

A BISYMMETRIC SPIRAL MAGNETIC FIELD IN THE MILKY WAY

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The distribution of Faraday rotation measure (RM) of extragalactic radio sources shows that a large-scale magnetic field in the Galaxy is oriented along the spiral arms. The field lines change direction from one arm to the next in the inter-arm region.

Figure 1 shows the distribution of RM for extragalactic radio sources using data by Tabara and Inoue (1981). Fig. 2a shows a smoothed RM distribution obtained by convolving the RM in Fig. 1 by a Gaussian beam of HPBW = 20° . Fig. 3 shows the RM variation along the galactic plane. The wavy RM variation suggests a reversal of the magnetic-field direction from one arm to the next as shown in Fig. 4. A model calculation of the RM distribution on the sky (Fig. 2b) based on a bisymmetric field configuration as shown in Fig. 5 reproduces well the characteristic features in Fig. 2a and the wavy variation along the galactic plane (Fig. 3) insofar as the RM at $|b| < 30^\circ$ is concerned. A full description is given in Sofue and Fujimoto (1983).

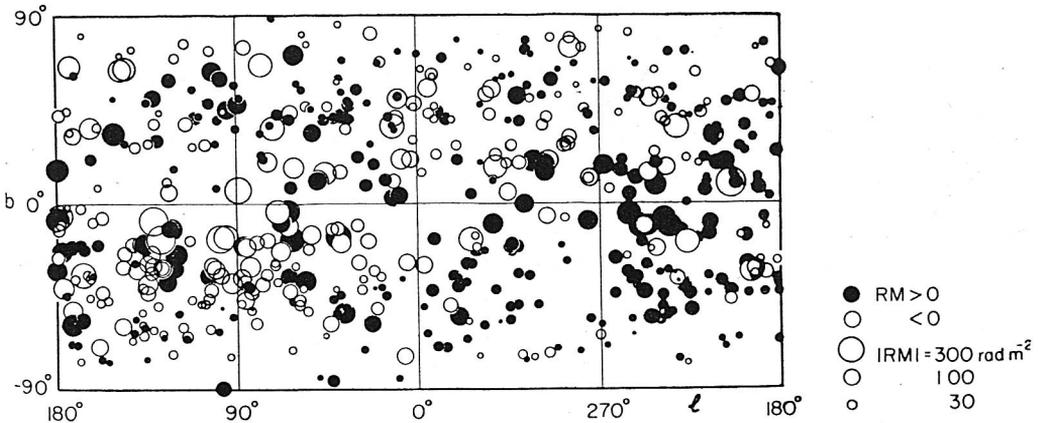


Figure 1. RM distribution on the sky. Positive RM (filled circle) shows field line toward the observer.

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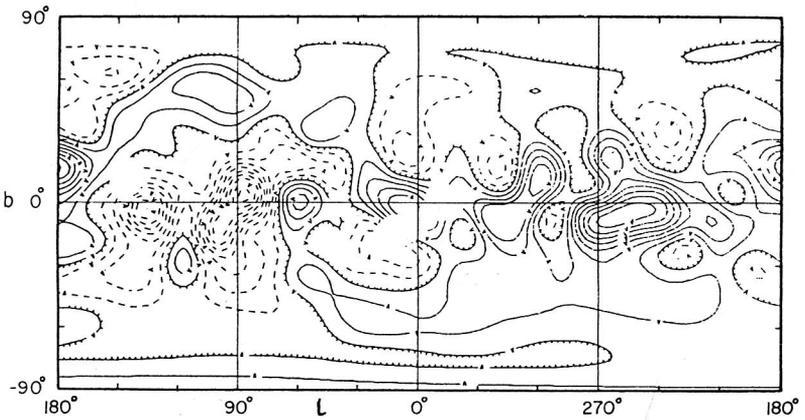


Fig. 2a: Observed RM distribution smoothed to $HPBW=20^\circ$. Negative RM shown by dashed lines, positive by full lines. The contour interval is 20 rad m^{-2} .

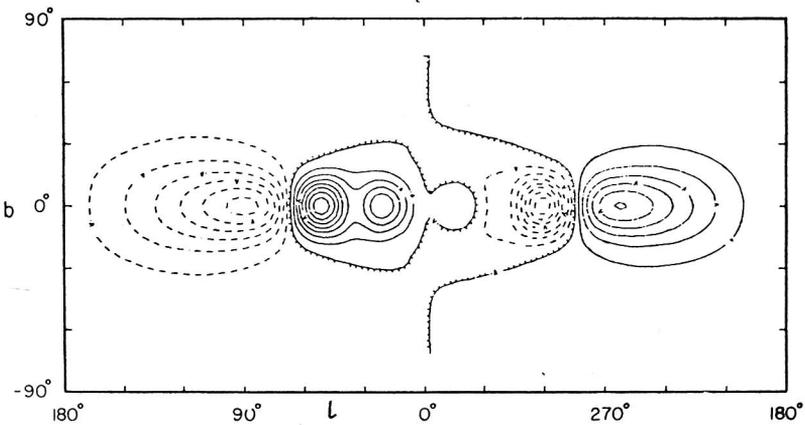


Fig. 2b: Calculated RM distribution smoothed to $HPBW=20^\circ$, based on the field configuration in Fig. 5. Characteristic RM distribution at $|b| < 30^\circ$ in Fig. 2a is well reproduced.

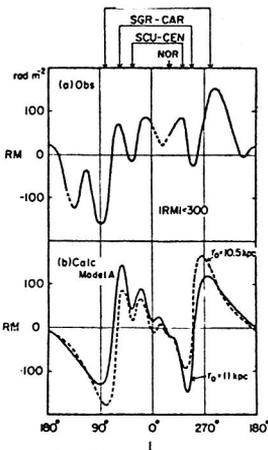


Figure 3.

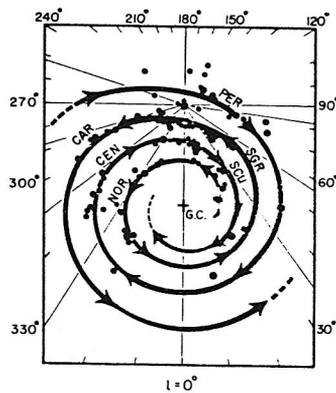


Figure 4.

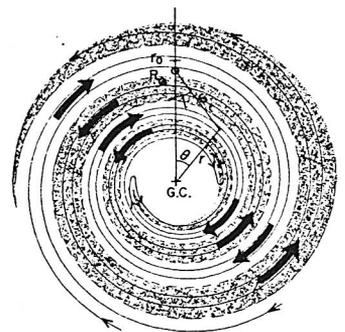


Figure 5.

Sofue, Y., and Fujimoto, M.: 1983, *Astrophys. J.* **265**, 722

Tabara, H., and Inoue, M.: 1981, *Publ. Astron. Soc. Japan* **33**, 603