THOR

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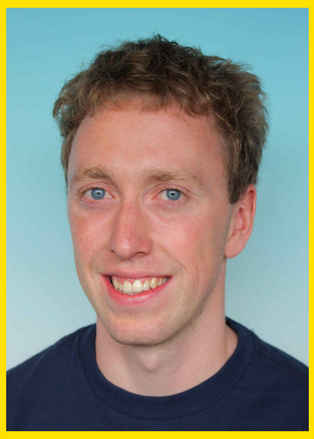

The HI, OH, Recombination Line Survey of the Milky Way

Abstract:
How do molecular clouds form from the diffuse atomic interstellar medium? To address this and further questions we are conducting the THOR survey, a galactic plane survey of the 21cm HI line, three OH lines, and 19 recombination lines as well as the continuum from 1 to 2 GHz at a spatial resolution of ~20''. We were granted 110 hours at the VLA in C-configuration and the observations are currently being carried out.

Pilot Study

To test the setup, we did a pilot study around the active star-forming region W43 in 2012. The data analysis is work in progress. We calculated the HI column density using the diffuse HI emission as well as HI absorption toward strong continuum sources. In addition, we compared our HI data with CO data to study cloud formation from the atomic to the molecular phase.

As shown in **Fig. 1**, the velocity structure of HI differs from that of CO. CO has narrow peaks ($\Delta v \sim 10$km s^{-1}), whereas HI is more diffuse and extended ($\Delta v > 20$km s^{-1}).

We find significantly higher column densities for W43 than for other regions such as Perseus (Lee at al. 2012). As shown in **Fig. 2**, our data agree well with the model of Krumholz et al. 2008,2009.

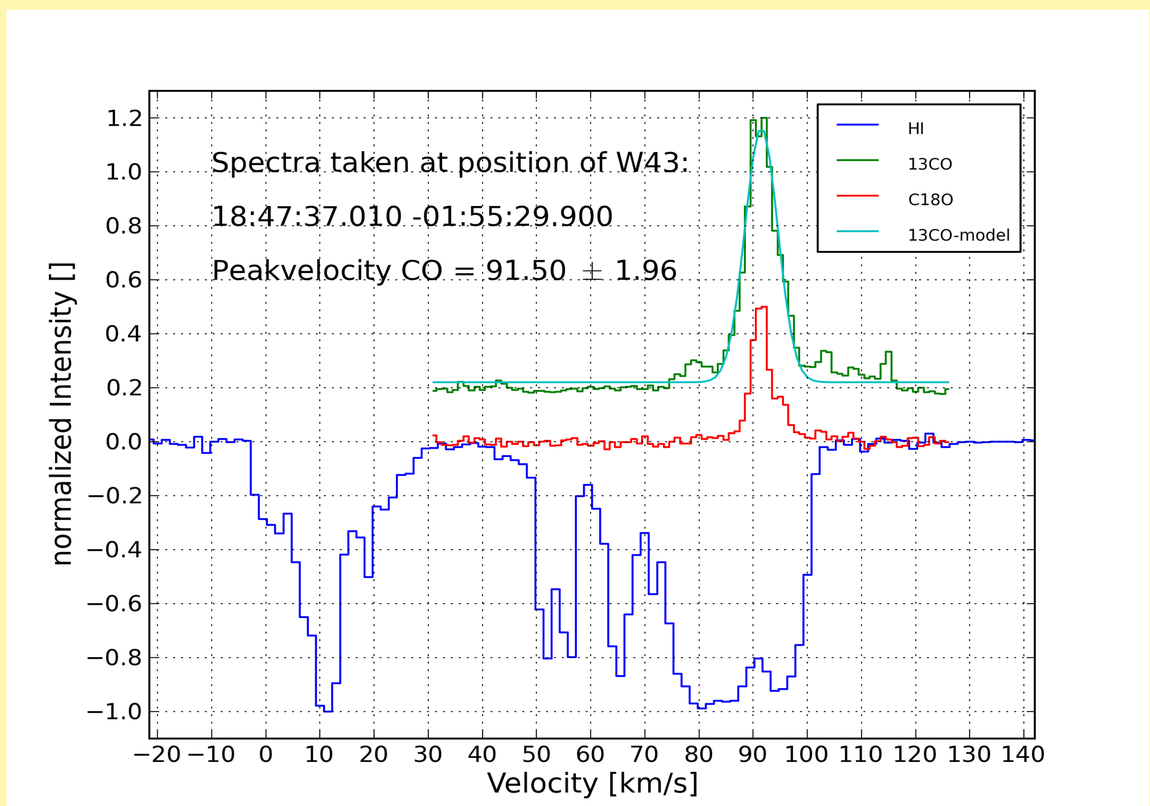

Fig.1: HI and CO spectra toward W43. Intensities are normalized to 1 (HI, ^{13}CO) or 0.5 ($C^{18}O$).

