SDSS-V

LOCAL VOLUME MAPPER
Resolving the Physics Driving Galaxy Formation

The Local Volume Mapper (LVM): Physics at the energy injection scale

The Local Volume Mapper in SDSS-V: Connecting Stellar Feedback with the ISM in the Milky Way and Local Group

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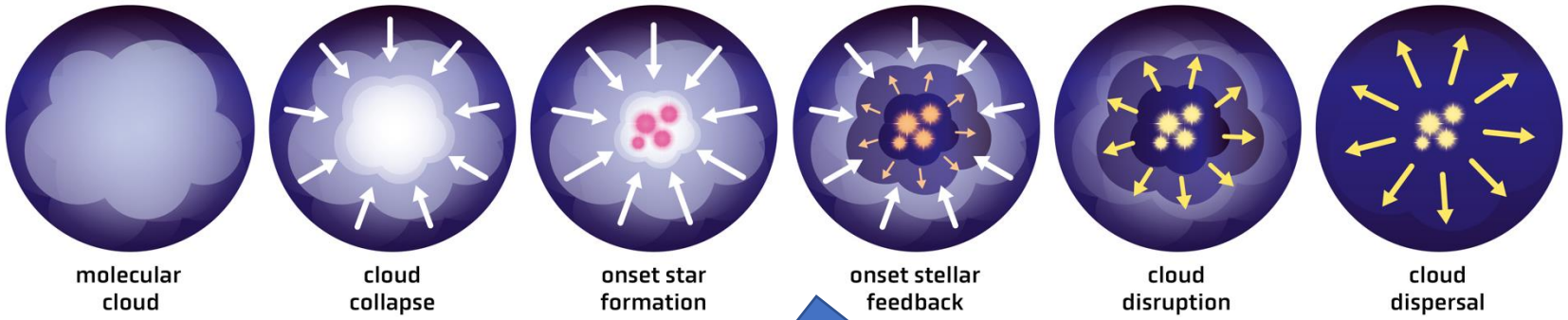
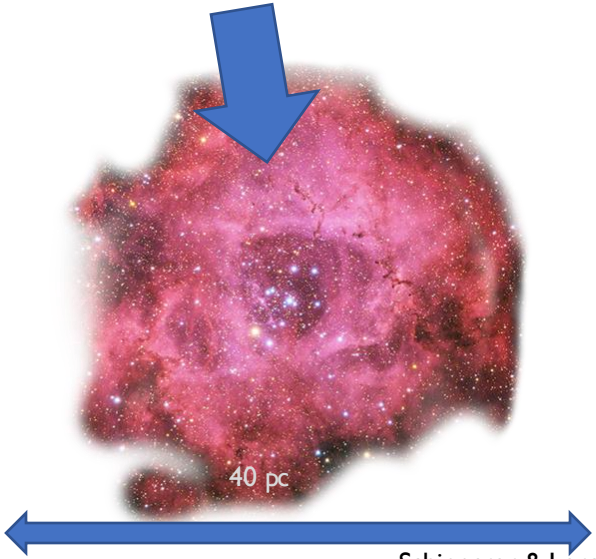
Stellar feedback (radiation, winds, SNe)



Flame nebula



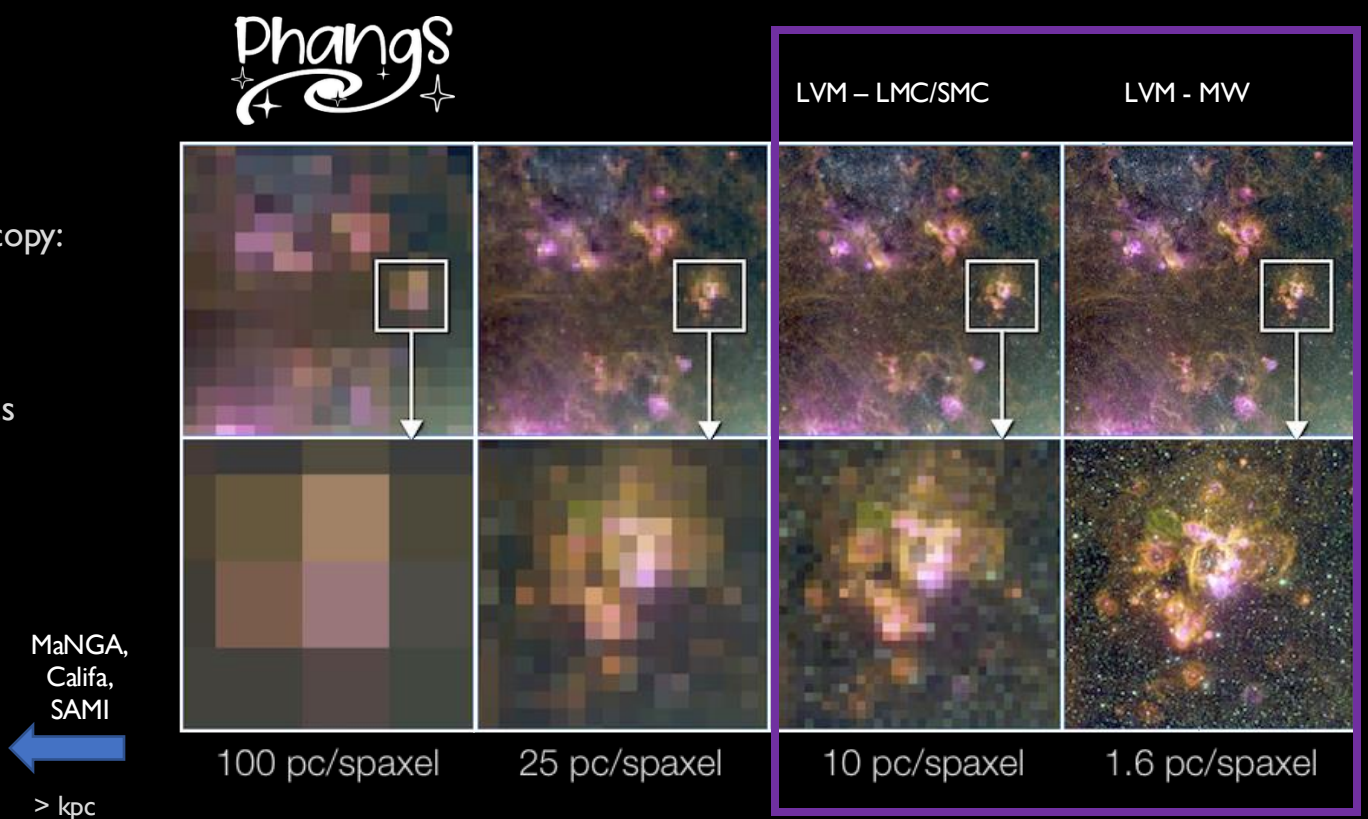
Rosette nebula

Schinnerer & Leroy 2024

Local Volume Mapper

Resolving the Physics Driving Galaxy Formation

Optical IFU spectroscopy:
- Stellar populations
- Ionization sources
- T_e, n_e, 12+log(O/H)
- stellar/gas kinematics



+ stellar parameters + dense gas + hot gas !

