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A SOUTHERN ATLAS OF GALACTIC HYDROGEN (The Region $0° \leqslant \ell \leqslant 12°$, $-3° \geqslant b \geqslant -17°$)

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RESUMEN

Se presentan datos observacionales en la línea de 21-cm del hidrógeno neutro obtenidos con el radiotelescopio de 30-m del IAR. Las observaciones cubren la región $0° \leqslant \ell \leqslant 12°$, $-3° \geqslant b \geqslant -17°$ en intervalos del 1° tanto en ℓ como en b. El intervalo de velocidades radiales se extiende desde -100 km s^{-1} hasta + 100 km s^{-1} con una resolución cinemática de 2 km s^{-1}.

ABSTRACT

We present observational data in the 21-m line of neutral hydrogen, which have been obtained with the 30-m dish of the IAR. The observations cover $0° \leqslant \ell \leqslant 12°$, $-3° \geqslant b \geqslant -17°$ at intervals of 1° in both ℓ and b. The radial velocity interval extends from -100 to + 100 km s^{-1} with a kinematical resolution of 2 km s^{-1}.

Key words: GALAXY-STRUCTURE – RADIO LINES-21-cm

I. INTRODUCTION

We present here the results of observations in the 21-cm line covering the region $0° \leqslant \ell \leqslant 12°$, $-3° \geqslant b \geqslant -17°$, with spacings of 1° in ℓ and in b, The range in radial velocities V_r covers the interval -100 to $+100$ km s^{-1}. The data constitute part II of a southern atlas of HI-observations (Pöppel *et al.* 1979). Part I covers the region $240° \leqslant \ell \leqslant 372°$, $+3° \leqslant b \leqslant +17°$ and has been published by Pöppel and Vieira (1974, 1985). Finally, part III, which covers the regions $320° \leqslant \ell \leqslant 345°$, $+18° \leqslant b \leqslant +25°$, and $346° \leqslant \ell \leqslant 350°$, $+18° \leqslant b \leqslant +20°$, has been published by Olano, Pöppel and Vieira (1981). The whole atlas has been revised and is available on magnetic tape. In this manner we have finished the publication of an extensive set of data obtained at the Instituto Argentino de Radioastronomía (IAR), which has been used for several studies of the local interstellar gas related to Gould's belt (Franco and Pöppel 1978; Strauss, Pöppel, and Vieira 1979; Olano and Pöppel 1981*a,b*; Olano 1982, 1985; Cappa de Nicolau and Pöppel 1986). We refer to these papers for further details.

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II. OBSERVATIONS AND REDUCTION PROCEDURES

The authors made the observations from December 1974 to February 1975, as well as from September 1975 to December 1975.

Each point on the sky was observed at least twice, at different dates. In those cases where the agreement between them was not good enough, additional observations were carried out (August and September 1976). Results were finally averaged.

All the observations were made with the 30-m radiotelescope at Parque Pereyra Iraola, originally provided by the Carnegie Institution of Washington, constructed in Argentina by members of both Institutions and operated by the personnel of the IAR. References to the antenna and to the receiver characteristics have been given by Pöppel and Vieira (1985). The total system temperature for all the observations was about 200 K, and this system temperature gave an rms channel-to-channel noise of about 0.5 K for a 2 X 90 sec integration time. To this we must add ~ 0.5 K due to base-line indeterminacy and $\sim 3\%$ of T due to gain uncertainties. The accuracy in the radial velocities is better than 1.0 km s^{-1}. They were reduced to the LSR. The observation and reduction procedures are the same as those described by Pöppel and Vieira (1985).

