

The Molecular Perseus Arm

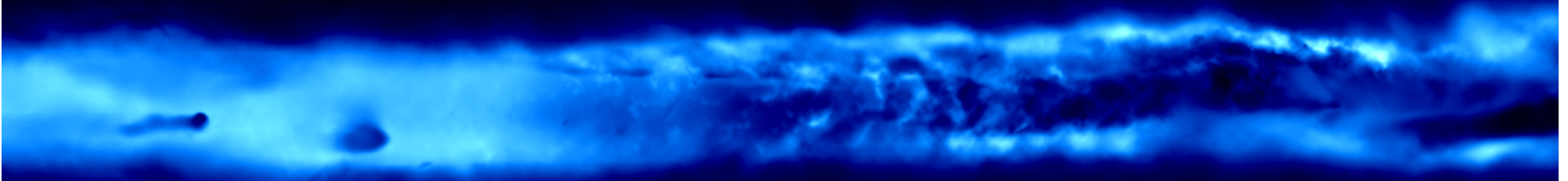


Image Credit: Acreman, Brunt, Dobbs & Douglas 2010

Lee J. Summers
Astrophysics Group
University of Exeter, UK

Chris Brunt (Exeter)

Motivation

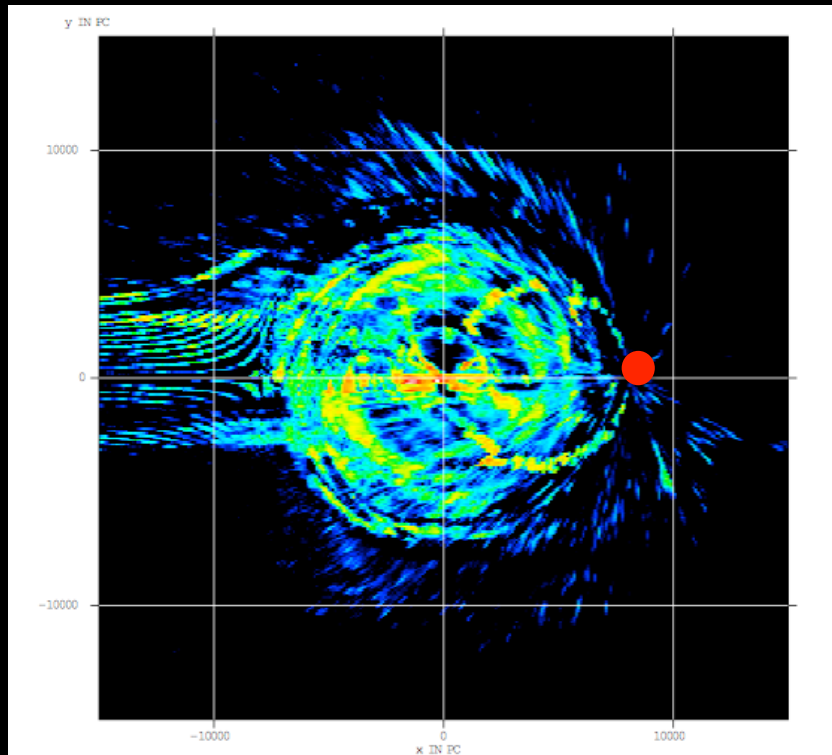
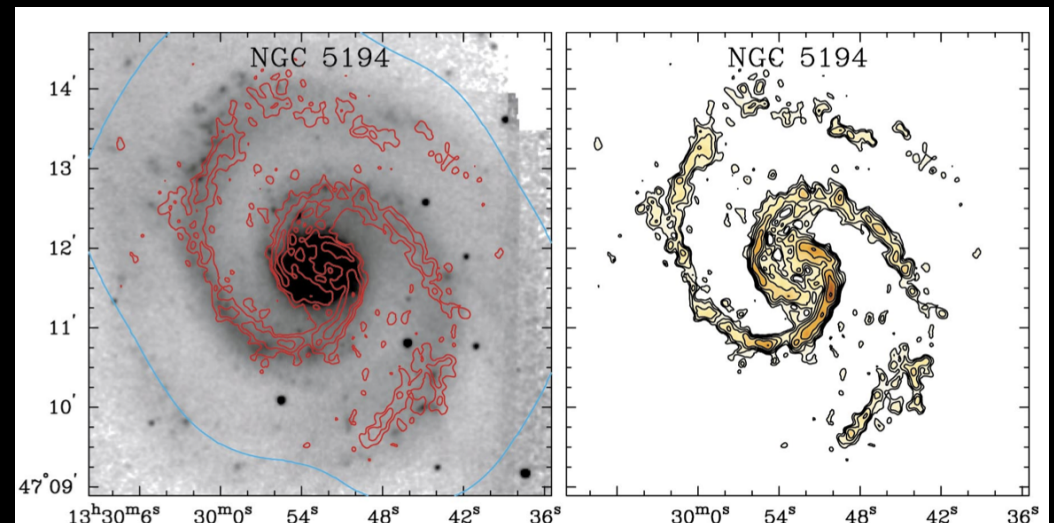
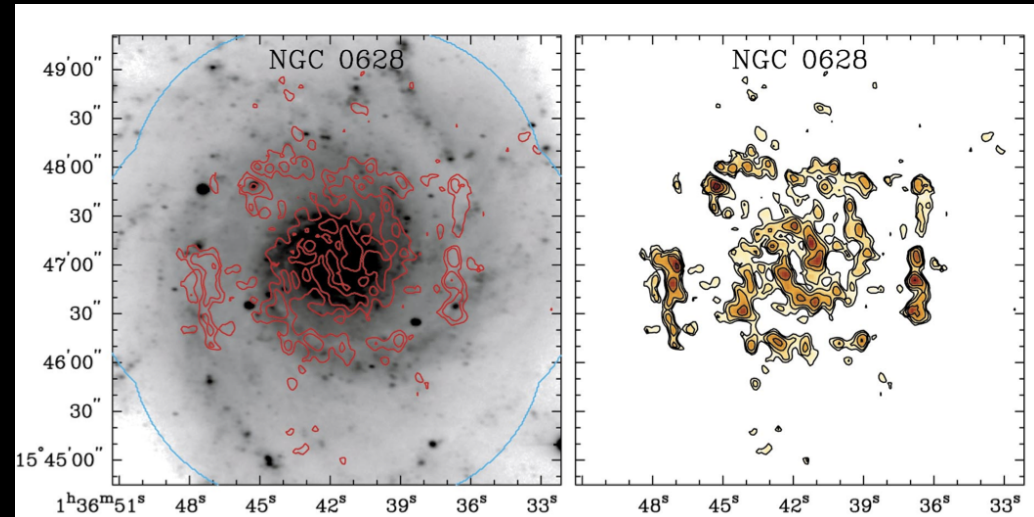


