Revealing the Physical Properties of the Leading Arm using Cloudy Simulations

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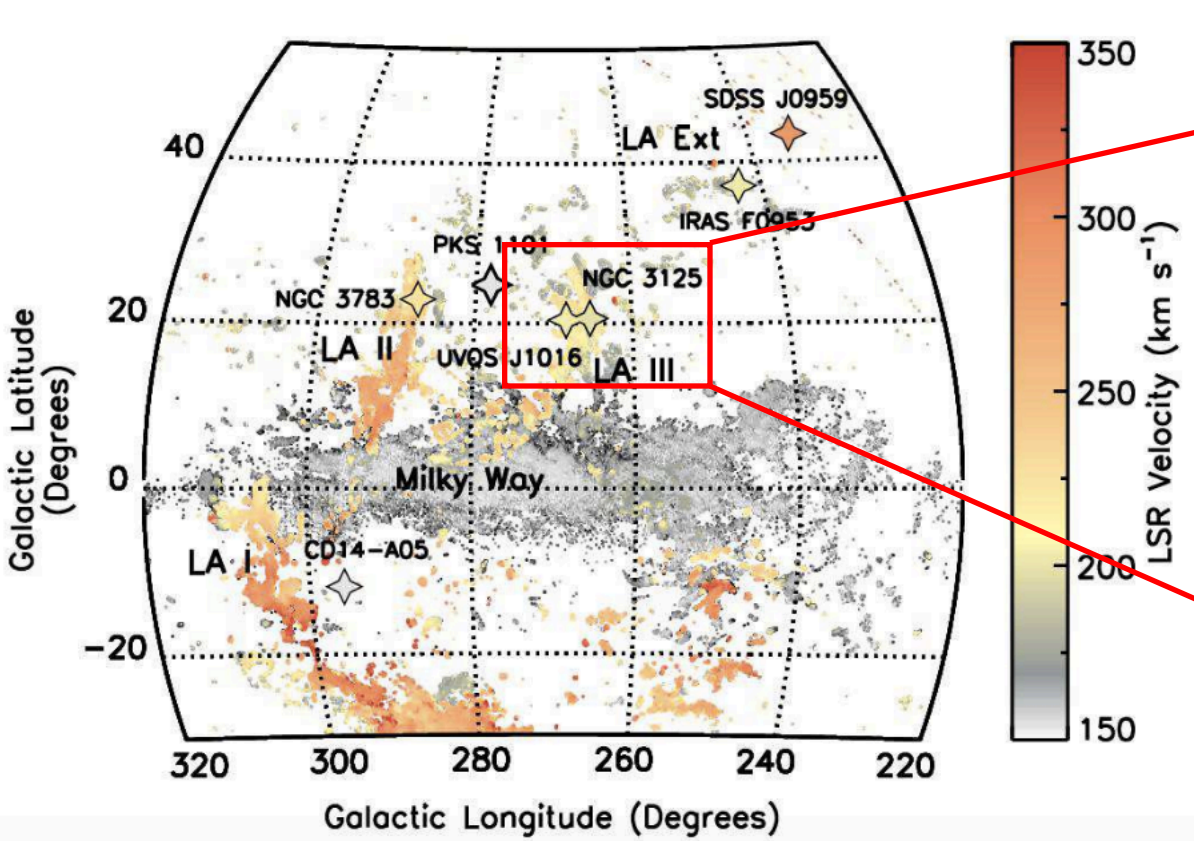
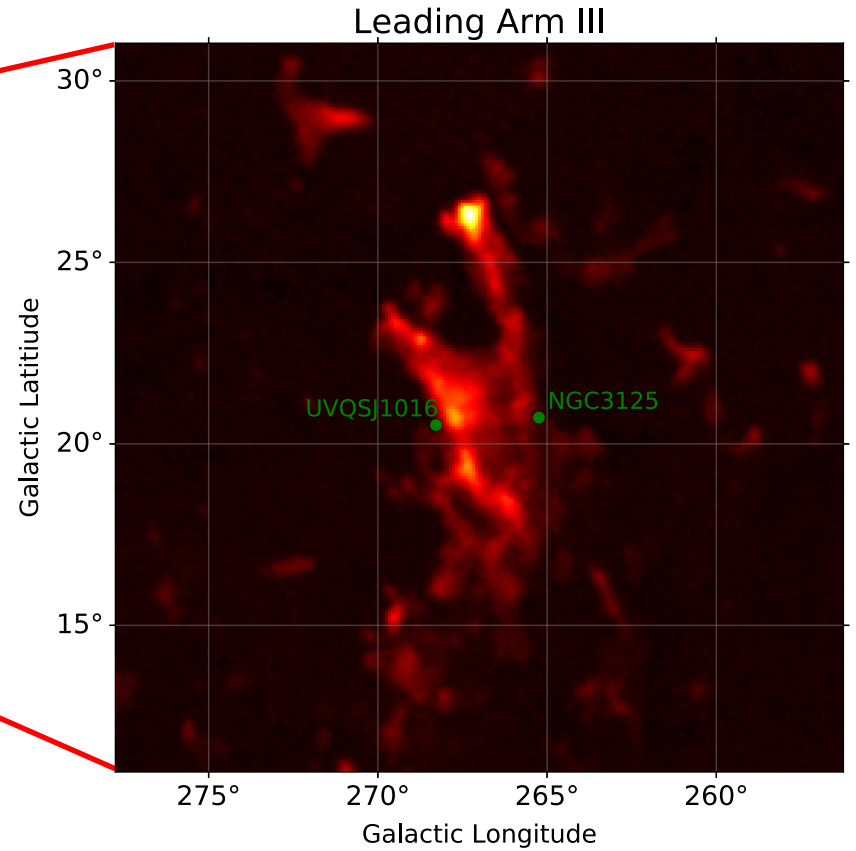
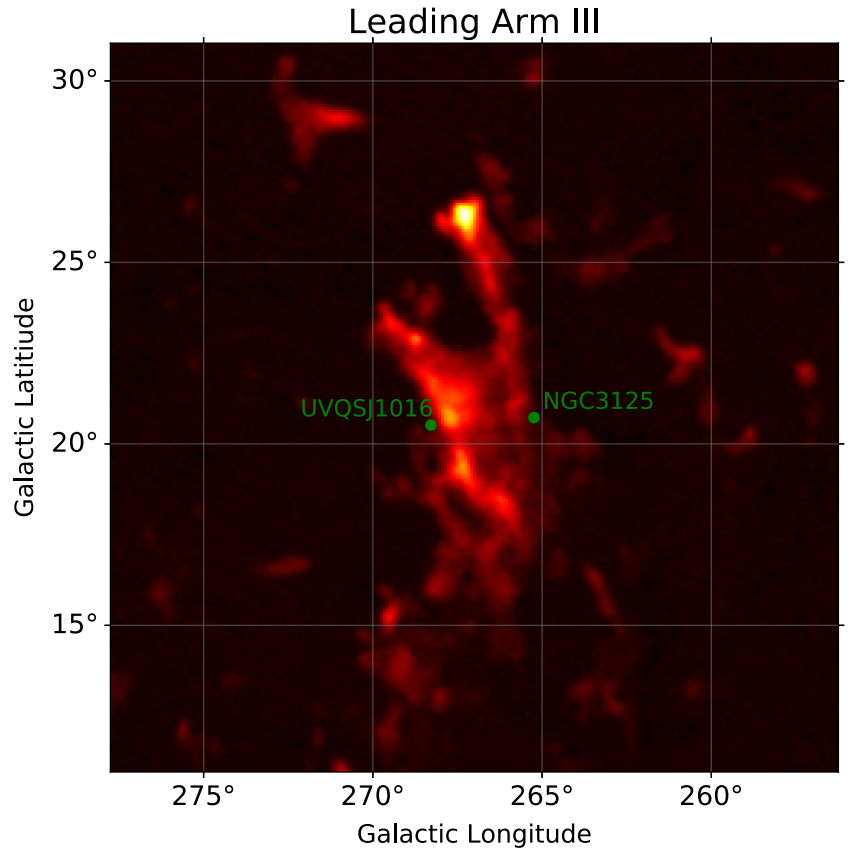
What is the Leading Arm?



