

# Intermediate/high-mass YSOs in IRAS

## 20343+4129: their nature and interaction with the surrounding medium

### A PUZZLING REGION:

- IRAS 20343+4129 (1.4 kpc, 3200  $L_{\odot}$ , edge of Cygnus OB2) is a high-mass protostellar object candidate<sup>1</sup> associated with IRS1 and IRS3.
  - IRS1:**
    - JHK photometry (2MASS): one of the **most massive and embedded** objects of Cygnus OB2<sup>2</sup>
    - CO(2-1) (IRAM30m): driving a NORTH-SOUTH large-scale outflow<sup>3,4</sup> ? (Fig. 3)
  - IRS3:**
    - associated with an **UCHII region**<sup>5,6</sup>
    - no IR excess: more evolved than IRS1?
- HOWEVER:**
- 1.2 mm cont. (IRAM30m): two peaks NOT assoc. with IRS1, but on either side of IRS3<sup>1</sup> (Fig. 1)
- QUESTIONS:**
- Is IRS1 really a massive deeply embedded object?
  - Why is IRS3 in the center of the two dust peaks?

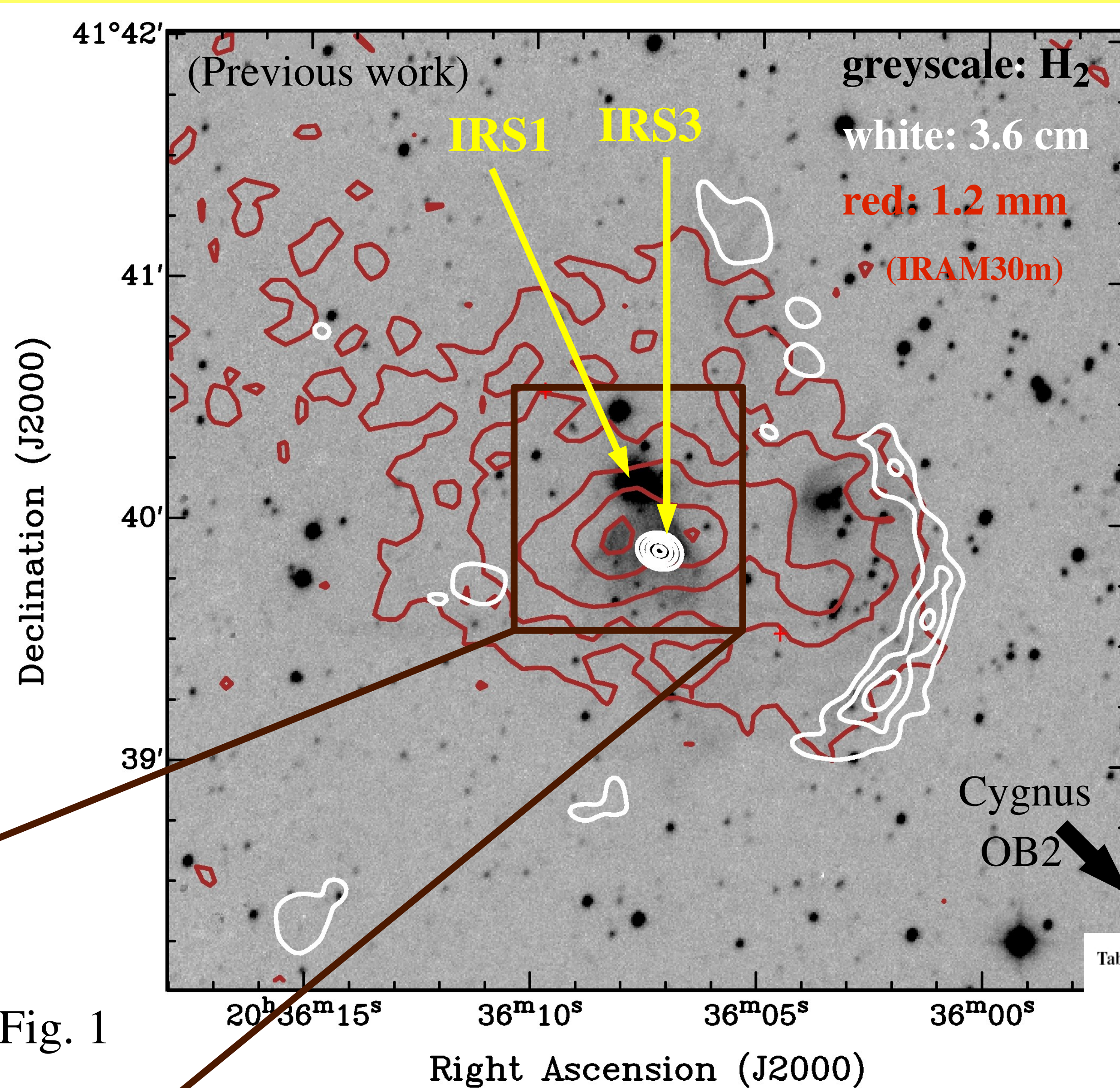


Fig. 1



**SMA: 1.3 mm and CO(2-1)**  
2003 Aug 3rd: 6 ants. on the array  
beam: 3.5"x2.6", PA=-38°  
spectral resolution: 1.06 km/s

Table 2. Physical parameters<sup>a</sup> of the outflow driven by IRS1

Lobe	Age (yr)	$N_{H_2}$ ( $cm^{-2}$ )	Mass ( $M_{\odot}$ )	$\dot{M}$ ( $M_{\odot} yr^{-1}$ )	$P$ ( $M_{\odot} km s^{-1}$ )	$\dot{P}$ ( $M_{\odot} km s^{-1} yr^{-1}$ )	$E_{kin}$ (erg)	$L_{mech}$ ( $L_{\odot}$ )
Red	3100	$2.7 \times 10^{16}$	0.028	$9.0 \times 10^{-6}$	0.50	$1.6 \times 10^{-4}$	$9.0 \times 10^{43}$	0.20
Blue	3800	$2.6 \times 10^{16}$	0.027	$7.2 \times 10^{-6}$	0.38	$1.0 \times 10^{-4}$	$5.3 \times 10^{43}$	0.09

