

# Radio recombination line map of the Carina Nebula

Shinji Horiuchi<sup>1</sup>, Doug Compton<sup>2</sup>, and Jimi Green<sup>3</sup>

1. CSIRO Astronomy and Space Science (CASS), Canberra Deep Space Communications Complex (CDSCC), 2. University of Sydney, 3. CSIRO Astronomy and Space Science (CASS), Australian Telescope National Facility (ATNF)

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The Carina Nebula is renowned for its proximity to a concentration of massive stars and is thus an ideal target for studying the physics of photodissociation regions (PDRs) and massive star forming regions (Smith & Brookes 2008). Conducting new observations with the Tidbinbilla 70m radio telescope, we present the emission maps of the H92 $\alpha$  radio recombination line (8309.37 MHz) in the Carina Nebula.

## Observations and Results

The observations were conducted with the Tidbinbilla 70-m telescope at the 8 GHz band and amounted to 30 hours in total spread across 12 days in December 2011 and January 2012. We used the ATNF correlator to process two polarisations with a 64-MHz bandwidth and 2048 channels each. We observed a 20 arcmin by 20 arcmin field, centred at RA 10:44:30, Dec -59:32:10 (J2000), that consists of many fields of a 5 by 5 grid of pointing, using the position-switch method with 1 minute integrations per point.

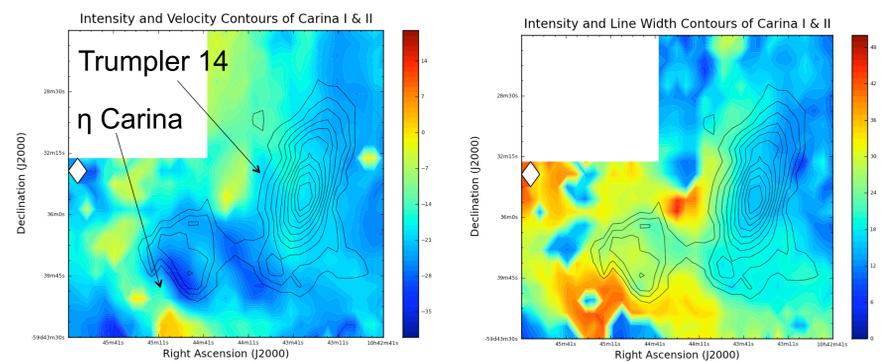


Figure 2: Emission maps of the H92 $\alpha$  radio recombination line. Intensity contours are 3 sigma and above. Colour scales are for (left) Velocity (km/s) and (right) line width (km/s)

## Peculiar features around η Carina in Carina II

To understand the nature of the double peaked profiles in Carina II, all the spectra in this region were fitted with two Gaussian components and mapped separately (Figure 4). It becomes evident that the red-shifted component centred at -15 km/s is broadly distributed forming an envelope directed from η Carina.

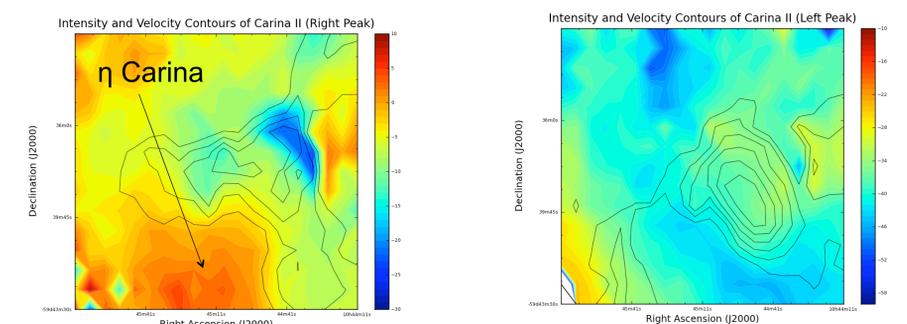


Figure 4: Emission maps of the H92 $\alpha$  recombination line in Carina II. Color scales are velocity (km/s) of (left) red-shifted component centred at -10 km/s components, (right) blue-shifted component centred at -35 km/s components.