LVM Fact Sheet

Completely **new** & **robotic** optical IFU survey telescope, located in Chile (LCO)

Science IFU:

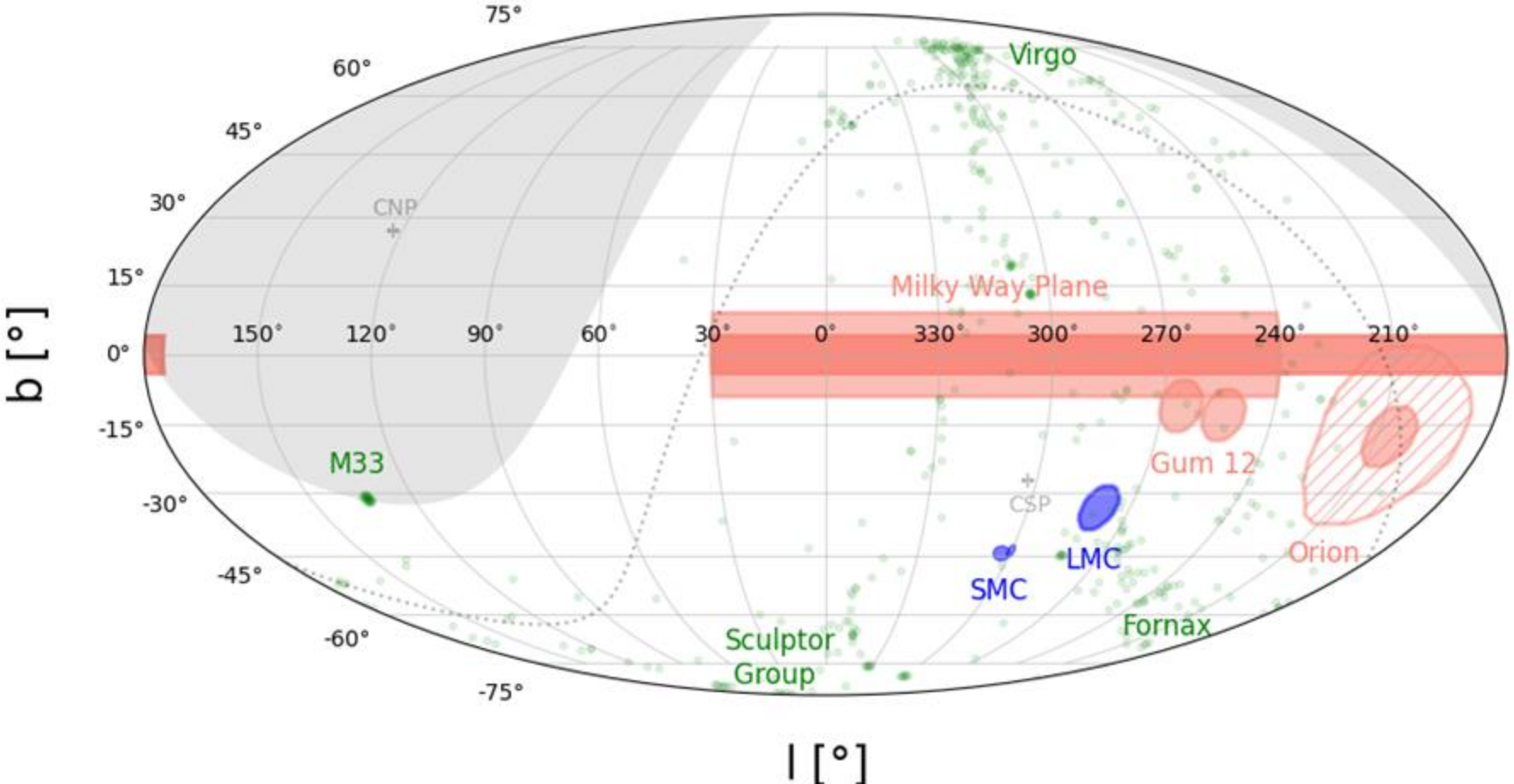
- FOV 0.5 deg diameter
  - 16 cm telescope
  - 35" fiber diameters
- 1801 fixed fiber bundle
- 3600-9800A at R~4000 (DESI spectrographs)

Survey footprint:

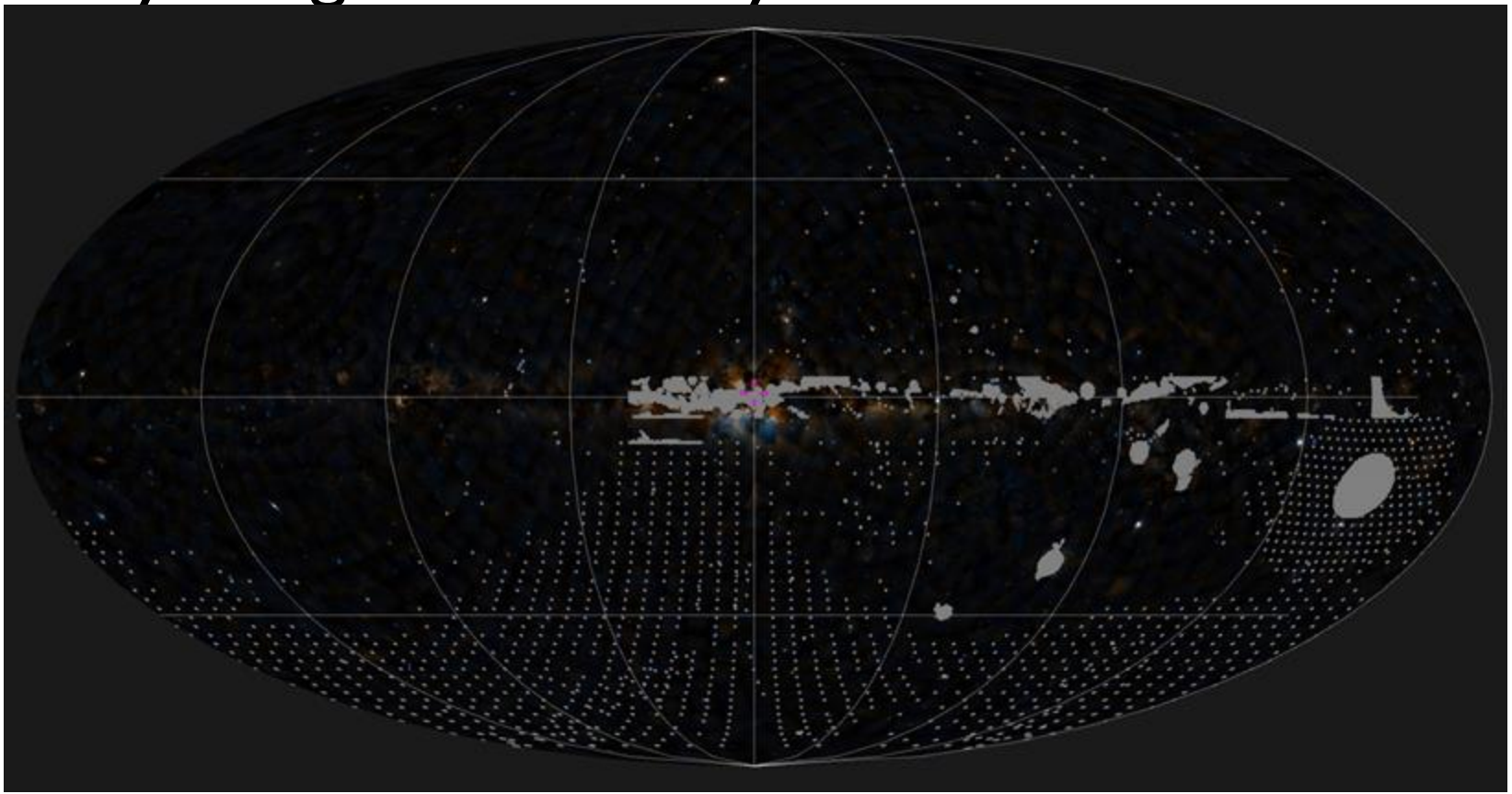
- MW plane @ 1 pc
- Full LMC/SMC @ 10 pc

SDSS-V

Survey Plan


75°
60°
45°
30°
15°
0°
-15°
-30°
-45°
-60°
-75°
b [°]
150°
120°
90°
60°
30°
0°
330°
300°
270°
240°
210°
l [°]
CNP
CSP
Virgo
Milky Way Plane
M33
Gum 12
Orion
LMC
SMC
Fornax
Sculptor
Group

Survey Progress – Reality!



