Probing For Bondi-Hoyle-Lyttleton Accretion In Orion Src I

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BACKGROUND

- Located in the Kleinmann-Low nebula, Orion Src I features a protoplanetary disk traced by swaths of NaCl.
- The NaCl outflow follows the movement of the disk, allowing us to trace the rotational velocity and direction of Orion Src I.
- The data we utilized for our PV cuts came from the Atacama Large Millimeter Array (ALMA) observatory.
- The full size of Orion Src I is 100 AU.

Bondi-Hoyle-Lyttleton (BHL) Accretion:

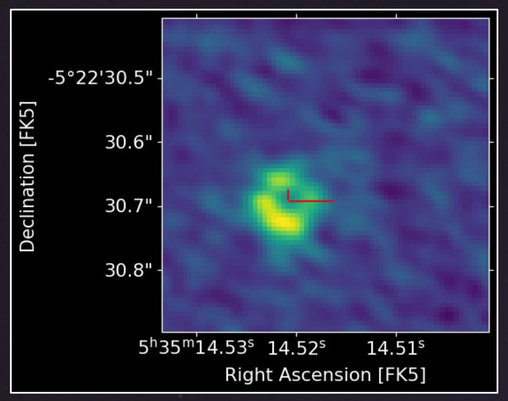
- Process by which a compact object accretes material from the surrounding gas and dust through gravitational attraction.
- Leads to gradual accumulation of matter around the object.
- Model of BHL accretion is widely used to study growth and evolution of compact objects.
- BHL accretion model is highly simplified and operates accurately only in ideal scenarios.
- We aim to use PV cuts of Orion Src I to probe for evidence of BHL accretion onto the protoplanetary disk.

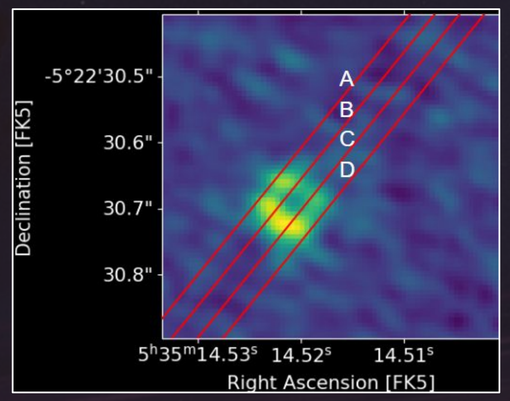
ALMA OBSERVATORY

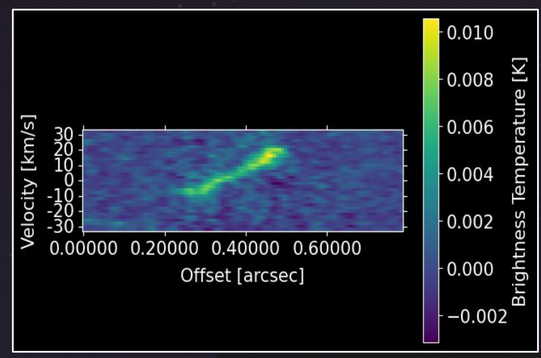
METHODS

1. **Outflow Model**
   - We assumed a doughnut-shaped outflow for NaCl.
2. **Generate PV plots**
   - Created spectral cubes to find one representative of the protoplanetary disk.
   - Experimented with different spectral cubes around the major axis of the disk in order to generate varying velocity distributions to indicate where BHL accretion may be occurring on the disk.

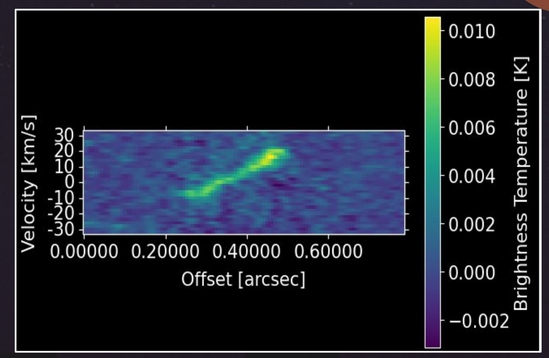
RESULTS







CUT A



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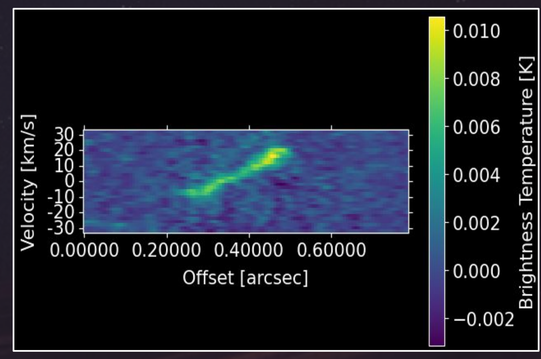

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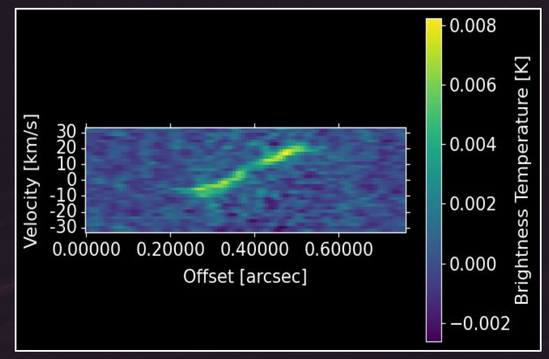

CUT D

FUTURE WORK

- We are interested in further refining our PV cuts to determine the rate of BHL accretion, as well as exploring other compounds like H2O along the disk.
- We will focus on determining specific angular momentum using NaCl, in order to refine our understanding of the dynamics in Orion Src I.

CONCLUSION

- We use the PV cuts of the NaCl molecular outflow to determine the rotational direction of Orion Src I.
- We determine the dimensions of the NaCl molecular outflow as follows: R_{inner} = 7.2 AU, R_{outer} = 24.48 AU.
- We conclude that NaCl traces the inner part of the disk.

SOURCES

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