CORNISH WORKSHOP

Leeds, 13th April 2007

James Green

The Methanol Multibeam Project

MMB

The Methanol Multibeam Project: The Team

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Participants

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Australia Telescope National Facility CSIRO

CSIRO

UCL

University of BRISTOL

UNIVERSITY OF LEEDS

UTAS

UH University of Hertfordshire

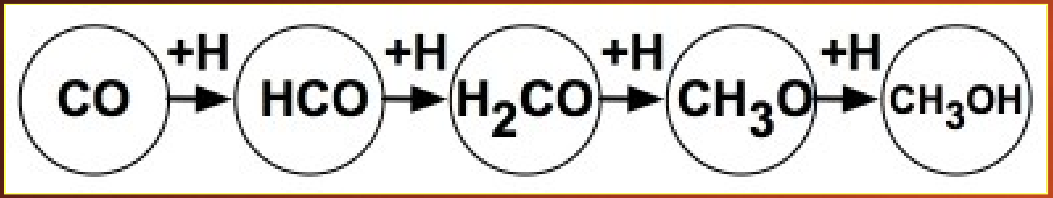
UNSW

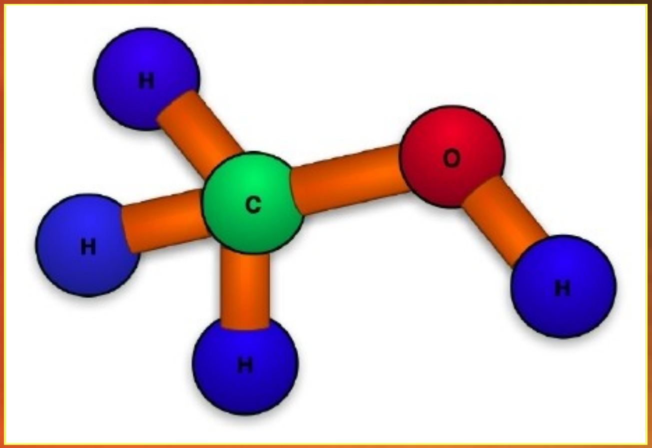
PPARC

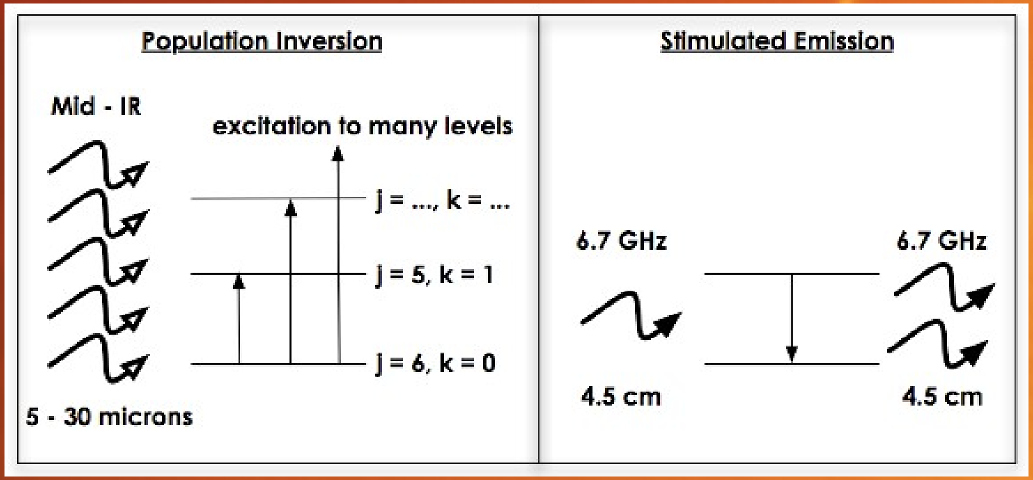
MERLIN / VLBI National Facility

CARDIFF UNIVERSITY

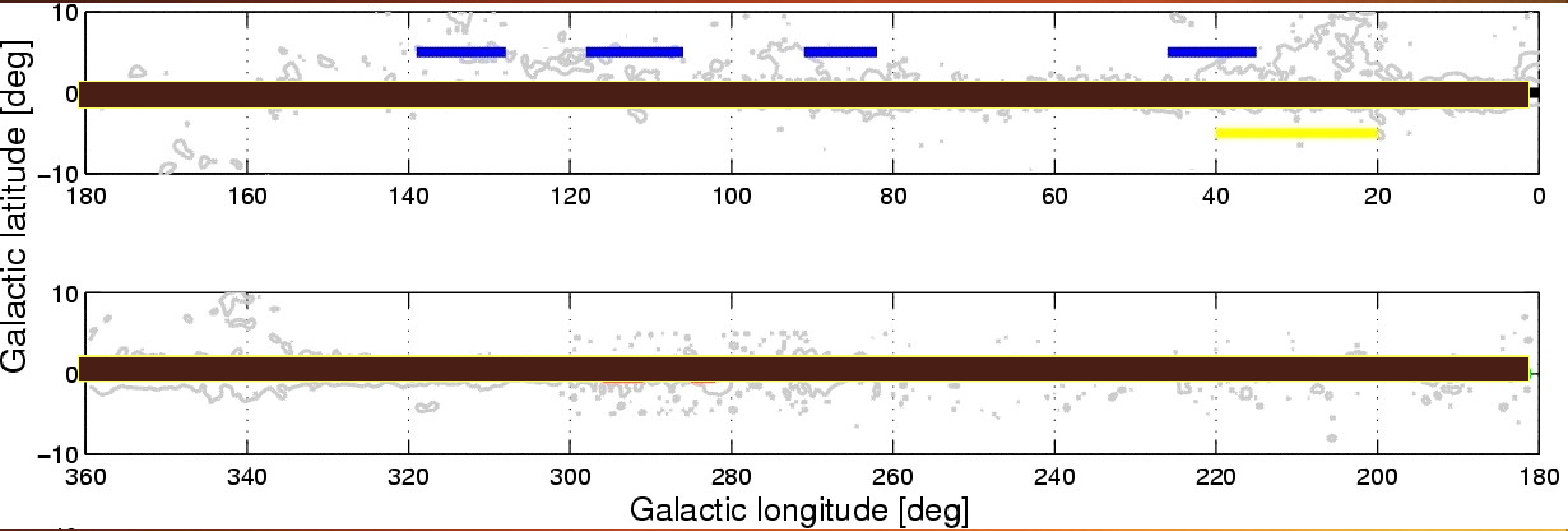
The 6.7 GHz Methanol Maser





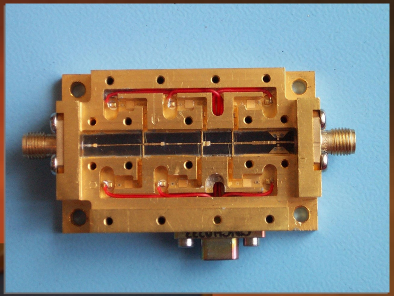


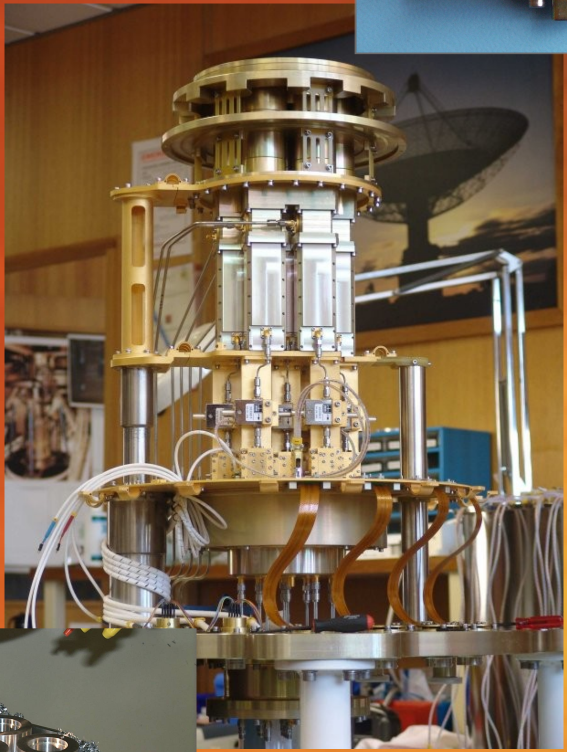
Why MMB? - Previous Surveys



MMB 7-Beam Receiver

- Jointly built by Jodrell Bank and ATNF.
- Hexagonal layout pattern of 7 equal receivers.
- Capable of dual polarisation over a large bandwidth.
- Calibration with noise injection sampled at 500Hz.



