

# STO2 [CII] Observations and the Structure of the Tr14 Region in Carina

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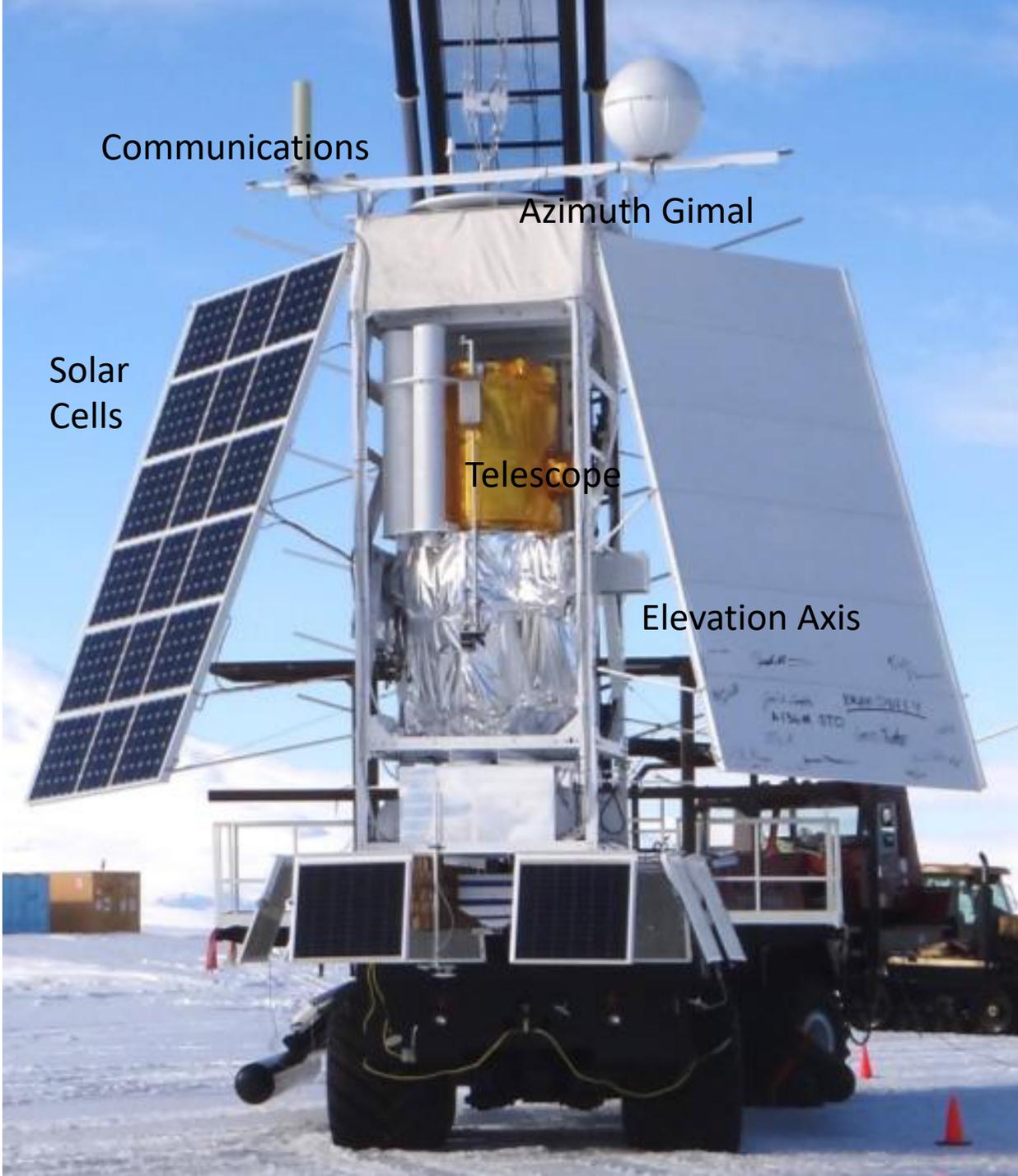
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Center for Astrophysics)

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And all of the individuals who contributed to STO2  
technical, support, and science



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## **STO2** - NASA APRA Balloon Mission

