

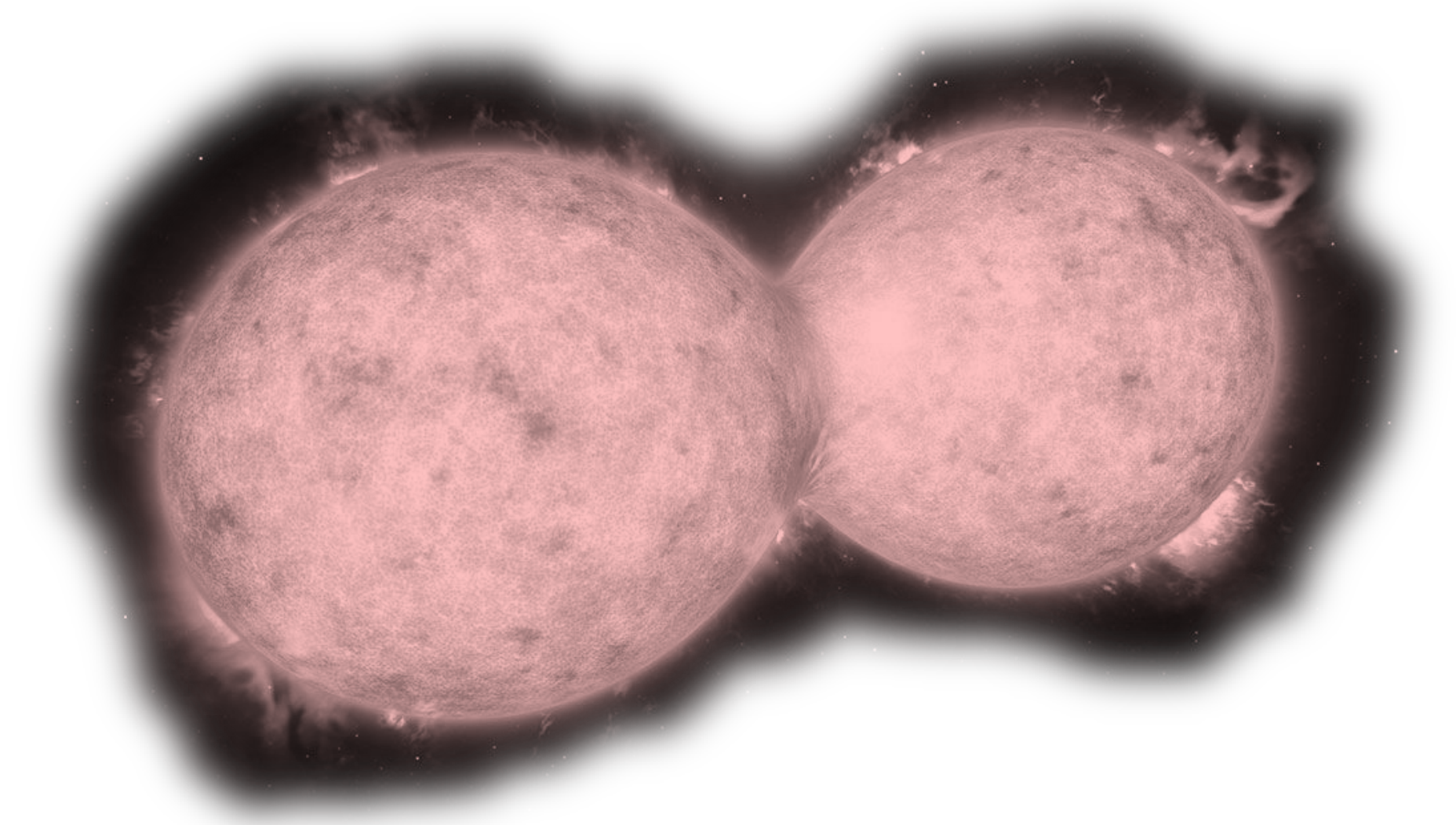


*Centrum Astronomiczne  
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oddział w Toruniu*

# **ANNUAL REPORT 2023/2024**

**Thomas Steinmetz**

**Collaborators: Tomasz Kamiński, Mohammed  
Zain Mobeen, Mirosław Schmidt**



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# RECENT PAPER: V1309 SCO

*Astronomy & Astrophysics* manuscript no. main  
September 1, 2023

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## A bipolar structure and shocks surrounding the stellar-merger remnant V1309 Scorpii

