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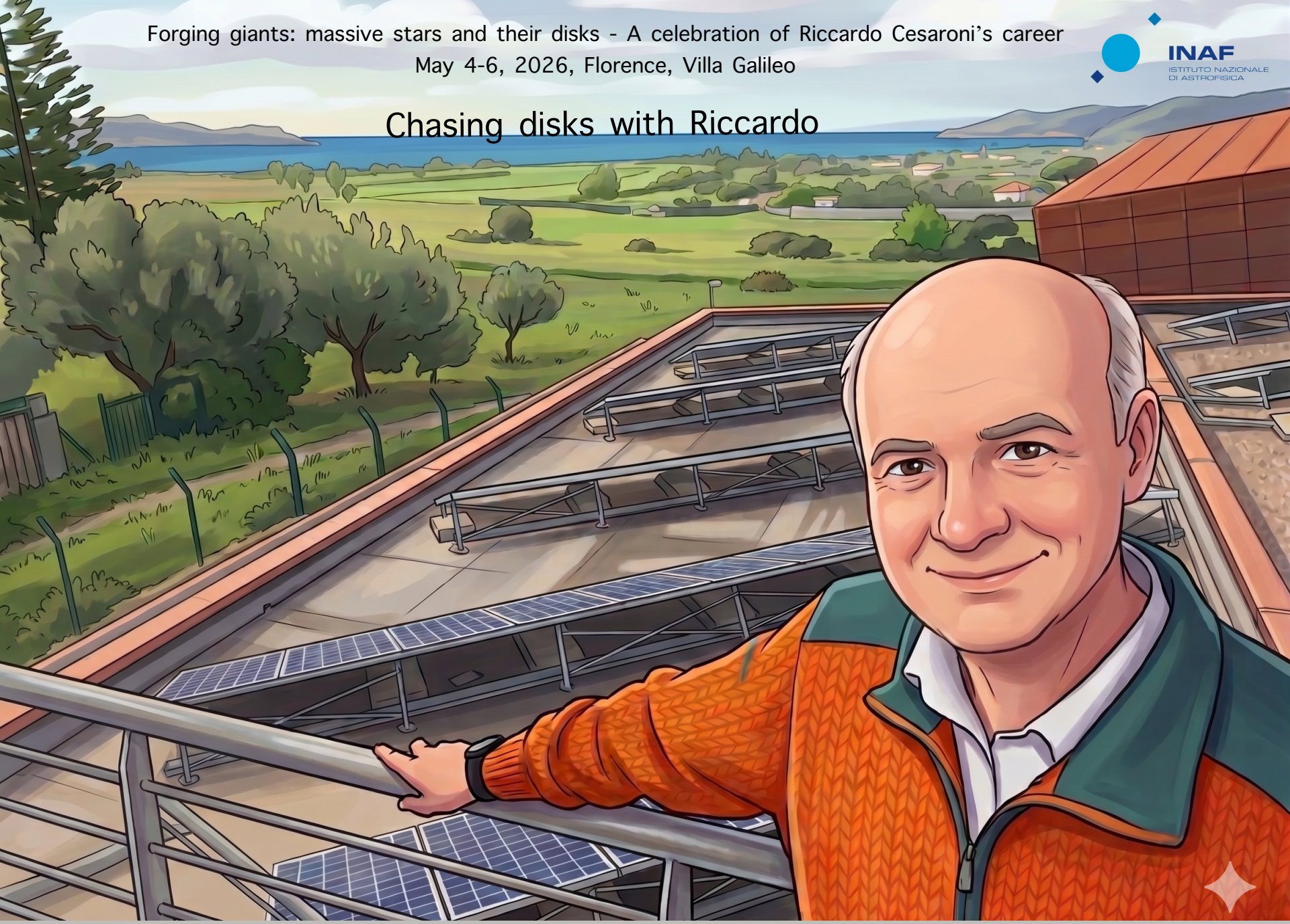
Chasing disks with Riccardo



OAC Osservatorio Astronomico di Cagliari

Alberto Sanna — Astronomical Observatory of Cagliari, INAF

SRT

Università degli Studi di Cagliari
Facoltà di Scienze Matematiche Fisiche e Naturali
Dipartimento di Fisica

Kinematics of High-Mass Star-Forming Regions via VLBI observations of Maser Species

PhD Thesis

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Ringrazio poi [illegible] *ed il mio referee, Riccardo Cesaroni, per i suoi attenti suggerimenti che hanno arricchito il mio lavoro.*

A&A 517, A71 (2010)
DOI: 10.1051/0004-6361/201014233

Astronomy & Astrophysics

VLBI study of maser kinematics in high-mass star-forming regions

I. G16.59–0.05*

A. Sanna[1,2], L. Moscadelli[3], R. Cesaroni[3], A. Tarchi[2], R. S. Furuya[4], and C. Goddi[5,6]

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DOI: 10.1051/0004-6361/201014234

Astronomy & Astrophysics

VLBI study of maser kinematics in high-mass star-forming regions

II. G23.01–0.41*

A. Sanna[1,2], L. Moscadelli[3], R. Cesaroni[3], A. Tarchi[2], R. S. Furuya[4], and C. Goddi[5,6]

[1] Dipartimento di Fisica, Università degli Studi di Cagliari, S.P. Monserrato-Sestu km 0.7, 09042 Cagliari, Italy
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[2] INAF – Osservatorio Astronomico di Cagliari, Loc. Poggio dei Pini, Strada 54, 09012 Capoterra (CA), Italy
[3] INAF – Osservatorio Astrofisico di Arcetri, Largo E. Fermi 5, 50125 Firenze, Italy
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Received 10 February 2010 / Accepted 27 April 2010

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Cesaroni, R.; Walmsley, C. M.

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Water maser variability and disk structure in S 255.
Cesaroni, R.

1988A&AS...76..445C 1988/12 cited: 109
A catalogue of H2O maser sources north of delta = -30.
Cesaroni, R.; Palagi, F.; Felli, M.; Catarzi, M.; Comoretto, G.; Di Franco, S.; Giovanardi, C.; Palla, F. *show less*

Are 6.7 GHz methanol masers disk tracers?

1990A&A...233..513C

Astron. Astrophys. 233, 513–522 (1990)

ASTRONOMY AND ASTROPHYSICS

Water maser variability and disk structure in S 255

R. Cesaroni

Dipartimento di Astronomia e Scienza dello Spazio, Università di Firenze, Largo E. Fermi 5, I-50125 Firenze, Italy

Received July 11, accepted October 7, 1989

Abstract. The 22 GHz H_2O maser emission from 5 sources associated with regions of star formation and showing triple peak profiles has been observed by means of the 32 m antenna of Medicina (Italy)[1]. One of these sources (S 255) has been monitored for about 2 years. The acquired spectra show an anticorrelated variability of the two side lines on time scales of a few months. This phenomenon is interpreted in terms of a disk in Keplerian rotation seen edge on. In order to quantify both the spectrum profile and its peculiar variations the radiative transfer equation in the disk is numerically solved and the computed spectra compared with the observed ones. The H_2O maser is demonstrated to be saturated and radiatively pumped.

Key words: accretion disks – masers – line formation

1. Introduction

1993ApJ...412..222N

THE ASTROPHYSICAL JOURNAL, 412:222–232, 1993 July 20

SYNTHESIS IMAGES OF 6.7 GHz METHANOL MASERS

R. P. NORRIS, J. B. WHITEOAK, J. L. CASWELL, M. H. WIERINGA, AND R. G. GOUGH
Australia Telescope National Facility, CSIRO, P.O. Box 76, Epping, NSW 2121, Australia
Received 1992 September 8; accepted 1993 January 5

ABSTRACT

We have used the Australia Telescope Compact Array to produce maps in the 6.7 GHz (5_1–6_0 A^+) transition of a number of methanol masers associated with star-forming regions and compared them with earlier maps of the 12.2 GHz (2_0–3_{-1} E) methanol masers. We find that in several cases the 6.7 GHz and 12.2 GHz maser positions are coincident to within our positional accuracy of 0.″02, placing a tight constraint on pumping mechanisms. We also find that the methanol masers are frequently located along lines or arcs, sometimes with velocity gradients along them, and interpret this to indicate the existence of edge-on protoplanetary disks around the nascent stars.

