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THE SMALL CIRCLES OF THE ORIGEM AND THE MONOCEROS LOOPS AT 1420 MHz

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Abstract. The parameters of the best fit circles of the Origem and Monoceros loops were calculated from the 1420 MHz data.

1. INTRODUCTION

At the time of the discovery of the Origem loop (Berkhuijsen, 1973), on the border of Orion and Gemini, four major radio loops were known (e. g. Salter, 1970; Berkhuijsen et al., 1971). The Monoceros filamentary loop nebula although already studied at optical (Morgan et al., 1965) and radio waves; at 237 MHz (Davies, 1963) and at 470 and 635 MHz (Milne and Hill, 1969), was not treated as an object similar to major loops untill the work of Spoelstra (1973). He modeled galactic loops as supernova remnants (SNR) in the local galactic magnetic fields. These two loops were assumed to be about 1 kpc away. Berkhuijsen (1973) included the Origem loop in her first $\Sigma - D$ relationship for loops. They were not considered by Berkhuijsen (1986) in the new $\Sigma - D$ study of SNR at *known* distances. Nevertheless, her study of observational aspects of the Origem loop (Berkhuijsen, 1974) suggests that it is a SNR. The Monoceros loop was suspected already by Davies (1963) to be a SNR, while Gebel and Shore (1972) extended this idea to a more elaborate study. In order to understand these features, more measurements are needed, particularly those which would provide better distances. We assumed that a calculation of the best fit small circles to these features on the high resolution 1420 MHz survey (Reich and Reich, 1986) could be useful. Later derivation of surface brightnesses Σ would allow to find D and thus distances.

2. ANALYSIS AND RESULTS

Points were read along the ridges of the Origem loop (22 of them) and the Monoceros loop (24), as seen on the 1420 MHz map (Reich and Reich, 1986), at a spacing interval of $18'.75$. As it was expected, nonthermal loops were less distinct than thermal sources at higher frequency. The Monoceros ridges were less clear than the Origem ridges. In both regions several point sources and Sharpless HII regions are superposed. Parts containing these sources were not included in sampling.

The programme for computing coordinates and radius of the best fit small circle was originally written by C. J. Salter (1970) and given to us. We adapted it to a PC computer and introduced some changes; a subprogramme for calculation of standard deviations and errors by the χ^2 method and reorganized it so that it could be used for small size circles. The criterion applied for the computation of errors was 2σ.

The results of the computation are given in the Table I and the Figure 1.

TABLE I
The best fit circles parameters.

Object	$l_{centre}(^\circ)$	$b_{centre}(^\circ)$	Radius ($^\circ$)
Origem loop	194.5 ± 0.10	$+0.6 \pm 0.15$	2.2 ± 0.25
Monoceros loop	206.4 ± 0.15	0.0 ± 0.15	2.1 ± 0.25

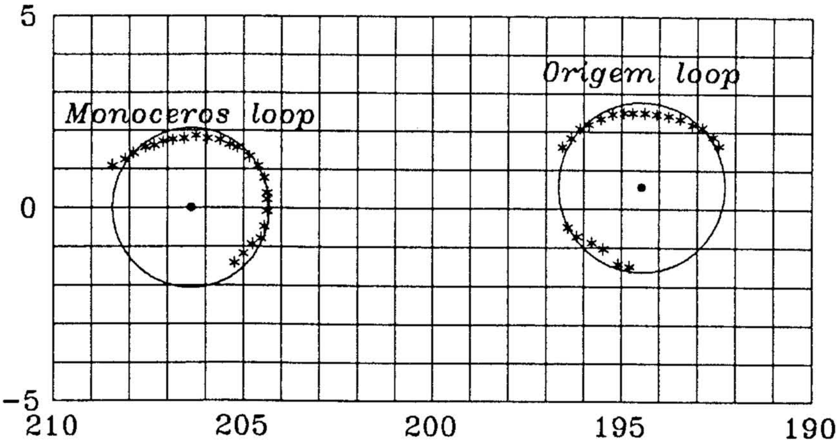

Fig. 1. The small circles of the Origem and Monoceros radio loops in galactic coordinates at 1420 MHz. The sampled points are labeled by asterisks, while the centers are dots.

Agreement with previously determined parameters (Berkhuijsen, 1974 and Spoelsta, 1973) is very good for the Origem loop. The Monoceros loop at 1420 MHz has badly defined part at higher longitudes, leading to a poorer longitude of the centre.

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