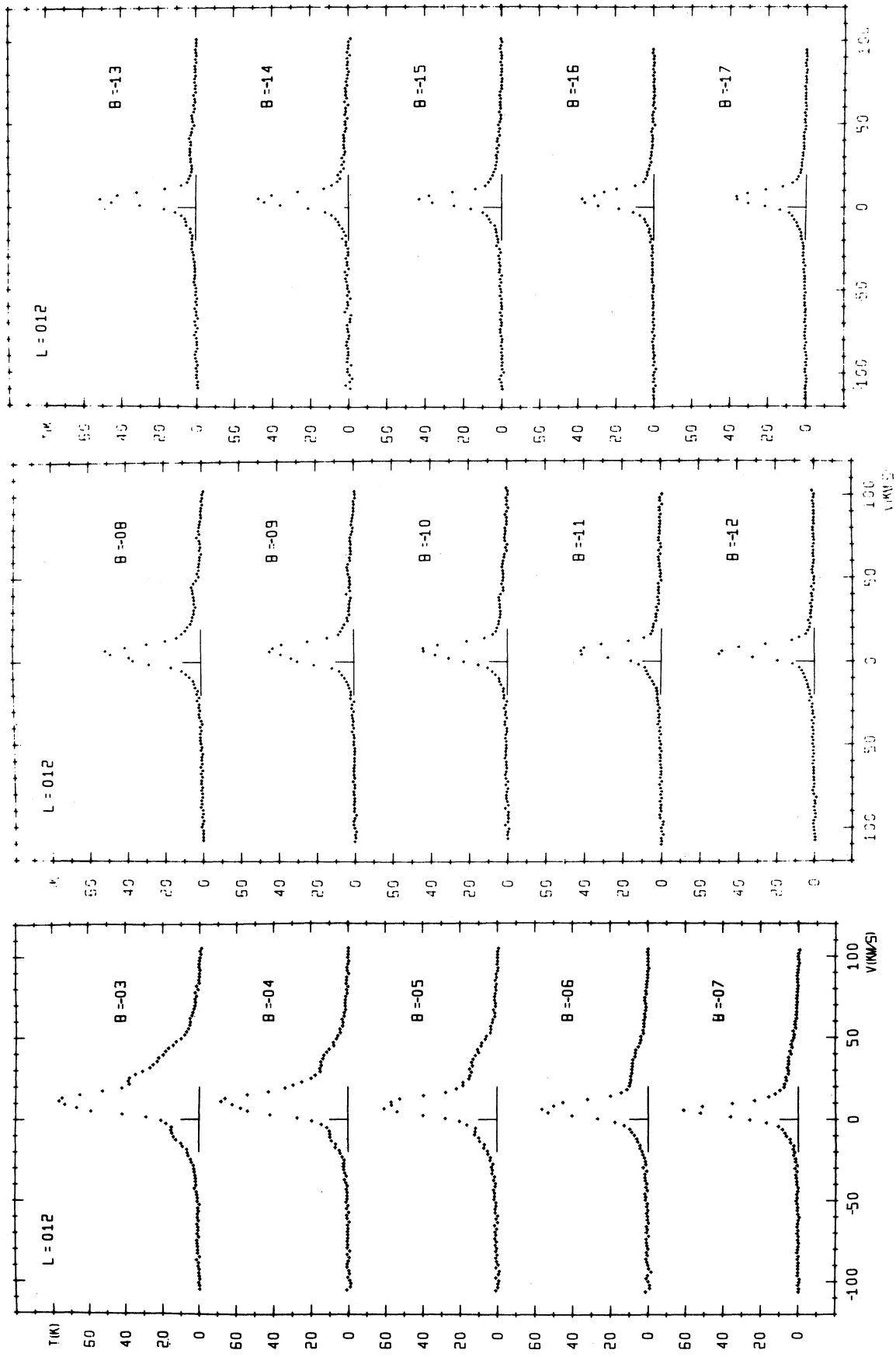


Fig. 1. Observed profiles for l = 12°

Fig. 2. Observed profiles for l = 12°

Fig. 3. Observed profiles for l = 12°

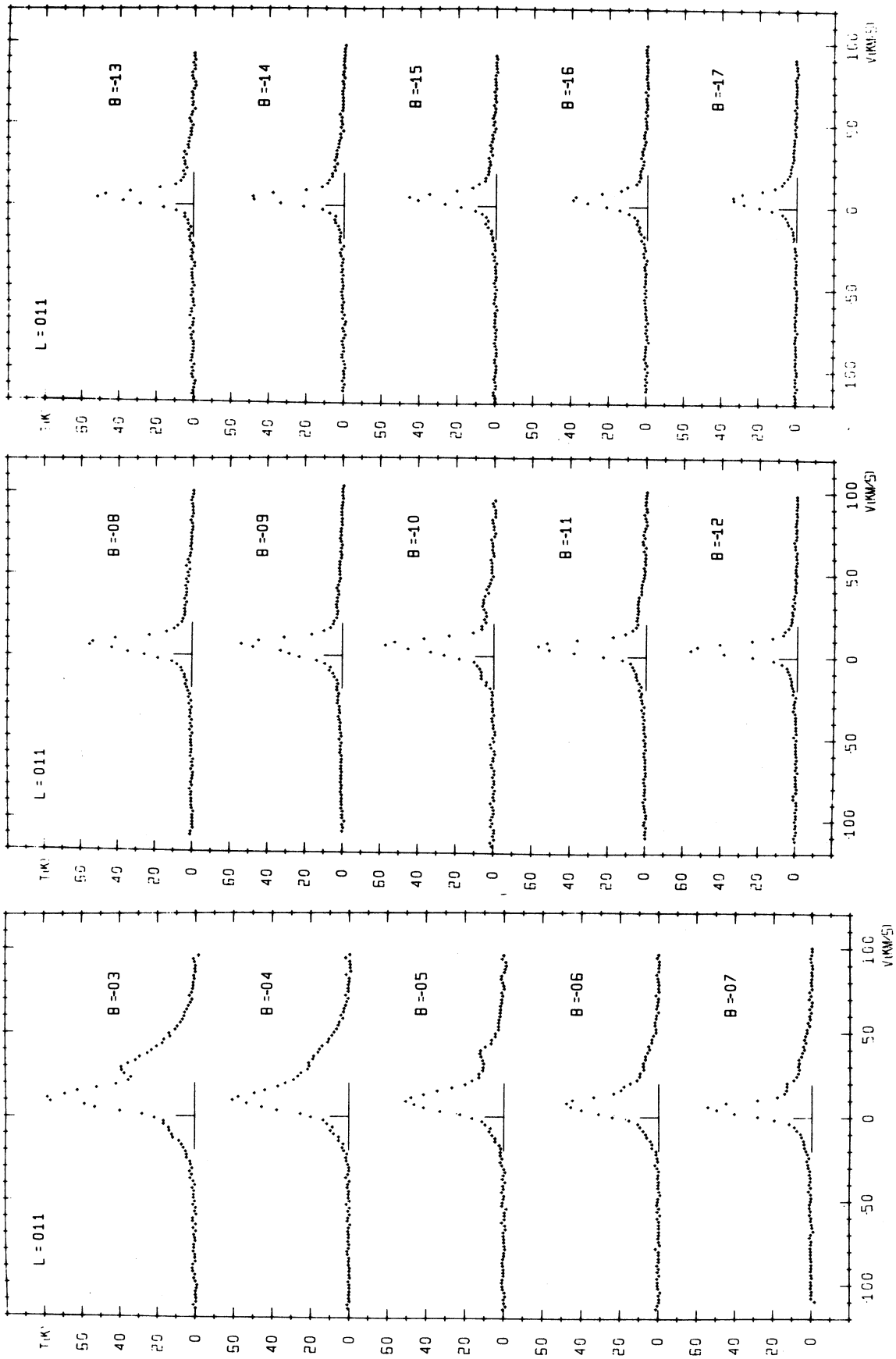