Image Credit:
(right) Regan et al. 2001
(left) Matin Powl, Iowa State University



Observations of Spiral Structure

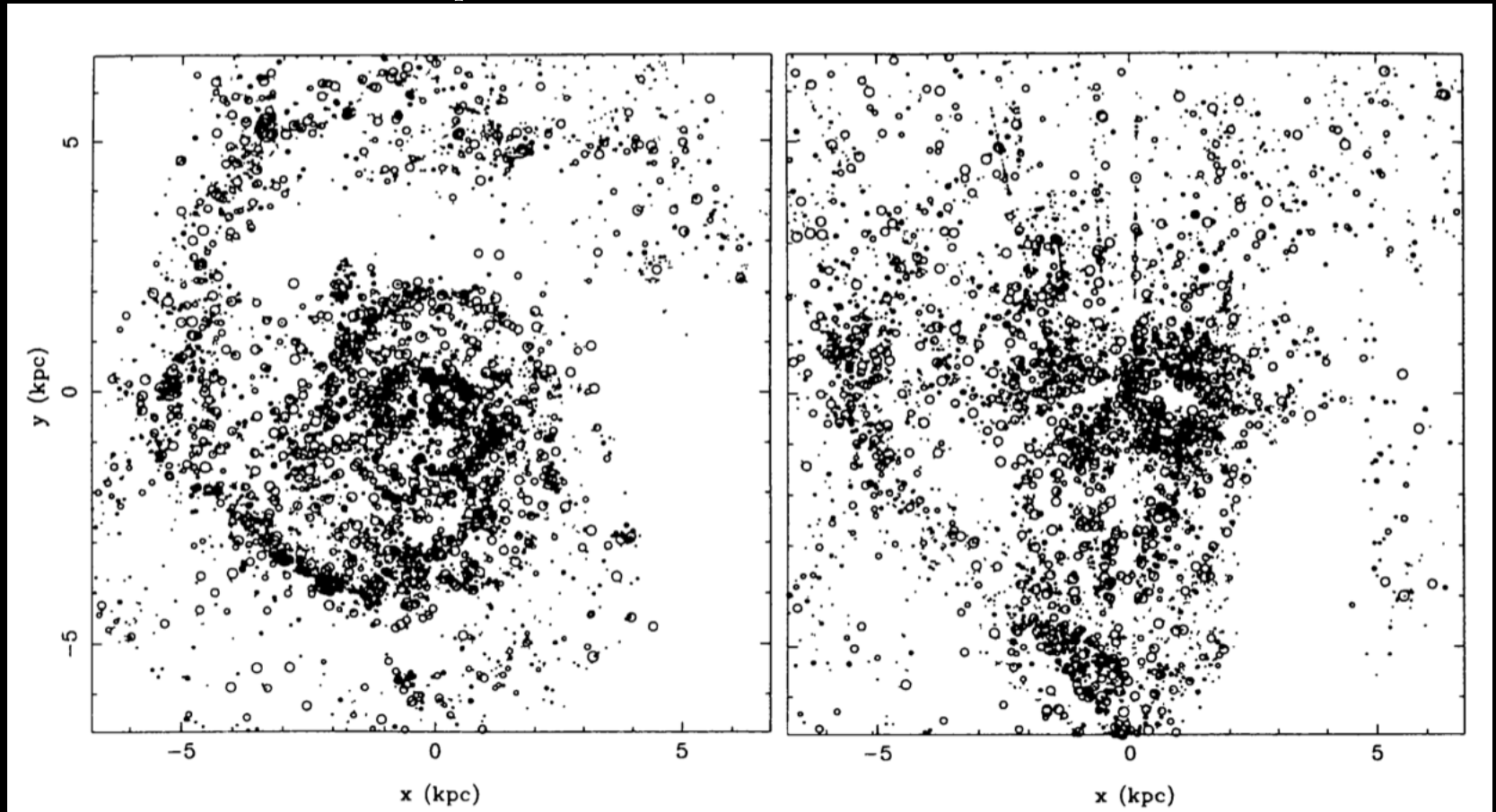
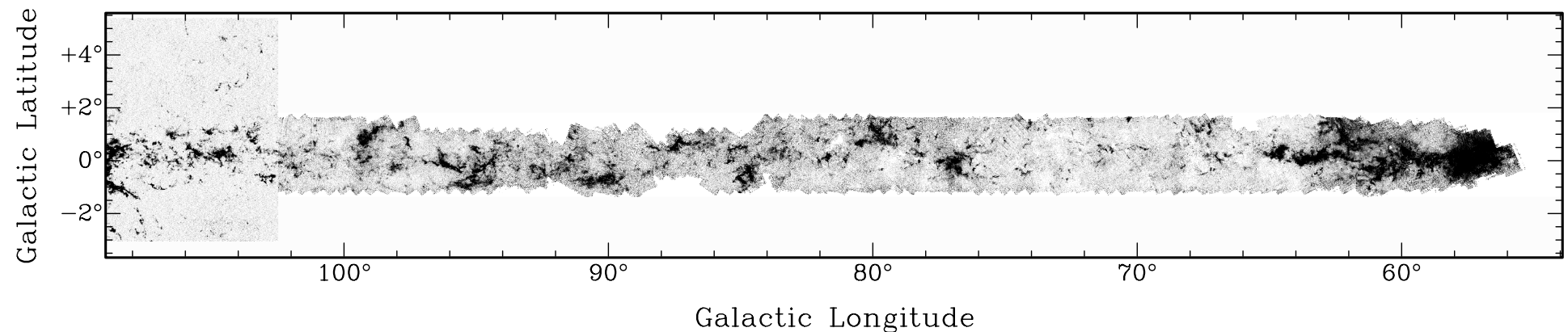
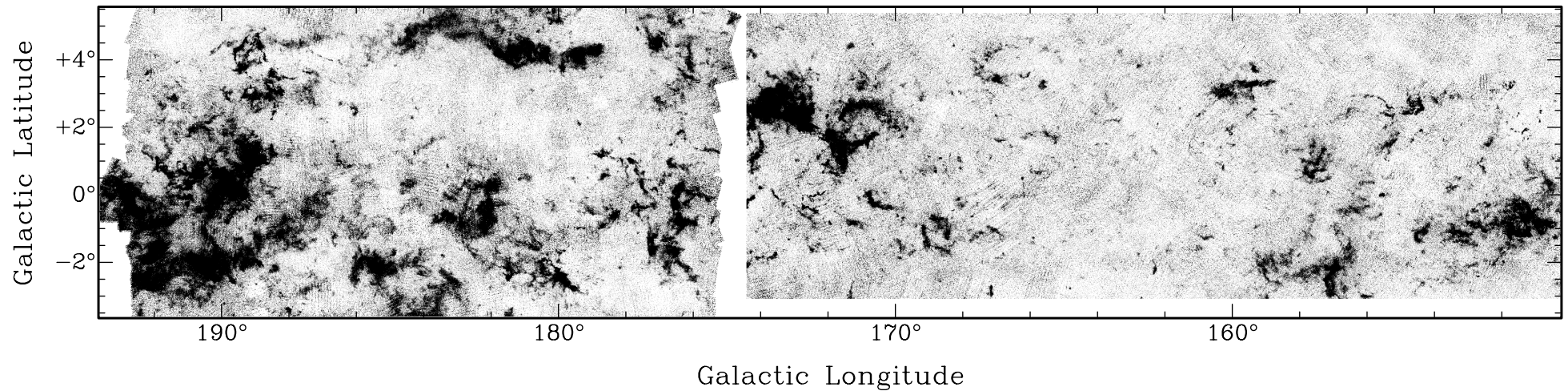
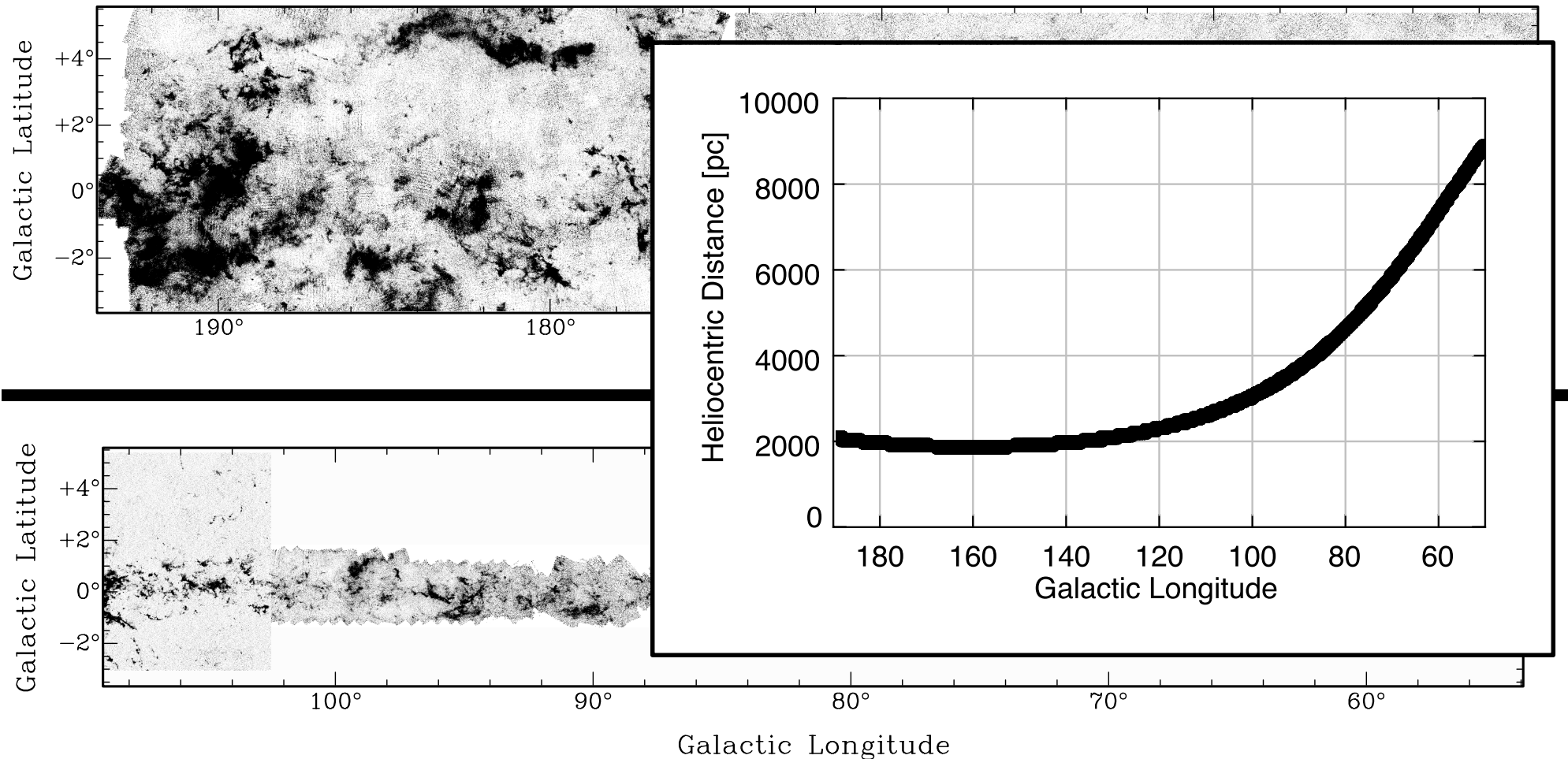