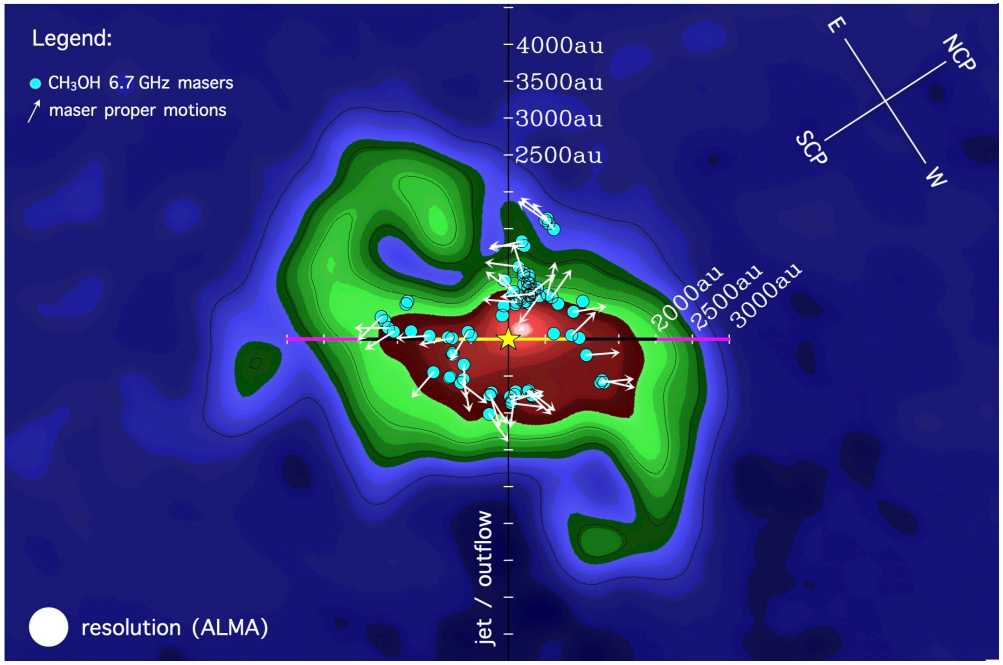
Subject headings: masers — radio continuum: stars — stars: formation

Are 6.7 GHz methanol masers disk tracers?

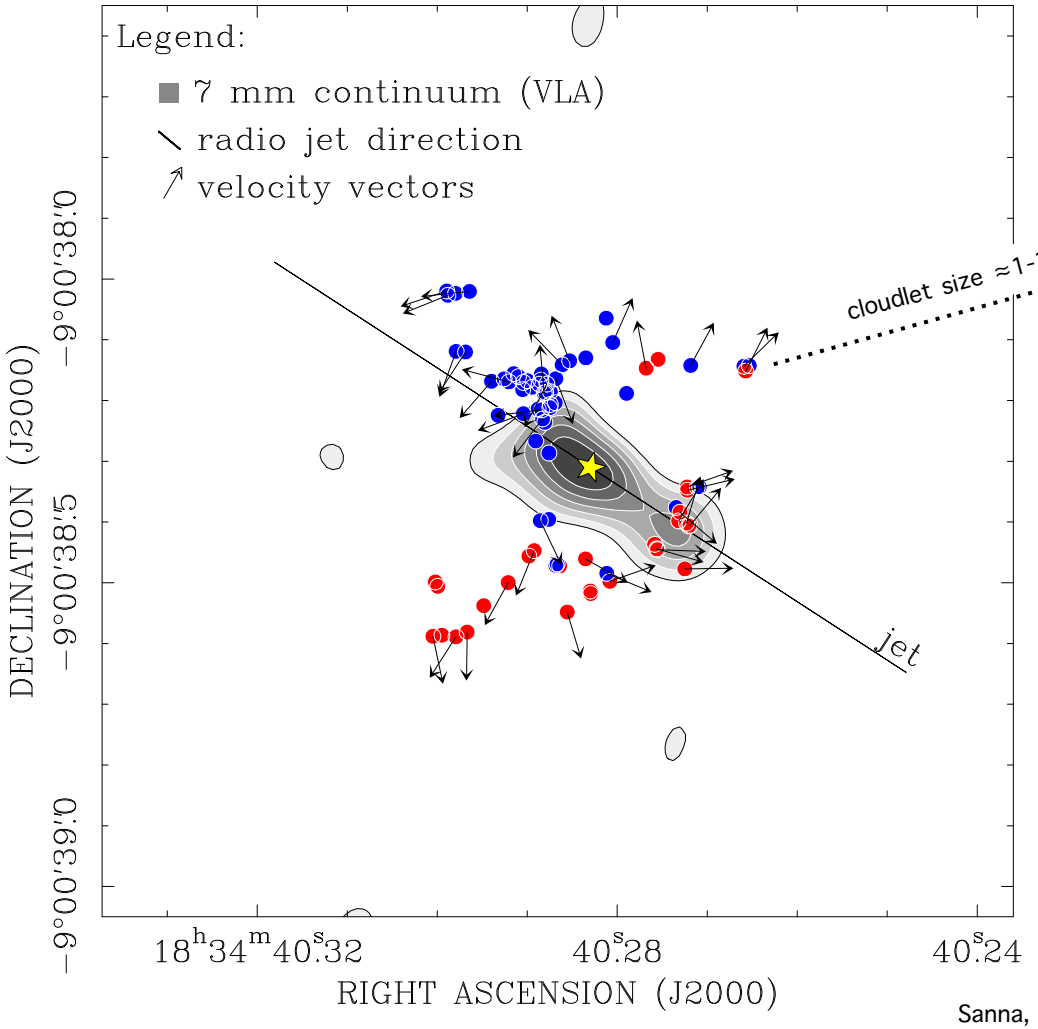
no, because:

- the dust temperature (100-200 K) should systematically be higher than the gas kinetic temperature locally;
- the H_2 volume density should not exceed values of 10^8 cm^{-3} above which the maser emission is promptly quenched;
- where proper motions have been measured, observational evidence shows expanding motions in all sources but two;

Ex., G023.01−00.41

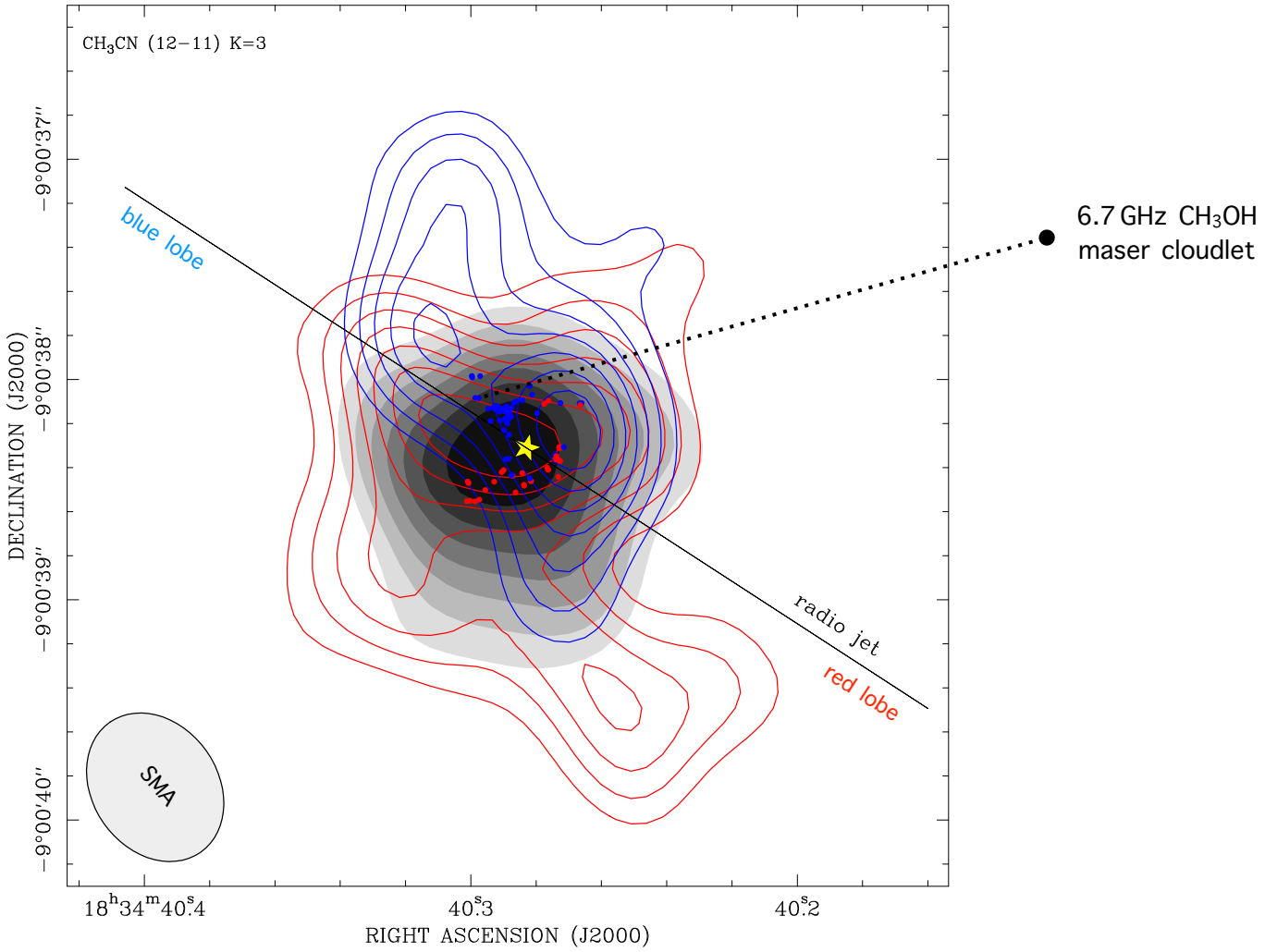


Sanna, … Cesaroni, … et al. (2021)



