing the overall efficiency of the telescope. When considering how to schedule the full VAST survey, which includes other components, we have been exploring alternative scheduling modes. Discussions with VAST have allowed adjustment of the observing constraints and we have implemented a more flexible scheduling mode that treats fields within a VAST region more independently, while aiming to maintain a suitable observing cadence for each field. This should allow VAST observations to fit more comfortably around longer integrations for other SSPs and increase overall observing efficiency. This method is currently being tested on the VAST extragalactic region, with the goal of replacing the old epoch-based method in the near term.

Starting GASKAP-HI with the LMC

GASKAP-HI and the ASKAP Operations team have agreed to ramp up survey observations in a hybrid processing mode, starting with the Large Magellanic Cloud region. Support for spectral line joint deconvolution in ASKAPsoft is nearing completion, and it would be beneficial to have fresh data for testing. There is also a desire to directly compare ASKAPsoft's performance with the alternative pipeline developed by GASKAP-HI during Pilot Surveys. To satisfy both goals and ensure that GASKAP-HI can get underway with its survey science as soon as possible, we will conduct a first pass of the LMC region (roughly 100 hours of observing) and archive the full spectral line visibilities in CASDA. Due to the large amount of data involved, this is not sustainable for the full survey, but it should provide the means to gain confidence in the methods that will be used long-term.

Development priorities and data quality

Analysis of ongoing survey observations has shown that residuals from bright sources (both within and outside the field of view) are a significant factor impacting data quality. We also see calibration problems on a few beams, but these are rare and can be addressed with better flagging or isolated re-observations as necessary. Bright source residuals appear in most observations at some level and can have a significant impact on data quality if there is a strong source just outside the field that is not cleaned during processing.

Solar interference

The Sun is a particularly bright source that sits outside the field of view during any day-time observation. The active Sun appears as a collection of relatively compact sources within the solar disk, but these can be quite dynamic and the resulting signature in the (u,v) plane is hard to define. We already use scheduling constraints to keep the Sun away from angles that could directly illuminate the PAF or approach the observed field of view.

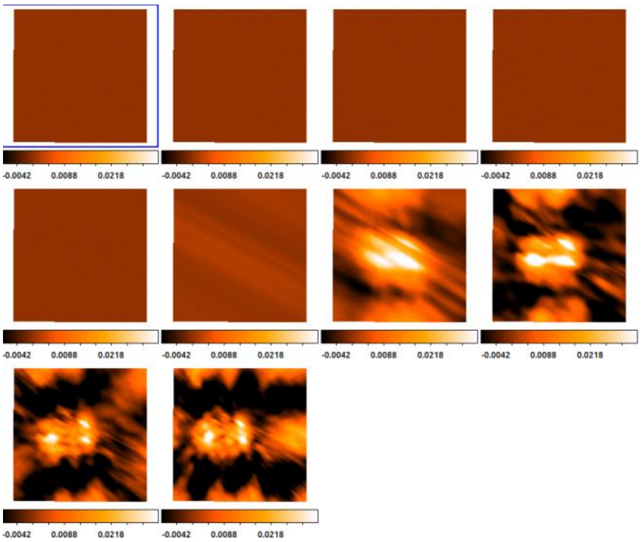

Figure 1: Data from a recent POSSUM observation, split into 1-hour integrations and re-imaged in the direction of the Sun far from the field of view to show its impact before (panels 1-5), during (panel 6) and after (panels 7-10) sunrise. Note the complicated structure in these images prior to deconvolution, most likely resulting from small active regions on the surface of the Sun. Images made by Stefan Duchesne.

The SSTs are actively investigating the impact of any remaining solar interference, which typically manifests as a long-period 2D ripple across the image and in frequency, up to the 10-sigma level. If the remaining solar interference is deemed to jeopardise science goals, it is likely that we will have to further adjust scheduling constraints and expand the existing avoidance zones where feasible.

Bright, stationary compact sources

Residuals from bright extra-solar sources outside the field of view can be mitigated by peeling these sources during pipeline processing. With the availability of RACS-low and the recently released RACS-mid data, we now have sufficient information to systematically identify sources of concern and develop a peeling strategy. This technique was used for RACS-mid itself.

The science data processing team are actively working on supporting peeling in the ASKAPsoft pipeline and hope to begin testing with SSP data soon. Successful peeling of bright sources will allow us to meet data quality requirements for more of the WALLABY survey and should benefit all other teams.

Key features and future plans

Alongside source peeling, our highest priority is to deliver the features required for all SSTs to begin their observations. We are also working to optimise the pipeline's disk usage and reduce the total number of jobs needed per run.

RACS-mid data now available

A paper describing the 1368 MHz frequency band of the Rapid ASKAP Continuum Survey has been accepted for publication and the corresponding data have been released via CASDA. The new data can be found under project code AS110, with a more detailed description available on the RACS web page. A combined catalogue will be published at a later date.

ASKAP guest science

The latest ATNF call for proposals closed on the 16th of June, with a number of ASKAP guest science proposals submitted for consideration. These will be checked for technical feasibility by the Operations team and ranked by the ATNF TAC. We will contact the PIs with more information as it becomes available.

For further information

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