Image Credit: Combes 1991

Observations

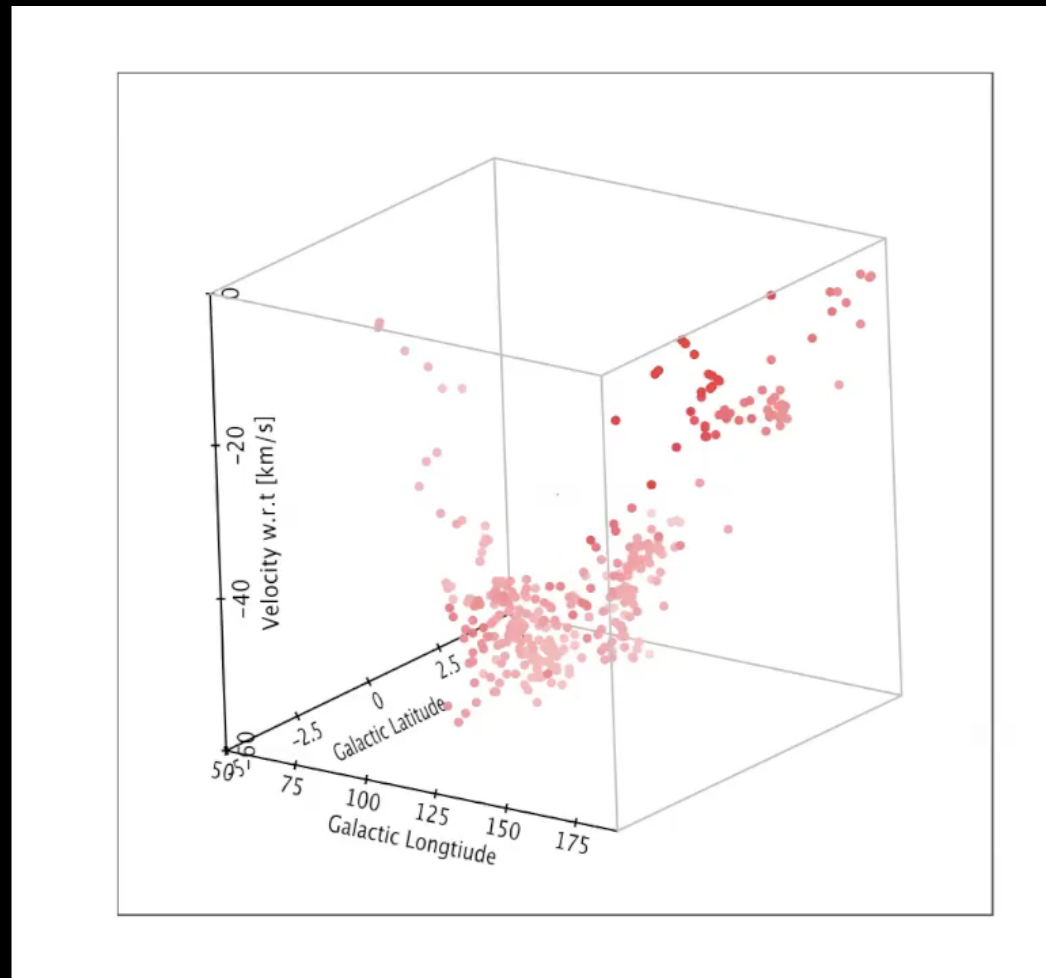


Observations



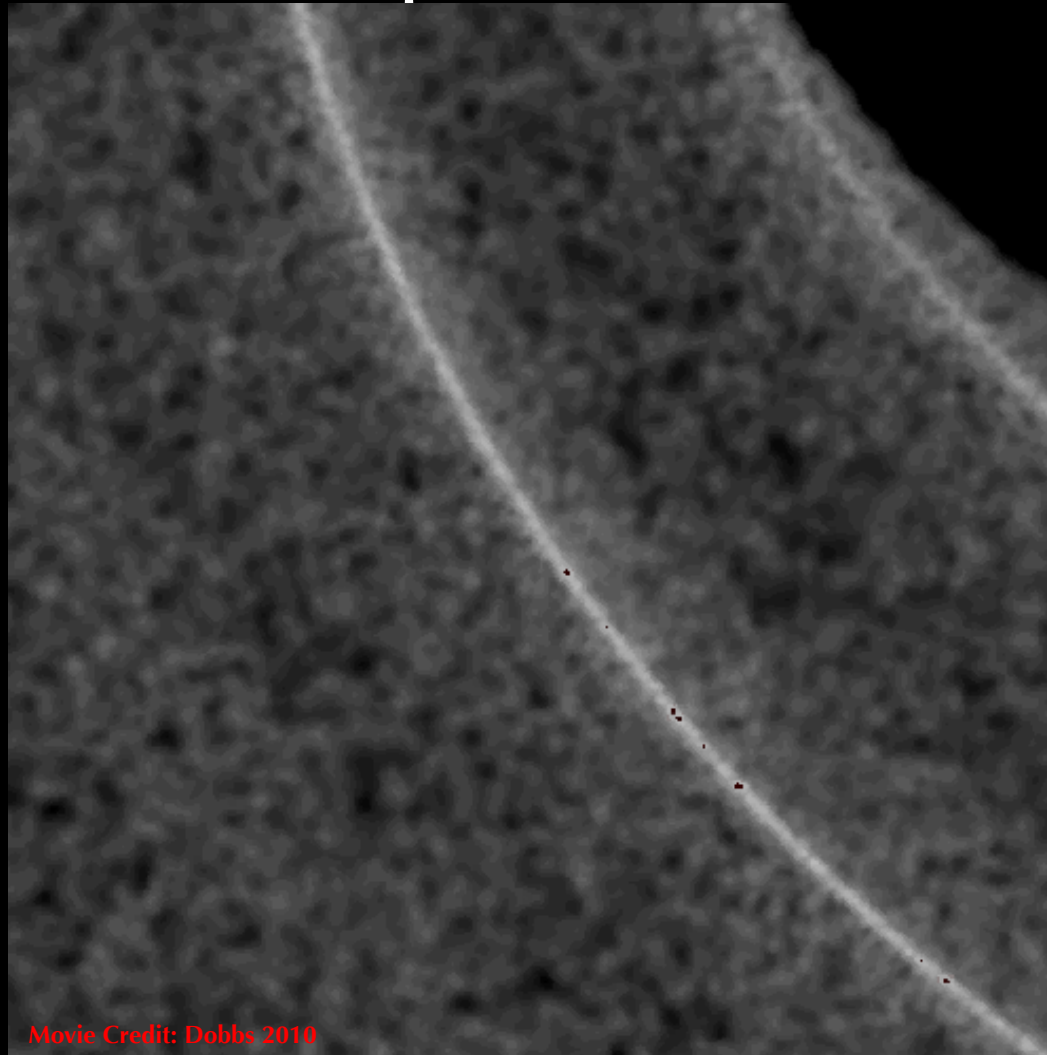
Movie URL : <http://www.astro.ex.ac.uk/people/lsummers/files/Arm.mov>

Persus Arm-In-A-Box



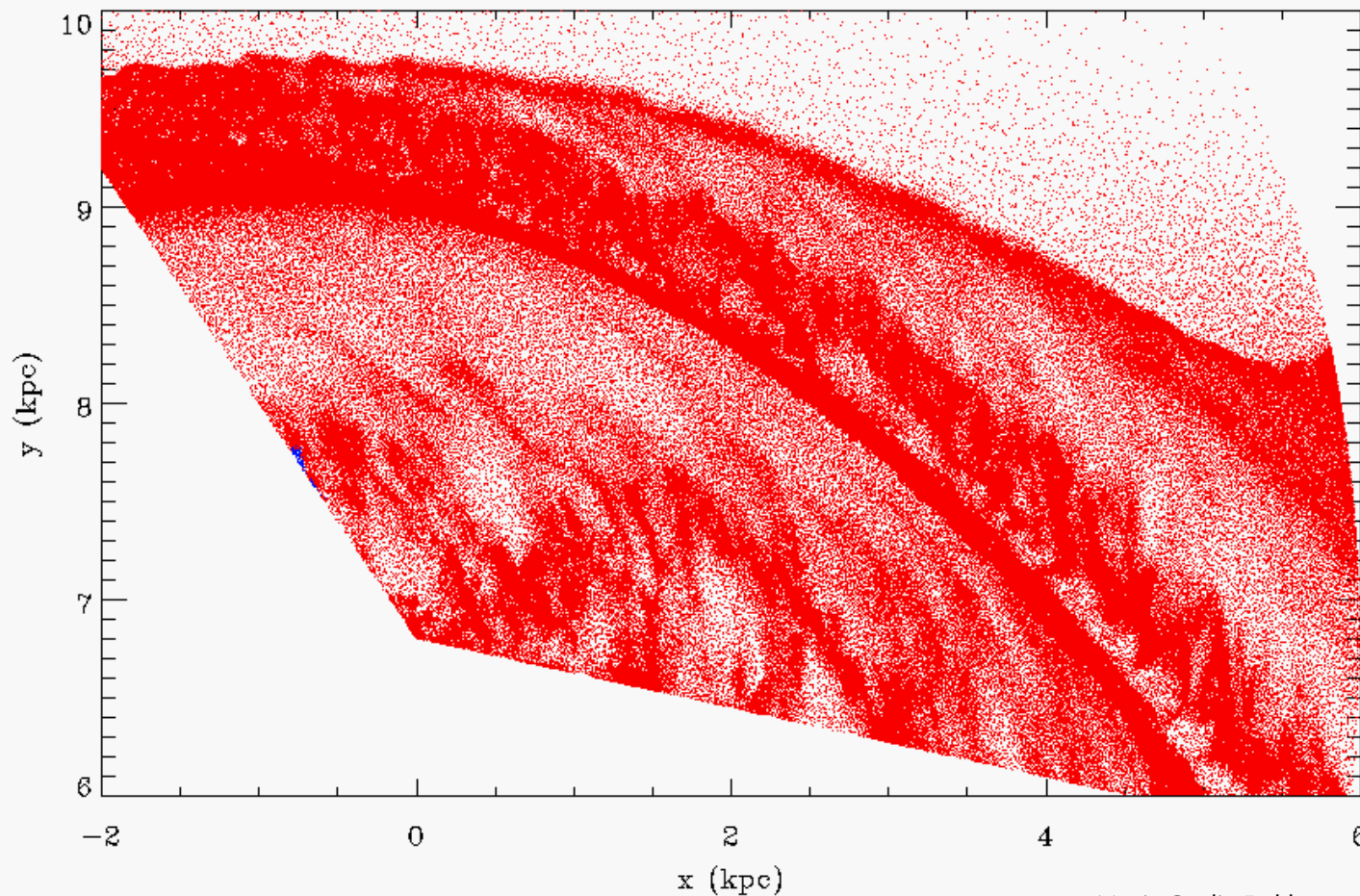
Movie URL : http://www.astro.ex.ac.uk/people/dobbs/dobbs_H2.mov