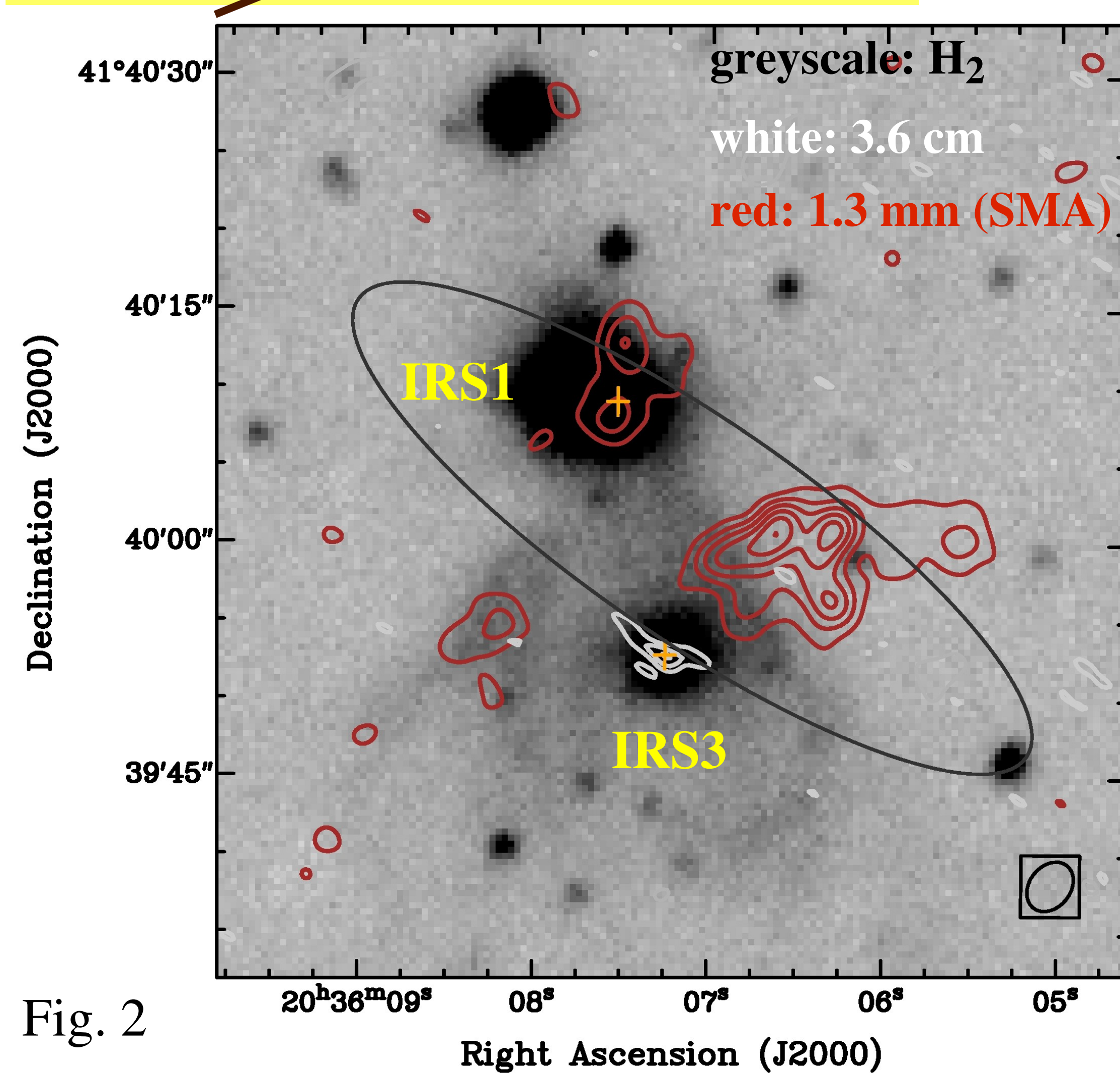


Fig. 2

### SMA RESULTS: 1.3 mm continuum (Fig. 2)

- strongest condensations** (of  $\sim 1 M_{\odot}$ ) lie to the west of IRS3, where IR emission is very weak
- one faint condensation associated with IRS1**, of  $\sim 0.8 M_{\odot}$
- to the east of IRS3 there is a faint condensation of  $0.7 M_{\odot}$

### SMA RESULTS: CO(2-1) (Fig. 3)

- high-velocity: bipolar structure in the EAST-WEST direction and centered on IRS1: **molecular outflow driven by IRS1**
- low-velocity: emission on either side of IRS3 associated with H<sub>2</sub> elongated structures (see below on the left, yellow contours); **large-scale blueshifted CO almost resolved out by the SMA**