Fig. 4. Observed profiles for l = 11°

Fig. 5. Observed profiles for l = 11°

Fig. 6. Observed profiles for l = 11°

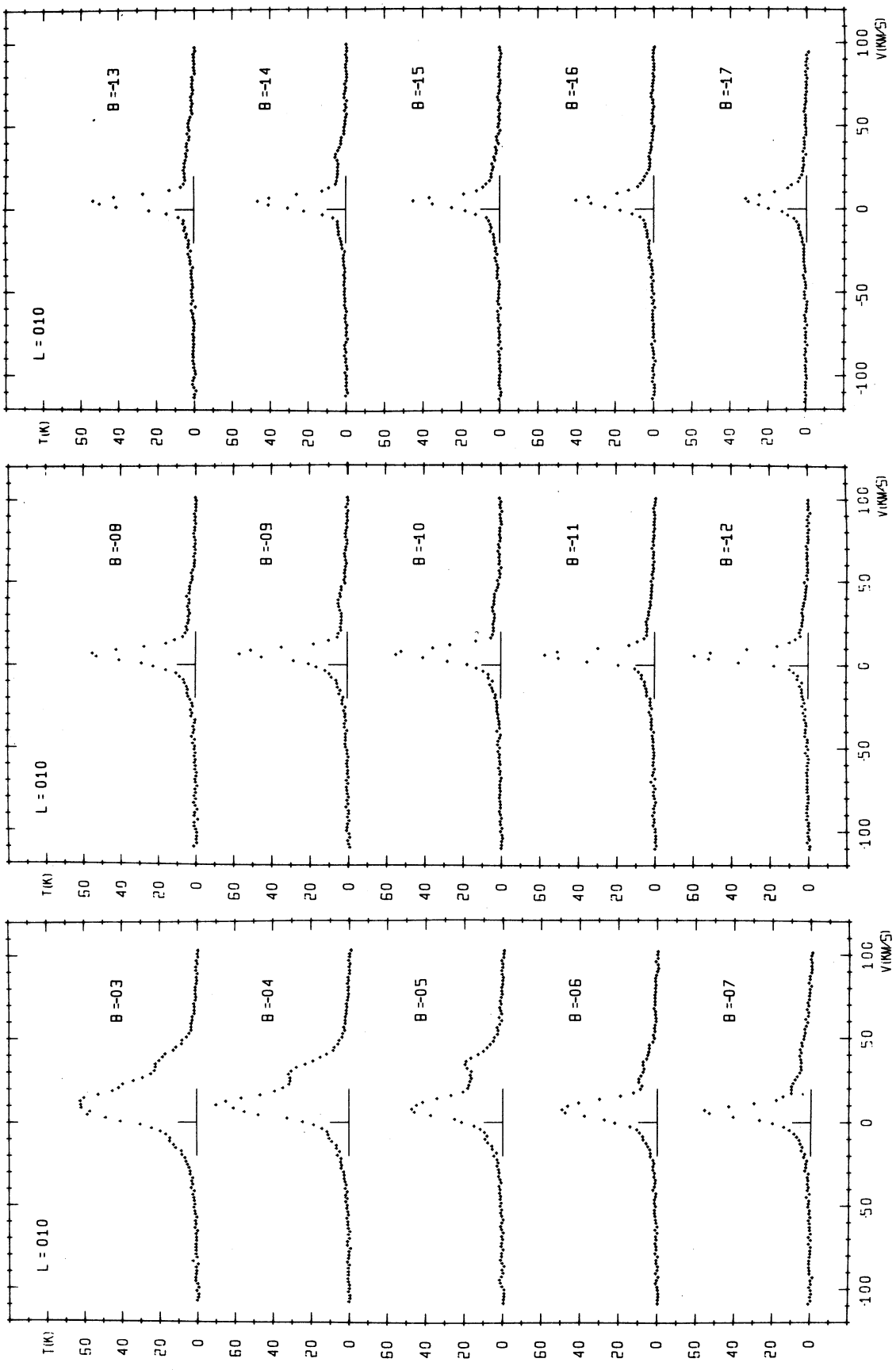


Fig. 7. Observed profiles for l = 10°