Molecular Gas In Spiral Arms



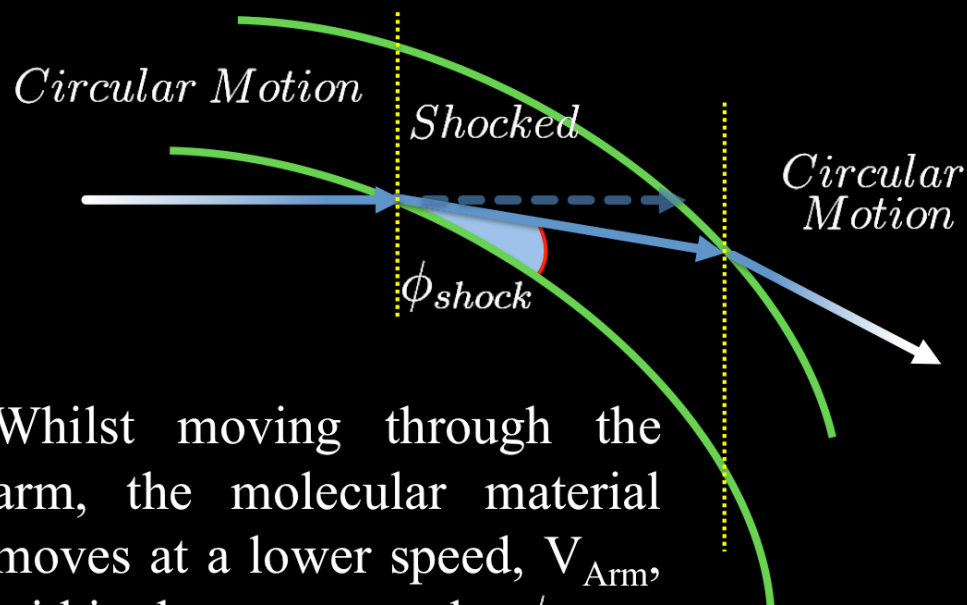
Movie URL : <http://www.astro.ex.ac.uk/people/lsummers/files/posclump.mov>

Molecular Gas Motion Through Spiral Arms



Movie Credit: Dobbs 2008

Arm Model Theory

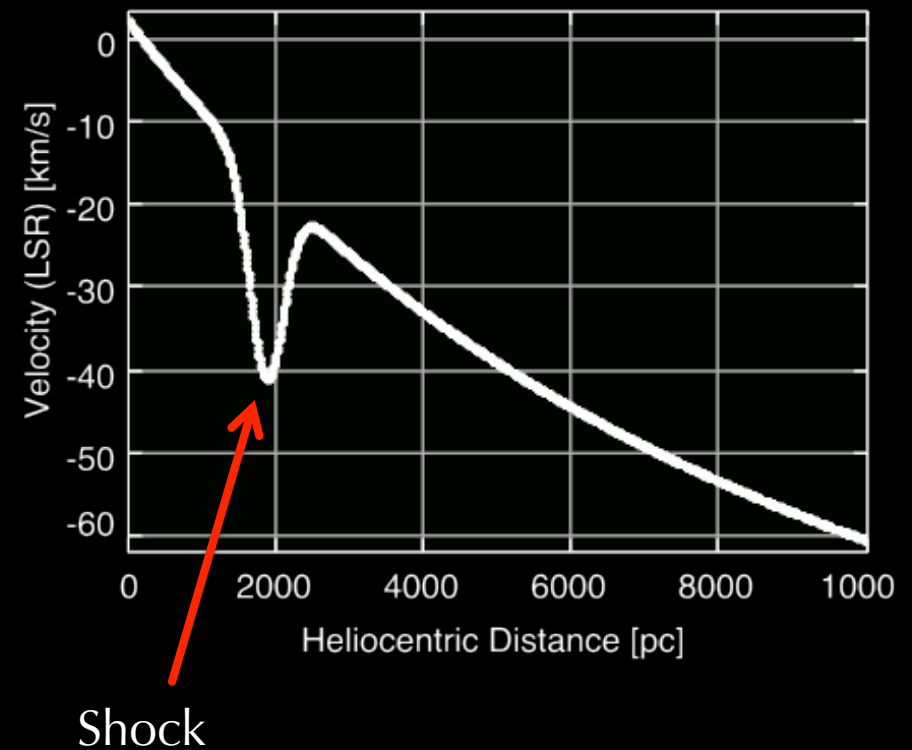


Whilst moving through the arm, the molecular material moves at a lower speed, V_{Arm} , within the arm at angle ϕ_{shock}