LVMvis: Ivan Katkov

The SDSS-V Local Volume Mapper (LVM): Scientific Motivation and Project Overview

Niv Drory [1], Guillermo A. Blanc [2,3], Kathryn Kreckel [4], Sebastián F. Sánchez [5], Alfredo Mejía-Narváez [6], Evelyn J. Johnston [7], Amy M. Jones [8], Eric W. Pellegrini [9], Nicholas P. Konidaris [2], Tom Herbst [10], José Sánchez-Gallego [11], Juna A. Kollmeier [12,2], Florence de Almeida [7], Jorge K. Barrera-Ballesteros [6], Dmitry Bizyaev [13], Joel R. Brownstein [14], Mar Canal i Saguer [4], Brian Cherinka [8], Maria-Rosa L. Cioni [15], Enrico Congiu [16], Maren Cosens [2], Bruno Dias [17], John Donor [18], Oleg Egorov [4], Evgeniia Egorova [4], Cynthia S. Froning [19], Pablo García [20,21], Simon C. O. Glover [22], Hannah Greve [4], Maximilian Häberle [10], Kevin Hoy [7,23], Hector Ibarra [6], Jing Li [4], Ralf S. Klessen [22,24], Dhanesh Krishnarao [25], Nimisha Kumari [8], Knox S. Long [8], José Eduardo Méndez-Delgado [4], Silvia Anastasia Popa [4], Solange Ramirez [2], Hans-Walter Rix [10], Aurora Mata Sánchez [6], Ravi Sankrit [8], Natascha Sattler [4], Conor Sayres [11], Amrita Singh [26], Guy Stringfellow [27], Stefanie Wachter [2], Elizabeth Jayne Watkins [28], and Tony Wong [29]

Drory et al. 2024

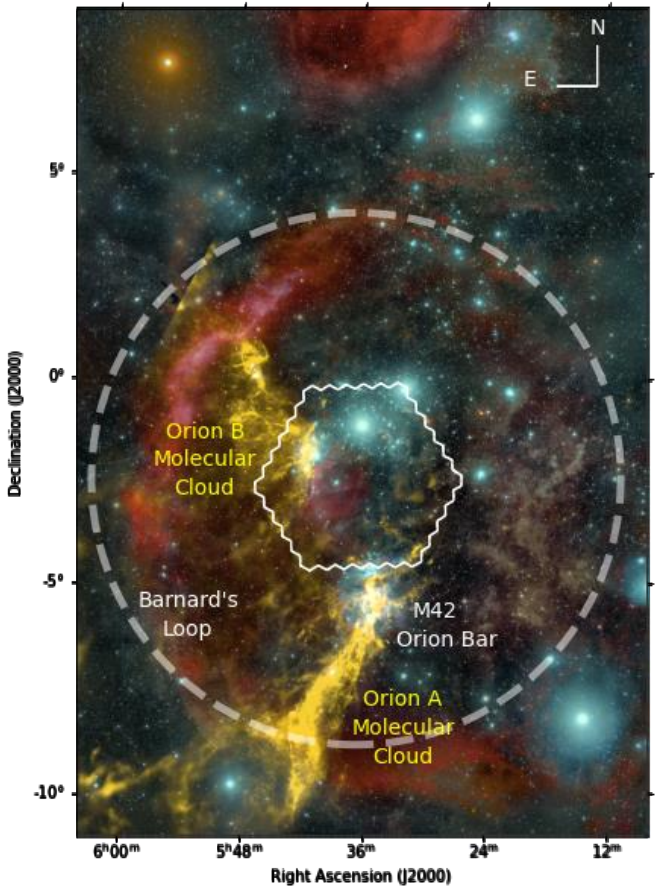
Instrument & science commissioning: Feb 2023-Oct 2023

Survey operations: Nov 2023 – September 2027

`Teaser' single tile (PN - Helix Nebula) released last week https://dr19.sdss.org/