Fig. 8. Observed profiles for l = 10°

Fig. 9. Observed profiles for l = 10°

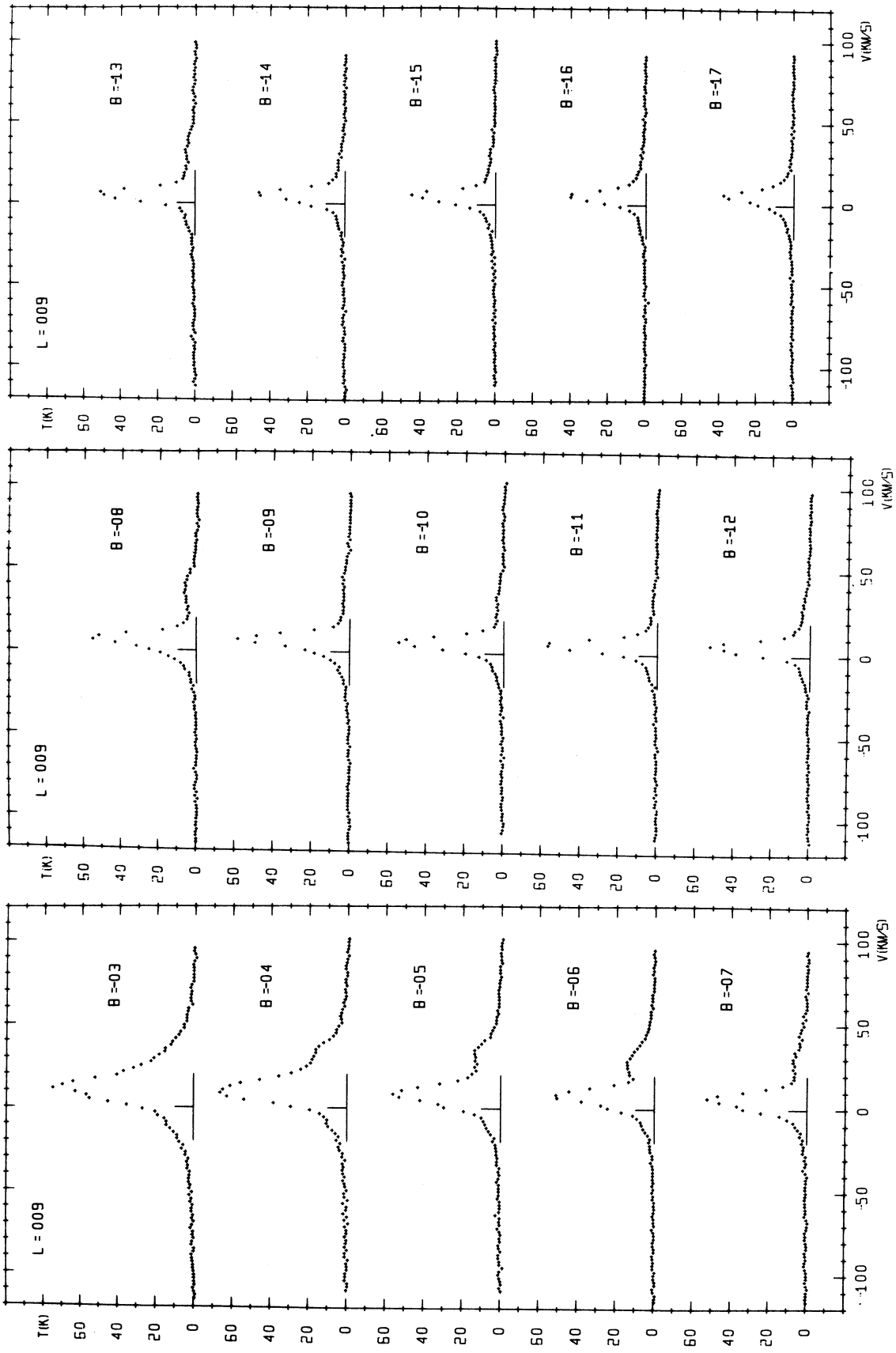


Fig. 10. Observed profiles for l = 9°

Fig. 11. Observed profiles for l = 9°