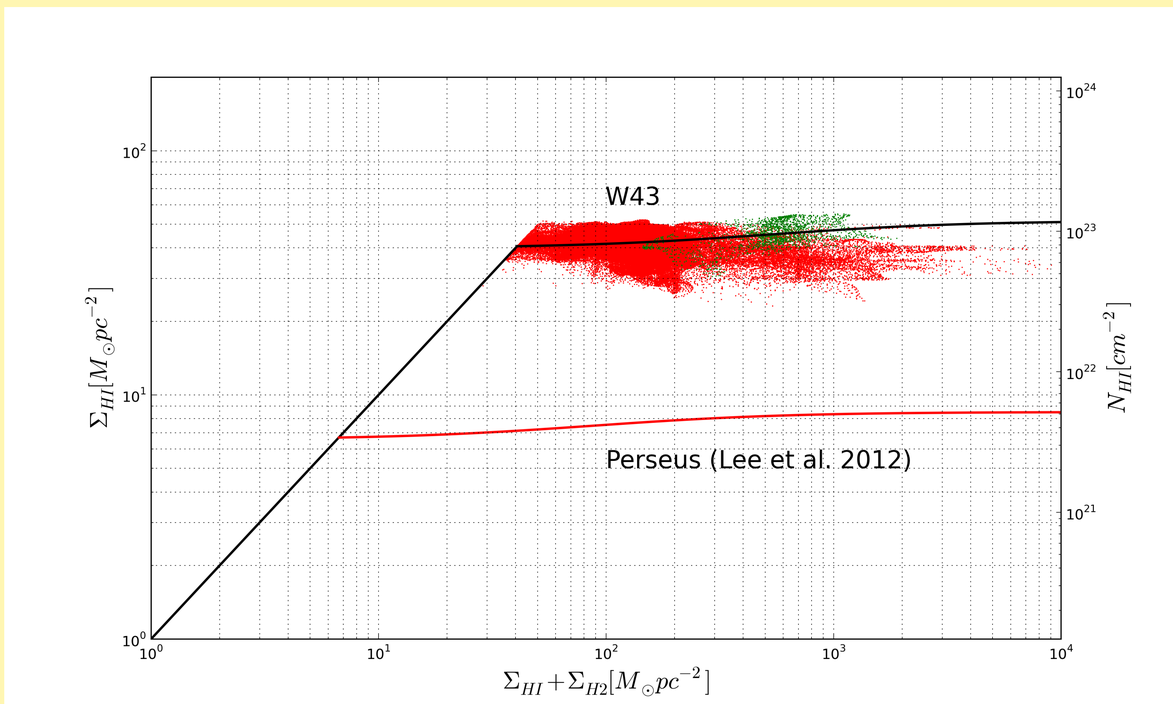

Fig.2: HI column density over HI+H_2 column density toward W43. Velocity range 80-110km s^{-1}. Red points show emission (T_{cont}<30K), green points show absorption (T_{cont}>300K) assuming a spin temperature of T_S=60K. Red line shows fit of Perseus (Lee at al. 2012). Black line shows fit of model by Krumholz et al. 2008, 2009)

Comparison of VGPS and THOR:

The existing HI survey (VGPS - VLA Galactic Plane Survey - Stil et al. 2006) has a resolution of 60''. This is not sufficient to compare with other existing surveys e.g. ATLASGAL (dust continuum @870µm). The comparison between VGPS (60'') and THOR (10'') is shown in **Fig.3**:

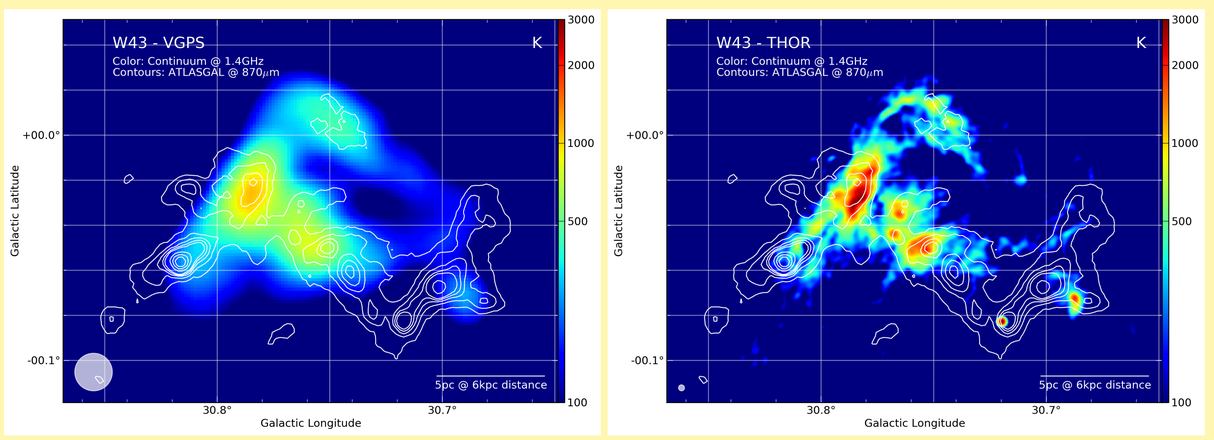

Fig.3: Comparison of VGPS and THOR (60'' and 10'' resolution)

THOR facts:

VLA large program (110h)	C-array
Resolution:	~10 - 20''
Coverage:	gal.long: 15-38° and 47-51°
	gal. lat: -1° to 1°
Velocity range:	-200 to 200 km s^{-1}
Lines: HI (21cm):	Δv=0.8km s^{-1}
3xOH:	Δv=1.4km s^{-1}
19xRecomb. lines	Δv=3-4km s^{-1}
Continuum:	1-2 GHz, full polarisation
Spacing:	15' - Nyquist sampling @ 1.7GHz
Raw data:	~2TB

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I will be around and look forward to discussing any questions with you!