C. Walker (University of Arizona, PI)

Complete high-resolution spectroscopic observatory for astronomy

80cm telescope with star tracker

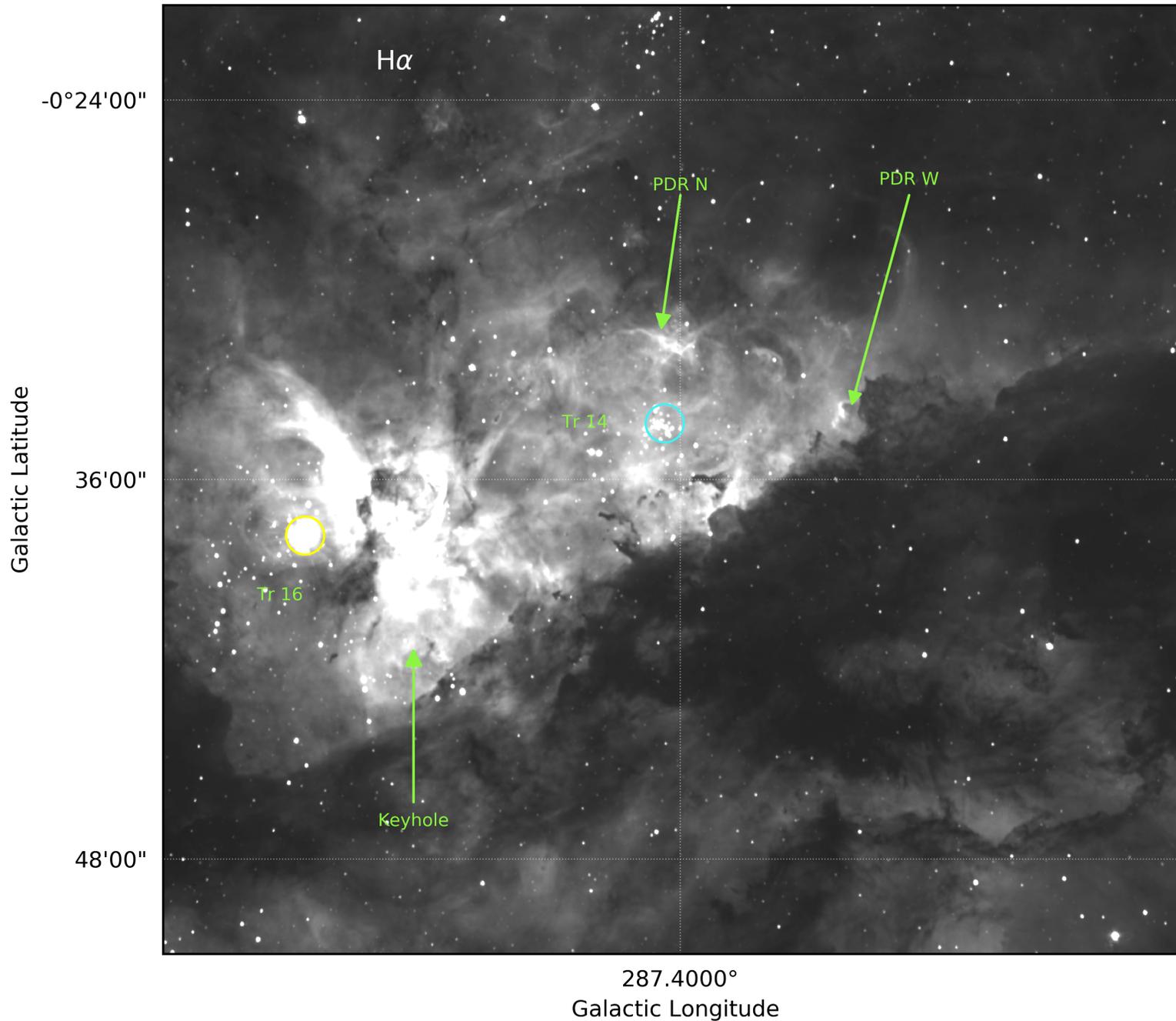
Heterodyne receivers for 1.4 THz ([NII]), 1.9 THz ([CII]), and 4.7 THz ([OI])

FFT digital spectrometers with 1024 channels each, providing 0.17 km/s resolution at [CII]