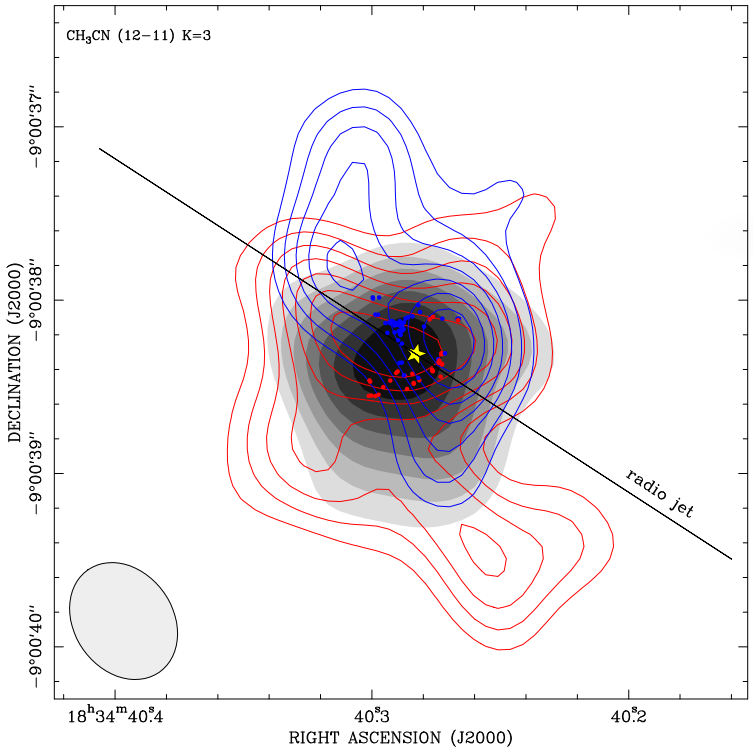
Sanna, Moscadelli, Cesaroni et al. (2010)

Sanna, Moscadelli, Cesaroni et al. (2016)



Sanna, Cesaroni, Moscadelli et al. (2014)

Sanna, Cesaroni, Moscadelli et al. (2014)



1994ApJ...435L.137C

THE ASTROPHYSICAL JOURNAL, 435:L137–L140, 1994 November 10

A MASSIVE YOUNG EMBEDDED OBJECT ASSOCIATED WITH THE UC H II REGION G31.41+0.31

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AND
E. CHURCHWELL AND P. HOFNER
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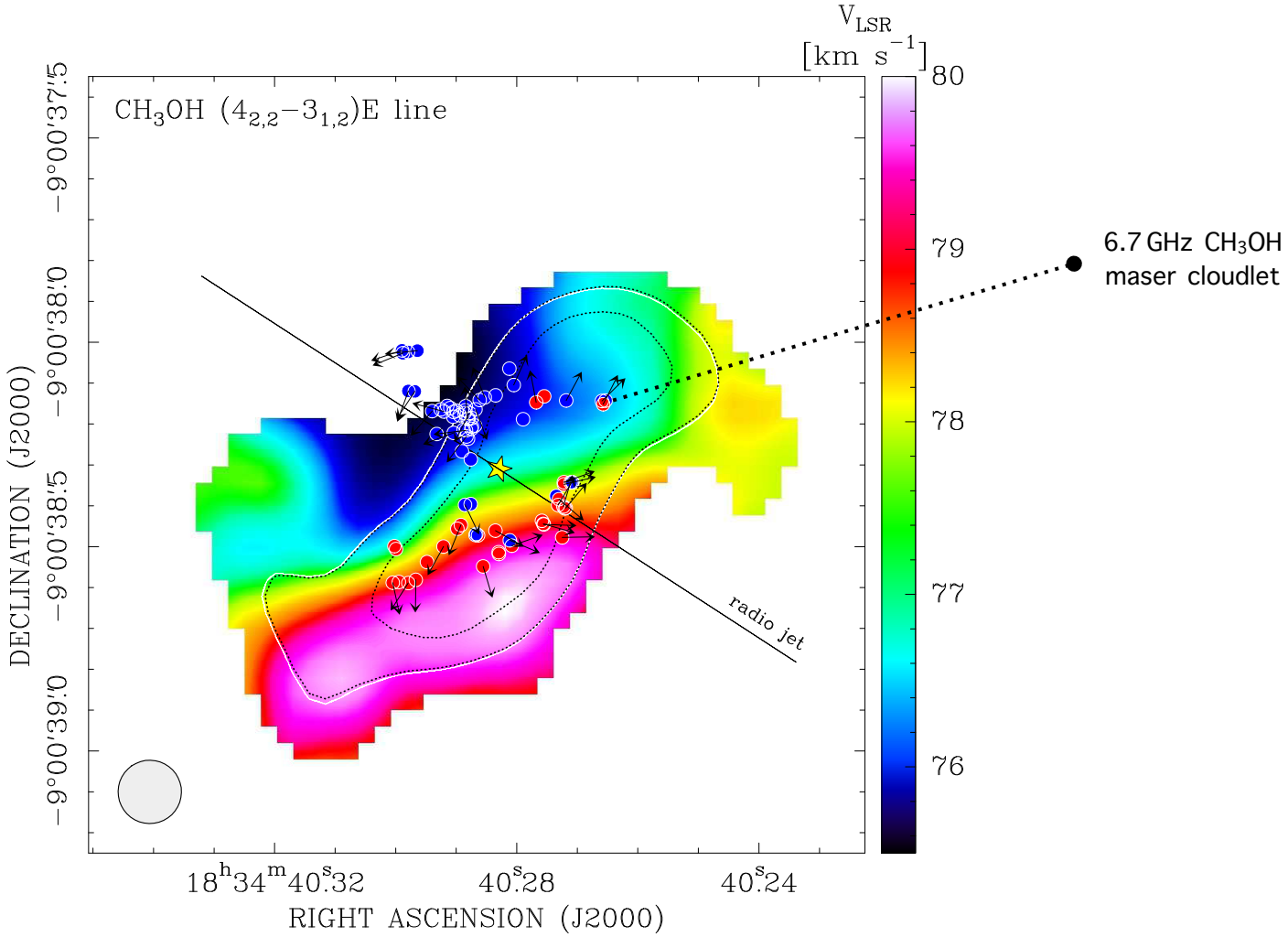
Received 1994 June 9; accepted 1994 August 22