$$V_{LSR} = (V_{Arm} \cdot \sin(\epsilon)) - (V_{circ} \cdot \sin(l))$$

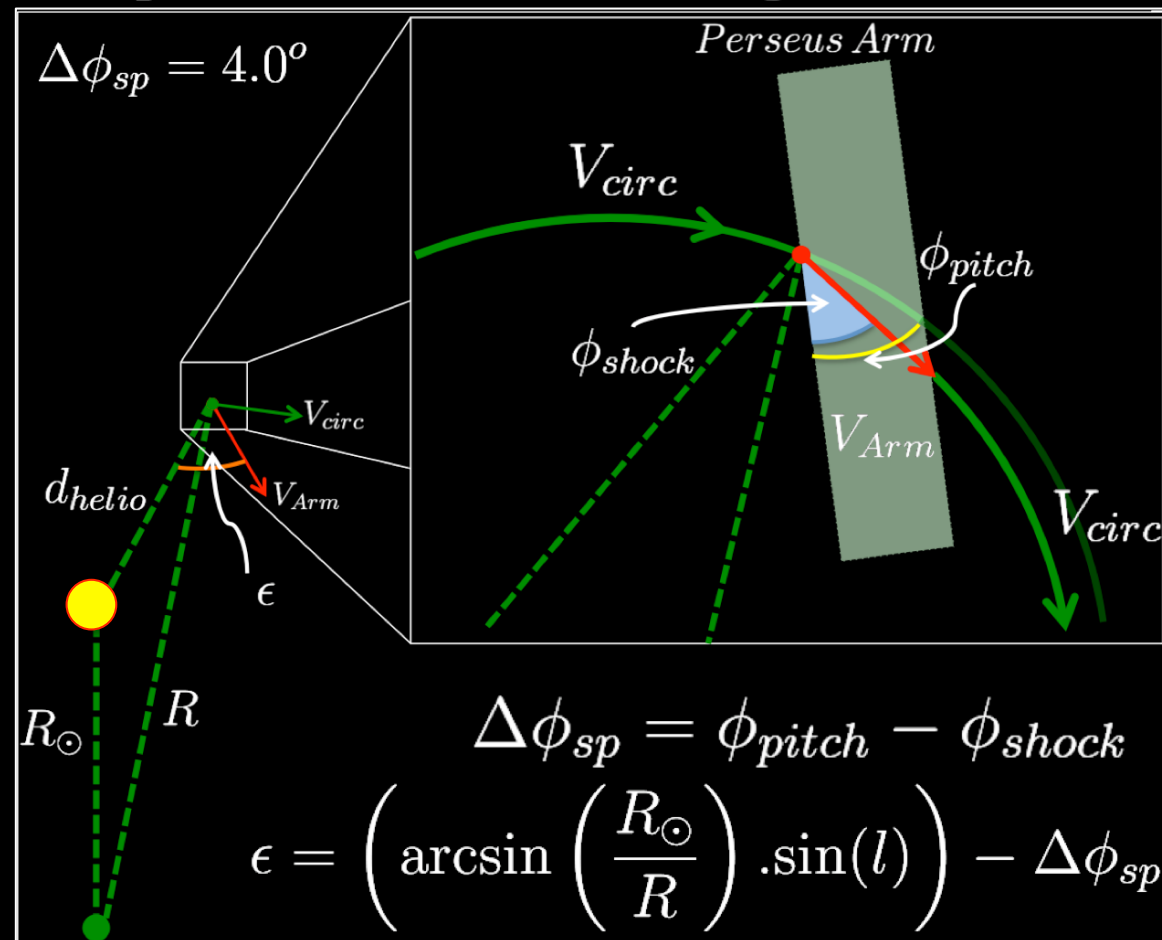
$$V_{Arm} = (V_{circ} - V_{shock})$$

$$V_{circ} = 220 \text{ km/s} \quad V_{Arm} = 200 \text{ km/s}$$

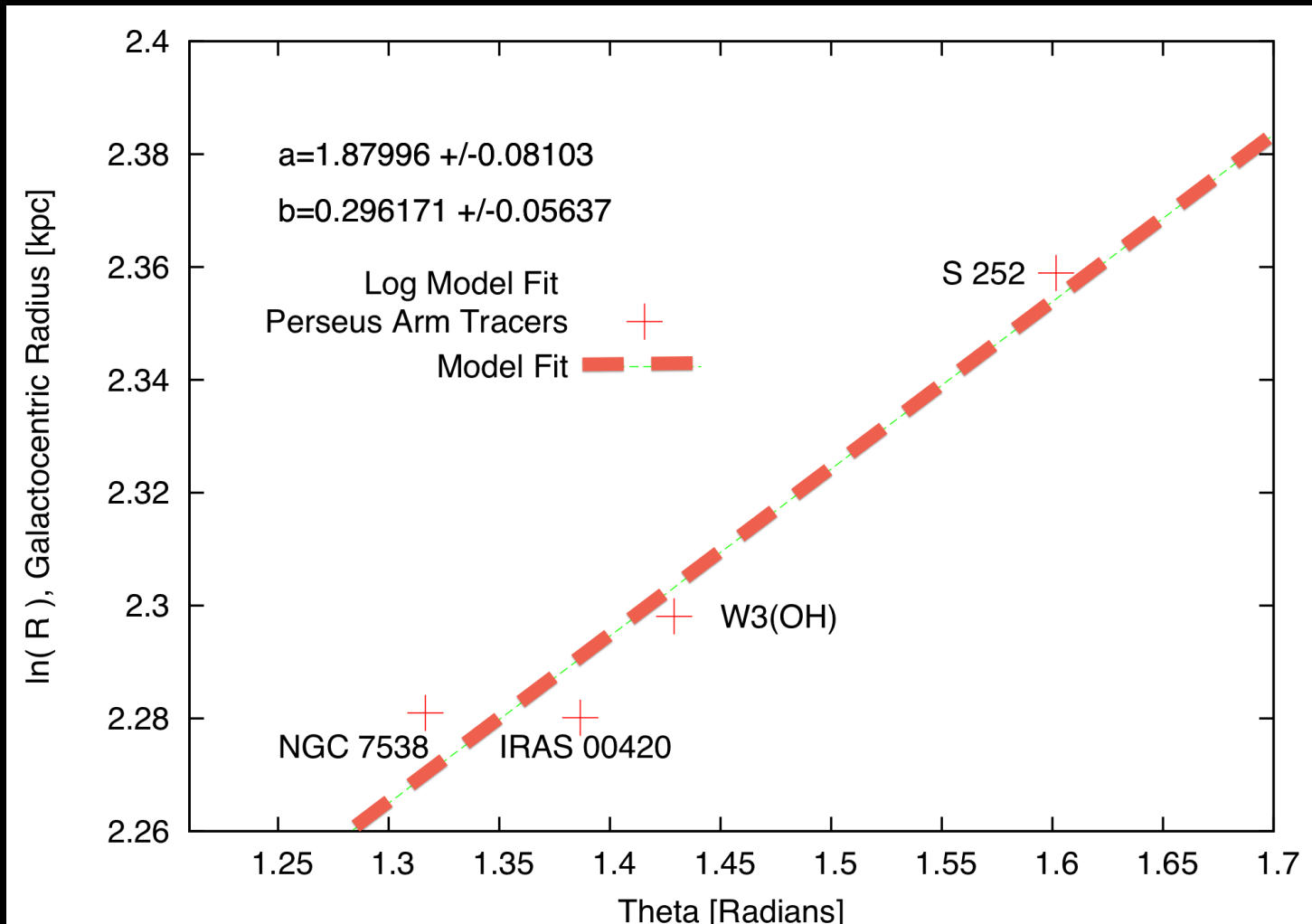