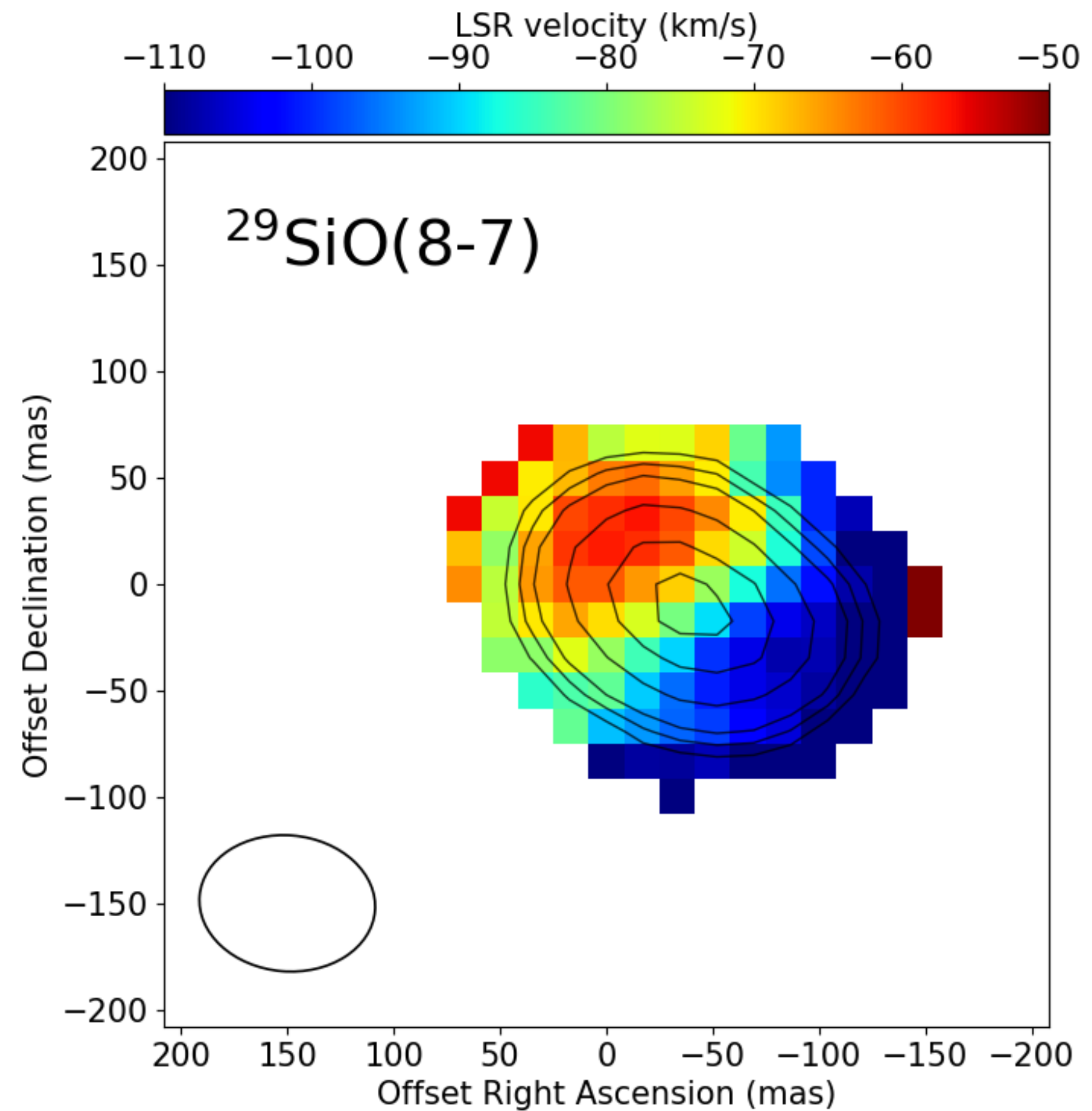
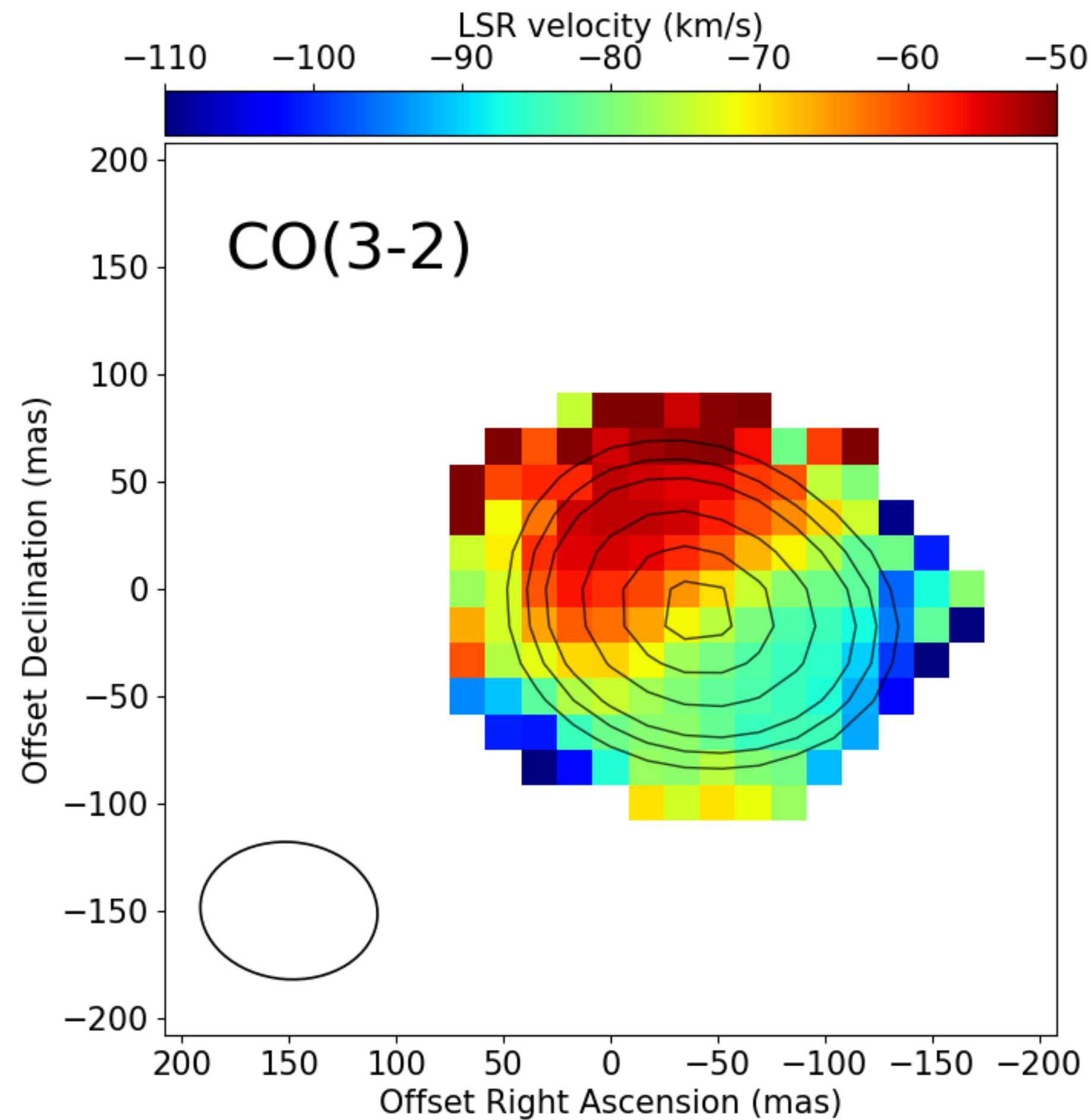
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<https://doi.org/10.1051/0004-6361/202347818>