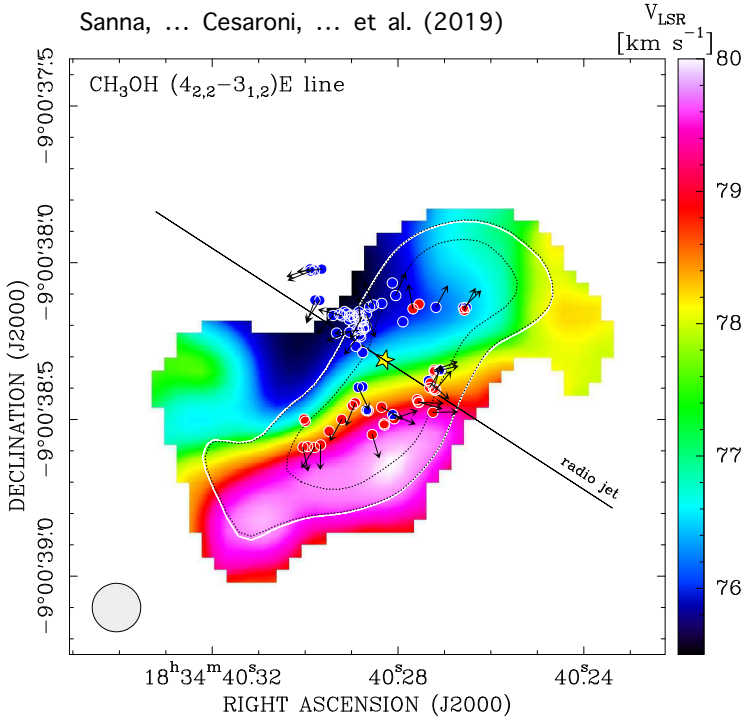
ABSTRACT

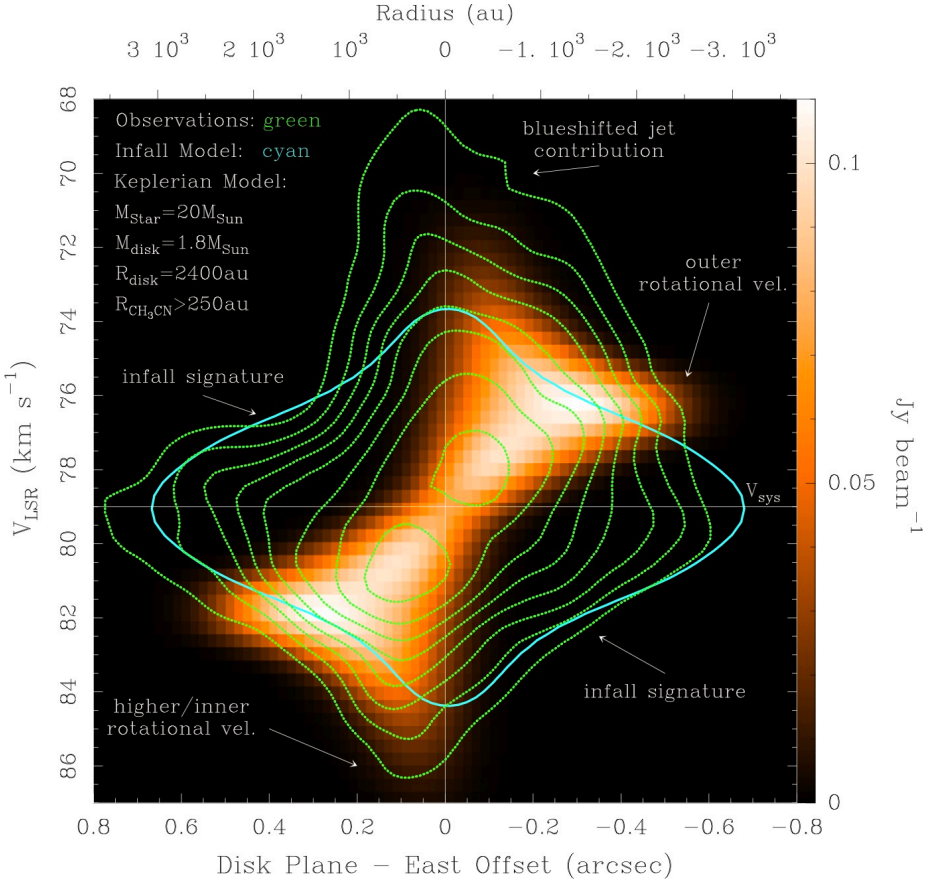
We have used the IRAM Plateau de Bure Interferometer to make high angular resolution observations of the star-forming region surrounding the ultracompact H II region G31.41+0.31. We have produced maps in the ground state $CH_3CN(6–5)$, $CH_3{}^{13}CN(6–5)$ and vibrationally excited $CH_3CN(6–5)$ transitions, and in the 3 mm continuum emission. From these, we derive estimates of the size and mass of the hot molecular core known from earlier ammonia observations. The core angular diameter as measured in both methyl cyanide and the 3 mm continuum is $\sim 1''$ corresponding to ~ 0.04 pc. If the continuum emission is due to heated dust, we derive a mass of $\sim 1000\ M_\odot$, but with large uncertainties. A remarkable velocity gradient (~ 400 km s^{-1} pc^{-1}) in the SW–NE direction is observed in CH_3CN implying an equilibrium mass $\sim 1000\ M_\odot$, consistent with the value quoted above. We discuss two possible scenarios (disk or outflow) for explaining this gradient and conclude that the molecular core must be dynamically unstable.

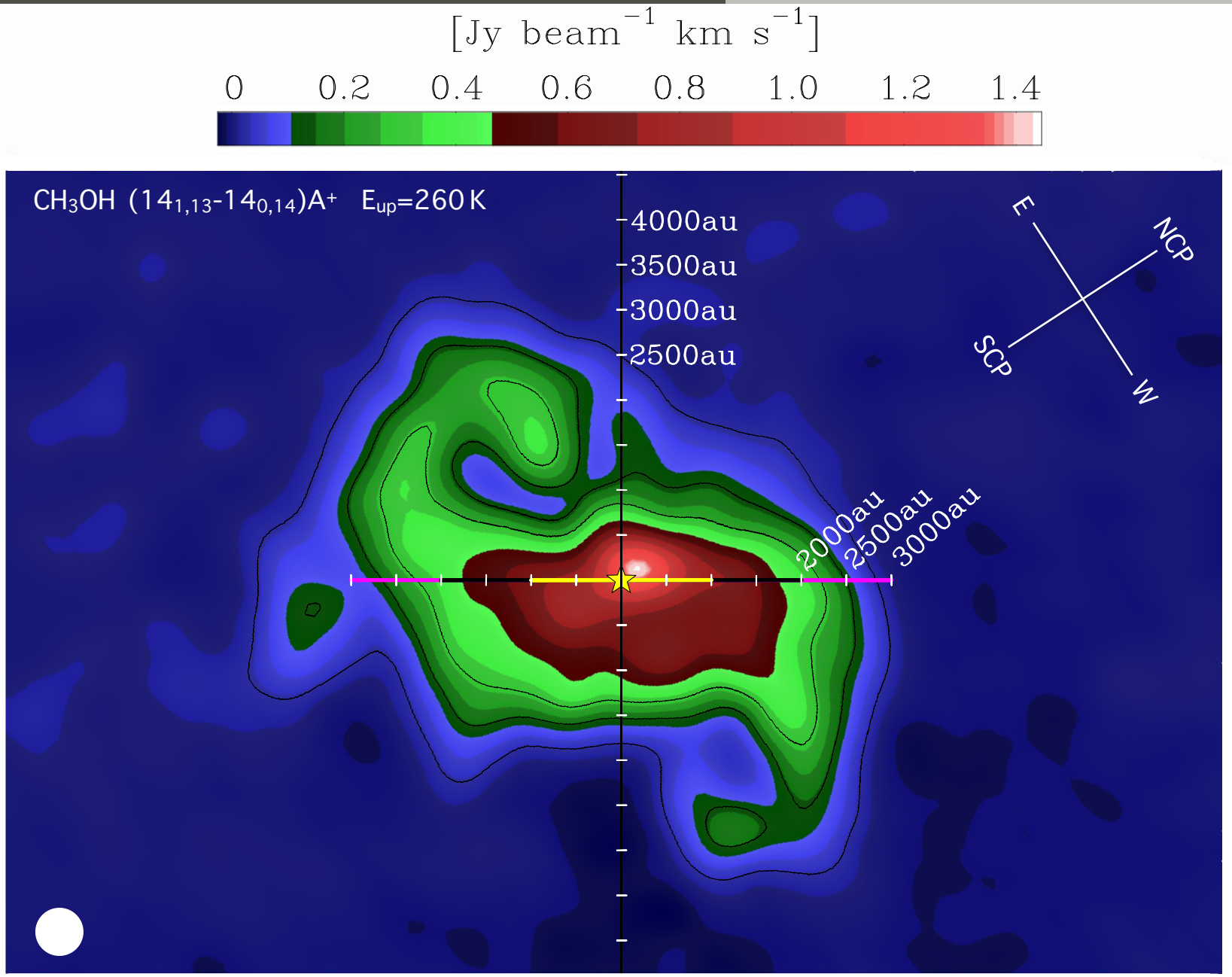
Subject headings: ISM: clouds — ISM: jets and outflows — ISM: molecules — radio lines: ISM