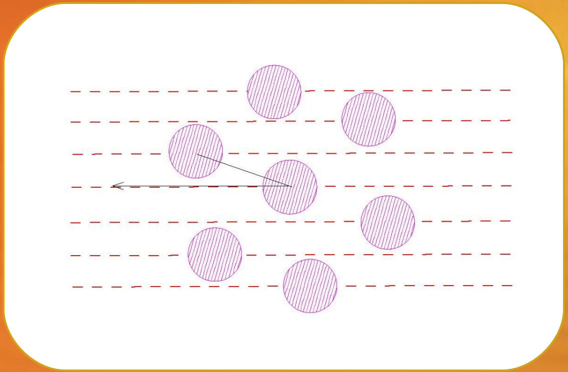


Survey Characteristics I

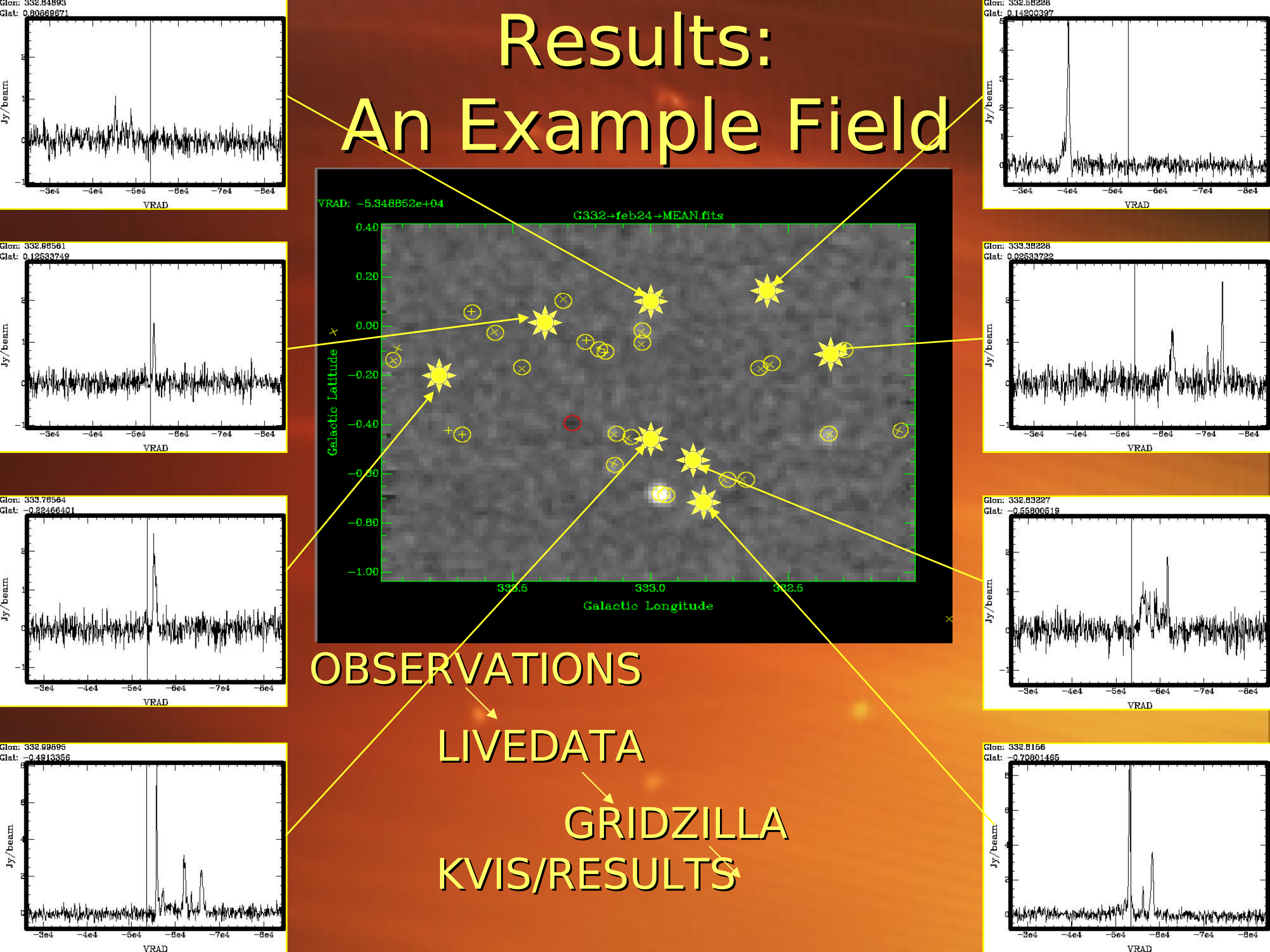
- 4 MHz Bandwidth (≡180 km/s at 6668 MHz).
- Assume 150km/s fully useful bandwidth, so multiple centre velocities toward Galactic centre 10km/s overlap.
- Doppler tracking provided by the first two local oscillators.
- Correlator configured to provide 2048 frequency channels across each 4 MHz band, at each line frequency and each polarization.
- Velocity resolution 0.09 km/s at 6668 MHz.
- Spectra dumped every 5 seconds.
- System noise temperatures ~20 K.

Survey Characteristics II

- HPBW 3.2 arcmin at 6668 MHz and 3.4 arcmin at 6035 MHz.
- Beams spaced by 6.46 arcmin on sky.
- Multibeam footprint is 15arcmin across.
- SPOT and MX observations to monitor variation in calibration.
- Blocks of 2^{o} in *l*, $\pm 2^{o}$ in *b*.
- Continuous scanning at 0.1^{o} min^{-1}.
- Optimal Orientation.
- Beam Sensitivity consistent to ±3.5%.