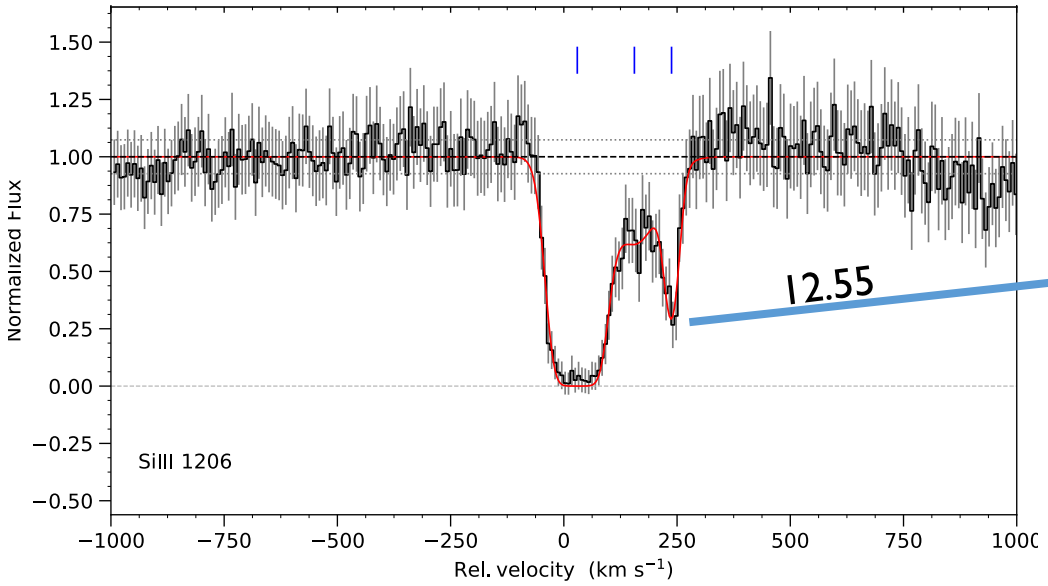


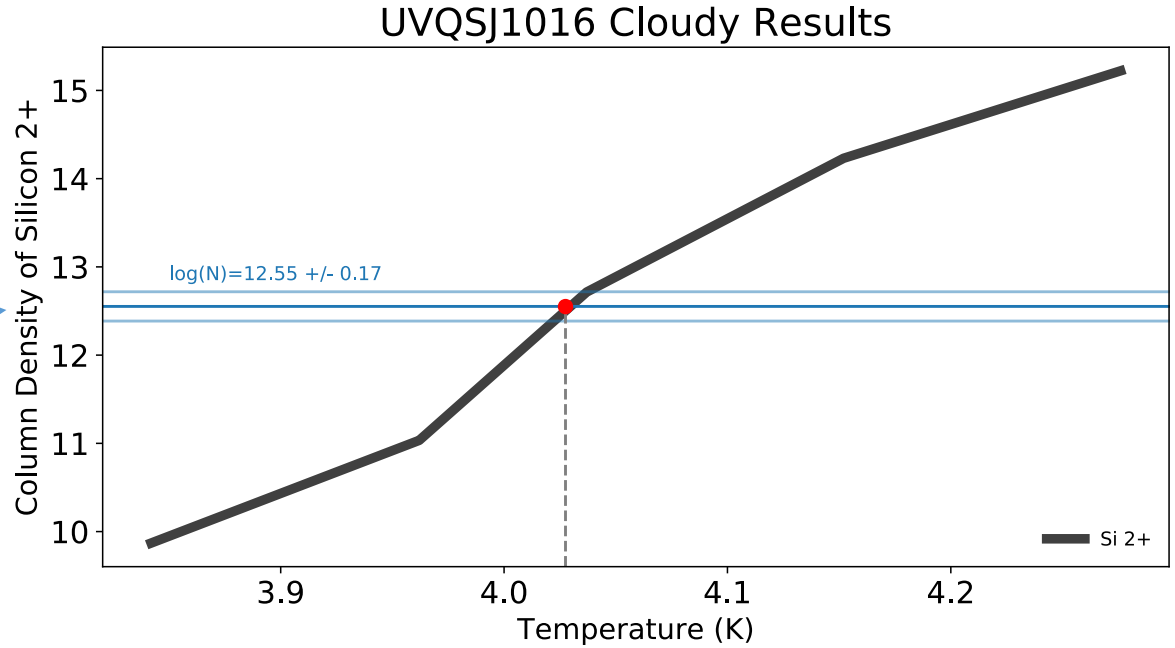
What are we looking for and why?