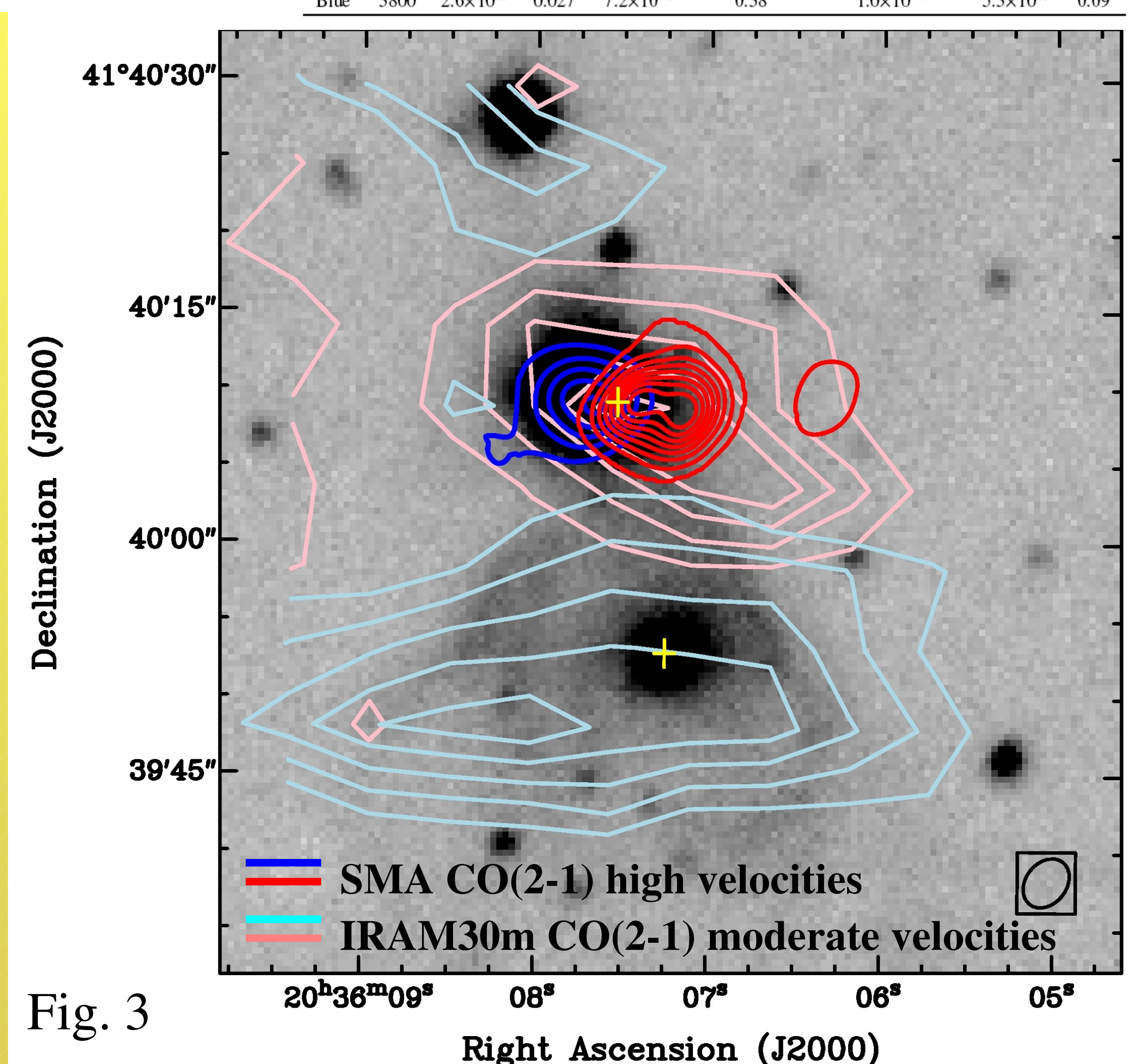