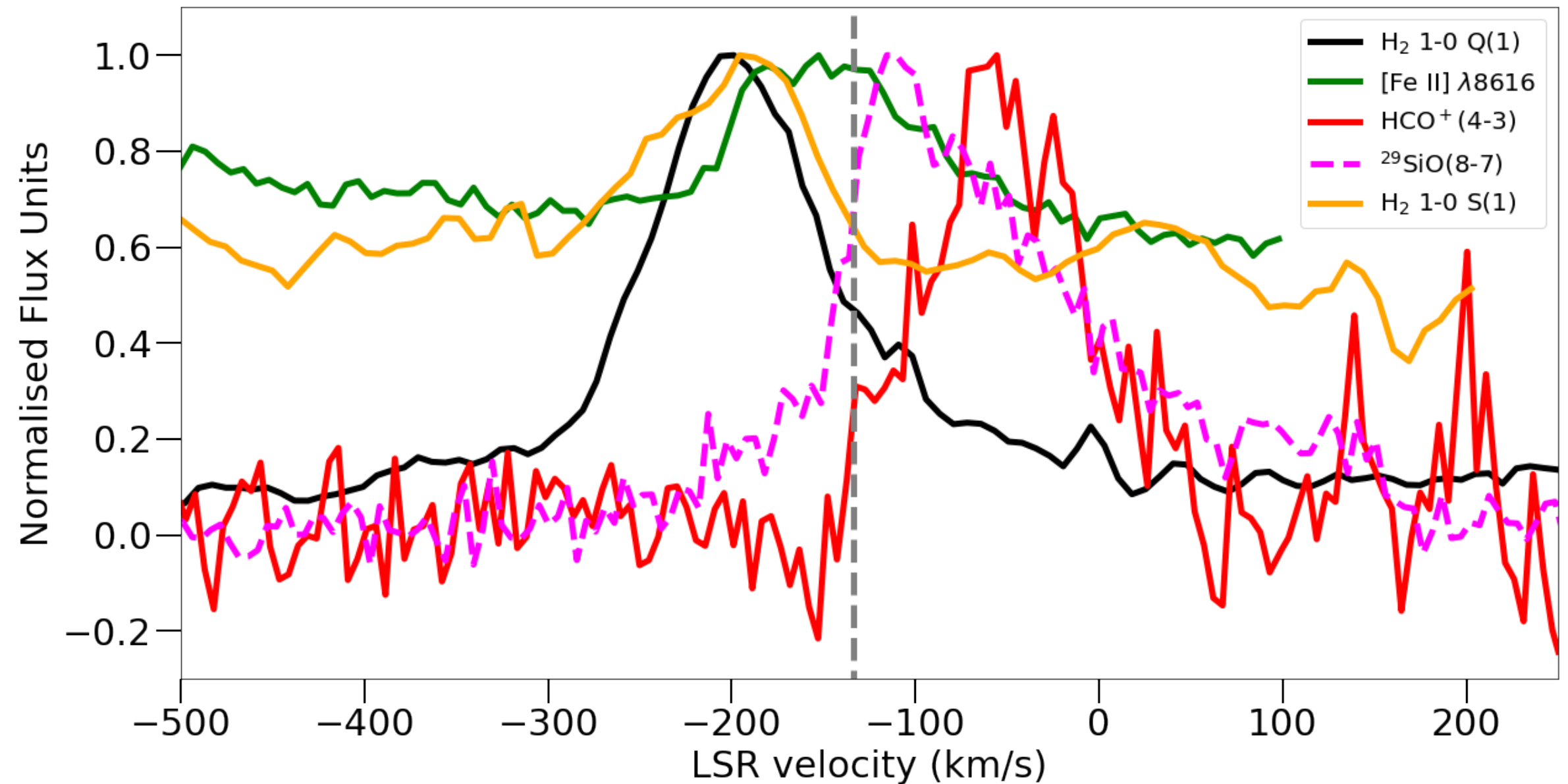