Arm Model Geometry

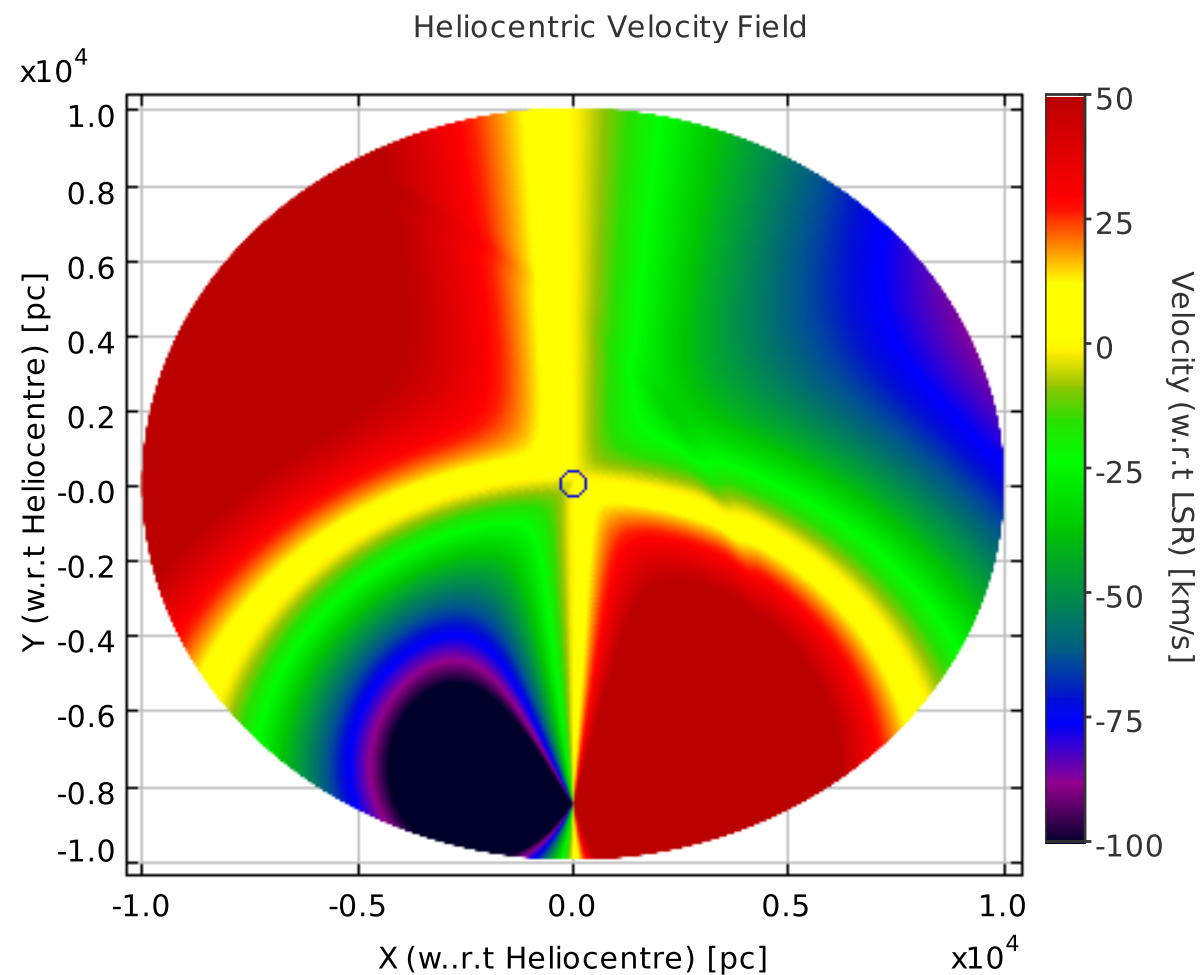
Top Down View Through The Disk



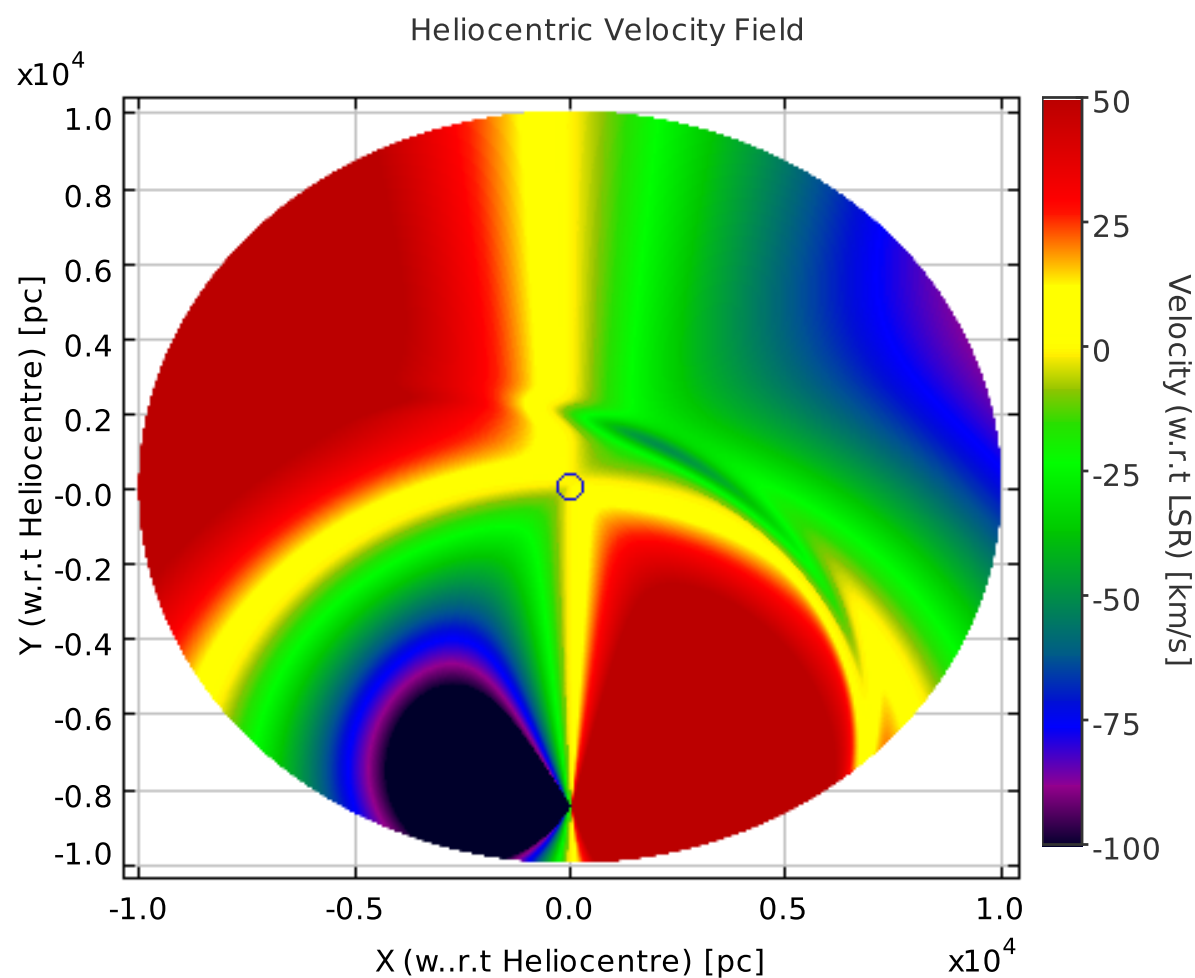
Spatial Structure



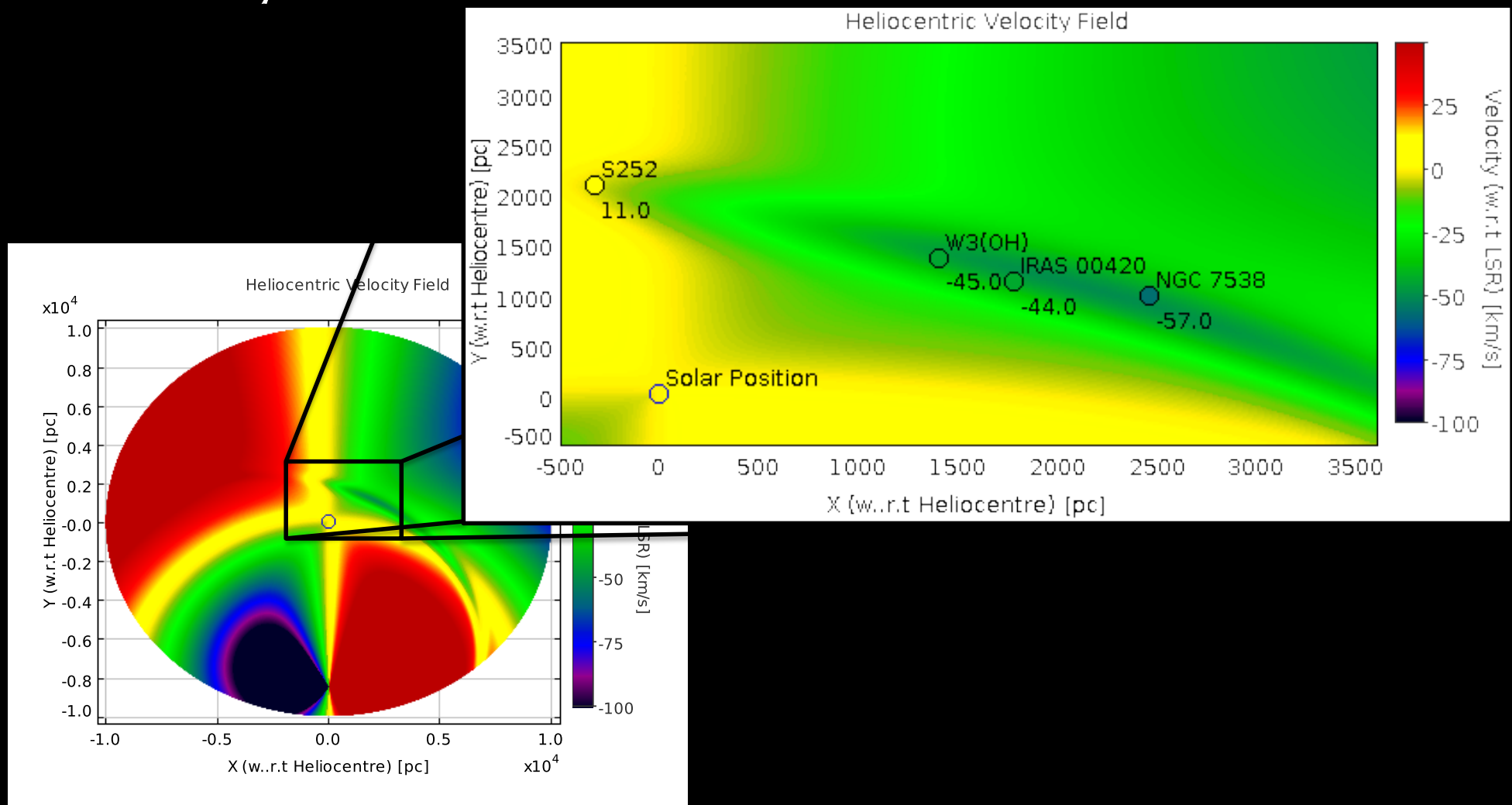
Velocity Field with Flat Rotation Curve