Results: An Example Field



OBSERVATIONS

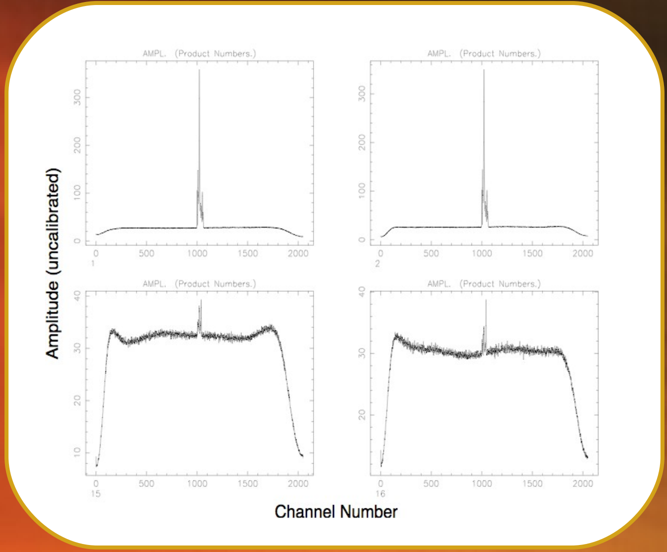
LIVEDATA

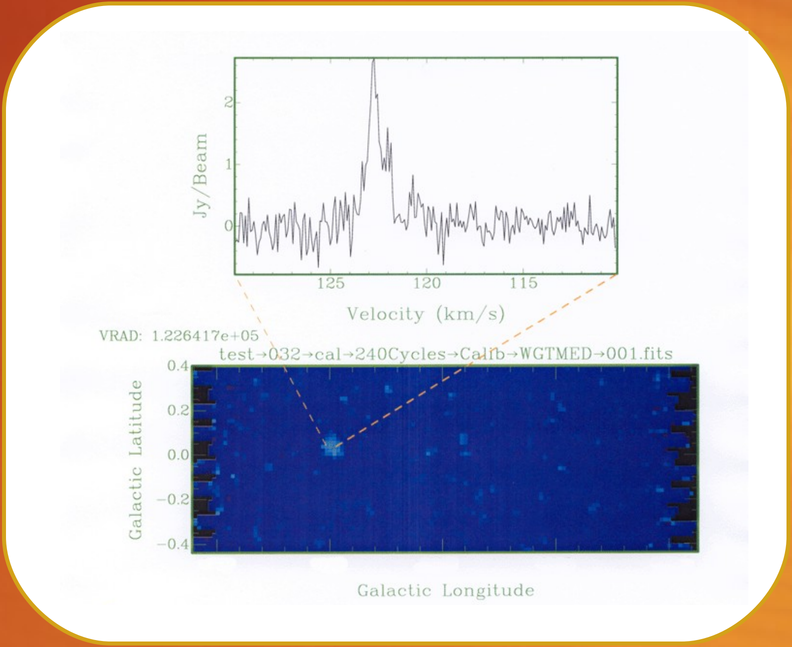
GRIDZILLA

KVIS/RESULTS

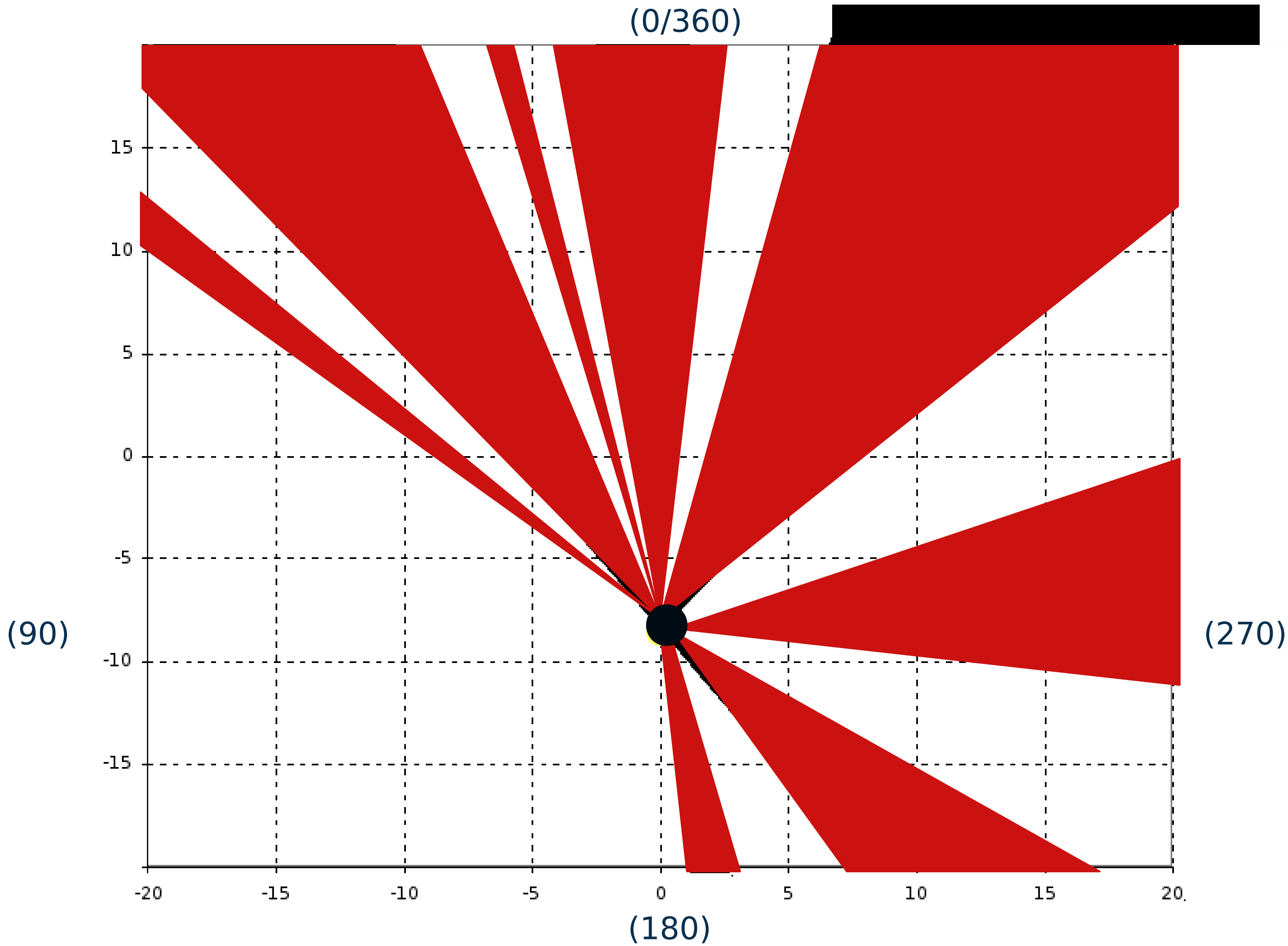
Survey Progress

- Surveyed 106 degrees galactic longitude.
- Observed 528 masers, of which 218 new.
- 53/100 days Parkes observing time.
- Most new are weak (S_{peak} < 4 Jy).
- Narrow linewidths (FWHM < 0.2 km/s).
- Far-side outer Galaxy detections.

