ASKAP update for January 2024

This month we report on activities during the holidays, our current status, and plans to resume full survey operations.

Survey progress report

During the period of reduced support capacity across the end of 2023, we restricted ASKAP's operating modes and survey pool to maximise reliability. Our focus was on observing a full-sky epoch of RACS-low using a different footprint configuration (matching RACS-mid and RACS-high), and maintaining the observing cadence required to meet VAST's science goals. Via SAURON, successful observations were able to be carried out at an observing efficiency of 94.8% over the full shutdown period. We had intended to promptly process both RACS and VAST observations while making progress on the existing backlog of SSP data (as a way of testing the full ASKAP workflow), but Setonix's scratch disk was unexpectedly taken offline just before the shutdown period and remained unavailable until the new year.

Setonix has now been returned to service with filesystem configuration changes that should improve its reliability. The ASKAPsoft pipeline was modified to support the new file locking scheme and has been working on RACS and VAST observations since the 9th of January. The system is running well and has been able to process these data about two times faster than they were recorded, so we have already caught up. We have also been using an allocation of CPU time on the main Setonix work queue (in addition to our dedicated operations partition) to reduce the backlog of SSP observations. Observing has also begun for the first round of Guest Science Projects.

SST	Deposited	Awaiting Validation	Released	Rejected
EMU	173	3	139	31
WALLABY	49	0	21	28
POSSUM	221	17	154	51
VAST	2519	355	2128	37
FLASH	85	0	42	43
GASKAP-HI	1	1	0	0

Table 1: Survey progress as of 22-01-2024

The next RACS epoch

The Rapid ASKAP Continuum Survey has proved instrumental to understanding how ASKAP's survey data products compare to other telescopes. RACS has helped develop requirements and methods for primary beam correction and monitor ASKAP's astrometry over a wide range of parameter space. Ultimately, we intend to use the three RACS frequency bands to create a sky model that can be used for calibration purposes, with the goal of reducing overheads and improving data quality.

The two existing epochs of RACS-low were observed in 2020 and 2022 at 888 MHz with a square_6x6 beam footprint and a relatively wide beam spacing of 1.05 degrees, to maximise survey speed. However, RACS-mid and RACS-high were observed with a closepack36 beam footprint and a smaller spacing of 0.9 degrees to account for the reduced primary beam diameter at these frequencies. Having two different footprints complicates the synthesis of a global sky model, so we decided to observe another RACS-low epoch at 944 MHz with the more compact beam arrangement.

Observations are ongoing and nearing completion, with 90.6% of the fields observed and 97.4% of those processed as of January 22nd. RACS-low3 has already surpassed the sensitivity record set by RACS-low2.

For the first time, we have adopted a prompt processing strategy for RACS, using the ASKAPsoft pipeline to image all scheduling blocks and upload the results to CASDA. This ensures that we can conduct prompt quality control and get the individual field images out to the community as soon as possible. Like previous RACS epochs, additional offline processing will be done to form combined images and catalogues that will be released as value-added data products in future.

Space weather opportunities

We are currently working with the interplanetary scintillation team to develop a viable observing strategy for future science with ASKAP. The idea is to study the impacts of solar weather via monitoring interplanetary scintillation (IPS) of background radio sources when they are close to the Sun (within about 30 degrees elongation). Two components of this demonstration project have been identified. The first is to characterise the typical scintillation properties of radio galaxies near the Sun to provide a baseline for comparison. This can be scheduled dynamically by selecting fields from a pre-defined list as they pass close to the Sun during the year.

The second component is a non-a-priori-assignable observation of fields in the path of a coronal mass ejection (CME), triggered when such an event is observed at other wavelengths. Studying the scintillation properties of the high density of compact sources in the ASKAP field of view as CME plasma passes through the foreground may yield information about how these events evolve across interplanetary space, which has been impossible to observe by means other than white light coronagraphs.

The IPS project requires high time resolution visibility data output by the CRACO system that is currently being commissioned. We are discussing the requirements for operational integration of CRACO as part of these technical tests, with the goal of transitioning it to a shared-risk national facility instrument as soon as feasible.