Fig. 12. Observed profiles for l = 9°

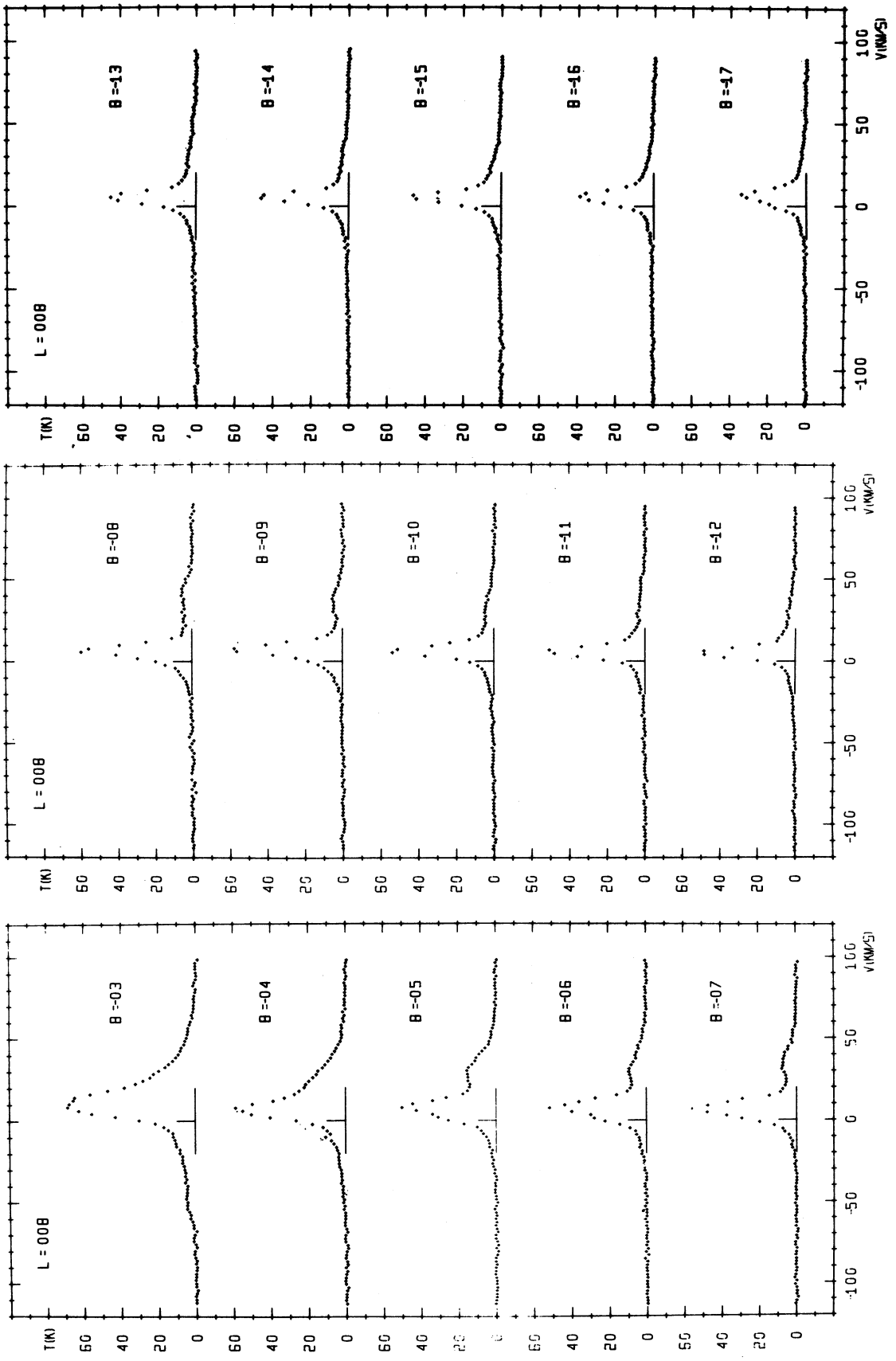


Fig. 13. Observed profiles for l = 8°

Fig. 14. Observed profiles for l = 8°

Fig. 15. Observed profiles for l = 8°

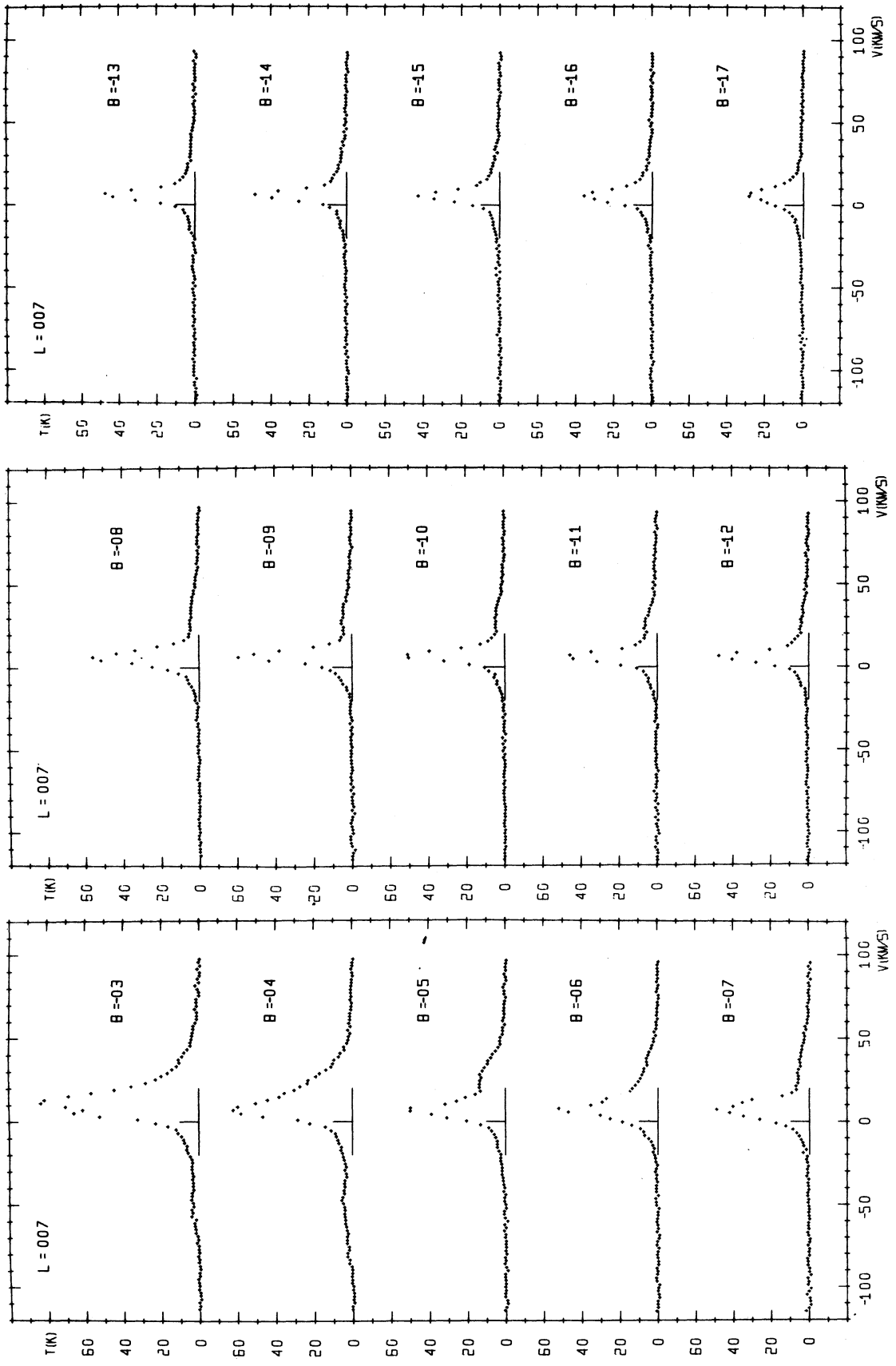