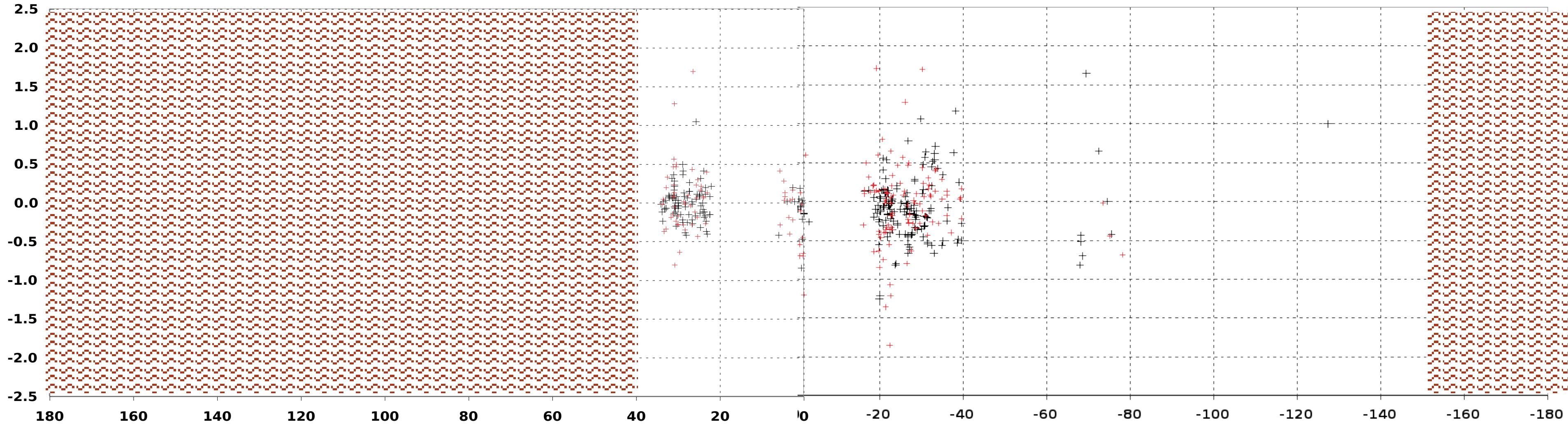




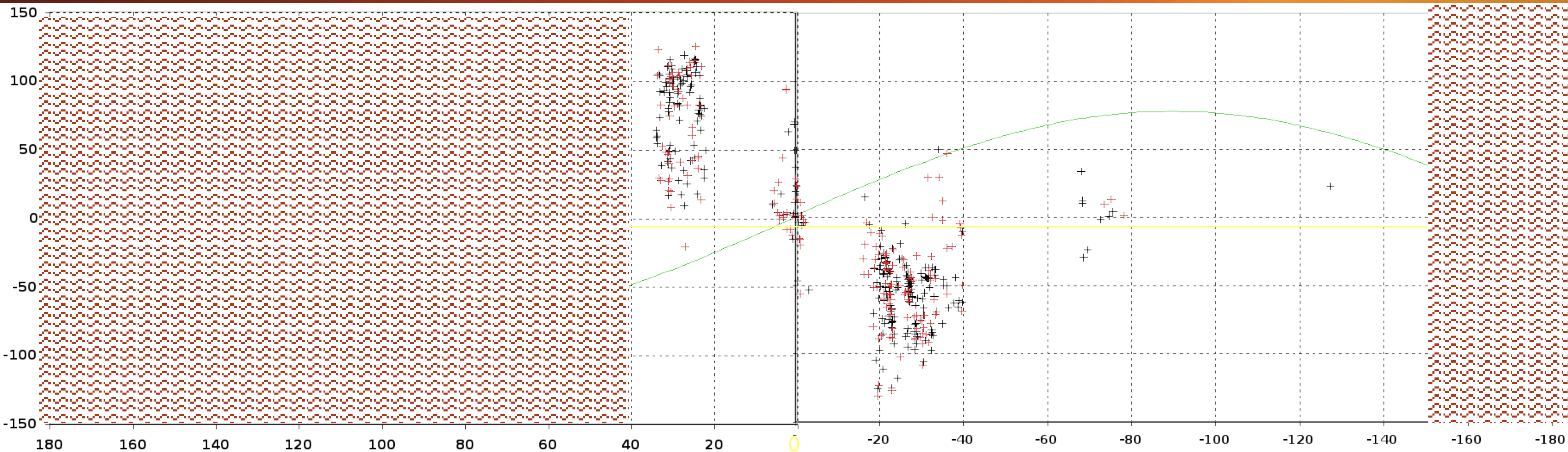
Observations - regions surveyed



Observational Distribution

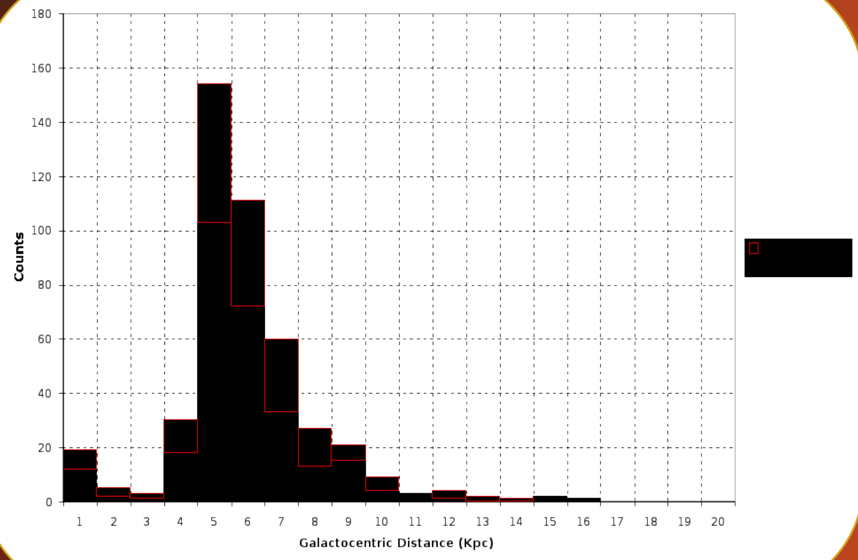


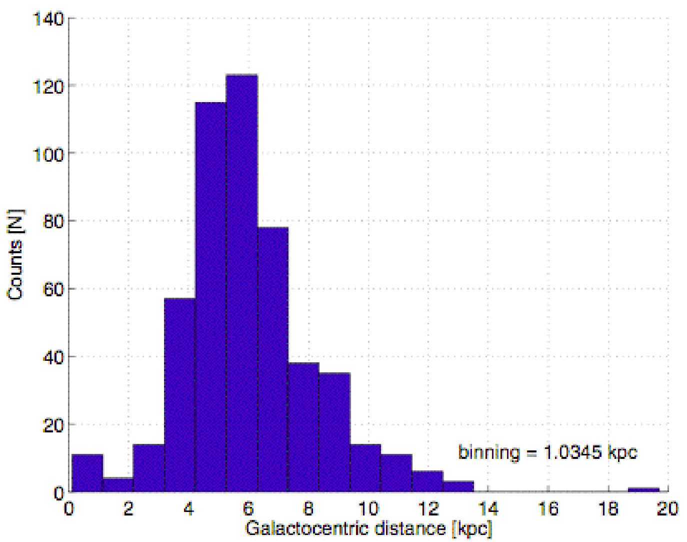
l vs *b*



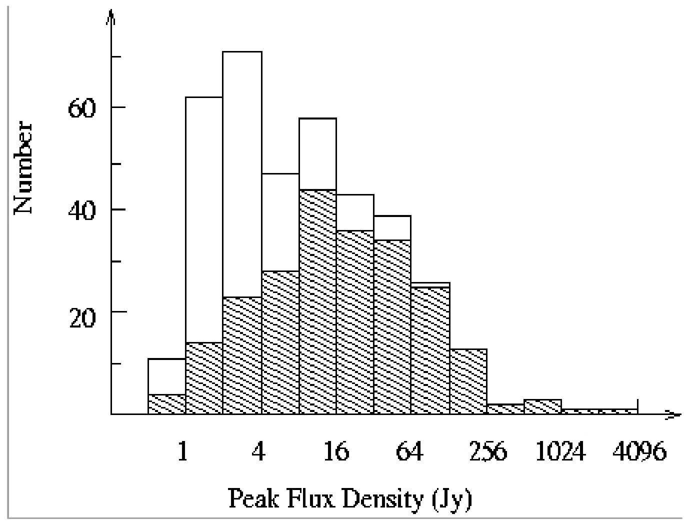
l vs Velocity (LSR)

