Research opportunities studying Dusty Star-Forming Galaxies

Jesse Rivera
Swarthmore College
Office: SC 125
Email: jrivera3@swarthmore.edu
What is a Dusty Star-Forming Galaxy?

- What is dust?
  - Particles that absorb visible light and re-emits it at infrared wavelengths.
Dust in the Milky Way
What is a Dusty Star-Forming Galaxy?

- **What is dust?**
  - Particles that absorb visible light and re-emit it at infrared wavelengths

- **Star-forming?**
  - DSFGs form stars at rates upwards of 1000 of solar masses/year!
What is a Dusty Star-Forming Galaxy?

- **What is dust?**
  - Particles that absorb visible light and re-emit it at infrared wavelengths

- **Star-forming?**
  - DSFGs form stars at rates upwards of 1000 of solar masses/year!

- **How are we studying them?**
  - Sources were discovered using the Atacama Cosmology Telescope; appeared as “point sources” in widefield map.
  - Followed-up with observations from radio/submillimeter observations
Submillimeter Array (SMA; Hawaii)

Large Millimeter Telescope (LMT; Mexico)

NOOrthern Extended Millimeter Array (NOEMA; France)

Image: http://www.iram-institute.org/

(Jesse Rivera for size reference)
What is a Dusty Star-Forming Galaxy?

- What is dust?
  - Particles that absorb visible light and re-emit it at infrared wavelengths

- Star-forming?
  - DSFGs forming stars up to 1000s of solar masses/year!

- How are we studying them?
  - Sources were discovered using the Atacama Cosmology Telescope
  - Followed-up with observations from radio/submillimeter observations

- Why are we studying them?
  - Galaxies are some of the largest structures in the universe.
  - DSFGs allows the study of galaxy formation and evolution. DSFGs in our sample are far away.
  - The sources I’m studying also have a unique property....
Hubble Space Telescope Image of a DSFG
Hubble Space Telescope Imaging of ACT J0209

Lens 2

ACT J0209

Lens 1
Gravitational Lensing

- Gravitational lensing is nature’s “cosmic telescope”; allows us to see distant objects.
Lens reconstruction from NOEMA CO(J= 3-2) observations

Rivera et al. 2019
Research Opportunities

- Looking for two students for summer research
- Current projects:
  - Lens modelling of additional NOEMA data using `gravlens` and `pixsrc`.
  - Data analysis of NOEMA data (after modelling) using Python.
  - Potential analysis of Southern African Large Telescope (SALT) data to study the lenses for better lens models.
- Also! Teaching “Introduction to Radio Astronomy” in the Spring with Prof. Debbie Schmidt!
  - Student will learn the basics of what they need to conduct research with me in the course!