Fig. 16. Observed profiles for l = 7°

Fig. 17. Observed profiles for l = 7°

Fig. 18. Observed profiles for l = 7°

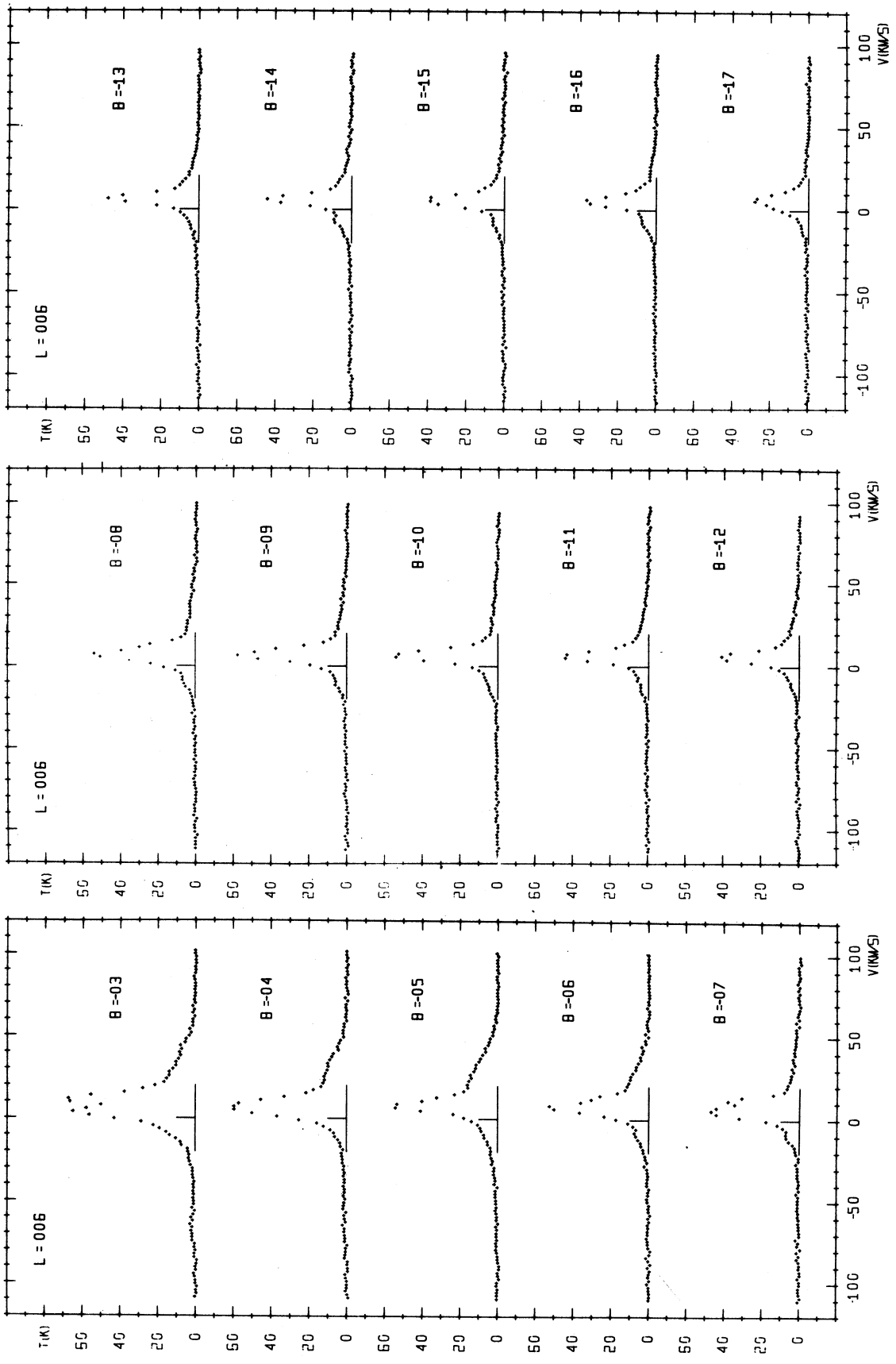


Fig. 19. Observed profiles for l = 6°