Survey Statistics - Galactocentric distances



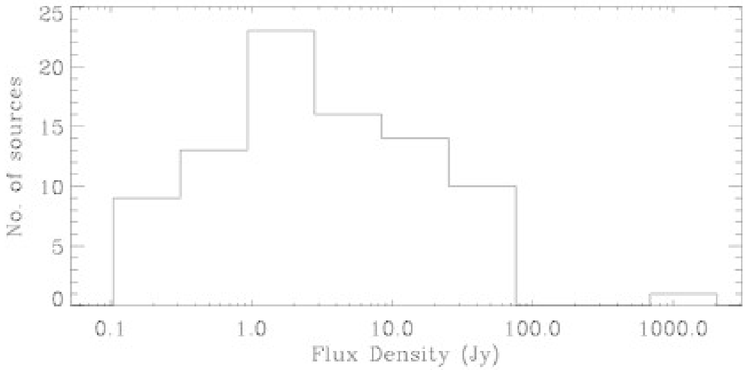


Survey Statistics - Flux distribution



MMB

Arecibo



Excited OH Results

L.Quinn

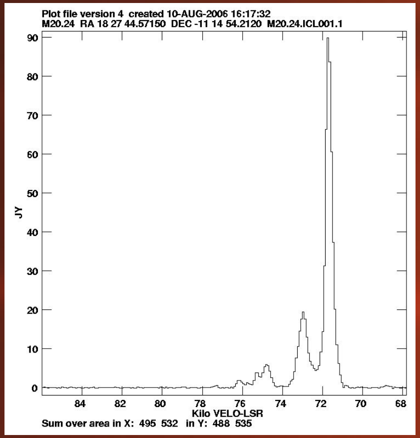
- Work in progress..

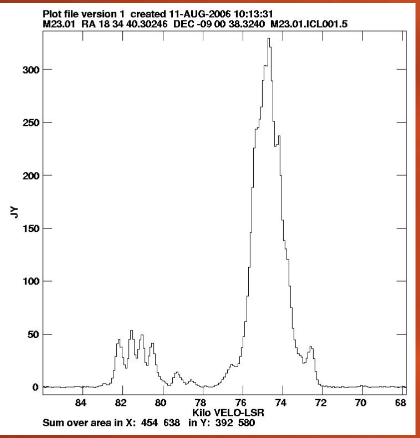
ATCA & MERLIN

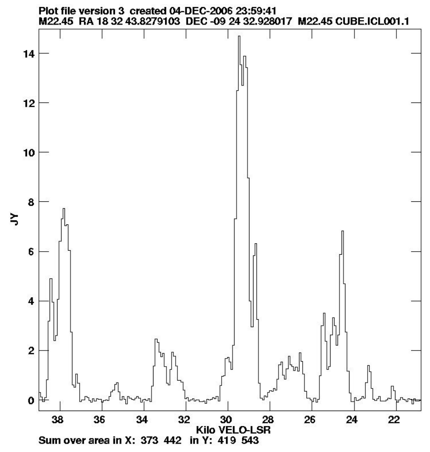
- Positioning follow-up: Parkes positions accurate to ± 30 arcsec.
- Capabilities to do it in both hemispheres with ATCA and MERLIN:
  - ATCA ± 0.1 arcsec
  - MERLIN ± 0.01 arcsec
- ATCA observed and positioned all new detections.
- MERLIN observed ~30 new in 20-30 region, positioned 25.

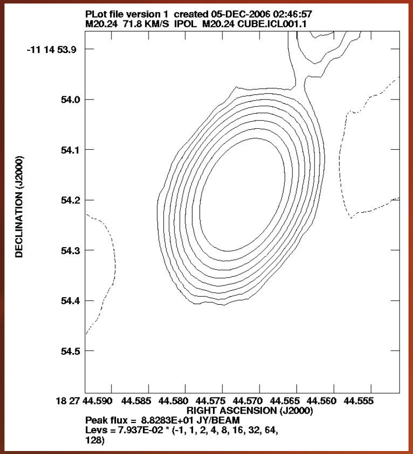
MERLIN Follow-up Examples

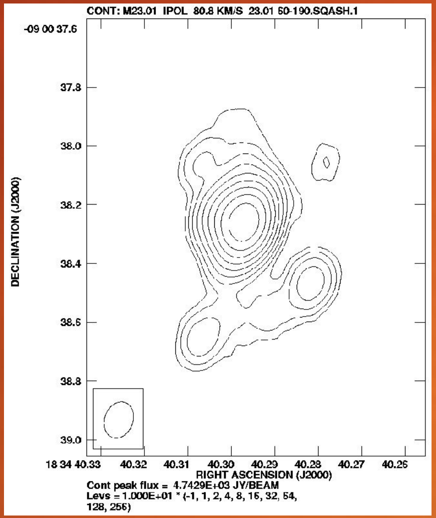
D. Wong-McSweeney

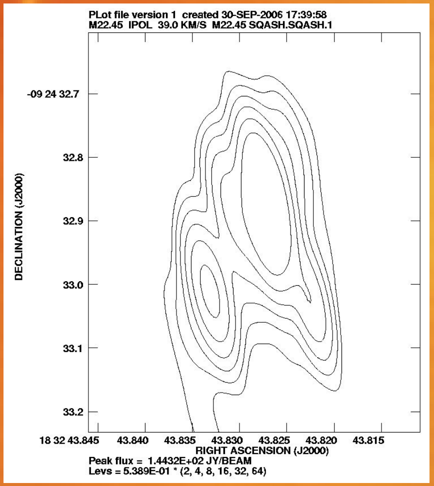












Pulsar Survey Piggyback

- Deep integrations through pointed observations conducted as part of the pulsar search program.
- No Doppler tracking.
- Just Methanol 6668 MHz frequency.
- Correlator configured for 8 MHz over 4096 channels for 7 beams, 2 polarizations.
- Same spectral resolution, but over wider velocity range.
- Focused on Galactic Centre, but covering -60 < *l* < +45 (maximum +/- 0.5 in *b*).