First data release summer 2027

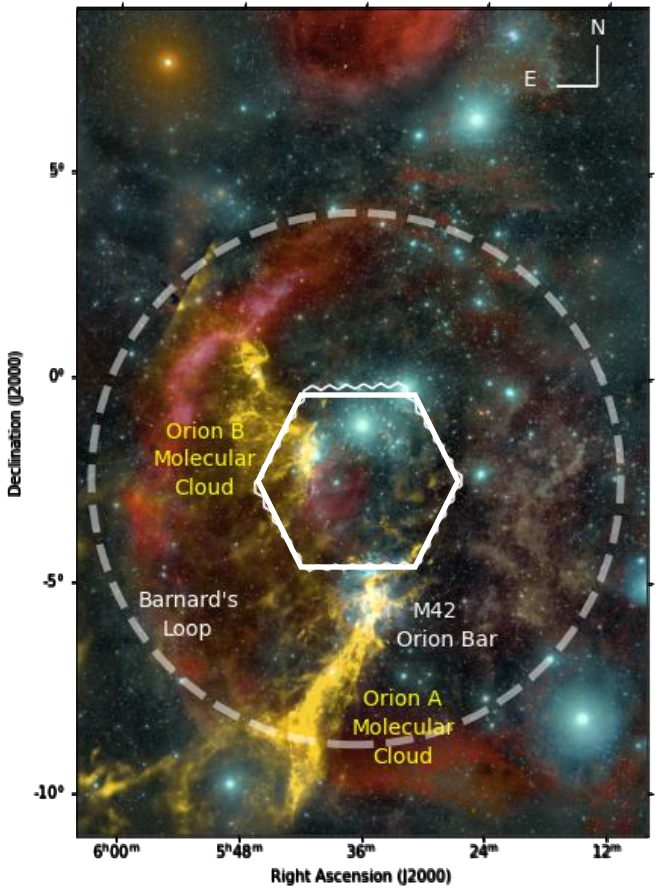
Glimpse into Orion



Kreckel et al. 2024

Glimpse into Orion

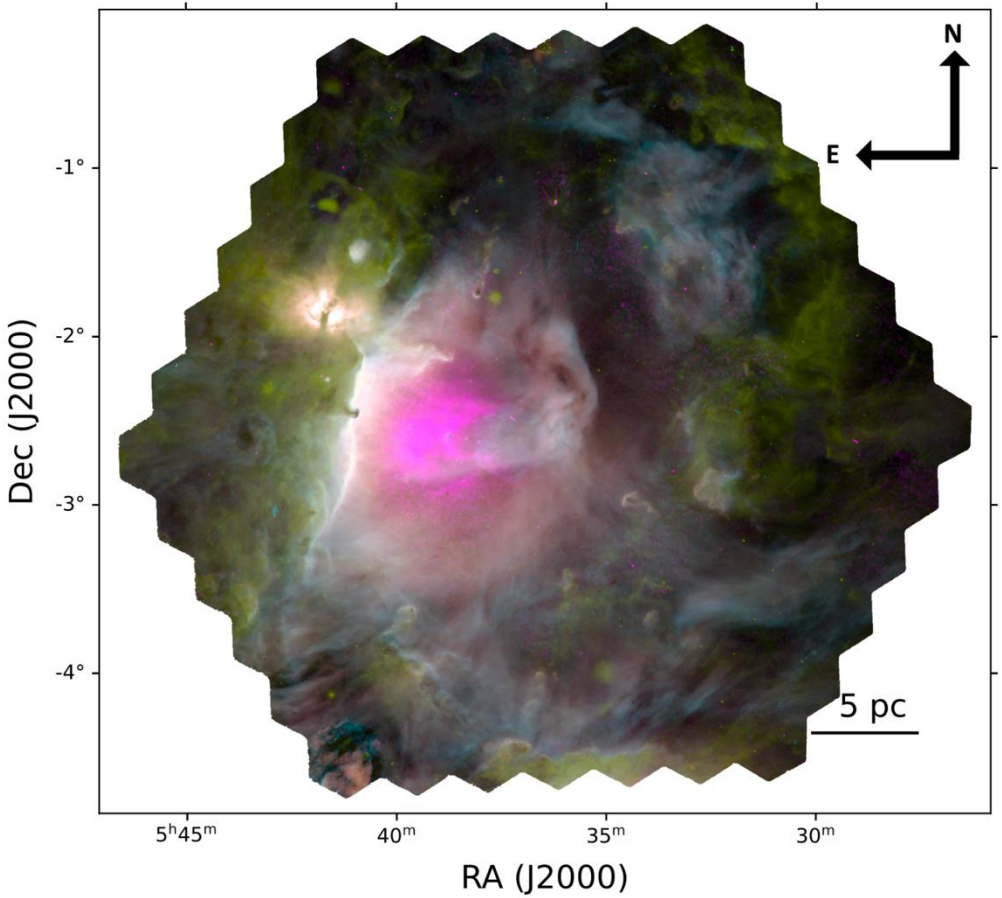
(Actually, this coverage is already complete)



10 degrees
70 pc

Kreckel et al. 2024

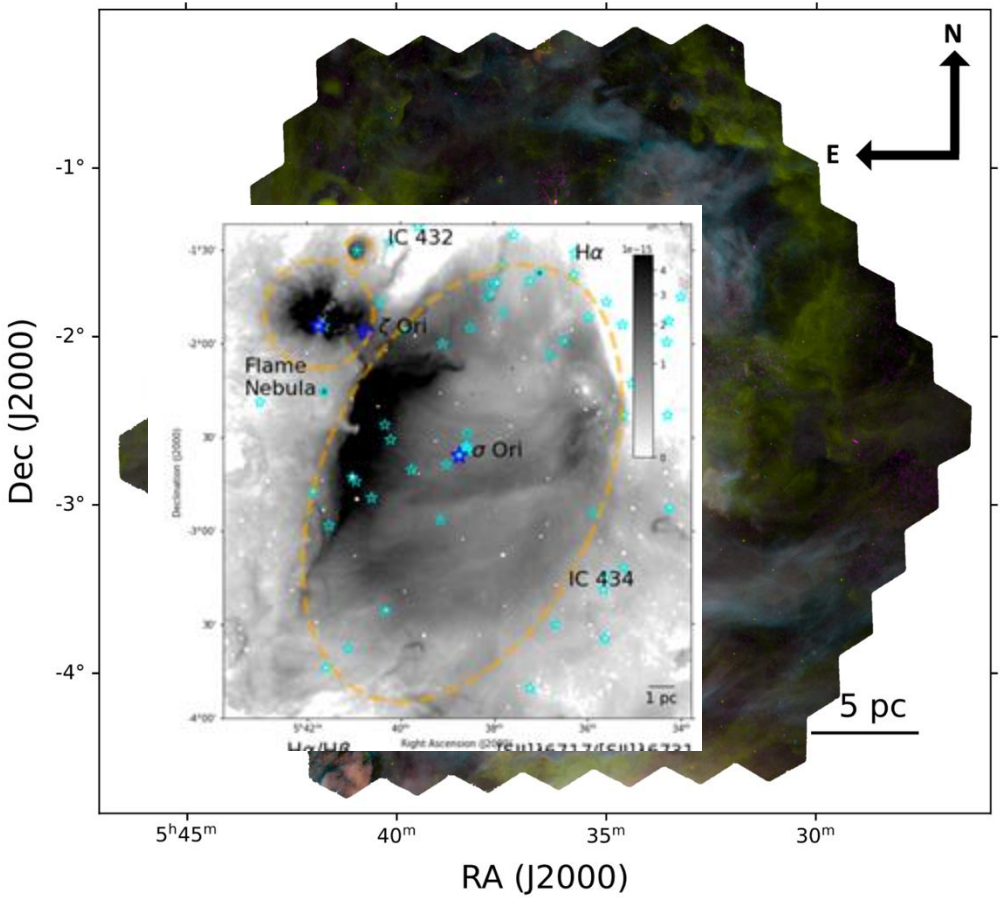
Glimpse into Orion – stars & gas



[SII]
Halpha
[OIII]
12micron

Kreckel et al. 2024

Glimpse into Orion – stars & gas



[SII]
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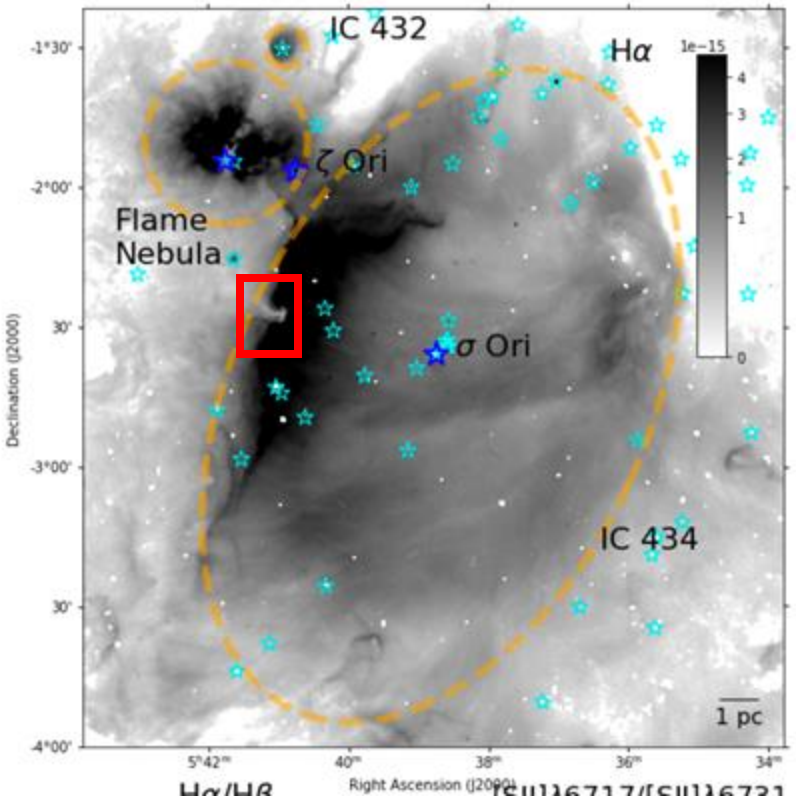
Kreckel et al. 2024