Velocity Field Integrating a Shock Potential

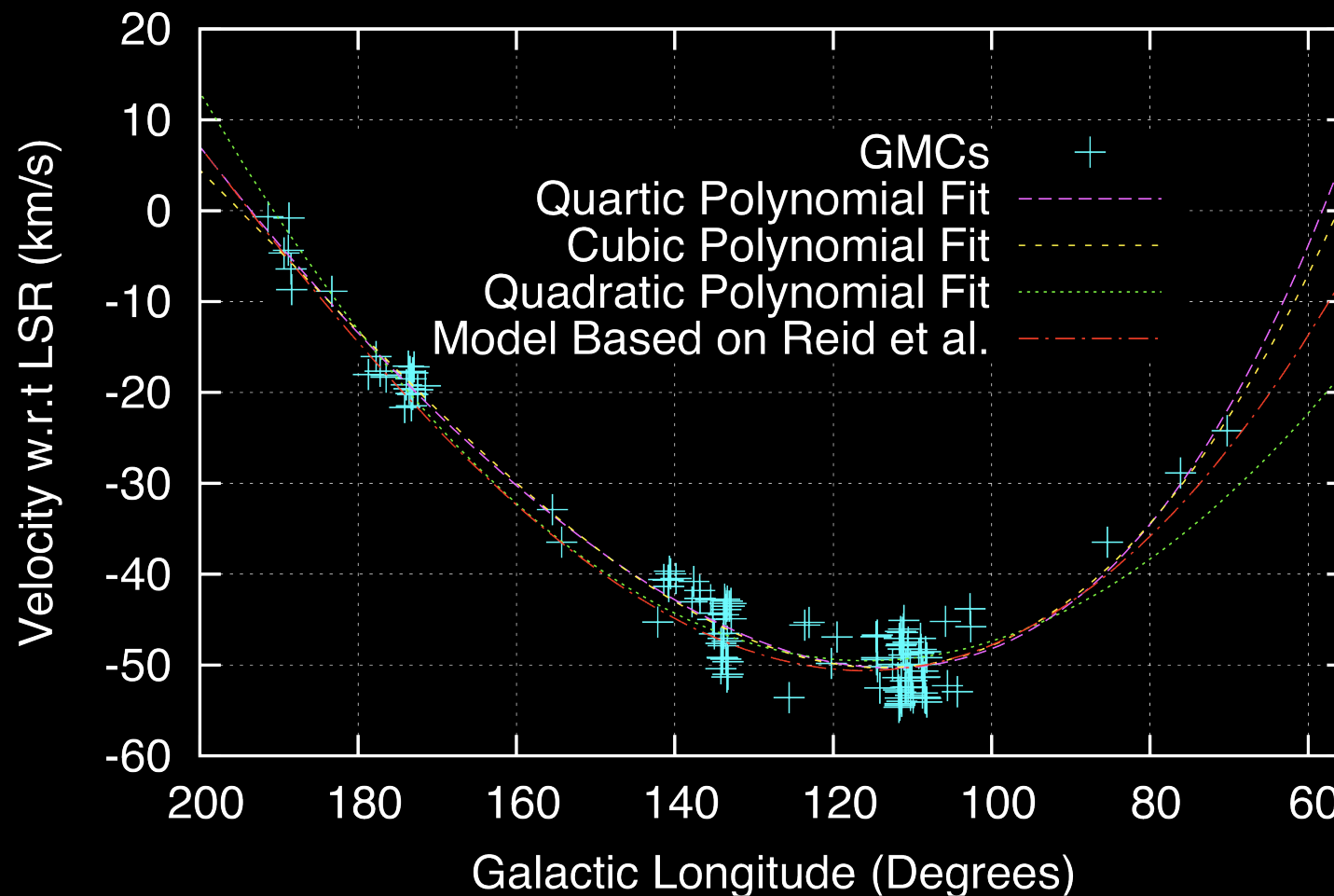


Velocity Field Tracers

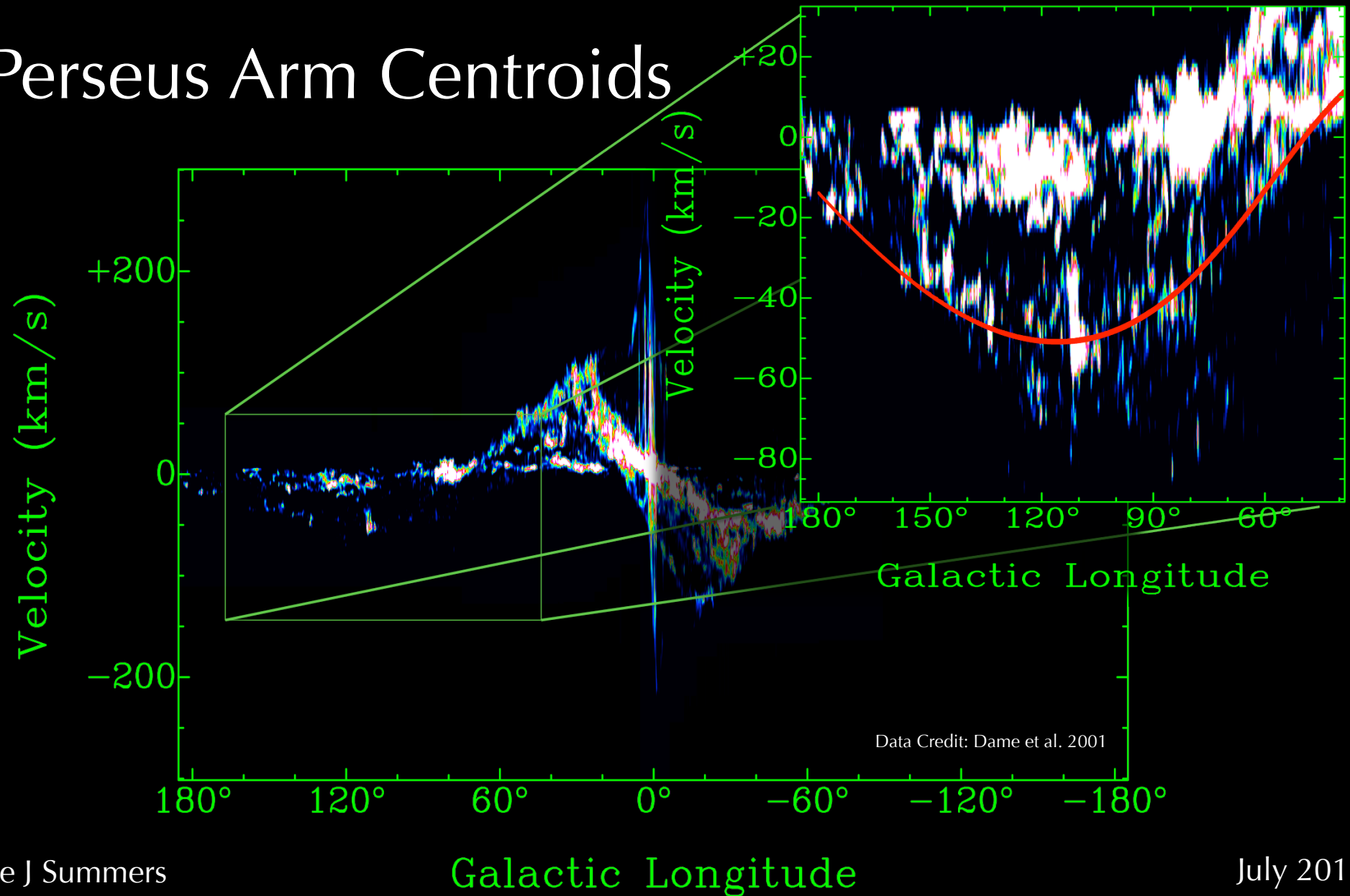


Perseus Arm Centroids

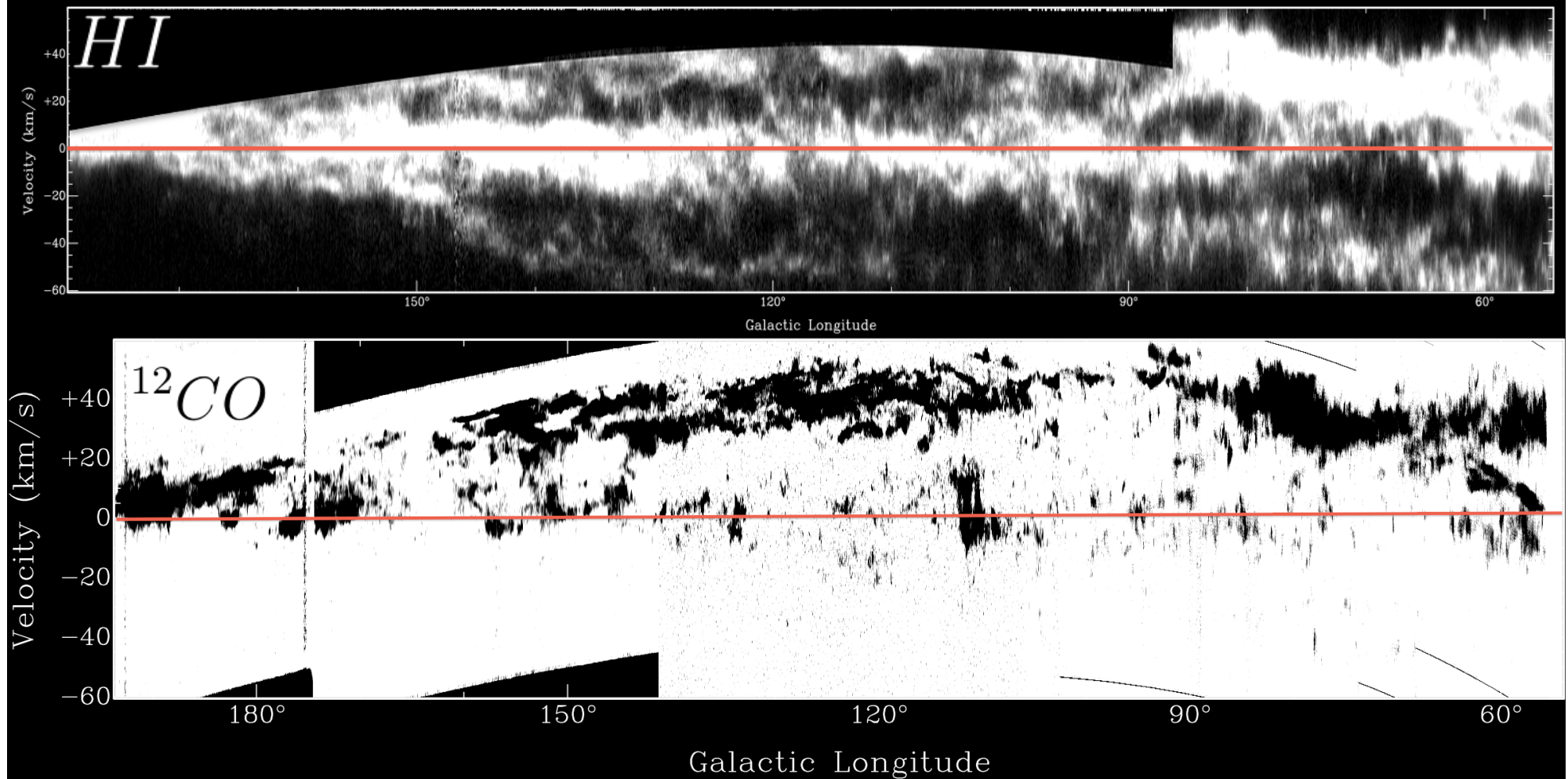
Perseus Spiral Arm Model: GMC Fits [Tmin(4.0K)]