Fig. 20. Observed profiles for l = 6°

Fig. 21. Observed profiles for l = 6°

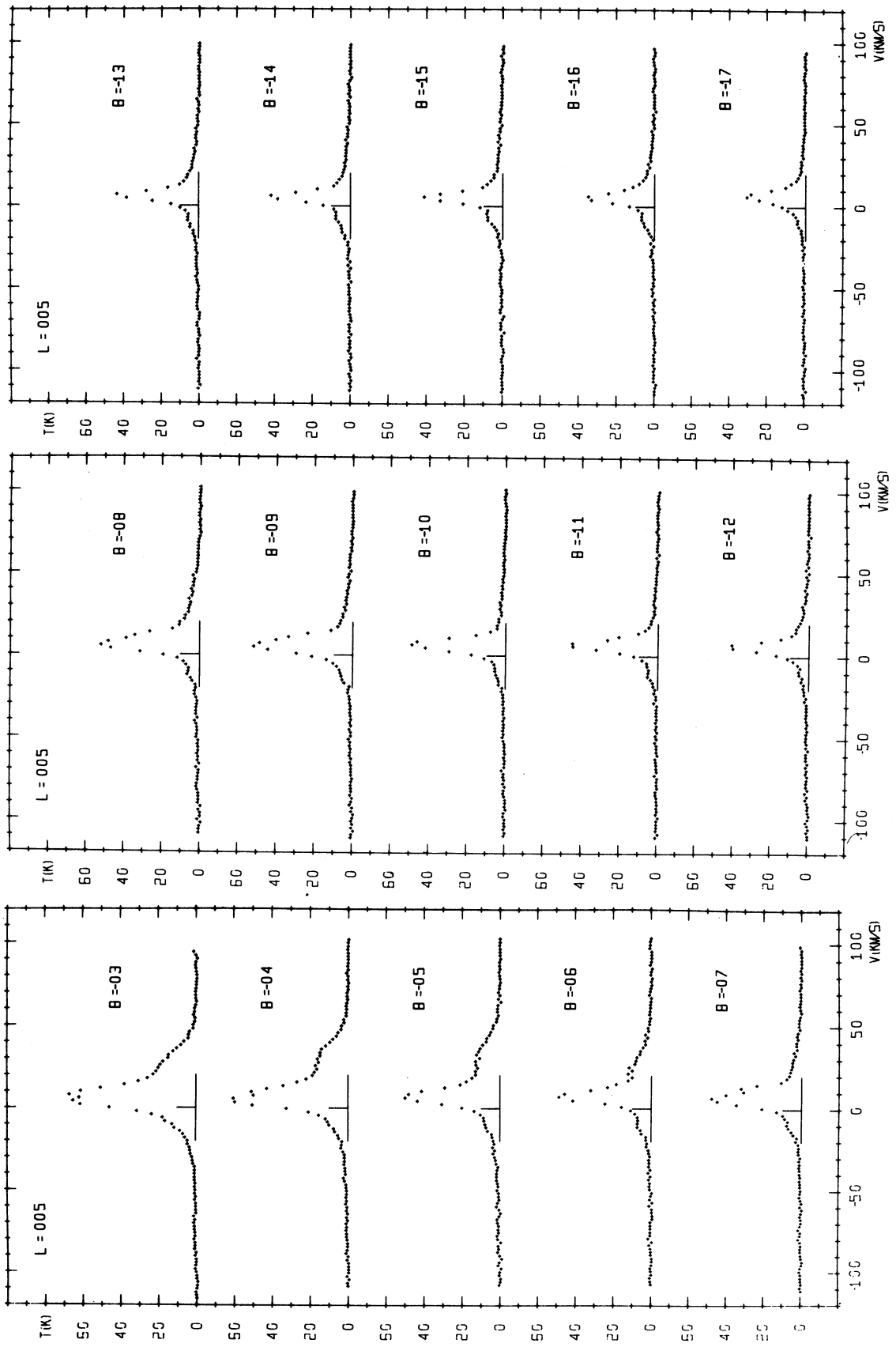


Fig. 24. Observed profiles for l = 5°

Fig. 23. Observed profiles for l = 5°