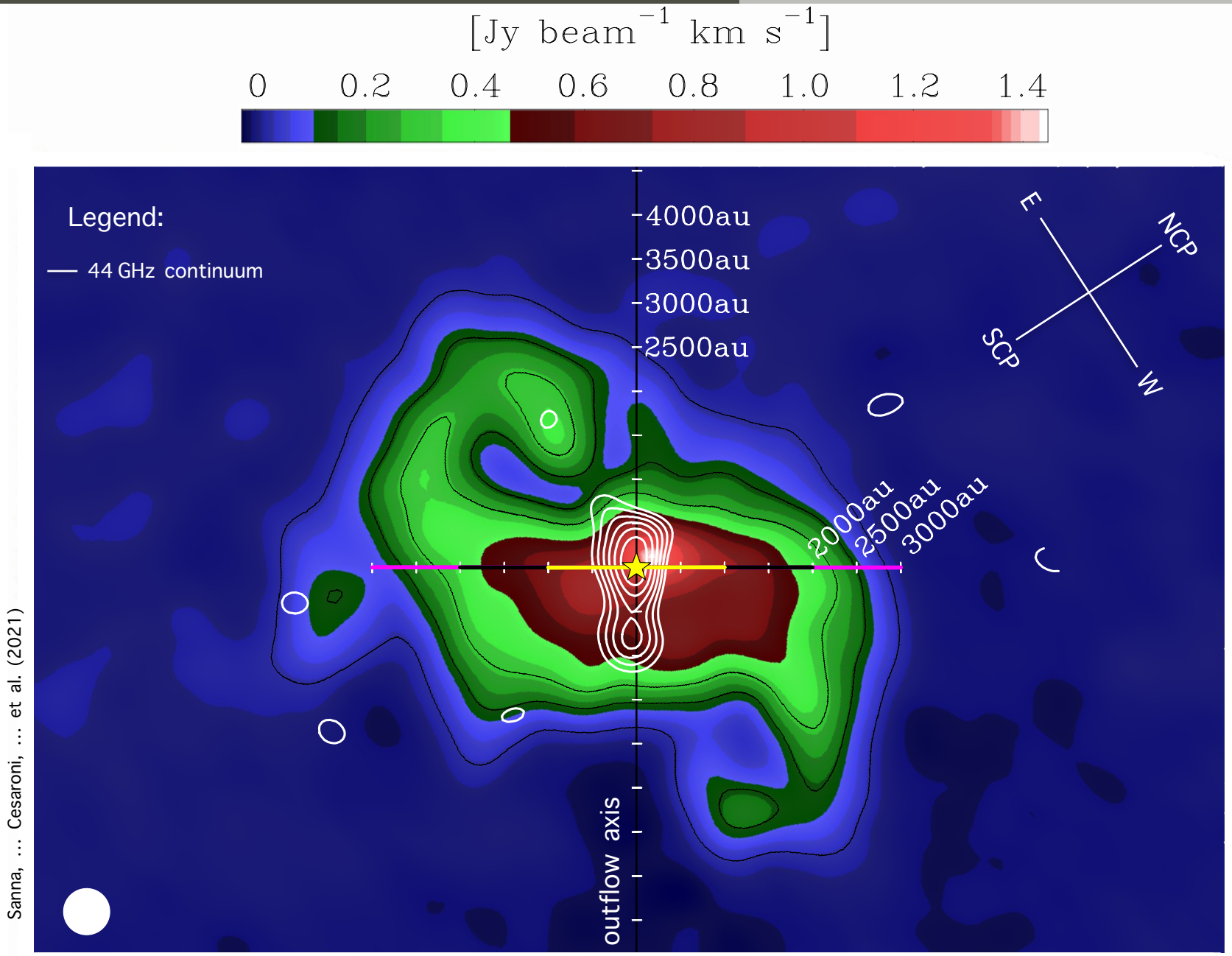


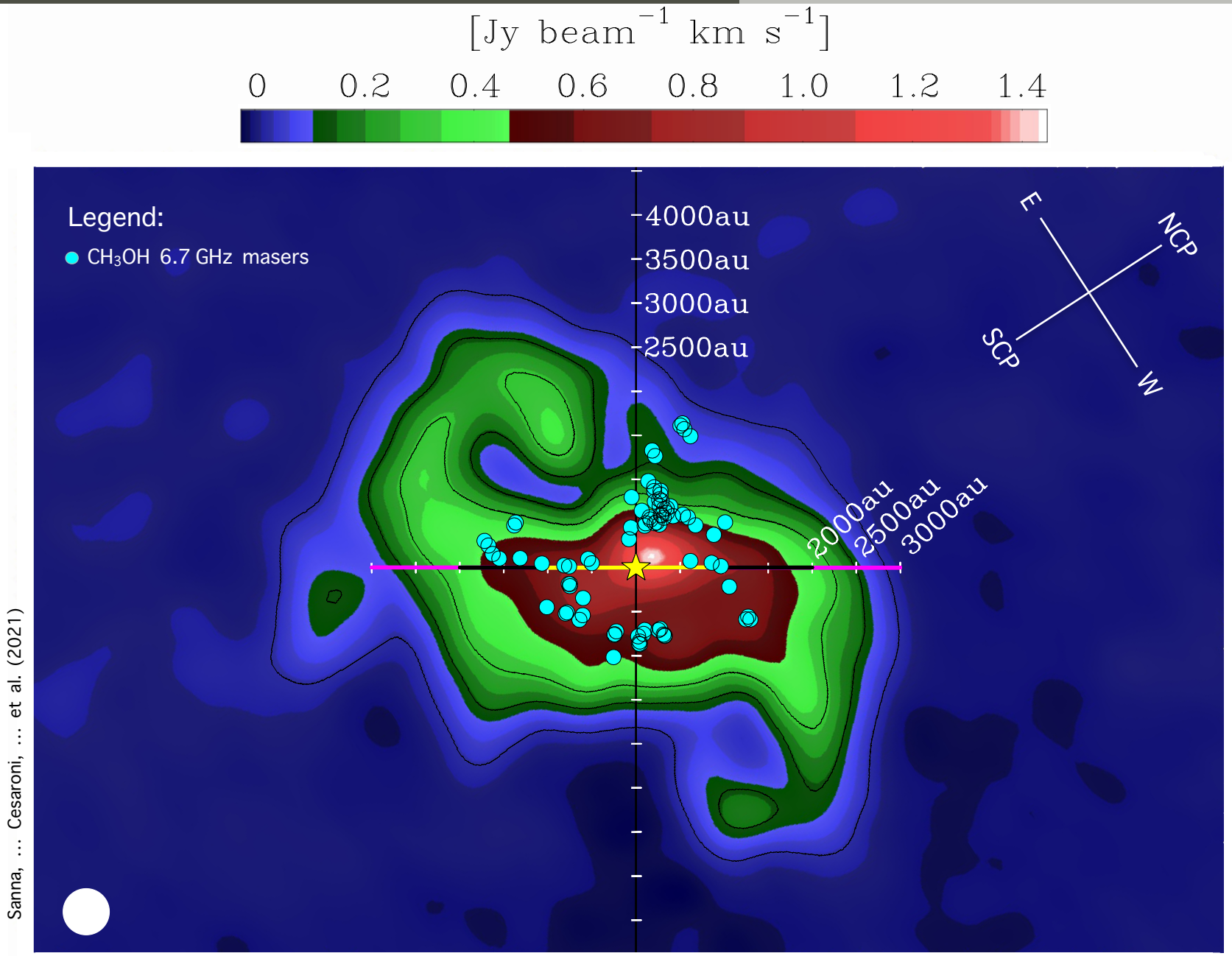
Sanna, ... Cesaroni, ... et al. (2019)