Perseus Arm Centroids



Arm-Centric Data



Arm-Centric $|P-P|(V)$ Map

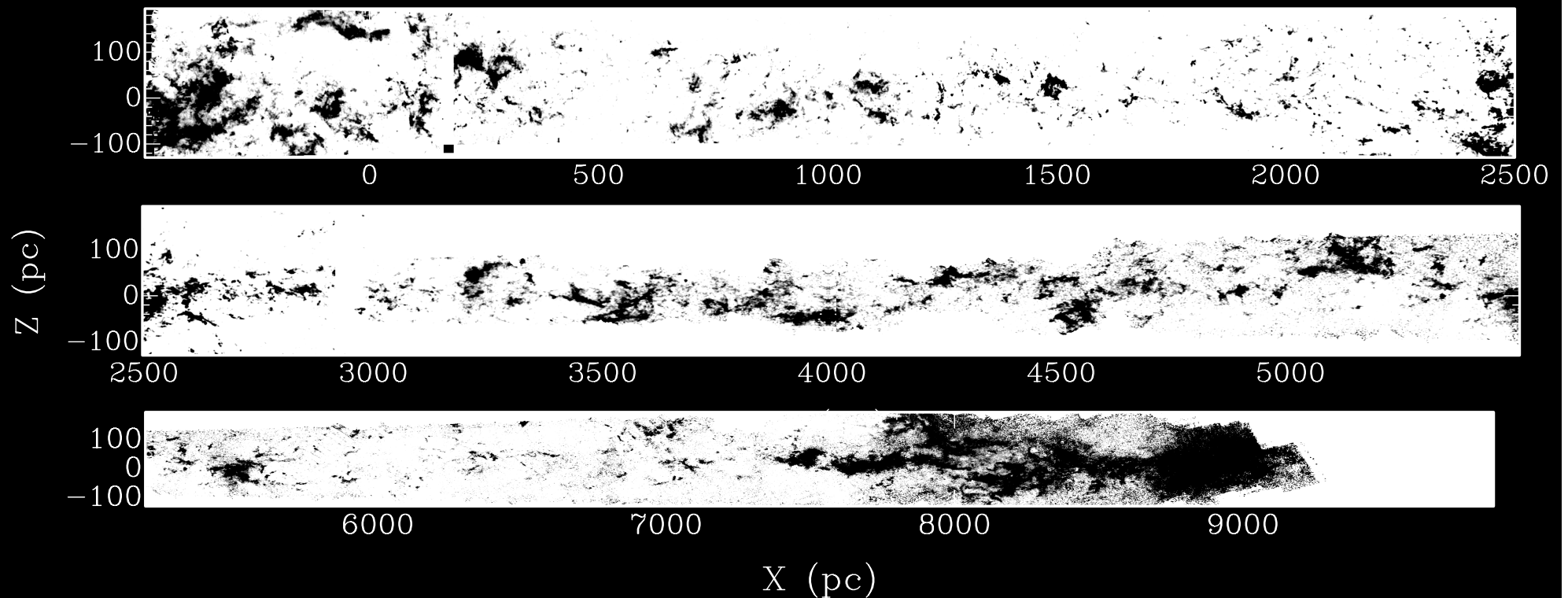
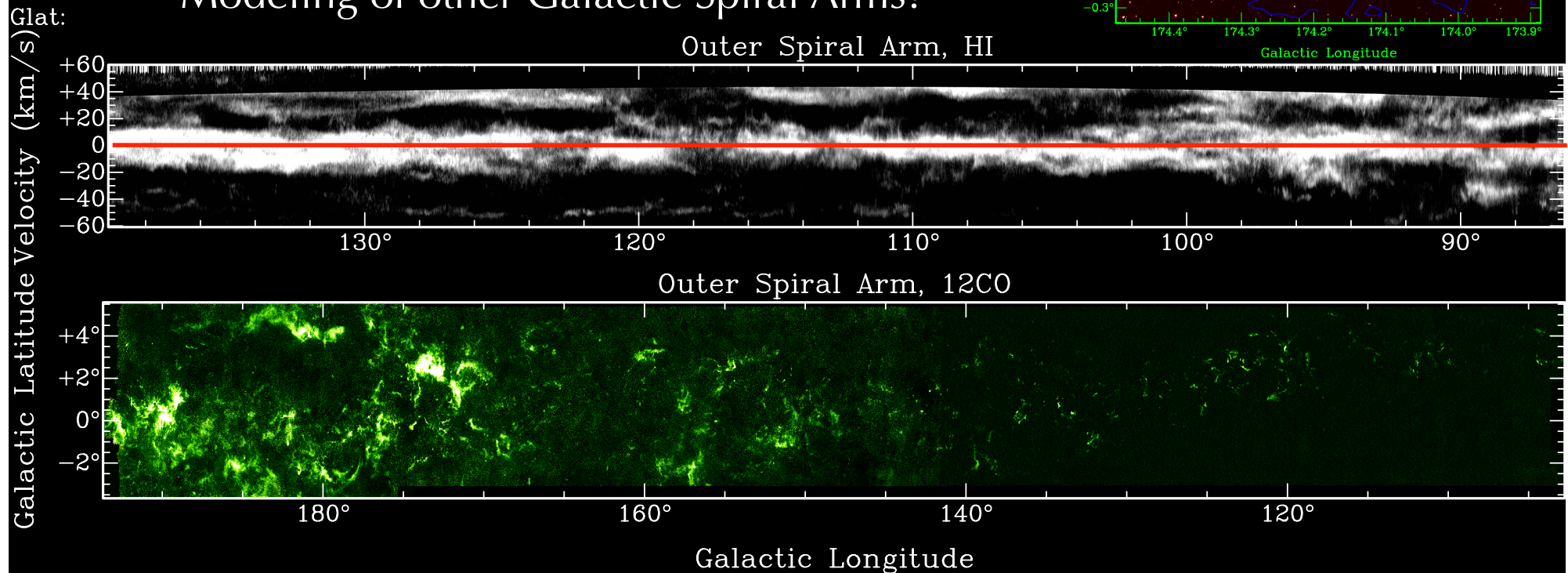
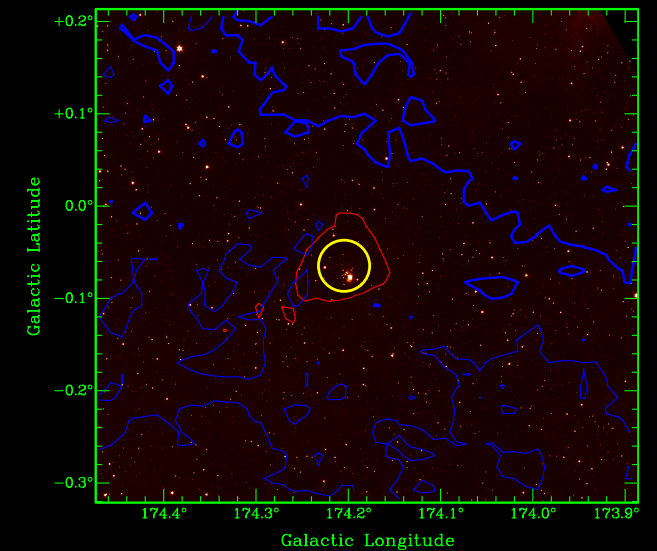


Image Ref: Summers, L. J. ; *From Stars To Galaxies*, J.Tan & S. Van Loo (eds.), e-proceedings: p100

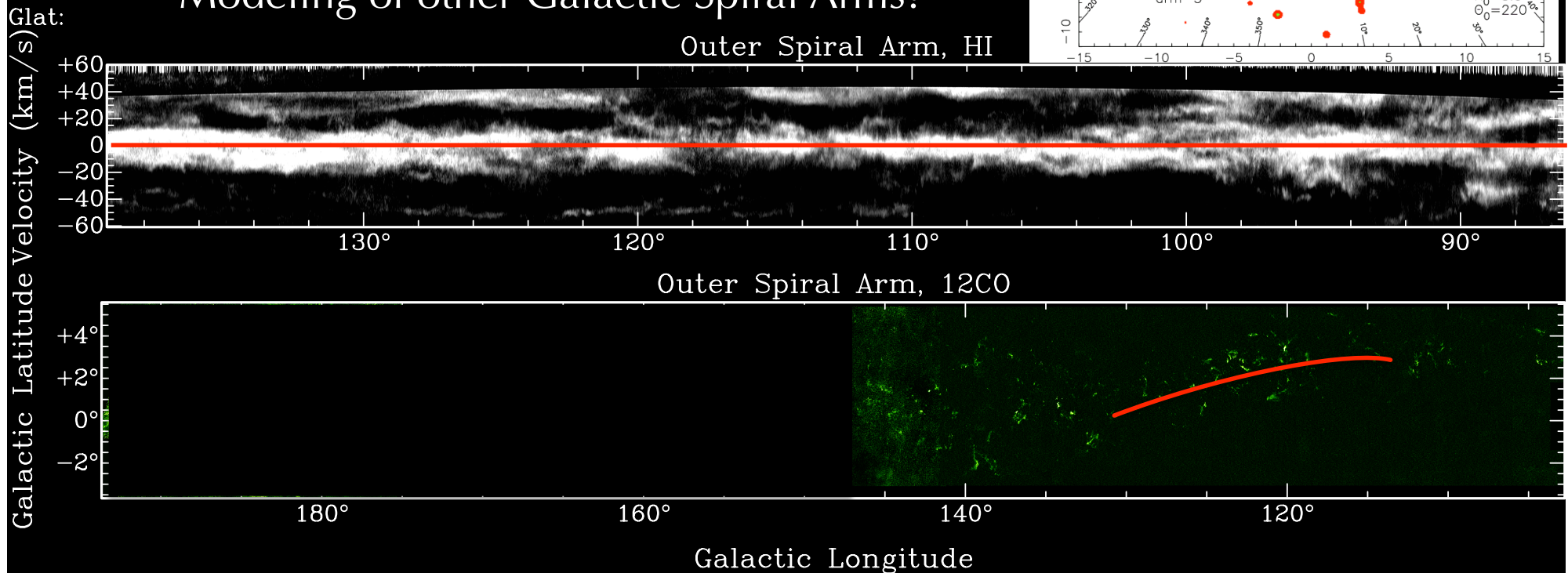
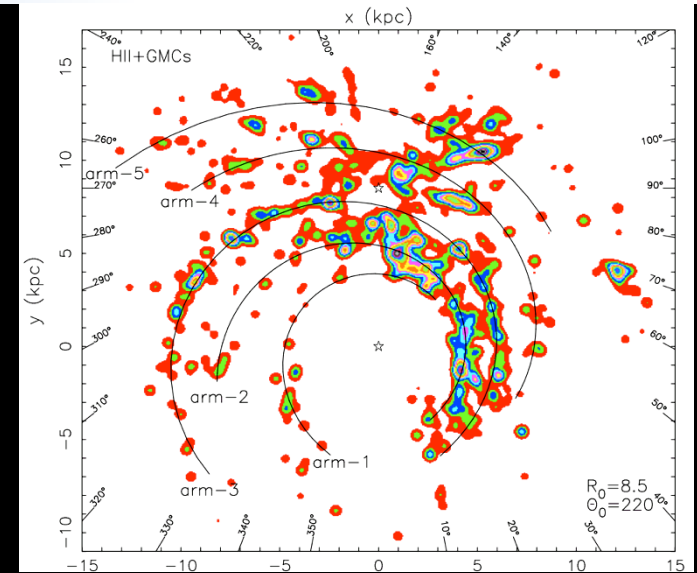
Further Work

- Cloud Decomposition & Analysis
- Refinement of Outer Spiral Arm Model
- Classification of Embedded Stellar Clusters
- Modeling of other Galactic Spiral Arms?



Further Work

- Cloud Decomposition & Analysis
- Refinement of Outer Spiral Arm Model
- Classification of Embedded Stellar Clusters
- Modeling of other Galactic Spiral Arms?



Arm Velocity Data Degeneracy

