LOFAR-discovered Supernova remnants

Statistical studies of supernova rates suggest that there should be considerably more galactic Supernova remnants ($\geq 1000$; Li et al. 1991) than we currently know of (294; Green 2014). We hypothesize that this disagreement is due to a selection effect of the surveys, which discriminate against those remnants whose emission lies at the low frequency radio end of the spectrum.

One defining property of SNR is that they are powerful emitters of synchrotron radiation, making them visible at radio frequencies and yielding a characteristic spectral index of $\alpha < 0$. In this study, we search for shell-like structures in low-frequency radio data from the Low Frequency Array (LOFAR) 110 MHz and VLA Galactic Plane Survey (VGPS)1.4 GHz surveys. The study has been constrained to a region of the sky ranging approximately between $38 < l < 48$, $-7 < b < 3$. Measuring the flux of the candidate SNR at two different frequencies allowed us to derive a spectral index ($\alpha$) for their emission, which for a SNR typically ranges $0 > \alpha > -1$. In order to distinguish the non-thermal emission of potential SNR candidates from that of HII regions or stellar wind-blown bubbles, we compute IR/radio ratios from MIPSGAL 24$\mu$, GLIMPSE 8$\mu$, and MSX IR 8$\mu$ data.

This study reports 7 new SNR candidates and contributes new information to the study of four other candidates suggested by Green 2014. This means multiplying by two the number of SNRs known in this region, supporting the claim that low-frequency surveys could close the gap between the number of predicted and currently known Supernova remnants.

Subject headings: supernova remnants - radio sources - synchrotron radiation - radio surveys - HII regions