Glimpse into Orion – stars & gas



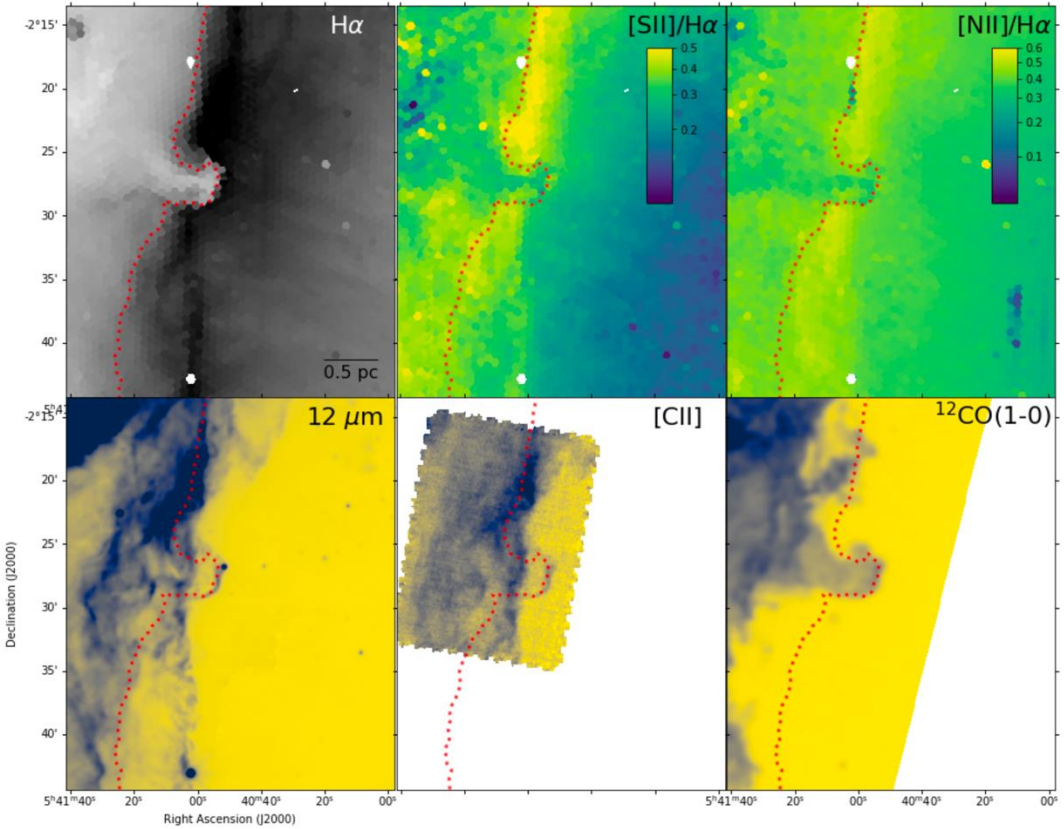
Combine information from gas and stars to map interactions