Angular resolution = 48" @ [CII] corresponding to 0.54 pc at distance of 2.3 kpc to the Carina Region

Launched 7 Dec. 2016; flew until 29 Dec. 2016

Terminated after LHe exhausted; payload recovered



## The Carina Nebula **COMPLEX**

is one of the most active star forming regions in the Milky Way  
 It includes two massive clusters, Tr14 and Tr16

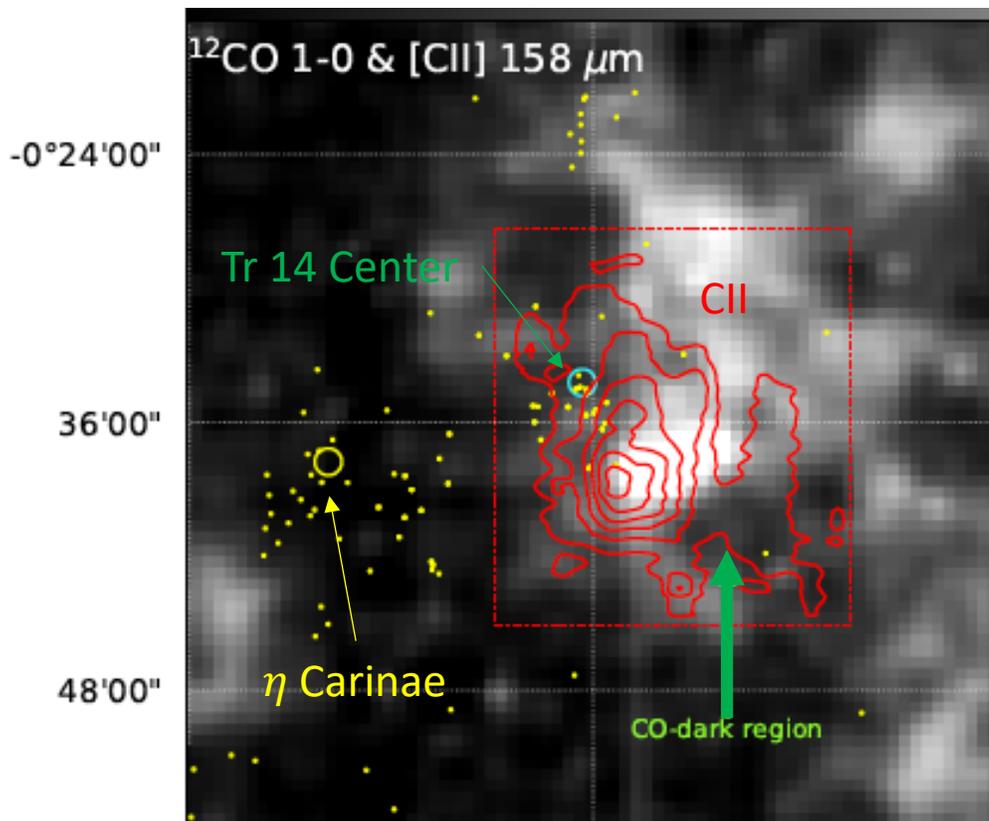
The latter includes the singular star  $\eta$  Carinae

Delimited by a Dark Lane with many foreground structures projected against the bright emission

Mapped in HI, CO,  $H\alpha$ , and other tracers;  
 stellar content extensively surveyed

