The Galactic Arecibo L-band Feed Array (GALFA) HI Survey

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Overview

• Galactic HI Surveys: Penticton to Puerto Rico
• The ALFA Instrument and the HI Backend
• Observations and Data Processing
• Science Highlights
• Advertising the Data: https://purcell.ssl.berkeley.edu/
Another DRAO Legacy

- The Canadian Galactic Plane Survey (CGPS) has inspired a multitude of similar efforts.
- Galactic Plane surveys, all-sky surveys, multiwavelength observations of the ISM, etc.
Brief History of GALFA

• About 10 years ago, the GALFA consortium was formed to carry out Galactic studies with Arecibo’s new receiver system, ALFA.
• Three sub-consortia, for HI, RRL, and radio continuum investigations.
• GALFA-HI observations were underway by September 2004
Advantages of Arecibo

• High sensitivity to low-level HI signals
• Seven-element array allows for fast mapping
• Quite good angular resolution, ≈ 3.5’
• Multiple back-ends allow commensal observing: majority of GALFA-HI data has been collected in ‘piggy-back’ mode (TOGS)
• Really good HI spectrometer, GALSPECT, developed by Jeff Mock; Δν = 0.18 km/s
GALSPECT:
Wertheimer, Mock et al.

ALFA
GALFA-HI compared to CGPS
Data Processing

• GSR software: IDL code developed at UC Berkeley, primarily by Josh Peek.
• Challenging! 14 beams, crossing point calibration, gain variations, RFI inter-modulation products, baseline ripple, sidelobes, stray radiation, et cetera
• End products are datacubes, roughly 8° on a side, with up to 2048 velocity channels
Tiling up the Arecibo Sky
The (very local) Leo Cold Cloud

I-GALFA: The Inner Galactic Plane
Jigsaw Mapping & Data Release 1
GALFACTS fields (first 8 of 12)
HI toward the Outer Galaxy
Recent Results

• Catalogue of compact HI sources
• Statistical characterization of IS turbulence
• Multiwavelength ISM investigations
• Reduction of latest GALFACTS fields
• Improvements to pipeline – better data on the way!
HI-H$_2$ interface in Perseus MC

Lee et al. 2012
ApJ, 748, 75
1,964 compact clouds in GALFA-HI (DR1)

Saul et al. 2012
ApJ, 758, 44
ISM Study of GLIMPSE bubble N107

HI Shells associated with SNRs

Park et al. 2013
HI Fibers, aligned with B fields?

Clark et al. 2014
Recent Improvements
Conclusions

- Survey science continues to excite
- Arecibo-based GALFA-HI efforts are paying off
- Lots of good data available now, and much more to come.

- Check out https://purcell.ssl.berkeley.edu/
Thank you!