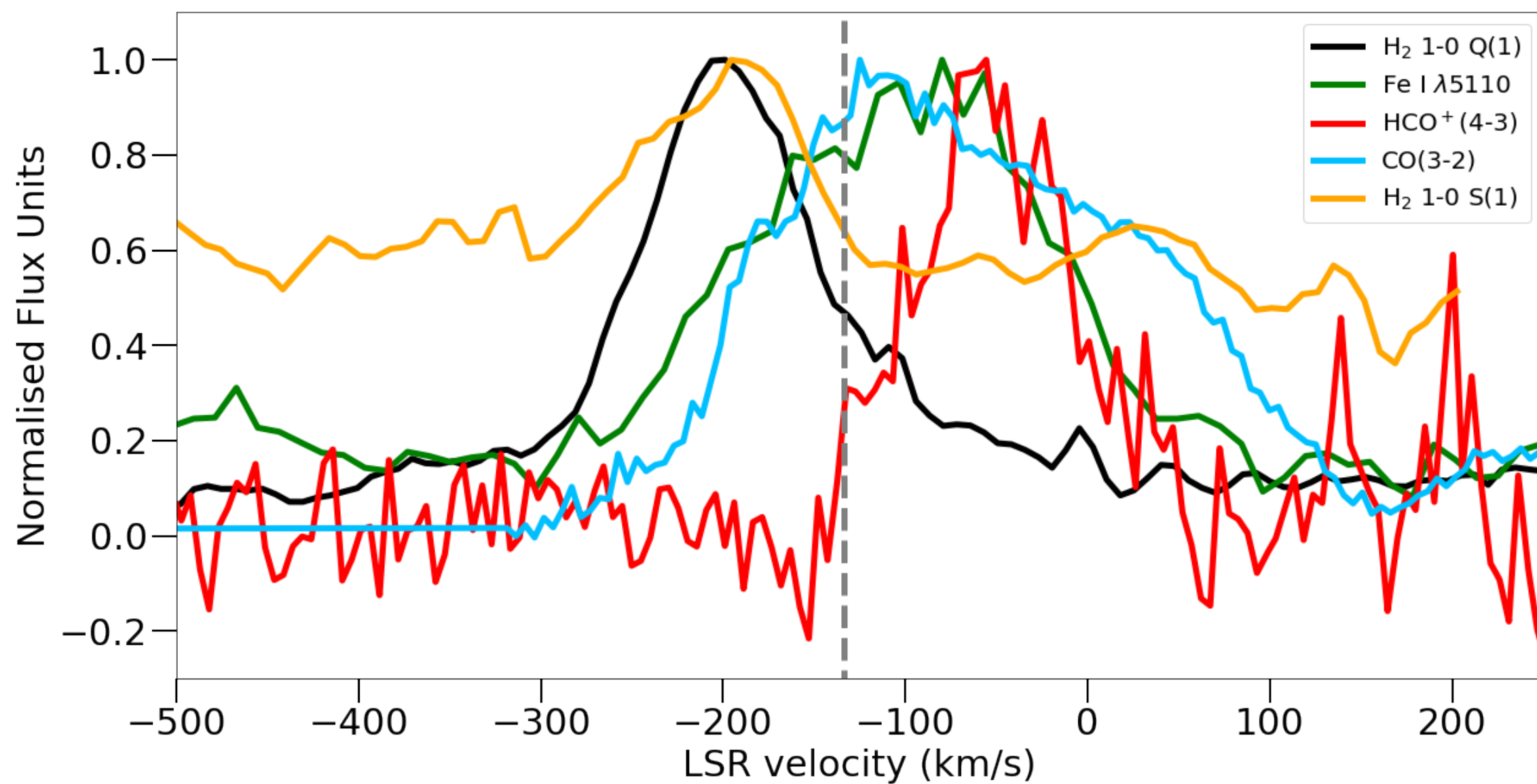
# BIPOLAR STRUCTURE