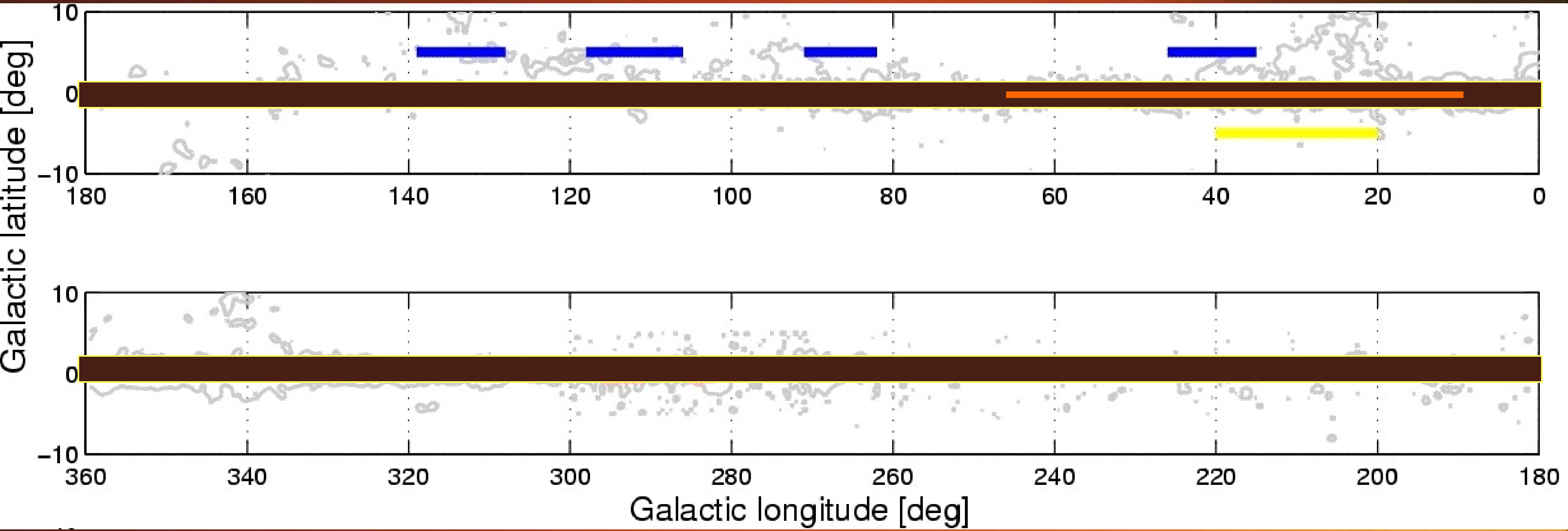
Magellanic Clouds

- Slightly different technique.
- Pointed MX observations as well.
- 1 new Methanol & 1 new excited OH.

The Work Plan : 2007-2011

- Parkes Multibeam survey till 2008.
- ATCA positions, snapshots and 8.4 GHz continuum.
- MERLIN positions and snapshots.
- Distances and Galactic Distribution.
- Jodrell Bank Multibeam survey 2008-2010.
- MMB catalogue of Milky Way.
- MMB survey of LMC/SMC.
- Simultaneous survey of excited OH 6035 MHz.
- Methanol deep fields at Pulsar pointings.

MMB-CORNISH Overlap



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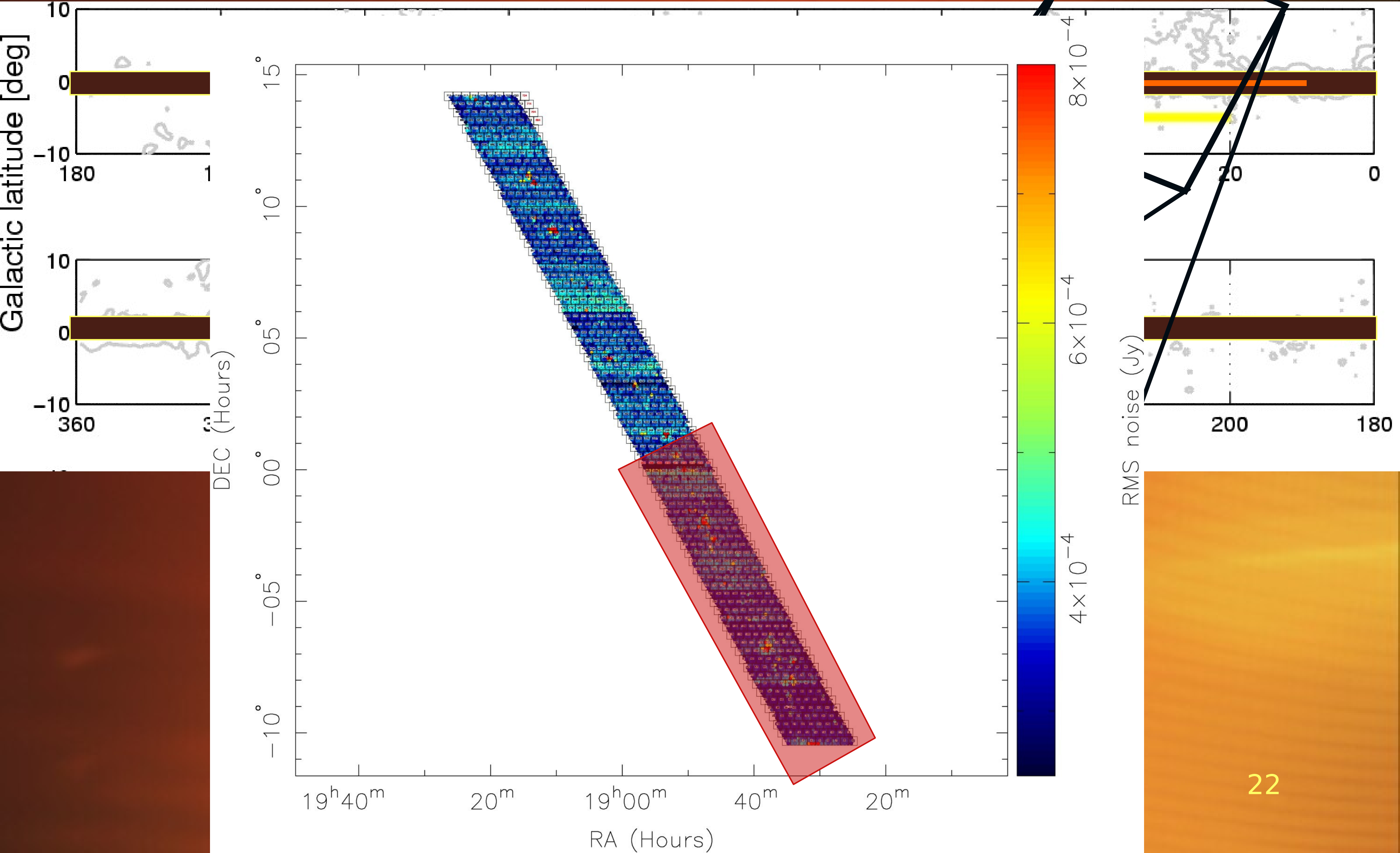
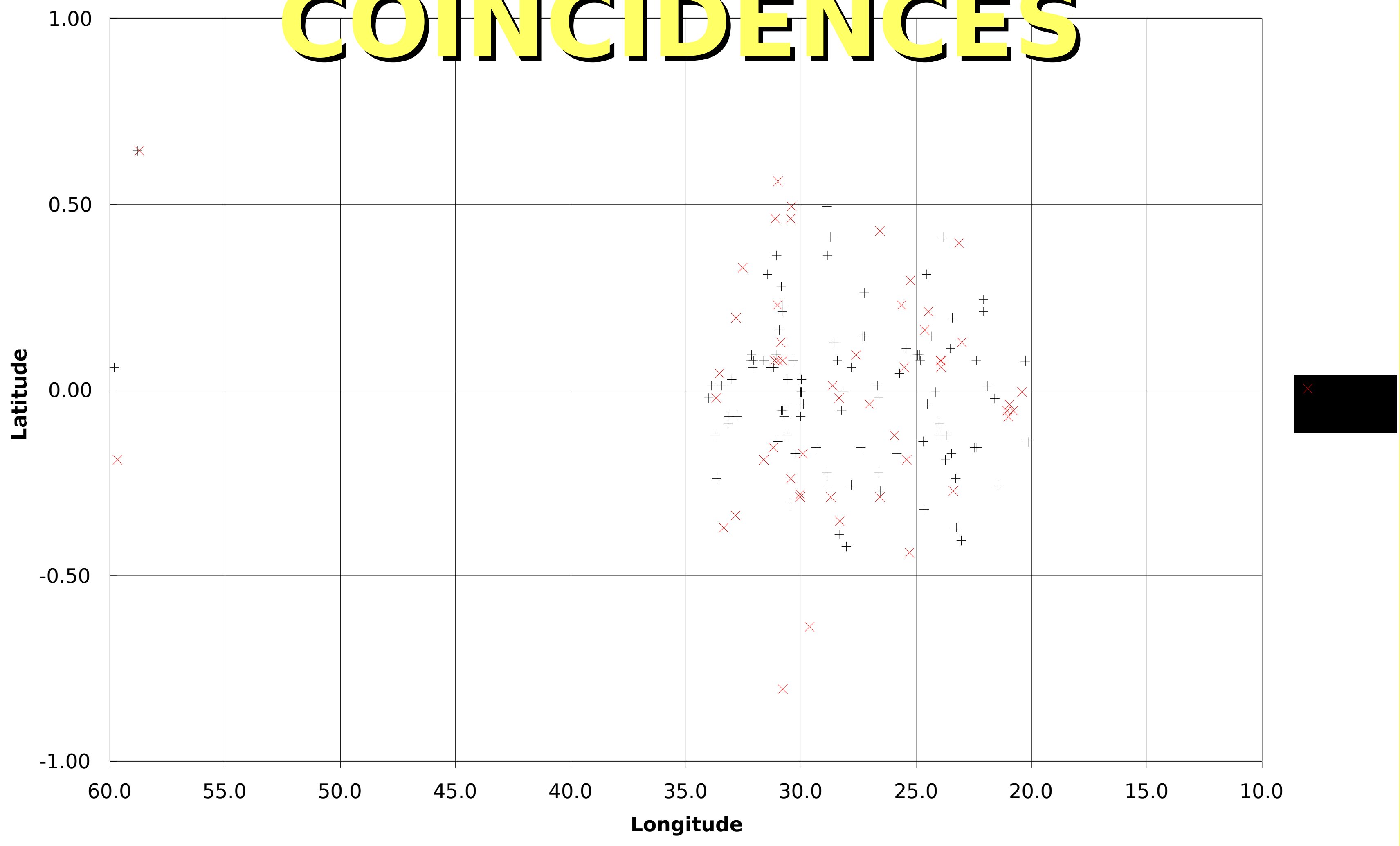