O type

B type

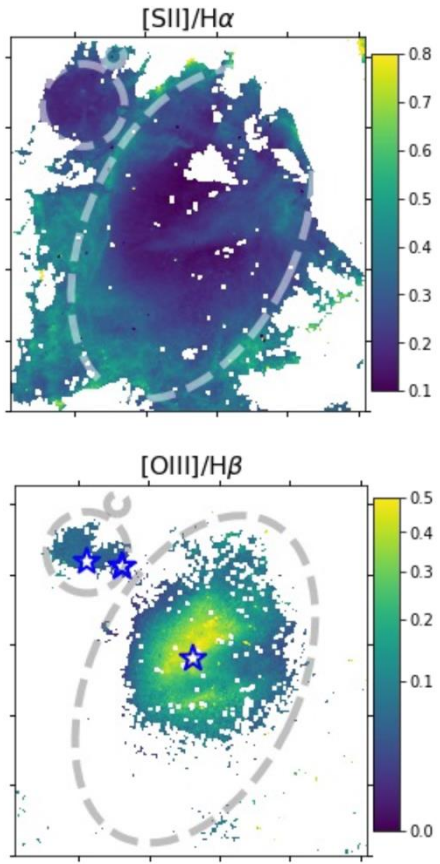
Kreckel et al. 2024

Glimpse into Orion – Horsehead Nebula



Kreckel et al. 2024

Line Ratios – maps & integrated

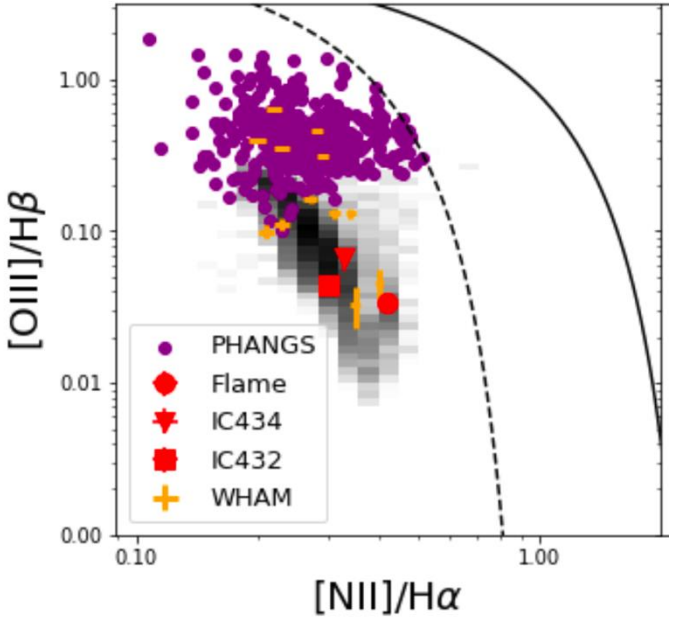


LVM resolved

Integrated LVM single star MW HII regions

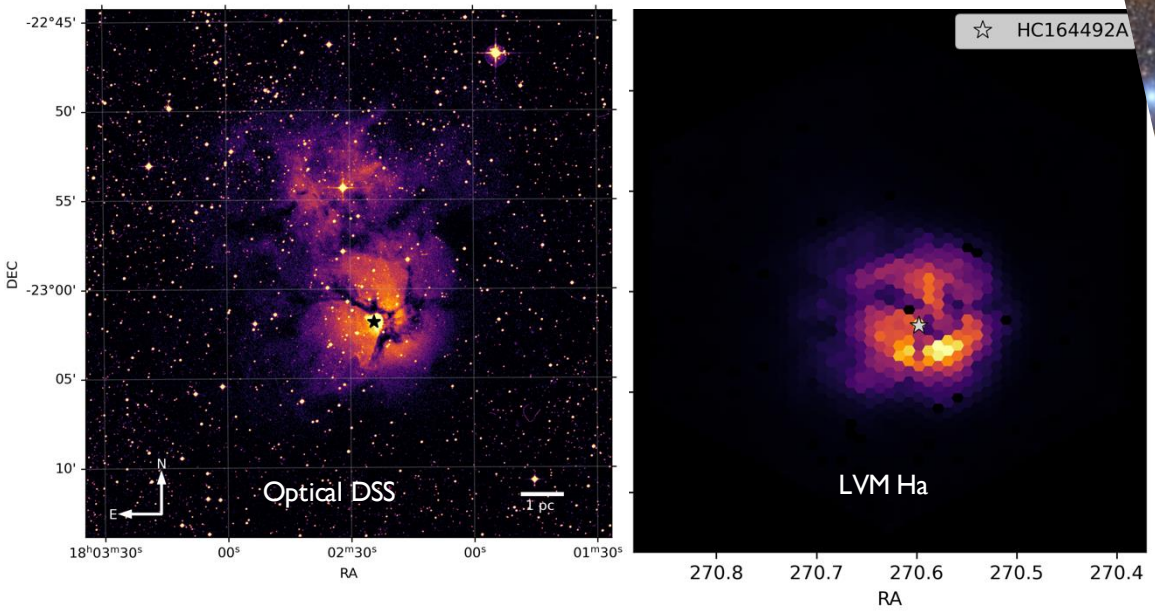
Integrated WHAM single star MW HII regions

Integrated PHANGS @ L(Ha)~10^{36} erg/s



Kreckel et al. 2024

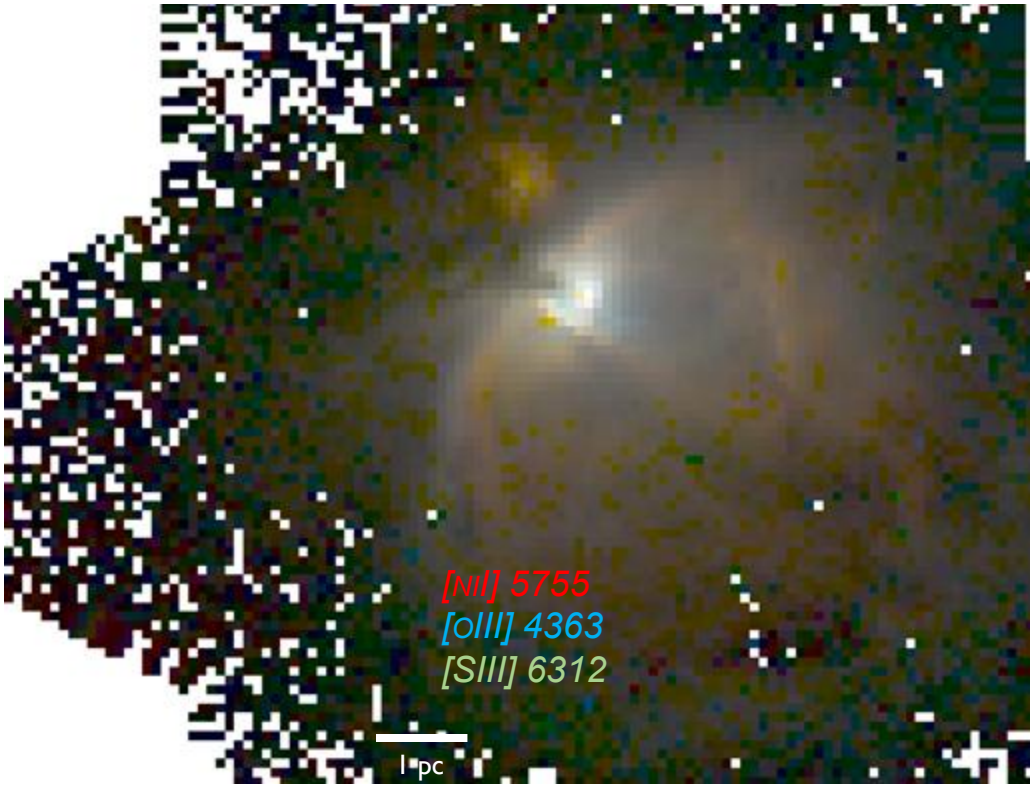
M20 / Trifid Nebula – Idealized Stromgren Sphere?



Powered by a single O7V star (HD 164492A)
Density variations tracing ionization fronts with denser gas clouds

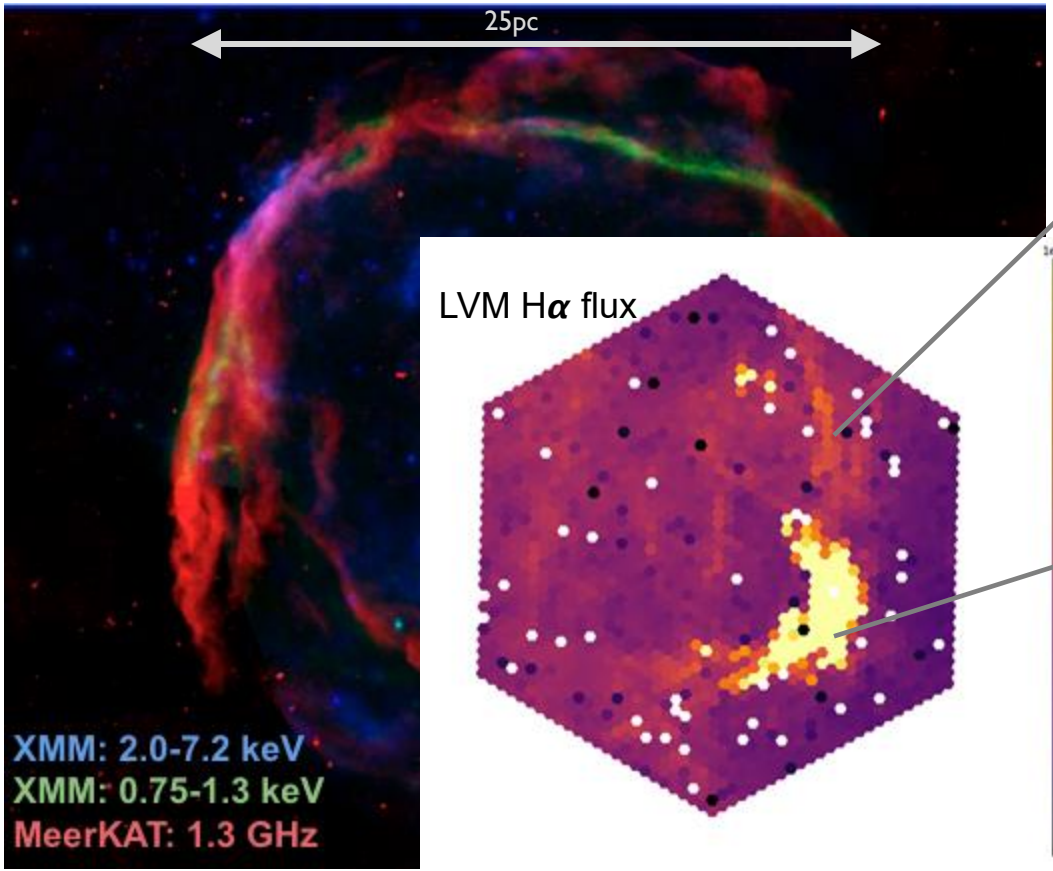
Sattler et al. in prep

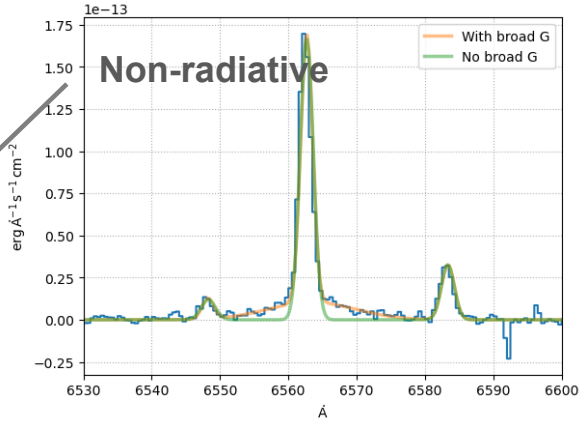
M42 - Orion Nebula – Direct Te & Abundances