1. How much material is present?
   - Milky Way consumption
2. What material does this structure contain?
   - Composition
   - Association
   - Origin
3. Has this material been ionized?
   - Processes impacting the gas

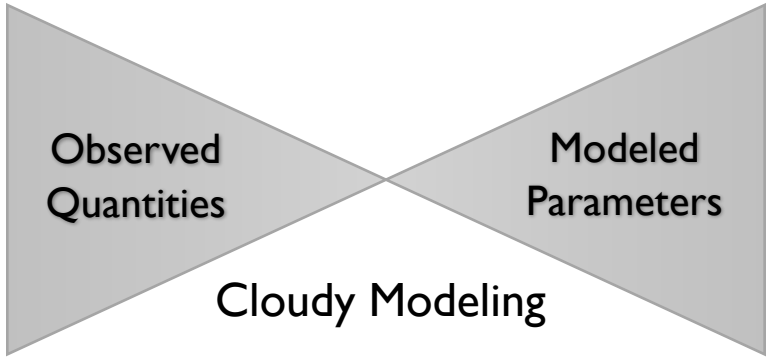


How do we find it?



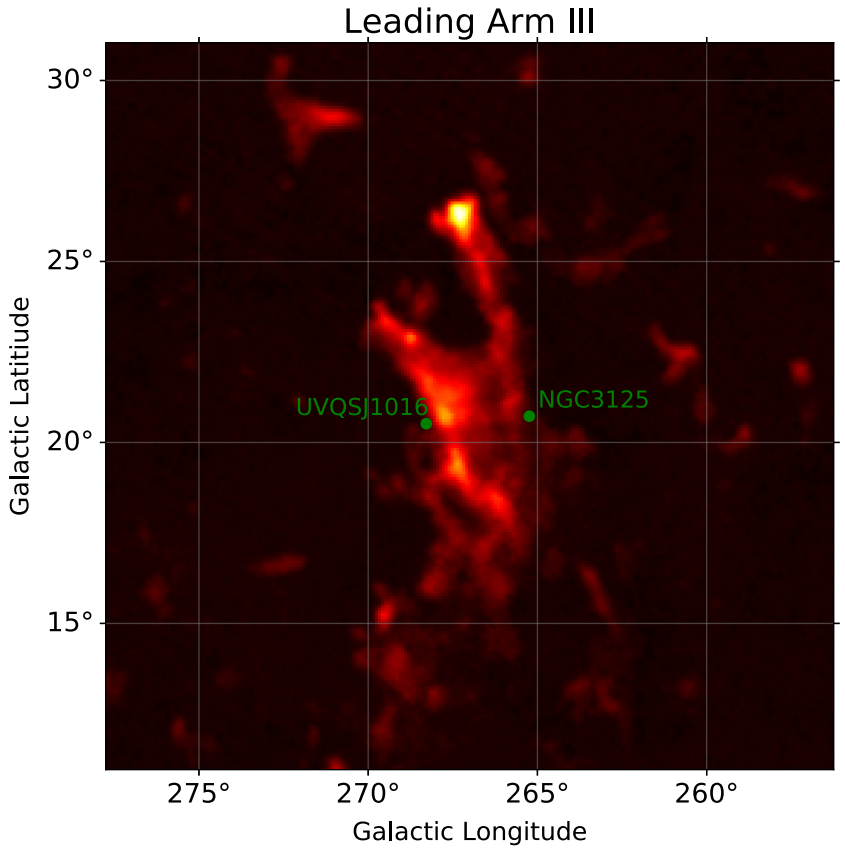


Column densities
Line ratios



Mass
Temperature
Pressure

Results and Future Work



- Results:
  - Both locations have temperatures around $10^4 K$
  - Spatial connection along neutral hydrogen
  - Ionizations appear to be similar
- Future Work:
  - Continue to run additional Cloudy simulations.
  - Observe similarities and differences across different gas complexes in our Milky Way halo.
  - Understand the possible origins, associations, and role the gas plays in our near future.

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Driving through the disk of the Milky Way galaxy resides a gaseous stream that is associated with the Magellanic Clouds galaxies called the Leading Arm. The Milky Way will capture this stream of gas torn from the Magellanic Clouds to supply our galaxy with material to make future stars and planets. We study this gas cloud using Hubble Space Telescope observations to determine the complex's physical properties, such as the motion, temperature, ionization fraction, density, and total mass of the gas. With this observational data, we run computer simulations created with the Cloudy software to constrain these properties better. Measured ionization ratios and column densities from the Hubble observations act as inputs for our models. Studying these properties will better depict the processes that affect the stream of gas falling onto our galaxy's disk.

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