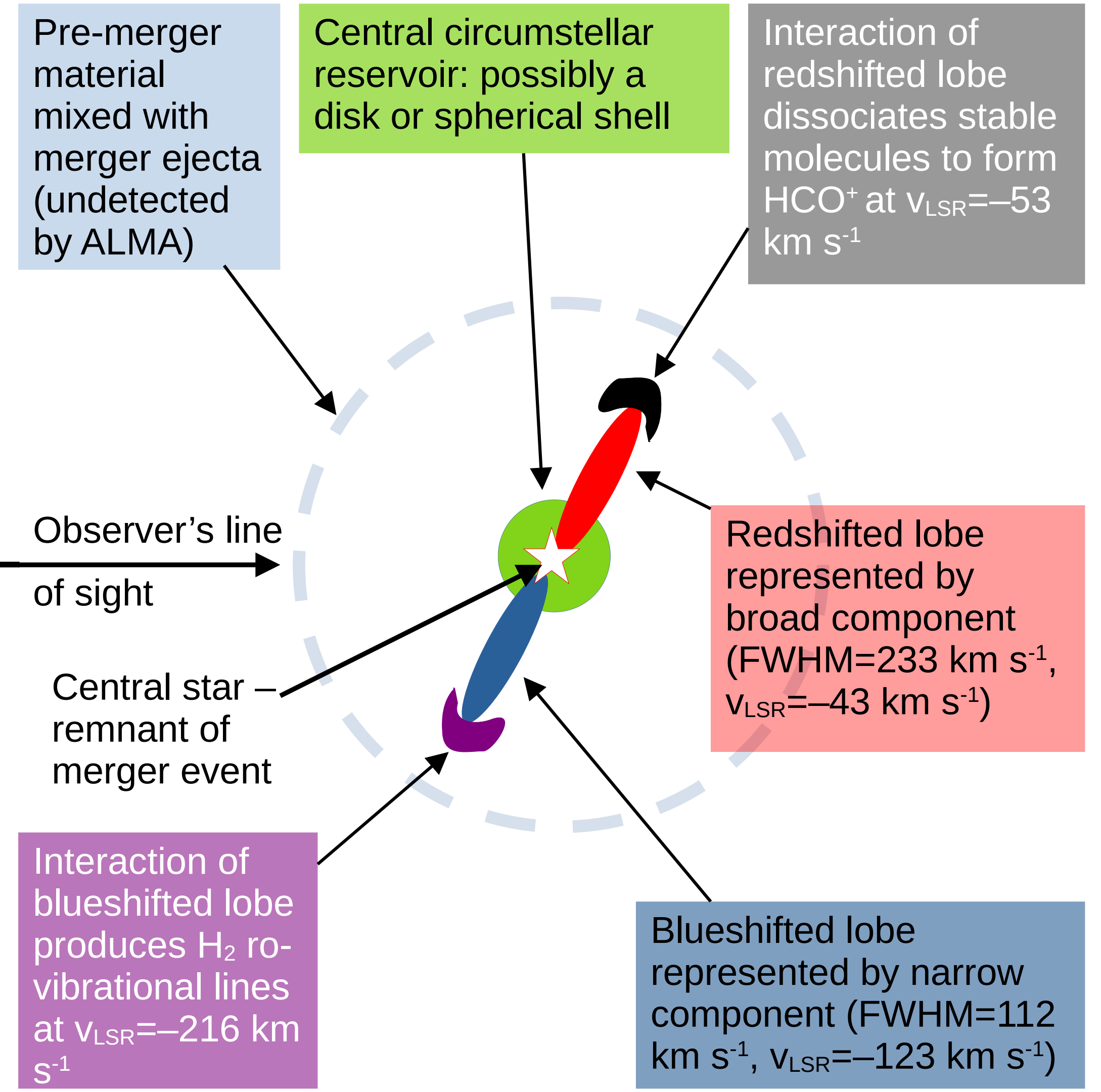