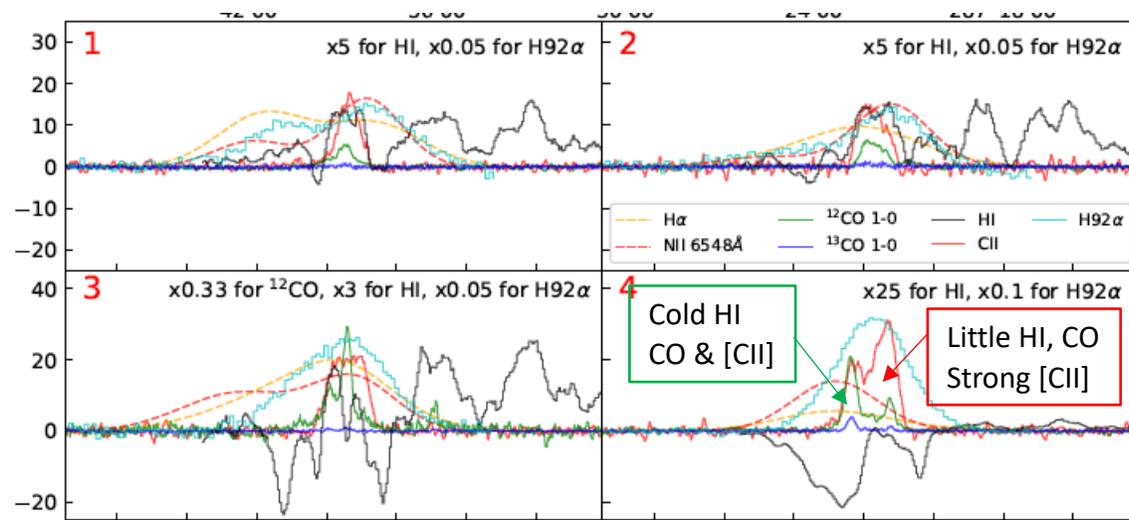
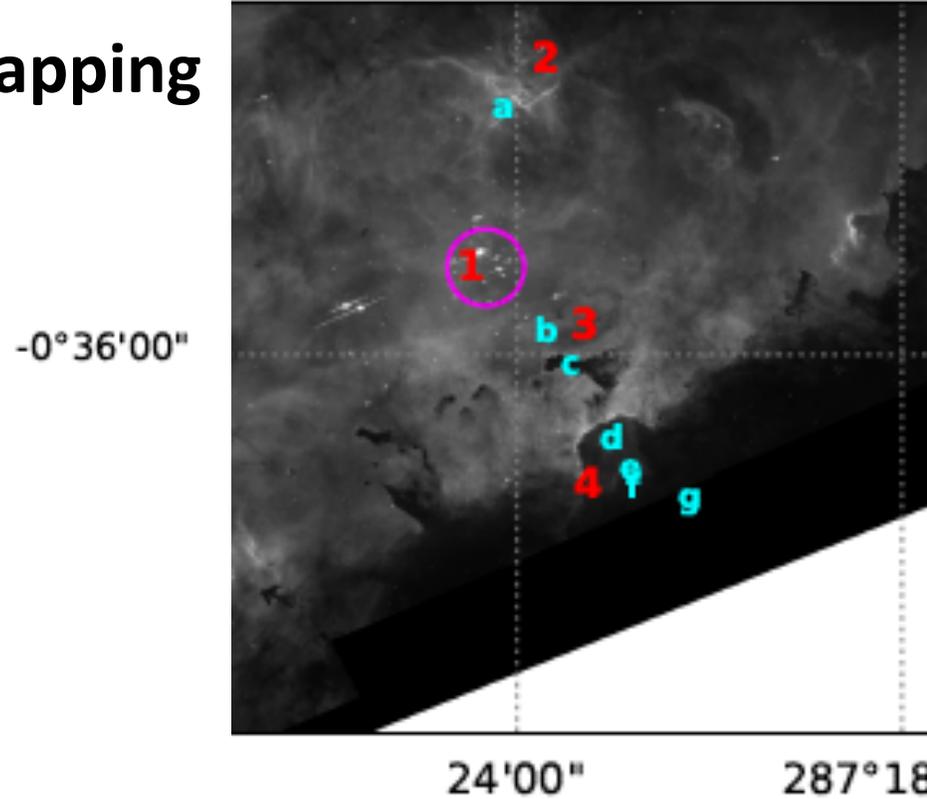
- **70** O-type and WR stars
- **400x** more luminous than Orion
- **20x** more massive than Orion
- Approaching 30 Dor in LMC in scale