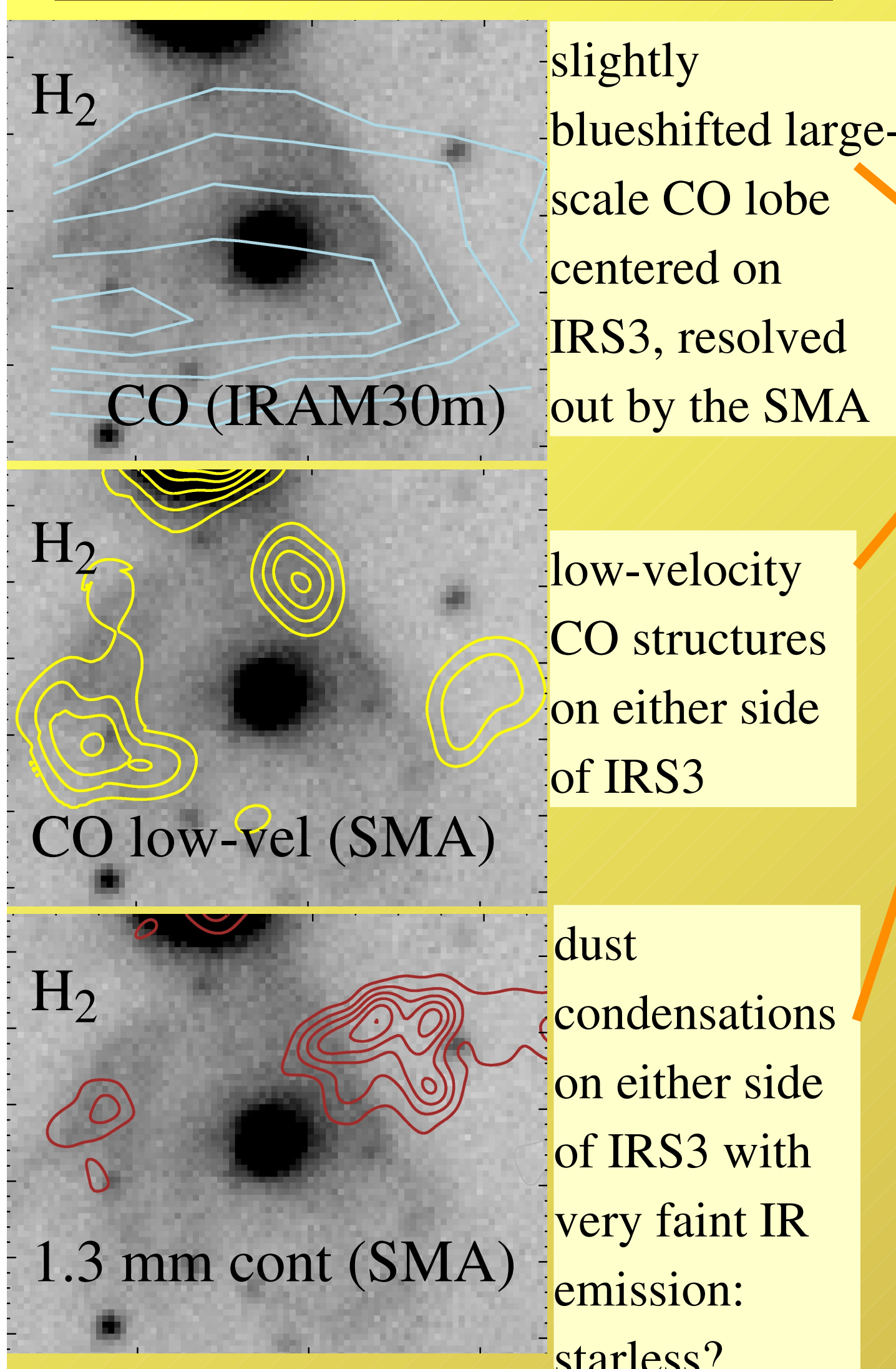