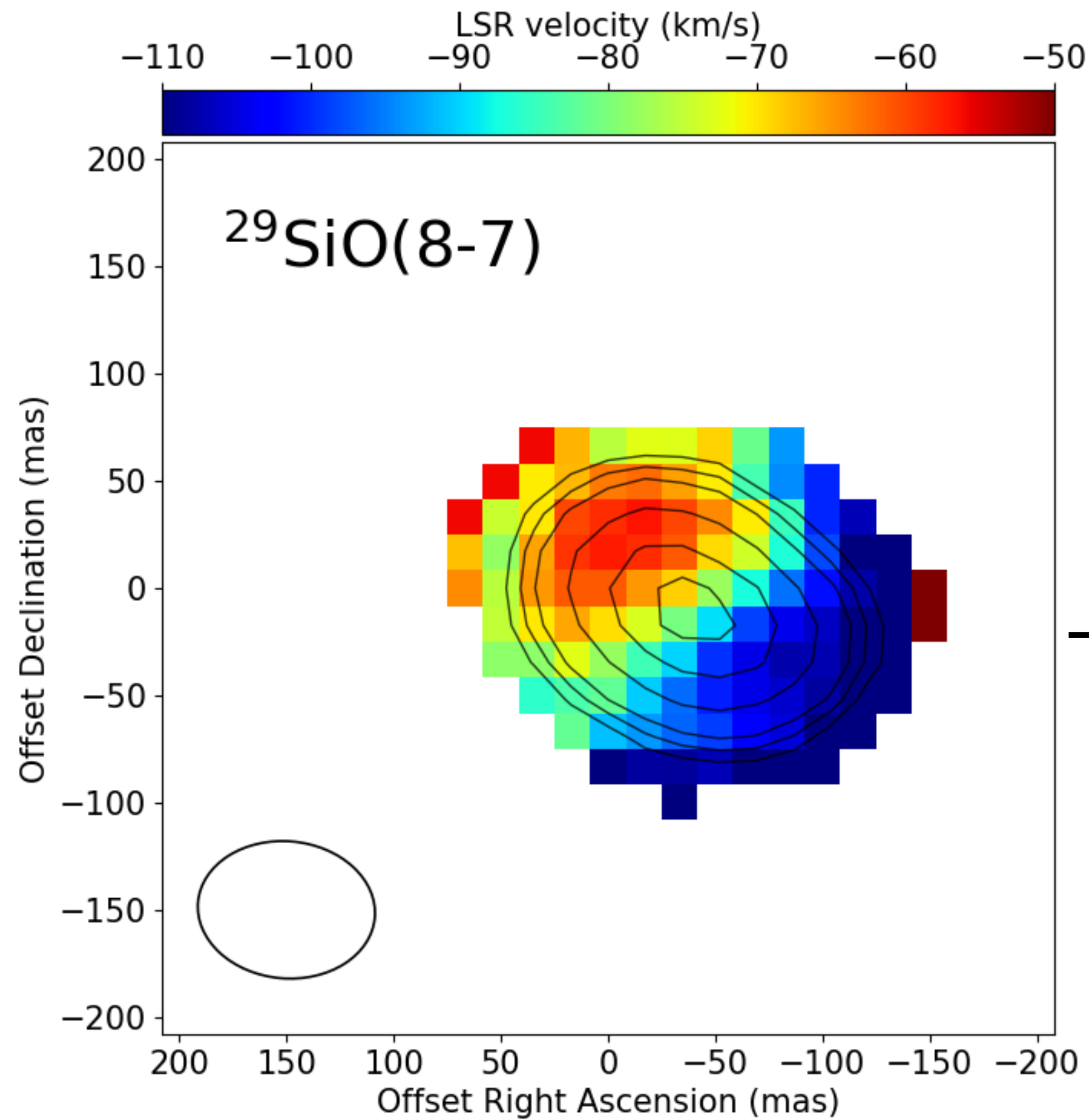