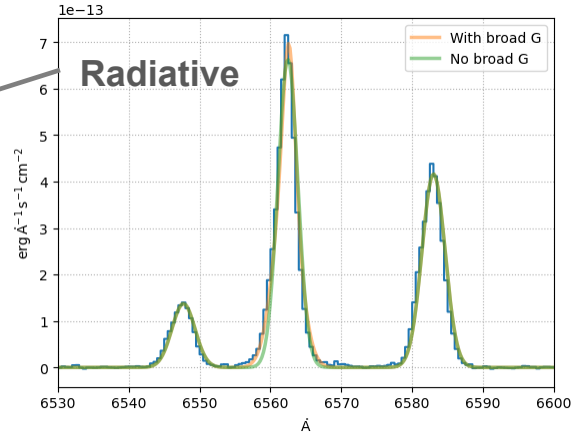


Mendez-Delgado et al. in prep

SNR – Balmer Dominated Shocks in RCW86





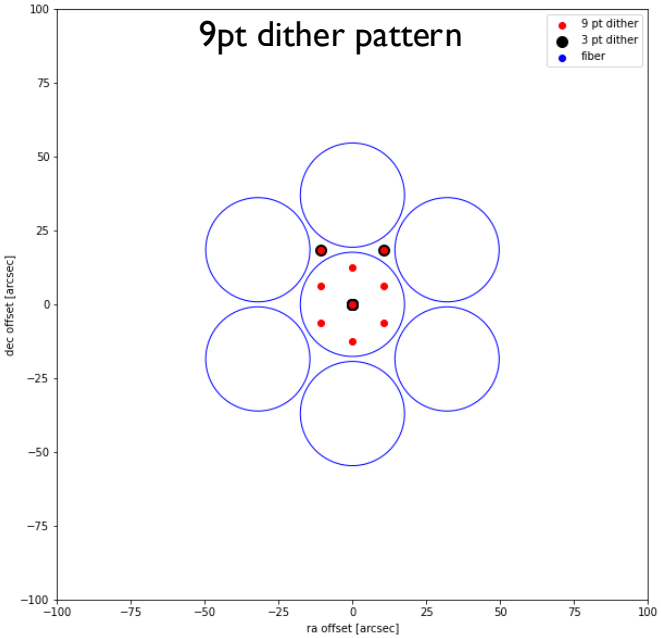


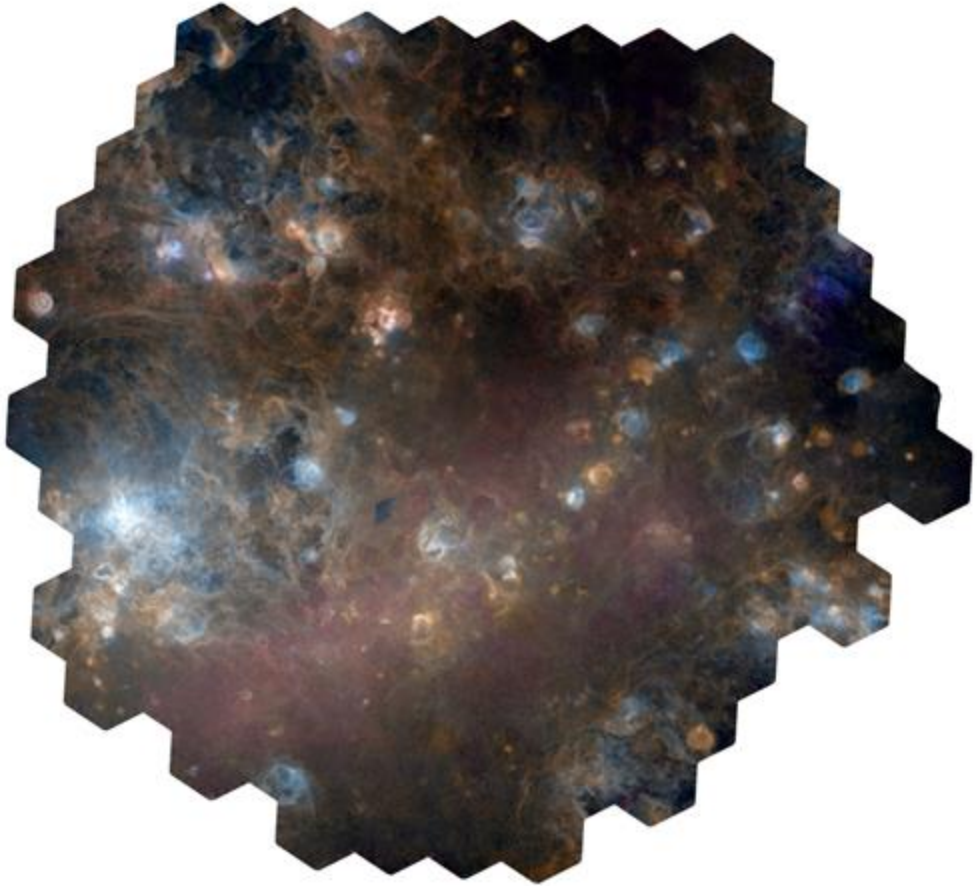
Constrains shock velocities in young SNR, along with age, density

Sarbadhicary et al. submitted (on arXiv)

LMC

- LMC @ 10 pc / spaxel
- 5 deg radius coverage (78 deg^2)
- 100% of the area out to R25
- 10^6 resolution elements

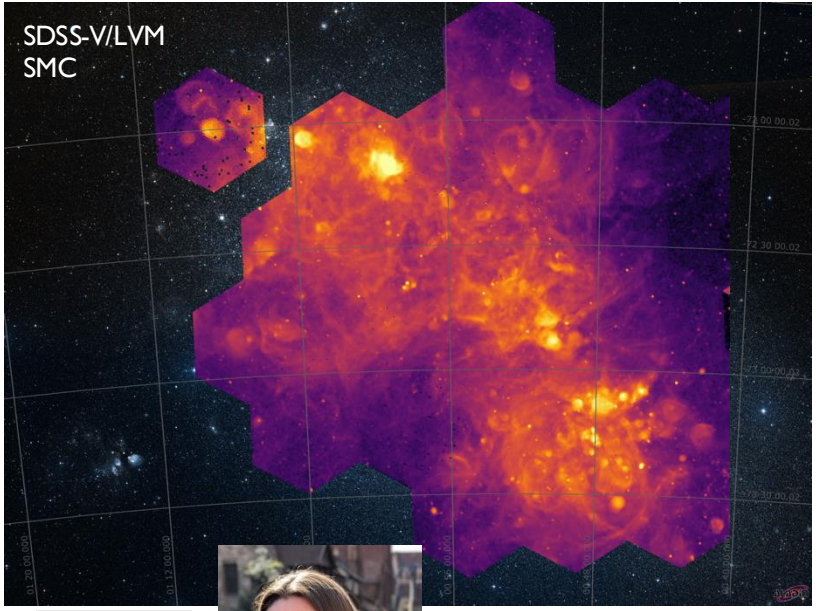




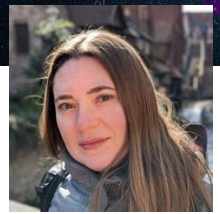
Ibarra et al. in prep

SMC - What's ionizing He II?