MMB-CORNISH COINCIDENCES



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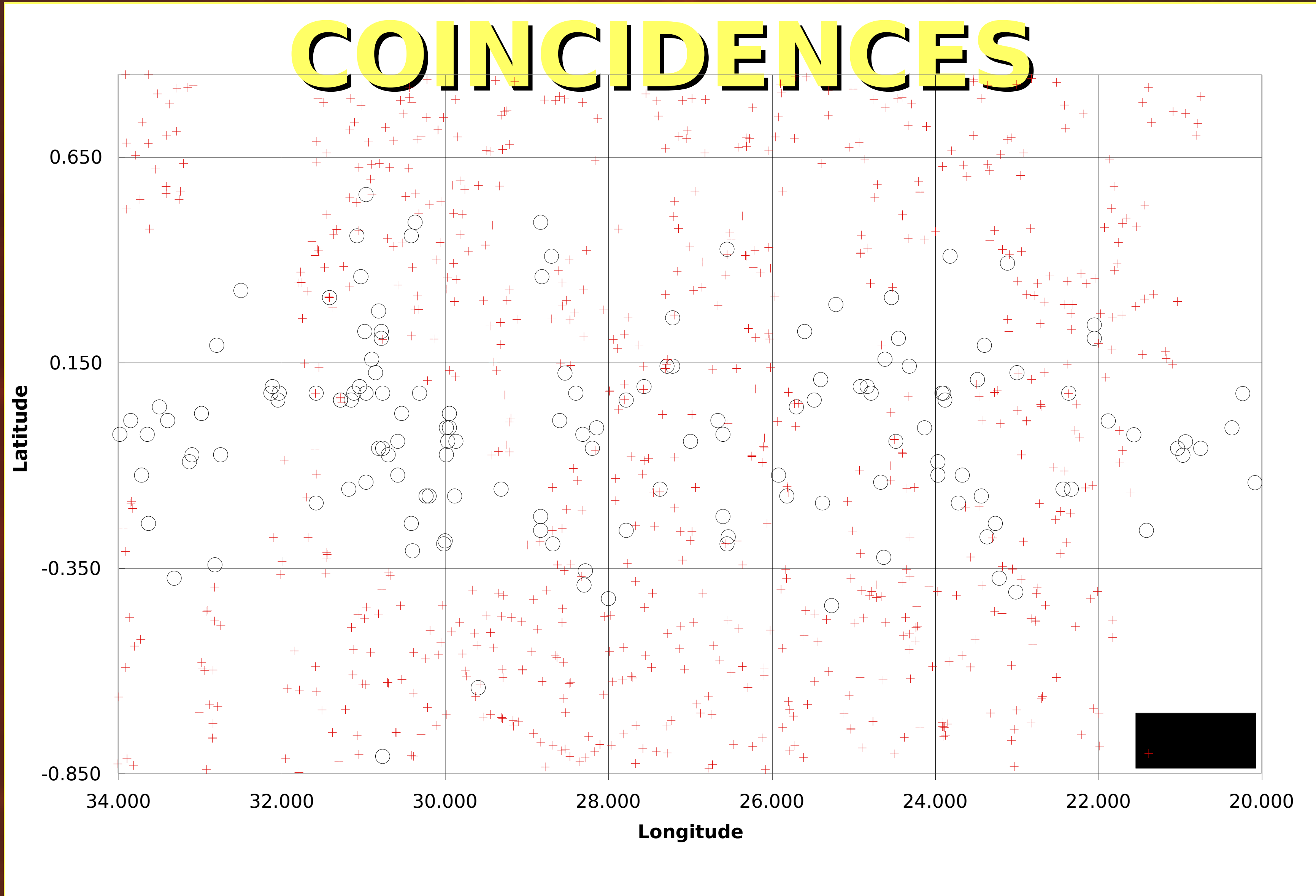