Plans for 2024

The Pawsey Supercomputing Research Centre is conducting high-voltage maintenance in the week starting January 22nd. Once services are restored, our priority will be to resume full survey operations as soon as possible, while finishing the remaining RACS and survey science project backlog processing. As we receive feedback on test observations from the GASKAP teams and DINGO, we will expand the active survey pool to include all SSPs and GSPs. Spectral line observations will continue to stretch our computing resources for the foreseeable future, which may impact the duty cycle of these modes.

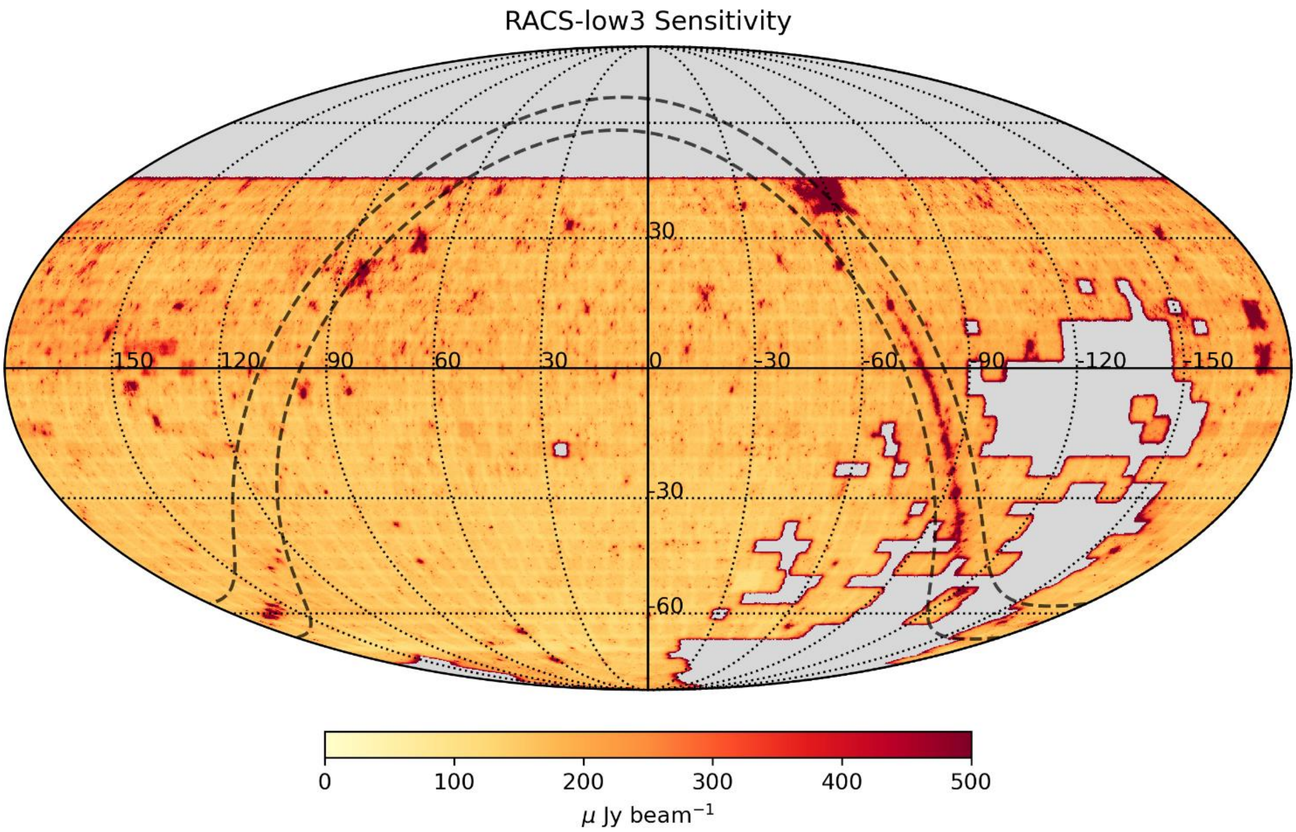

Figure 1: RACS-low3 noise map as of January 18th, 2024, with a median RMS of 171.8 μJy/beam for the region processed. For comparison, RACS-low2 has a median RMS of 183.8 μJy/beam and RACS-low1 has a median RMS of 229.7 μJy/beam. The large improvement between 1 and 2 was due to hour angle constraints made possible by autonomous scheduling with SAURON.

For further information

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