Fig. 3

### NATURE OF IRS3:

- cm emission associated: UCHII or thermal radio jet?
- no IR excess from JHK bands
- no outflow assoc. --> UCHII
- ZAMS B2 star of 2900  $L_{\odot}$**



slightly blueshifted large-scale CO lobe centered on IRS3, resolved out by the SMA

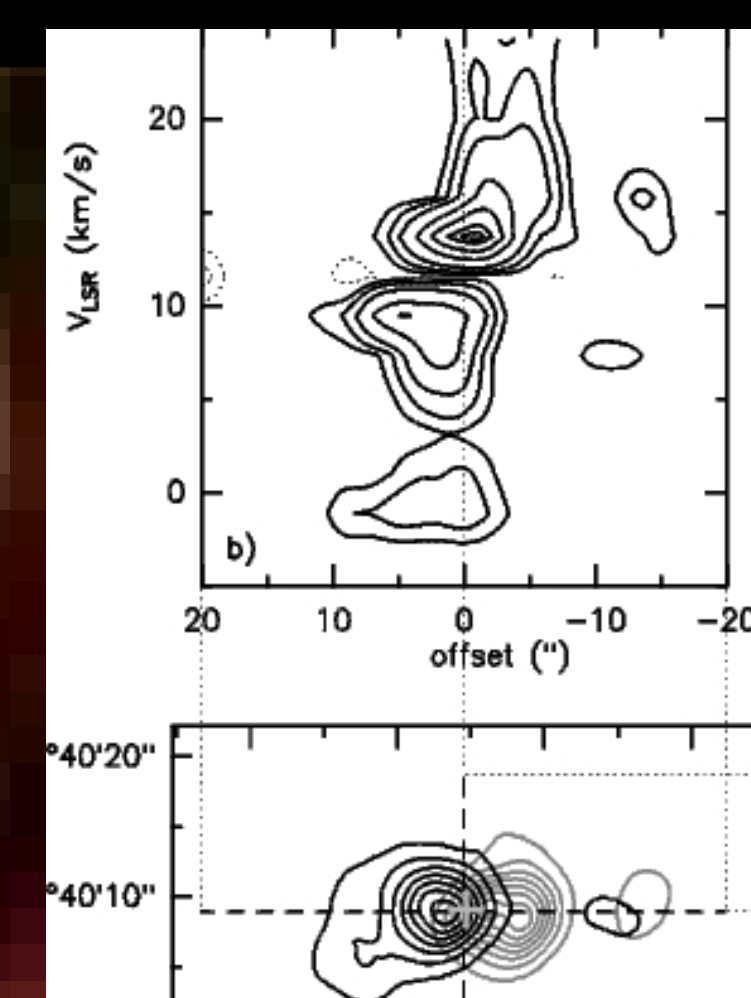
low-velocity CO structures on either side of IRS3

dust condensations on either side of IRS3 with very faint IR emission: starless?