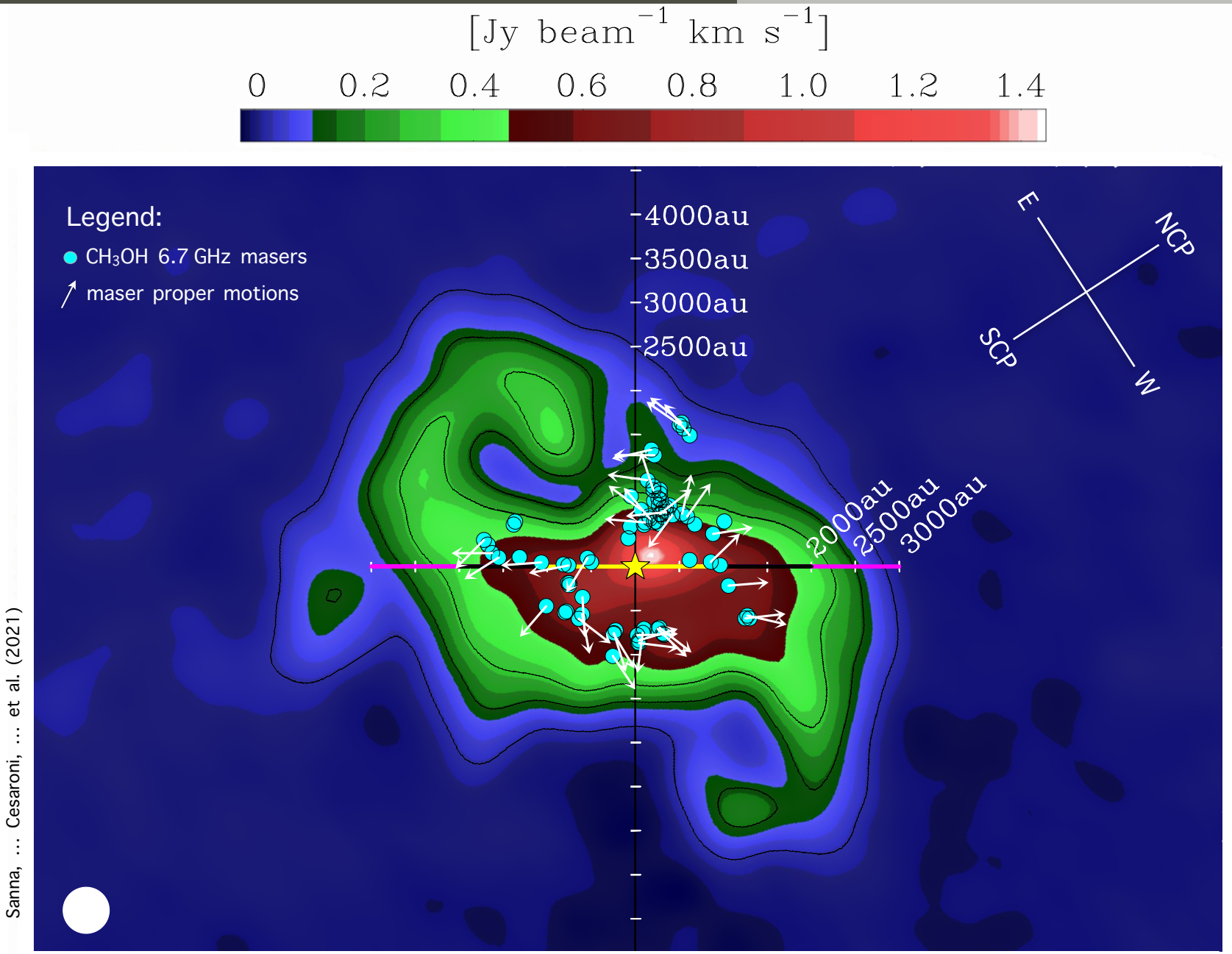

Sanna, ... Cesaroni, ... et al. (2019)
V_{LSR} [km s^{-1}]
CH_3OH $(4_{2,2}-3_{1,2})E$ line
radio jet
DECLINATION (J2000)
RIGHT ASCENSION (J2000)

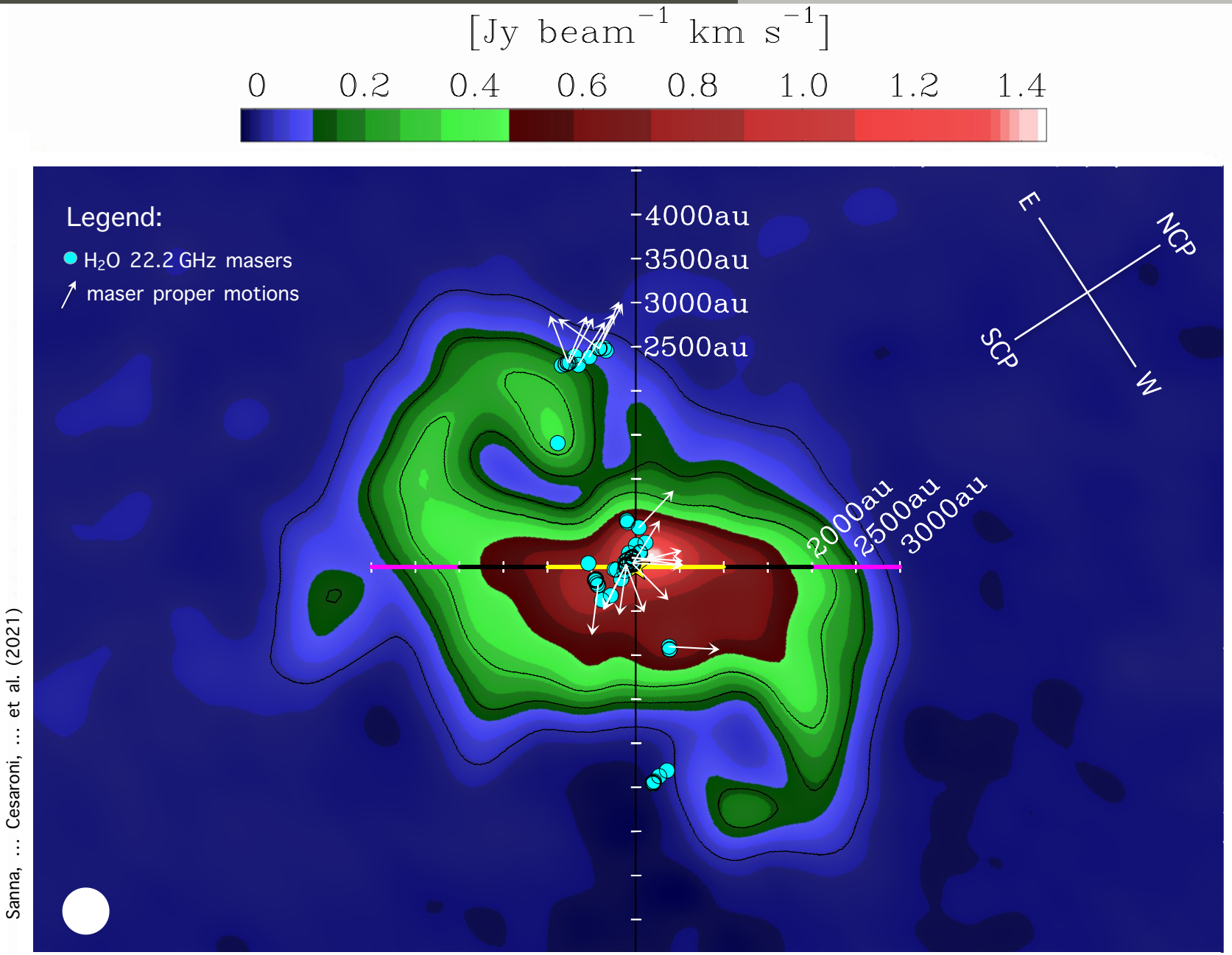

Radius (au)
Observations: green
Infall Model: cyan
Keplerian Model:
$M_{Star}=20M_{Sun}$
$M_{disk}=1.8M_{Sun}$
$R_{disk}=2400$au
$R_{CH_3CN}>250$au
blueshifted jet contribution
outer rotational vel.
infall signature
V_{sys}
infall signature
higher/inner rotational vel.
V_{LSR} (km s^{-1})
Jy beam^{-1}
Disk Plane − East Offset (arcsec)

