HEATING IN PROTO-PLANETARY DISKS AROUND INTERMEDIATE MASS YOUNG STARS

Matt Stevans
Dr. Sean Brittain
Clemson University
Today I will talk about...

1. How planets form
2. How we study planet formation by modeling disks
3. Results and conclusions of my work
Planet Formation

1. Nebula
2. Protoplanetary disk
3. Forming planets

Not to scale
Herbig AeBe Stars

- Young; 2-10 Solar Masses
- Flared Disks
Herbig AeBe Observables

Spectral Energy Distribution (SED)

CO Emission Line Profiles in IR Excess
Thermal-Chemical Model

Thermal Structure at Surface

Disk Cross-Section

Gaseous Surface

Settled Dust at mid plane

Temperature (K)

Column Density (powers of 10)
My work

- Assembled list of Herbig AeBe stars that have both CO and Br\( \gamma \) flux measurements.
- Reduced 9 spectra from PHOENIX at the Gemini Observatory.

Observatory: Gemini
Instrument: PHOENIX
Wavelength: 1-5 microns
Resolution: \(~65,000\)
CO flux scales with Br $\gamma$ flux.

Scatter in correlation plot can be reduced with simultaneous observations of Br $\gamma$ and CO.
Take Away

- We cannot see into disks.
- Accretion/viscous heating plays a role in disk surface heating in inner disk.
- This needs to be incorporated into models.
Acknowledgements

This project was funded by the National Science Foundation Research Experiences for Undergraduates (REU) program through grant NSF AST-1004872

Thanks to Dr. Brittain for working with me this entire summer.

Thanks Thomas Rice and Charles Kurgatt for many useful discussions.
Extras