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Imaging radio recombination line emission from galactic star forming regions using GMRT

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Abstract. We have successfully mapped two star forming regions W3A and W48A in radio recombination lines (RRLs) of hydrogen (H172α) and carbon (C172α) in the 1.28 GHz band with an angular resolution of 10" using GMRT.

Keywords : Interstellar medium, Star forming Region, Radio Recombination Lines

1. Introduction, observations, data analysis and results

We have observed the star forming regions W3 and W48 in RRL using GMRT. Both the regions consist several components with different stages of evolution. W3 is located in the Perseus arm at l = 133.7, b = +1.2 where as W48 is located at l = 35, b = −1.8. In this paper, we report our results on W3A. The W3 observations were done in a single 12-hour observing run which included calibration and resulted in on-source time of 6 hours. A 2 MHz bandwidth with 512 channels was used giving a spectral resolution of 0.8 kms^{-1}. A bandpass calibrator was observed every 2 hours to ensure a stable bandpass required for these weak signals. To improve the signal to noise ratio of the line detections, we made a low resolution (10") cube by excluding the outer GMRT antennas. All the processing was done in NRAO AIPS. Figure 1 shows the RRL spectrum integrated over W3A. The H172α was fitted by two components; a narrow (8.3 kms^{-1}) and broad (27.6 kms^{-1}) and a strong narrow C172α (5.6 kms^{-1}) was detected likely arising from the associated cool gas. The spectrum is similar to the earlier results (e.g. Onello & Phillips, 1995, Kantharia et al. 1998). We estimate line-to-continuum ratios of 1.4 % for H172α (broad) , 3.7 % for H172α (narrow) and 4.6 % for C172α. Figure 2 shows that the line emission from W3A in the

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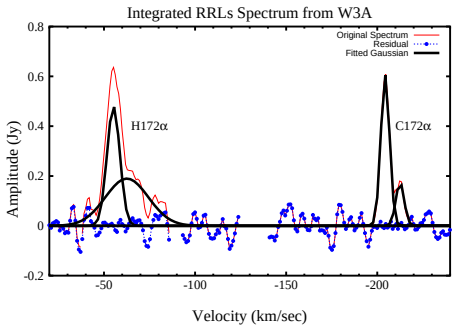

Figure 1. Integrated line spectrum of W3A. Notice that H172α consists of a broad and a narrow component.

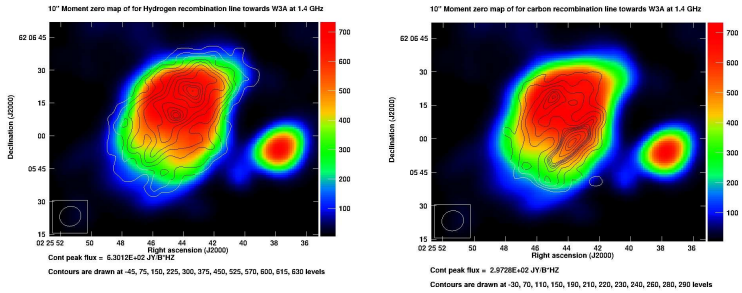

Figure 2. The distribution of H172α (left) and C172α (right) shown in contours superposed on the continuum image of W3A in colour at 10" resolution. Notice the distinct morphologies traced by the two lines.

H172α and C172α is distributed across the entire continuum source but with distinct detailed morphologies. While the peak H172α emission appears to arise close to the continuum peak, interestingly, the C172α peaks in the south-west of the source. Stimulated emission due to the continuum source is expected to play a major role in the line strengths and distribution. We plan to use this detailed distribution to model the line forming region in W3A. No RRL emission was detected from other HII regions in W3.

Acknowledgements

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References

Onello J.S., Phillips J.A., 1995, ApJ, 448, 727
Kantharia N. G., Goss W. M., Anantharamaih K. R., 1998, ApJ, 504, 374