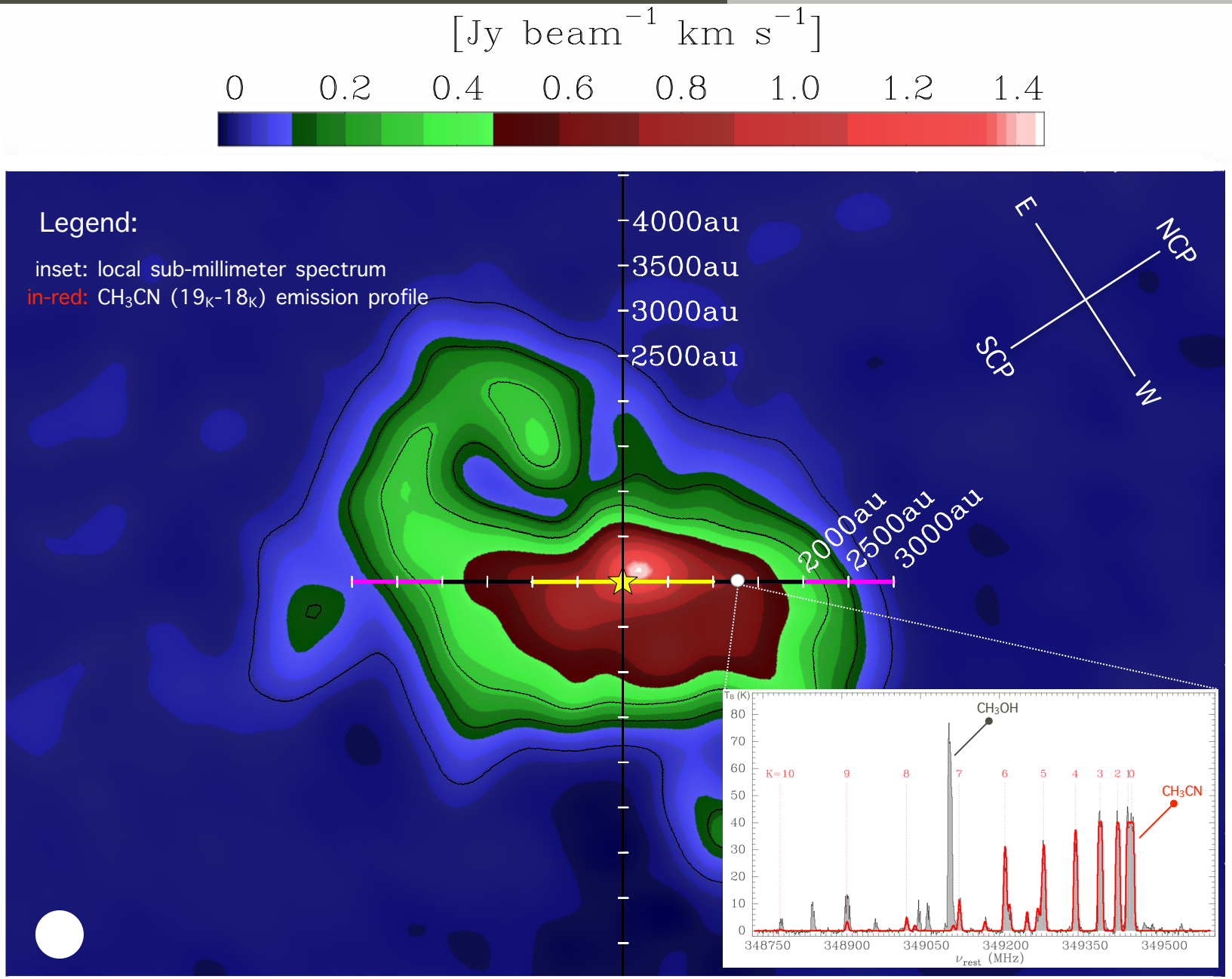

[Jy beam^{-1} km s^{-1}]
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
CH$_3$OH (14$_{1,13}$-14$_{0,14}$)A$^+$ E$_{up}$=260 K
4000au
3500au
3000au
2500au
2000au
2500au
3000au
E
NCP
SCP
W
Sanna, ... Cesaroni, ... et al. (2021)


[Jy beam^{-1} km s^{-1}]
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Legend:
44 GHz continuum
4000au
3500au
3000au
2500au
E
NCP
SCP
W
2000au
2500au
3000au
outflow axis
Sanna, ... Cesaroni, ... et al. (2021)

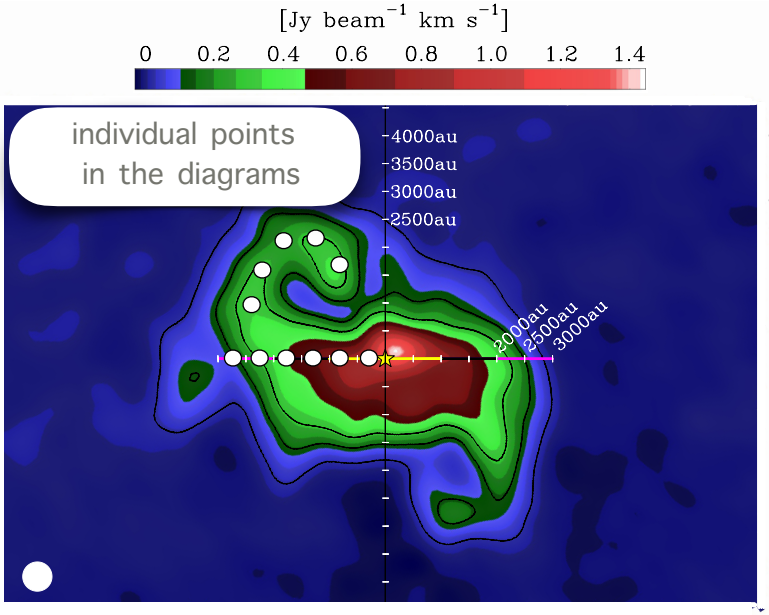

[Jy beam^{-1} km s^{-1}]
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Legend:
CH$_3$OH 6.7 GHz masers
4000au
3500au
3000au
2500au
2000au
2500au
3000au
E
NCP
SCP
W
Sanna, ... Cesaroni, ... et al. (2021)


[Jy beam^{-1} km s^{-1}]
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Legend:
CH$_3$OH 6.7 GHz masers
maser proper motions
4000au
3500au
3000au
2500au
2000au
2500au
3000au
E
NCP
SCP
W
Sanna, ... Cesaroni, ... et al. (2021)

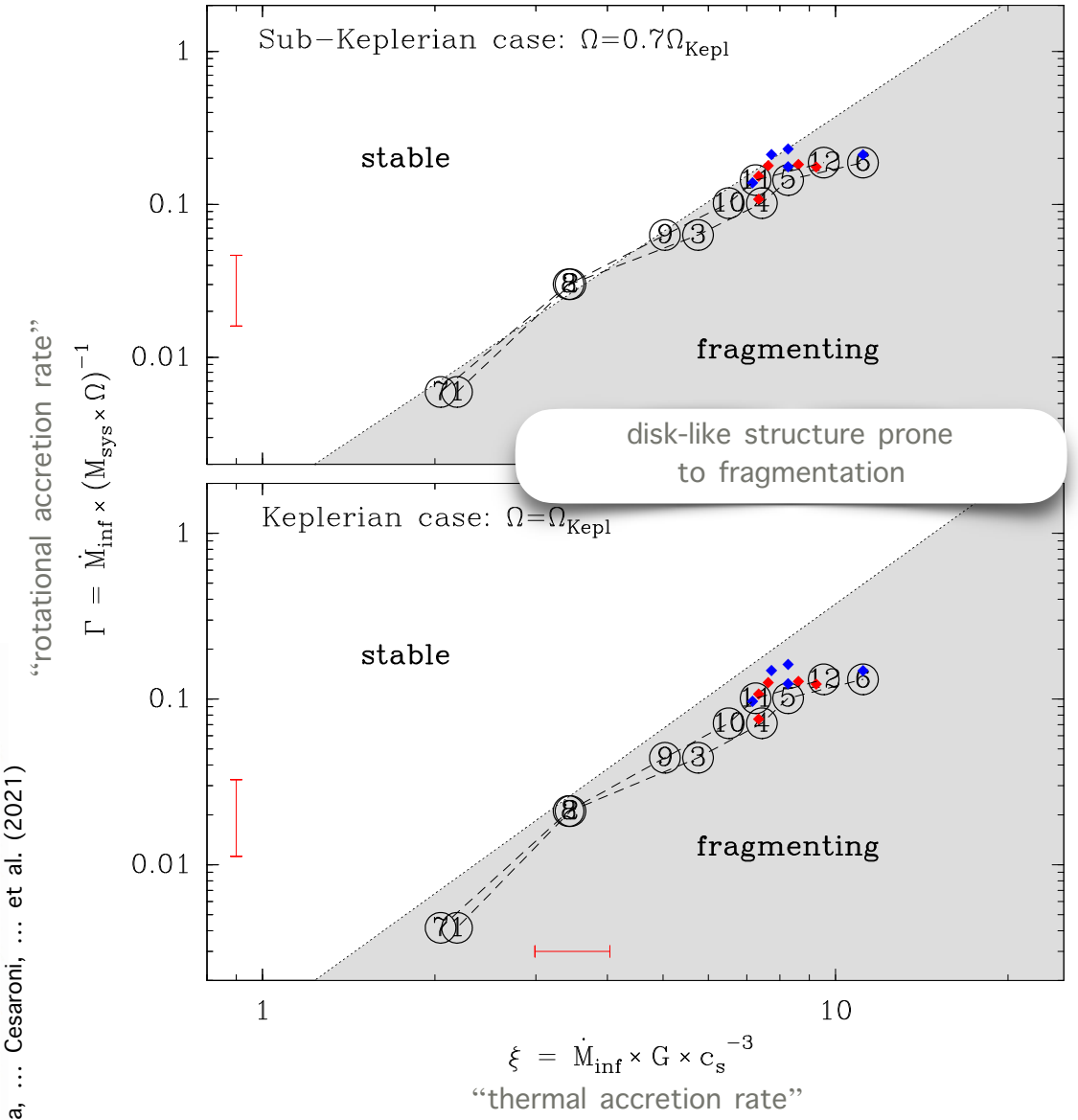

[Jy beam^{-1} km s^{-1}]
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Legend:
H_2O 22.2 GHz masers
maser proper motions
4000au
3500au
3000au
2500au
E
NCP
SCP
W
2000au
2500au
3000au
Sanna, ... Cesaroni, ... et al. (2021)