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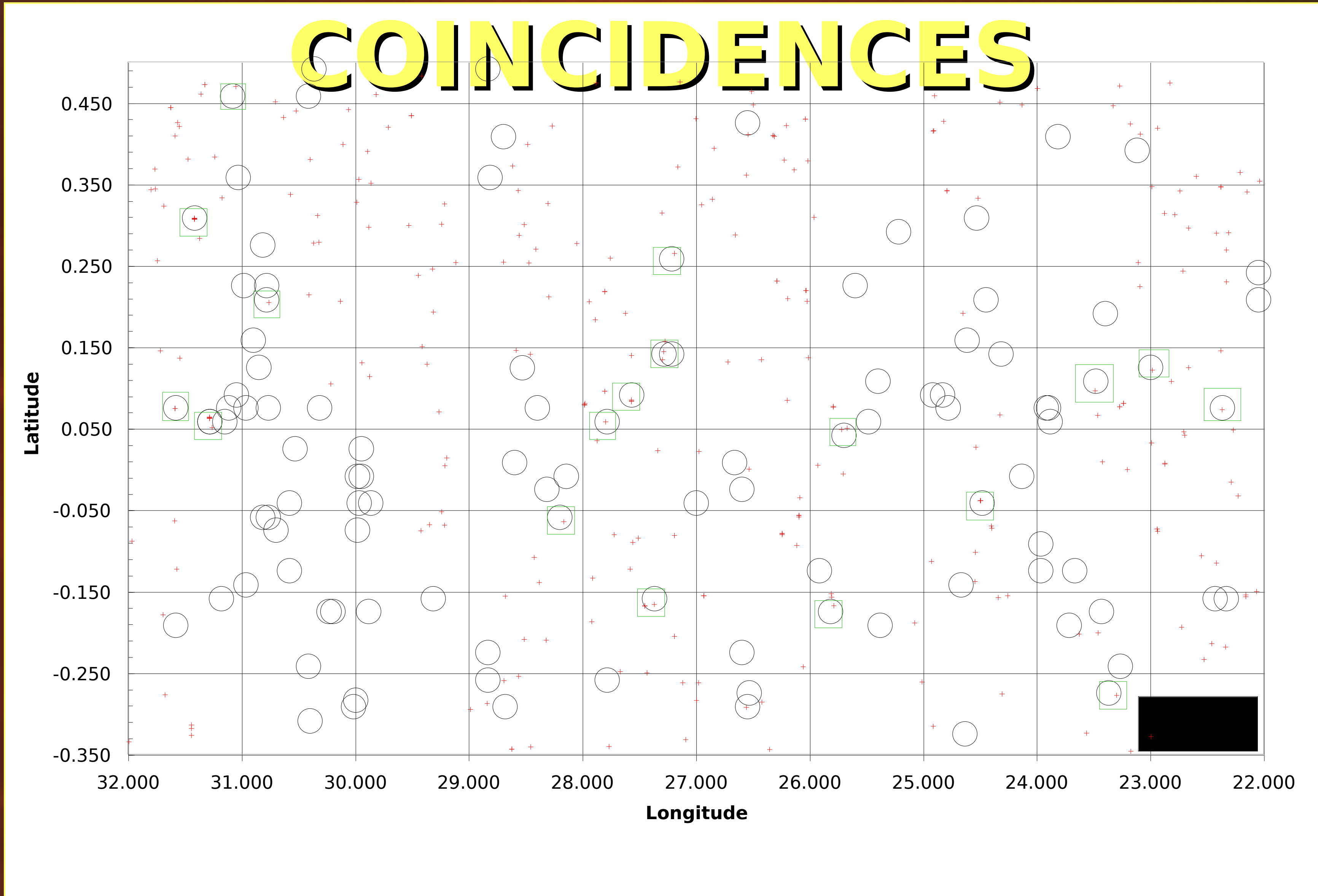

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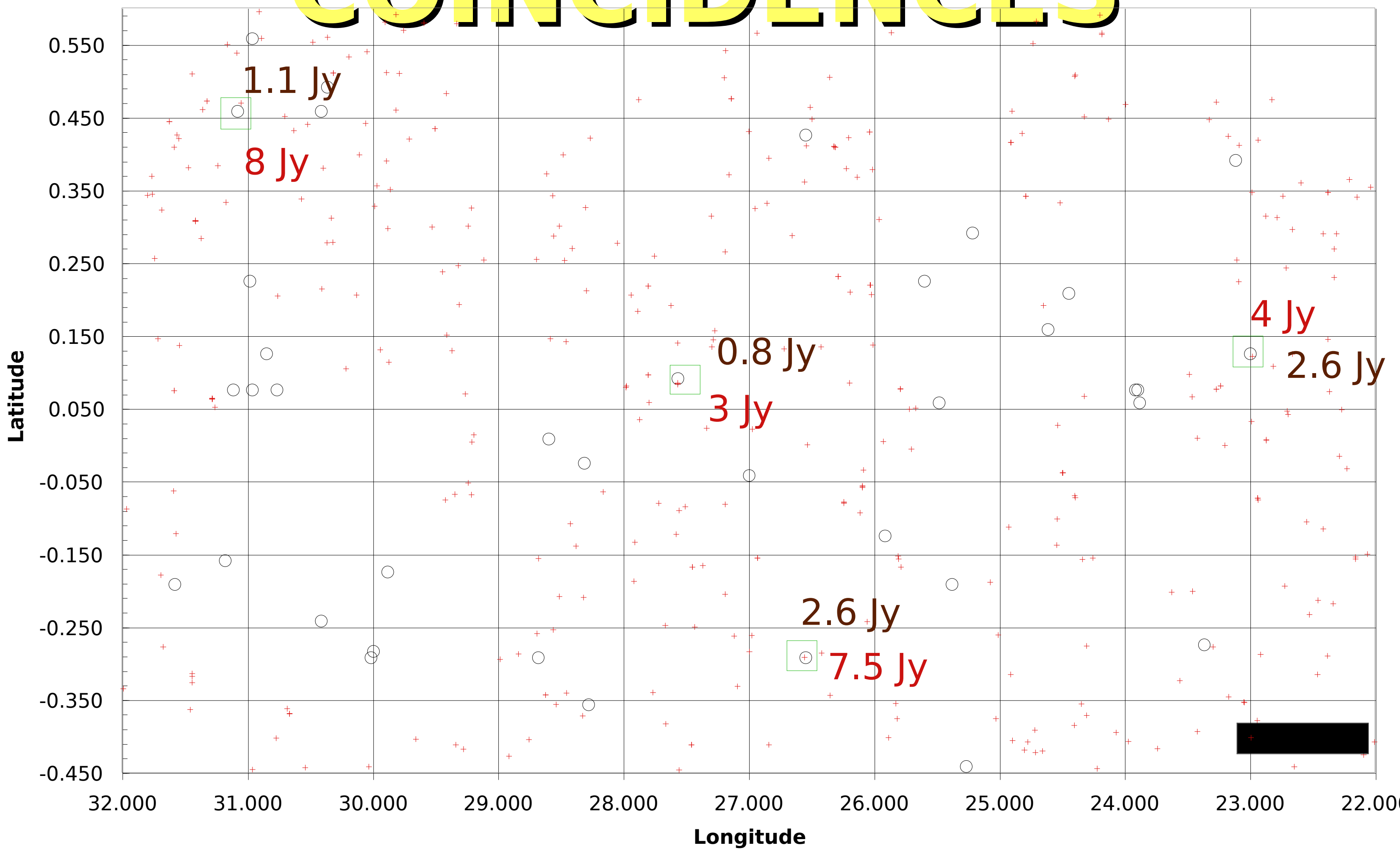

Conclusion

- MMB first full Galactic plane survey.
- 528 detections & counting
- MMB-CORNISH overlap looks very promising.