All these features are associated with the H<sub>2</sub> elongated structures on either side of IRS3

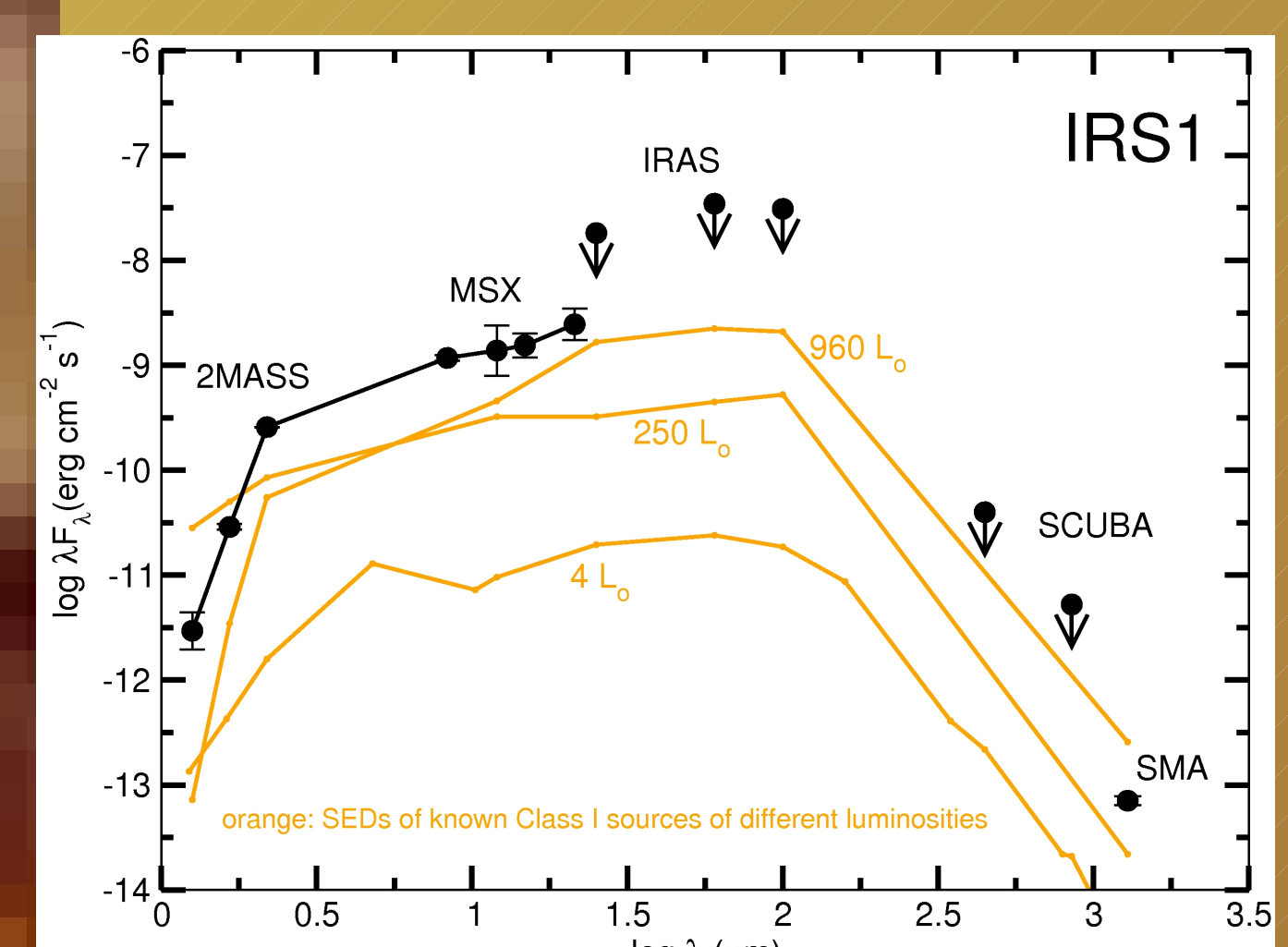
**IRS3 is driving an expanding cavity of swept-up material and accumulating mass in its walls**  
(wind-driven and/or radiation-driven cavity)

### IRS1 is driving a high-velocity molecular outflow



### NATURE OF IRS1:

- outflow parameters similar to those of interm.-mass YSOs
- circumstellar mass:  $\sim 0.8 M_{\odot}$
- the SED of IRS1 suggests it is a **Class I YSO of  $\sim 1000 L_{\odot}$**



### REFERENCES:

- Beuther et al. (2002, ApJ, 566, 945)
  - Comerón et al. (2002, A&A, 389, 874)
  - Beuther et al. (2002, A&A, 383, 892)
  - Kumar et al. (2002, ApJ, 576, 313)
  - Miralles et al. (1994, ApJSS, 92, 173)
  - Carral et al. (1999, RmxA&A, 35, 97)
- NOTE:** The content of this poster has been accepted for publication in A&A (Palau et al. 2007)

2MASS JHK composite image of the IRAS 20343+4129 region