# BIPOLAR STRUCTURE

☐ Shock tracers  $\text{H}_2$ ,  $\text{HCO}^+$  detected in optical (VLT/X-SHOOTER) and sub-mm (ALMA)

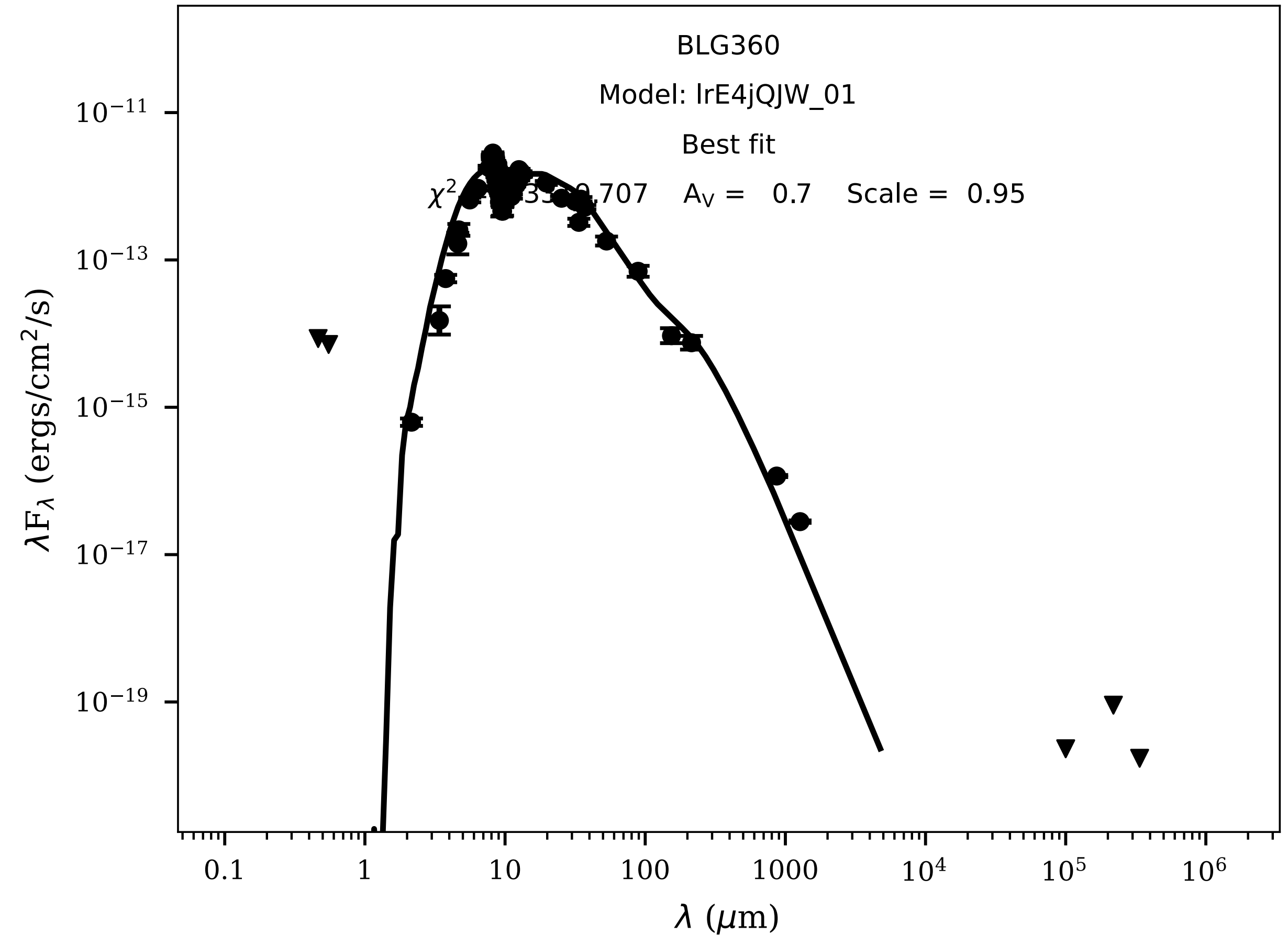
☐ Lack of symmetry suggests asymmetric outflows or circumstellar environment





# ONGOING WORK

- Dust modelling of OGLE-2002-BG-360**
- Deeply embedded object**
- No clear insights on structure on composition from literature**
- Current working model:**
  - Spherical dust shell with inner cavity**
  - No biconical cavity**
  - $20 R_{\odot}$ ,  $T_{\text{eff}} = 2150 \text{ K}$**



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# PUBLICATIONS

**Papers:**

- **`A bipolar structure and shocks in the stellar-merger remnant V1309 Scorpii', Steinmetz et al, in production (A&A), DOI: 10.1051/0004-6361/202347818 (1st author)**
- **`A radical transition in the post-main sequence system U Equulei', Kamiński et al, in production (A&A), DOI: 10.1051/0004-6361/202347770**
- **`A 500 pc volume-limited sample of hot subluminous stars. I. Space density, scale height and population properties', Dawson et al, in preparation (A&A)**

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# OTHER ACTIVITIES

## Lectures:

- **Introduction to Astrophysics (CAMK), dr hab. Krzysztof Nalewajko, prof. dr hab. Krzysztof Belczyński, prof. dr hab. Ewa Łokas, dr Stanisław Bajtlik**
- **Basic Space Physics (CBK), Jan Błęcki**

## Conferences/workshops:

- **19th Synthesis Imaging Workshop, 13/06/23-21/06/23, Charlottesville, VA, USA**
- **EAS 2023, 10/07/23-14/07/23, Kraków, Poland**
- **ALMA at 10 years: Past, Present and Future conference, 04/12/23-08/12/23, Puerto Varas, Chile (online) - poster submission**