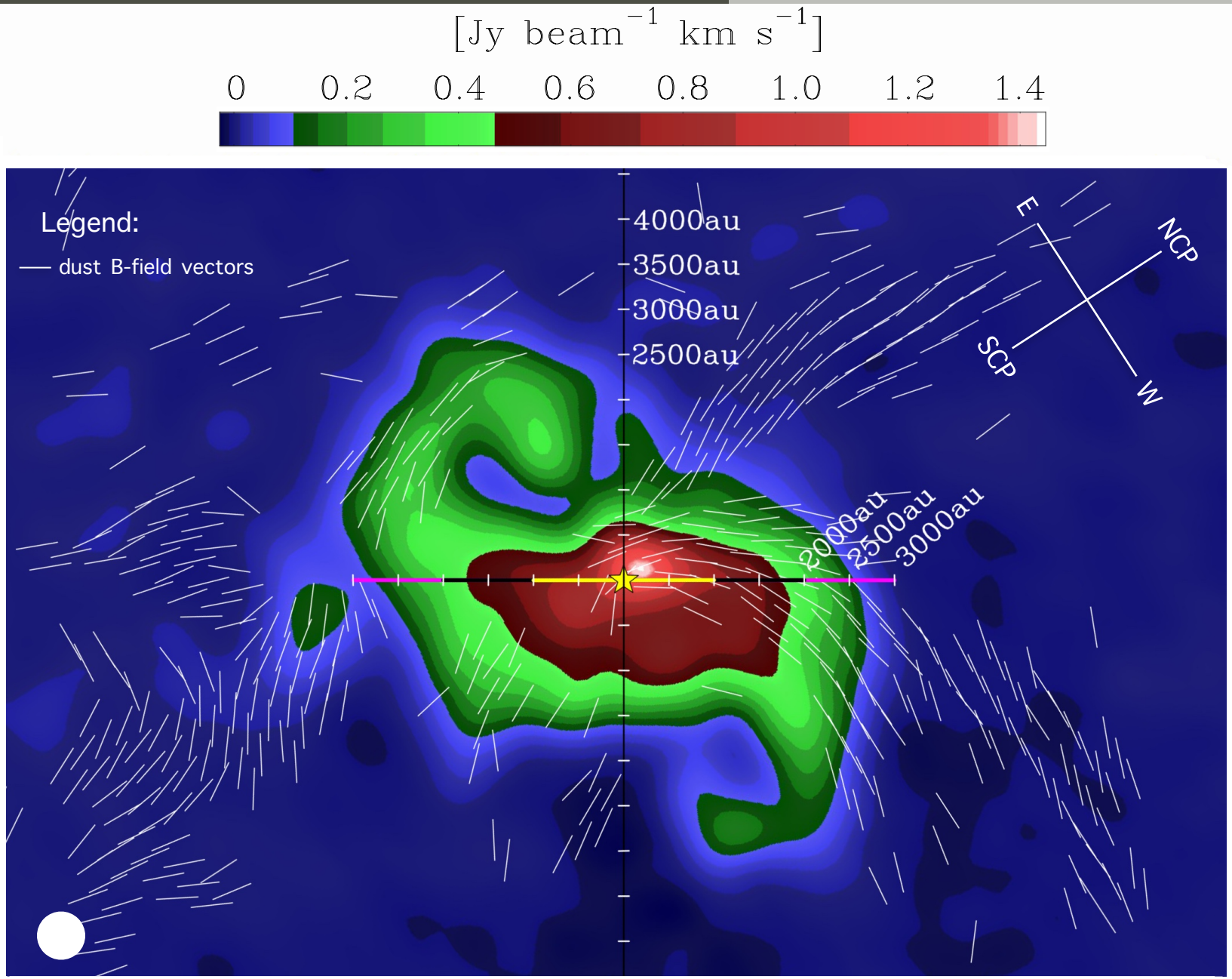
Sanna, ... Cesaroni, ... et al. (2021)



Sanna, ... Cesaroni, ... et al. (2021)



disk-like structure prone to fragmentation


[Jy beam^{-1} km s^{-1}]
0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Legend:
dust B-field vectors
4000au
3500au
3000au
2500au
E
NCP
SCP
W
2000au
2500au
3000au

Mark Reid: “astronomers should not trust what’s written in papers”

Karl Menten: “astronomers must be greedy”

Riccardo Cesaroni: “astronomers must be lucky”

Luca Moscadelli: “……”

on May 2025

Mark Reid: “astronomers should not trust what’s written in papers”

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on May 2025

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Author: AND OR — Cesaroni, R

Object: AND OR — SIMBAD object search (one per line)

Publication date between: MM / 1987 and MM / 2026

2007prpl.conf..197C 2007 cited: 194
Disks Around Young O-B (Proto)Stars: Observations and Theory
Cesaroni, R.; Galli, D.; Lodato, G.; Walmsley, C. M.; Zhang, Q.

2006Natur.444..703C 2006/12
The critical role of disks in the formation of high-mass stars
Cesaroni, Riccardo; Galli, Daniele; Lodato, Giuseppe; Walmsley, Malcolm; Zhang, Qizhou

1994A&A...288..903C 1994/08 cited: 202
Hot ammonia towards compact HII regions
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1998A&A...331..709C 1998/03 cited: 113
Sub-arcsecond structure of hot cores in the NH_3 (4,4) line
Cesaroni, R.; Hofner, P.; Walmsley, C. M.; Churchwell, E.

	Totals	Refereed
Number of papers	353 (60)	208
Total citations	14499	14293
h-index	69	68

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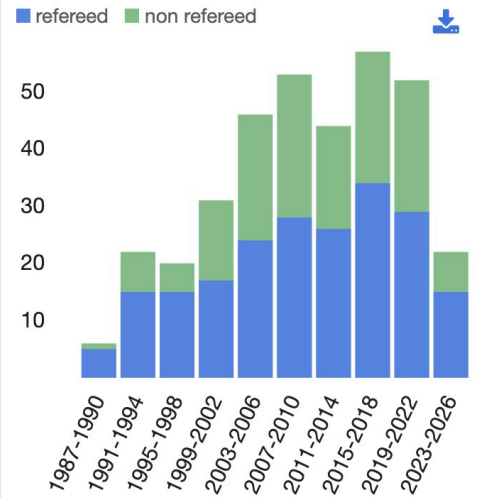

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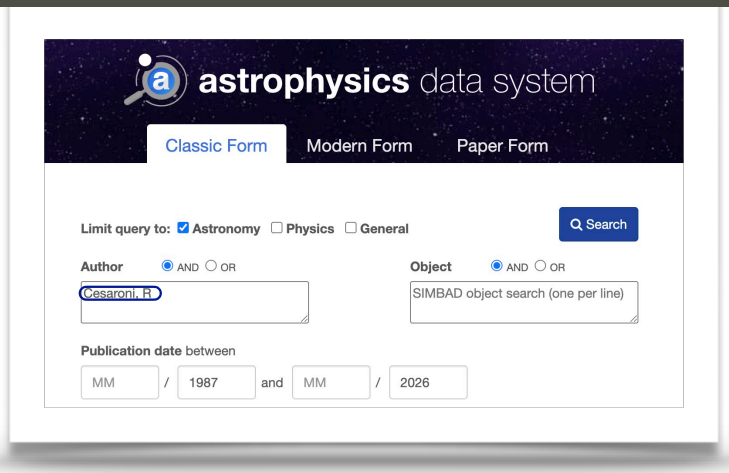

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