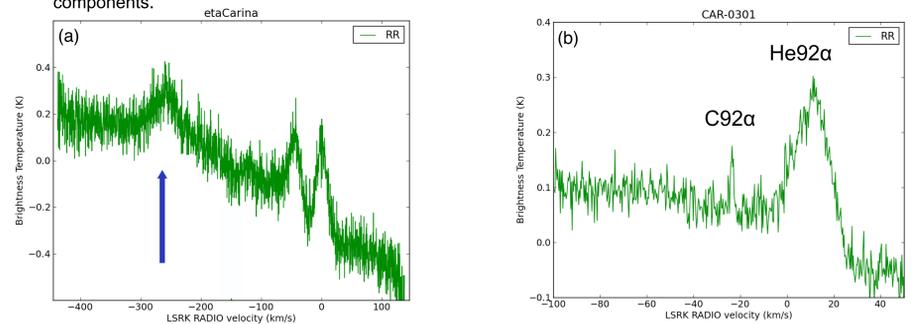


Figure 5: Deep integration emission spectra. (left) η Carina with velocity scale for H92 $\alpha$  line (8313.52 MHz) (b) Carina I for C92 $\alpha$  line (8313.52 MHz)

## Concluding remarks

We detected also high velocity H92 $\alpha$  emission at η Carina (-260 km/s) as well as C92 $\alpha$  line (-22 km/s) and He92 $\alpha$  line at Carina I (Figure 5). The presented results will facilitate future analysis of the region which should lead to a greater understanding in influence of η Carina and stellar clusters on the star forming activity in the molecular clouds.

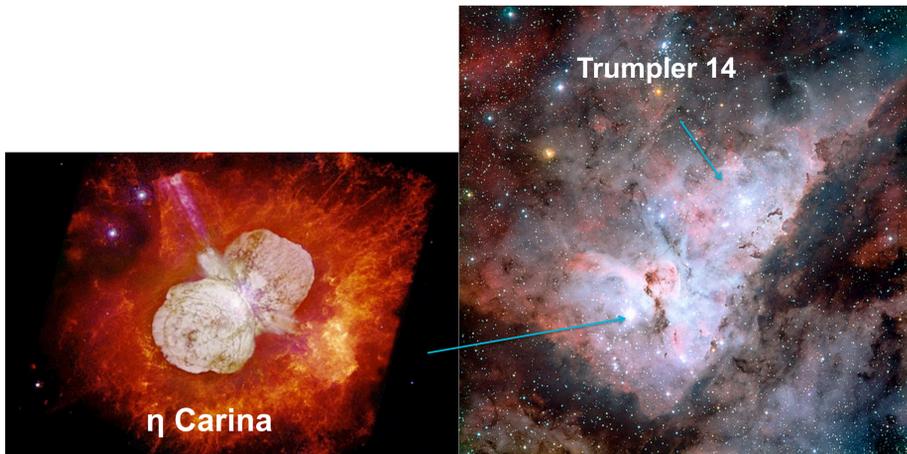


Figure 1: Optical view of the Carina Nebula. (right) HST image of the η Carina. (left) ESO image.

## Results

The emission region consists of two distinct parts, Carina I in west, near Trumpler 14, and Carina II in east, near η Carina. Typical spectra in a tile is presented for each of Carina II and Carina I in Figures 2 (left) and (right), respectively. We detected double profiles dominated in Carina II and single profile in Carina I. This is consistent with previous studies for H109 $\alpha$  and/or H90 $\alpha$  lines (Gardner et al. 1970, Huchtmeier and Day 1975, Brooks, Storey, Whiteoak 2001). The map of the entire mapping field is presented in Figure 3, with different colour scales, (left) for line velocity and (right) for line width, adopting a Gaussian fitting of each spectrum.

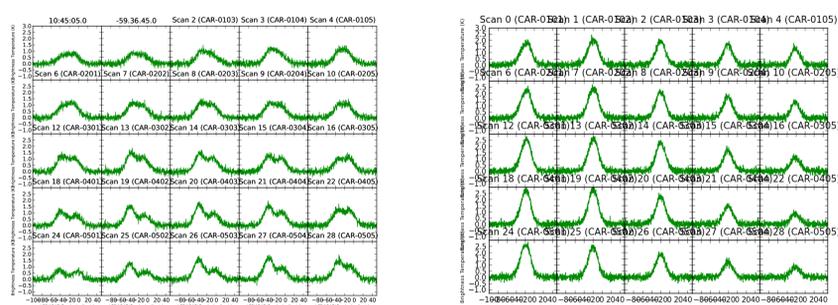


Figure 2: Example of spectra in a tile. (left) Carina II, the coordinate axis are centred at RA 10:45:05, and DEC -59:36:45 (J2000). (right) Carina I, the coordinate axis are centred at RA 10:43:20, and DEC -59:34:00 (J2000)

## FOR FURTHER INFORMATION

Shinji Horiuchi  
p: (02) 6201 7869  
e: shoriuchi@cdsc.nasa.gov  
w: <http://www.atnf.csiro.au/observers/tidbinbilla>

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