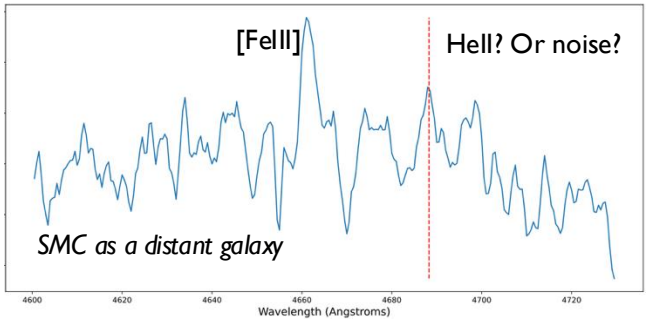
Hard Ionizing Sources at low Metallicity



DSS image



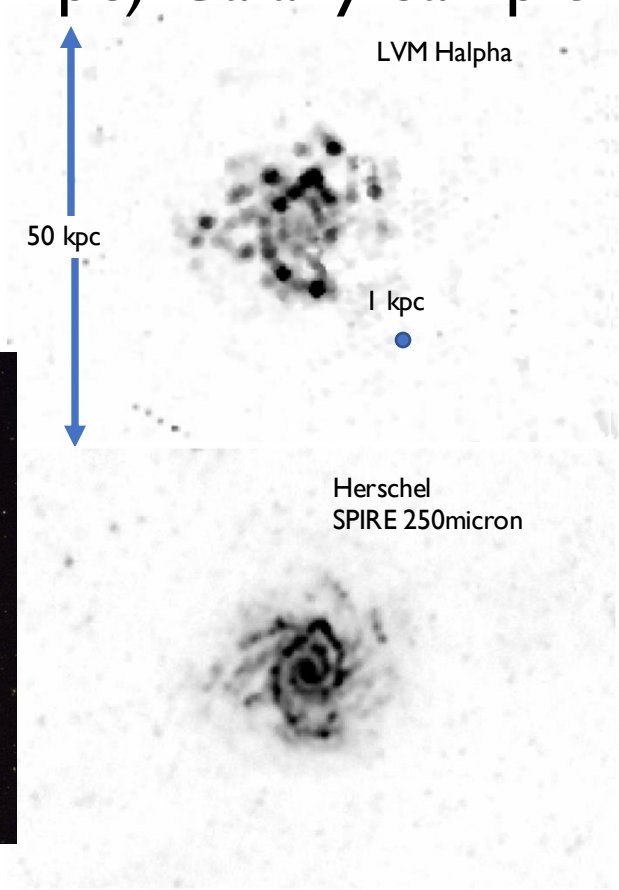
Egorova +in prep

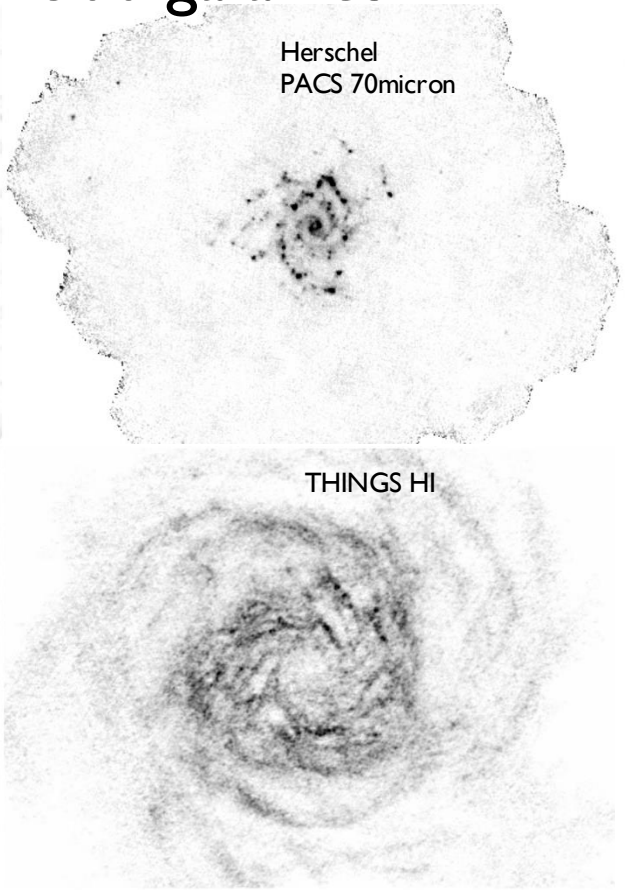


Nearby (<20 Mpc) Galaxy Sample ~500 galaxies

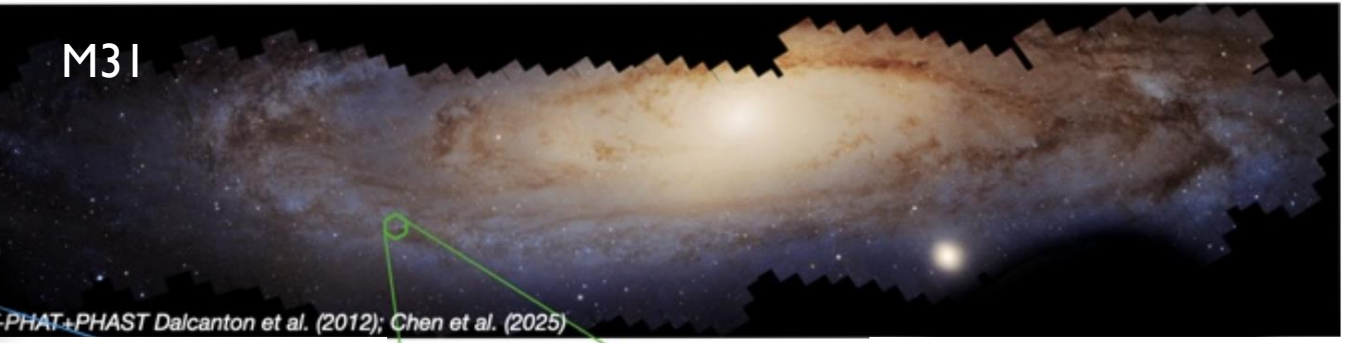
NGC 628

D = 10 Mpc
~kpc (MaNGA) resolution
Multi-wavelength views
at matched resolution





What comes next? After SDSS-5 (AS5)



New northern IFU on 2-3m telescope

<10pc on M31, M33
& Local Group dwarfs

Talk to Oleg Egorov to learn more!