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The Galactic ionized gas seen with THOR

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Abstract. We present the 21cm continuum emission observed with the THOR survey (The HI/OH/Recombination line survey of the Milky Way) covering the whole inner Milky Way from 14.5 to 67.4 deg in Galactic longitude and ±1.25 deg in Galactic latitude. These data provide a detailed view on the compact as well as extended radio emission of our inner Galaxy and thousands of extragalactic background sources. Investigating the distribution and spectral indices of the identified continuum sources with the THOR data allows us to characterize the physical properties of the sources.

1. Introduction

With the new WIDAR correlator, we covered the continuum between 1 and 2 GHz with eight sub-bands, with a bandwidth of 128 MHz each. The spectral windows around 1.2 and 1.6 GHz are not usable due to strong radio frequency interference (RFI) contamination. The remaining six continuum windows (centered at 1.06, 1.31, 1.44, 1.69, 1.82 and 1.95 GHz) were calibrated and imaged with CASA. For details of observations and data reduction, see Bihr et al. (2016) and Beuther et al. (2016). We used the BLOBCAT software (Hales et al. 2012) to extract sources (see Bihr et al. 2016). In total, 11189 sources were identified. After removing sidelobe sources and "possible artifacts" (signal-to-noise ratio < 7), we classified 7546 sources as reliable detections. We smoothed the images to a common resolution of 25″ and extract the peak flux density of each source in each spectral window to determine the spectral indices α (assuming $I(\nu) \propto \nu^{\alpha}$).

By crossmatching with the WISE HII region catalog (Anderson et al. 2014), we identified radio counterparts for 588 HII regions in our continuum map. Furthermore, the THOR combined VGPS (Stil et al. 2006) 1.4 GHz continuum dataset (shown in Fig. 1) allows us to resolve the small-scale structure with the THOR resolution (25″) and recover the large-scale structure at the same time. By comparing the combined dataset with mid-infrared (MIR) data from GLIMPSE, MIPSGAL and WISE surveys, we locate 76 new Galactic SNRs, and measure the radio flux density for 52 known SNRs (Anderson et al. 2017).

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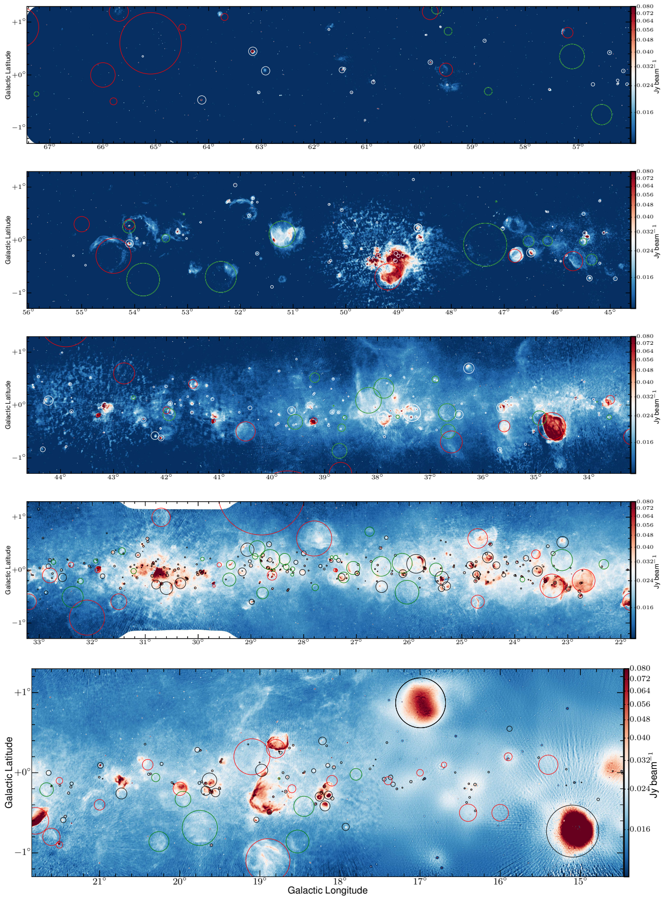

Fig. 1. The THOR and VGPS combined 1.4 GHz continuum image (Wang et al. in prep). The white/black circles are the Galactic HII regions from the WISE catalog (Anderson et al. 2014). The red circles are the previous known Galactic SNRs (Green, 2014). The green circles are the new SNR candidates (Anderson et al. 2017)

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