Detection of CH in the Pipe Nebula

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BACKGROUND

- The Interstellar Medium (ISM) exists between stars, mainly composed of gas.
- Nebulae, such as the Pipe Nebula, are large aggregations of gas in the ISM.
- The Pipe Nebula is a dark nebula with high density, harboring molecular clouds.
- CH molecules within these clouds emit three spectral lines around 3.3 GHz.
- The Pipe Nebula is notable for its high density and low star formation rate, as well as its strong magnetic field.

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RESEARCH QUESTIONS

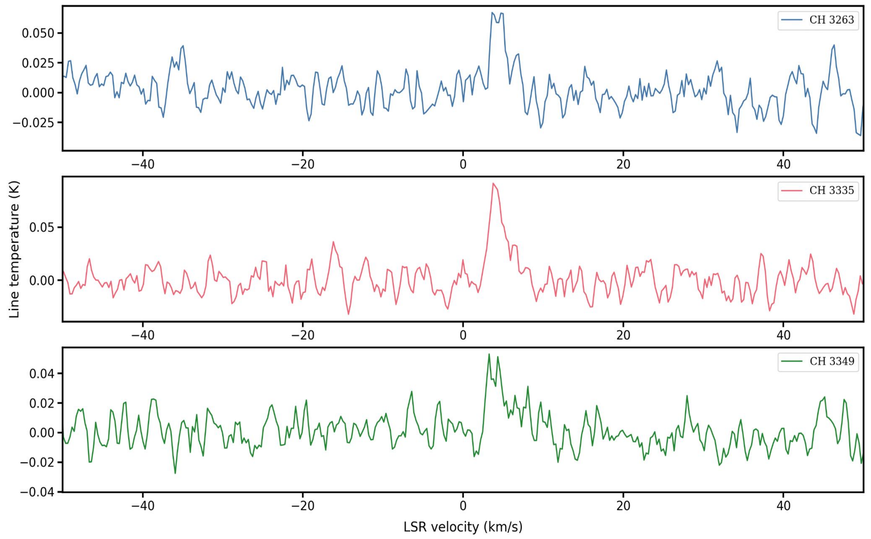
- What are the implications of detecting CH in the Pipe Nebula?
- How do the observed CH spectral lines contribute to our understanding of molecular cloud dynamics?
- What are the factors influencing star formation within the Pipe Nebula?
- How does the low star formation rate in the Pipe Nebula correlate with its high density?
- What insights can be gained from studying the strong magnetic field of the Pipe Nebula?

METHODS AND MATERIALS

Observations were conducted using the upgraded 12-meter radio telescope at the Arecibo Observatory (AO).The data was collected using an (ON/OFF) method and six species were observed. each sub-spectrometer has 25 MHz bandwidth, 8192 channels, and, hence, a resolution of 3 kHz.

RESULTS

Our initial detection of the Pipe Nebula is highly promising. The 3335 transition stands out for its reliability, primarily due to its strong signal-to-noise ratio. Nevertheless, we have observed detections for all three transition states. Importantly, these findings are consistent with previous surveys and spectral analyses documented in the literature. We did not detect an recombination lines which is consistent with the fact that the Pipe Nebula does not produce many new stars. A very interesting property of CH is that it is a tracer for both CO and H2(molecular hydrogen), therefore these observations can help us trace these molecules



CONCLUSION

Our initial detection of the Pipe Nebula is highly promising. The 3335 transition stands out for its reliability, primarily due to its strong signal-to-noise ratio. Nevertheless, we have observed detections for all three transition states. Importantly, these findings are consistent with previous surveys and spectral analyses documented in the literature. We did not detect an recombination lines which is consistent with the fact that the Pipe Nebula does not produce many new stars. A very interesting property of CH is that it is a tracer for both CO and H2(molecular hydrogen), therefore these observations can help us trace these molecules

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Future Work

The preliminary results we have obtained seem highly promising, and our current plan is to investigate the additional insights this new section can contribute to the existing literature, more specifically we plan to compare our results with existing CO data to show consistency between the two species. This project, along with others, can serve to inspire a comprehensive survey of the galactic plane.