# STO2 [CII] Spectrally-Resolved Mapping

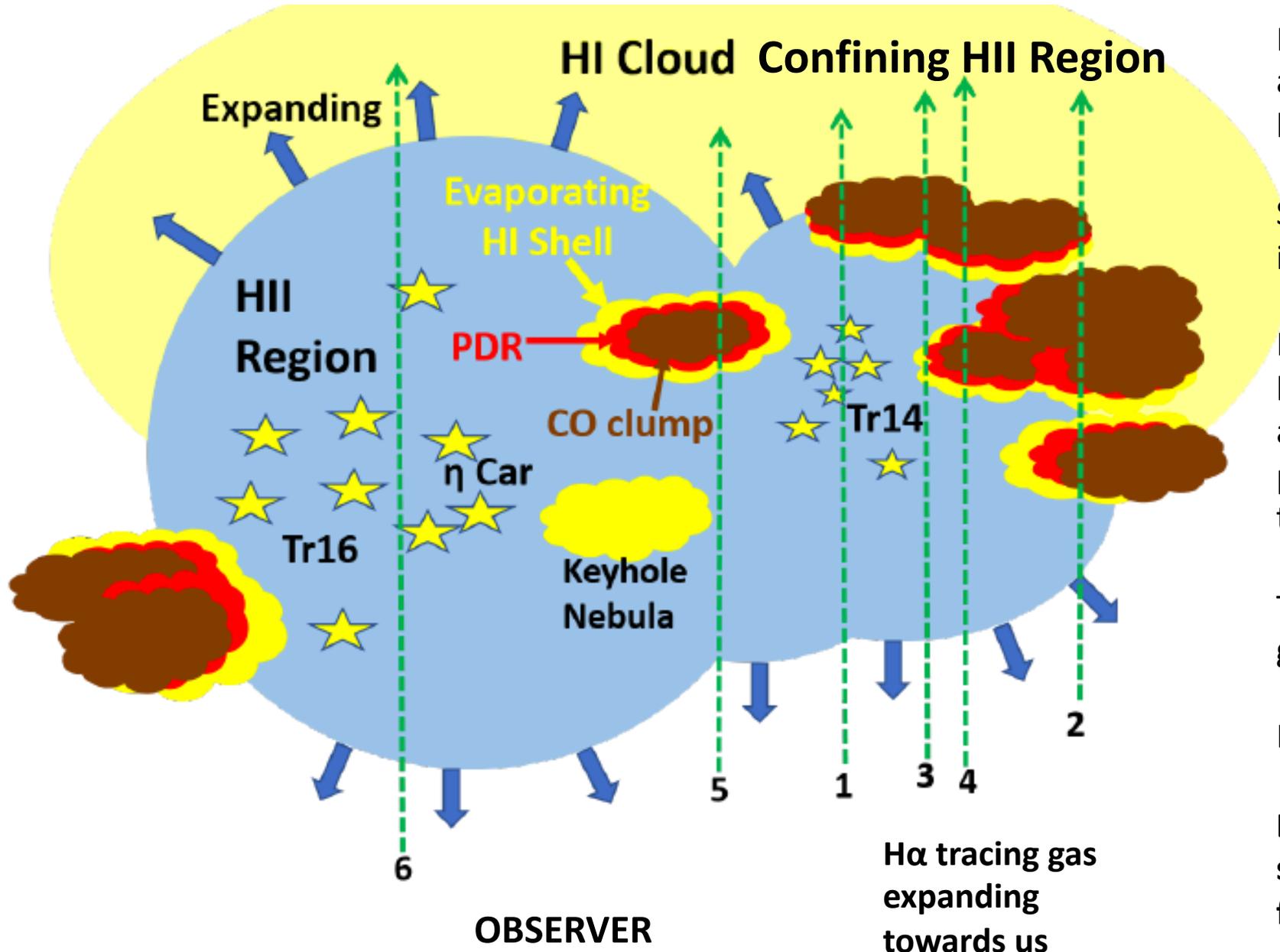


[CII] emission extended towards  $\eta$  Carinae and Tr14 relative to CO – as expected for PDR regions

A significant fraction of the [CII] emission comes from widely-distributed ionized gas



# A MODEL OF THE CARINA NEBULA COMPLEX



Individual CO “clumps” are accompanied by [CII] emission (PDR layers)

Some “CO-dark molecular gas” even in this very highly excited region

HI absorption red- and blue-shifted by 3 – 15 km/s with respect to CO and [CII] emission; HI is being photoevaporated or stripped from the condensations

Total of ~5000 solar masses of such gas in the region

HII Region expanding towards us

Energy input from massive young stars does control future of star formation in different ways