Fig. 22. Observed profiles for l = 5°

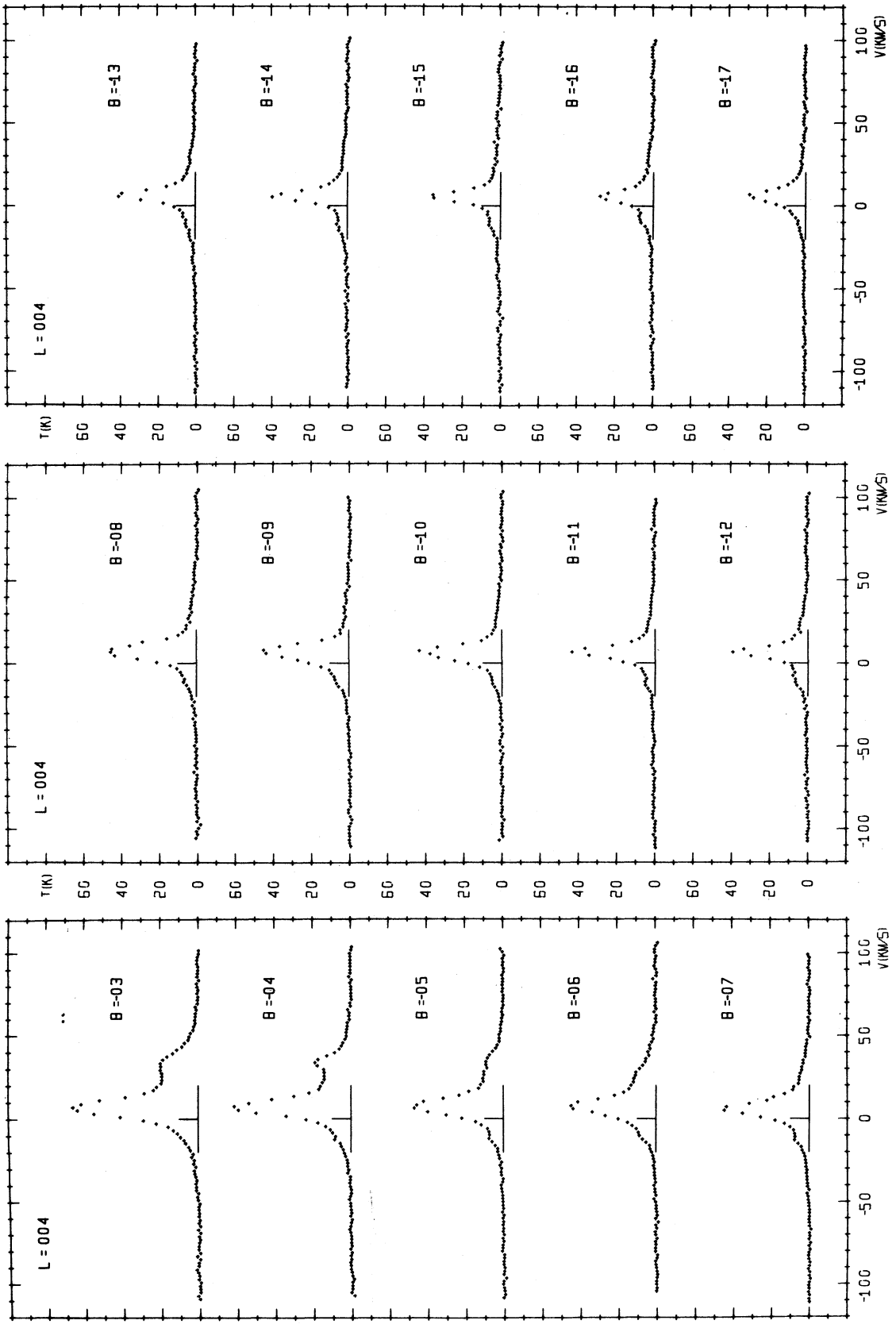


Fig. 25. Observed profiles for l = 4°

Fig. 26. Observed profiles for l = 4°

Fig. 27. Observed profiles for l = 4°

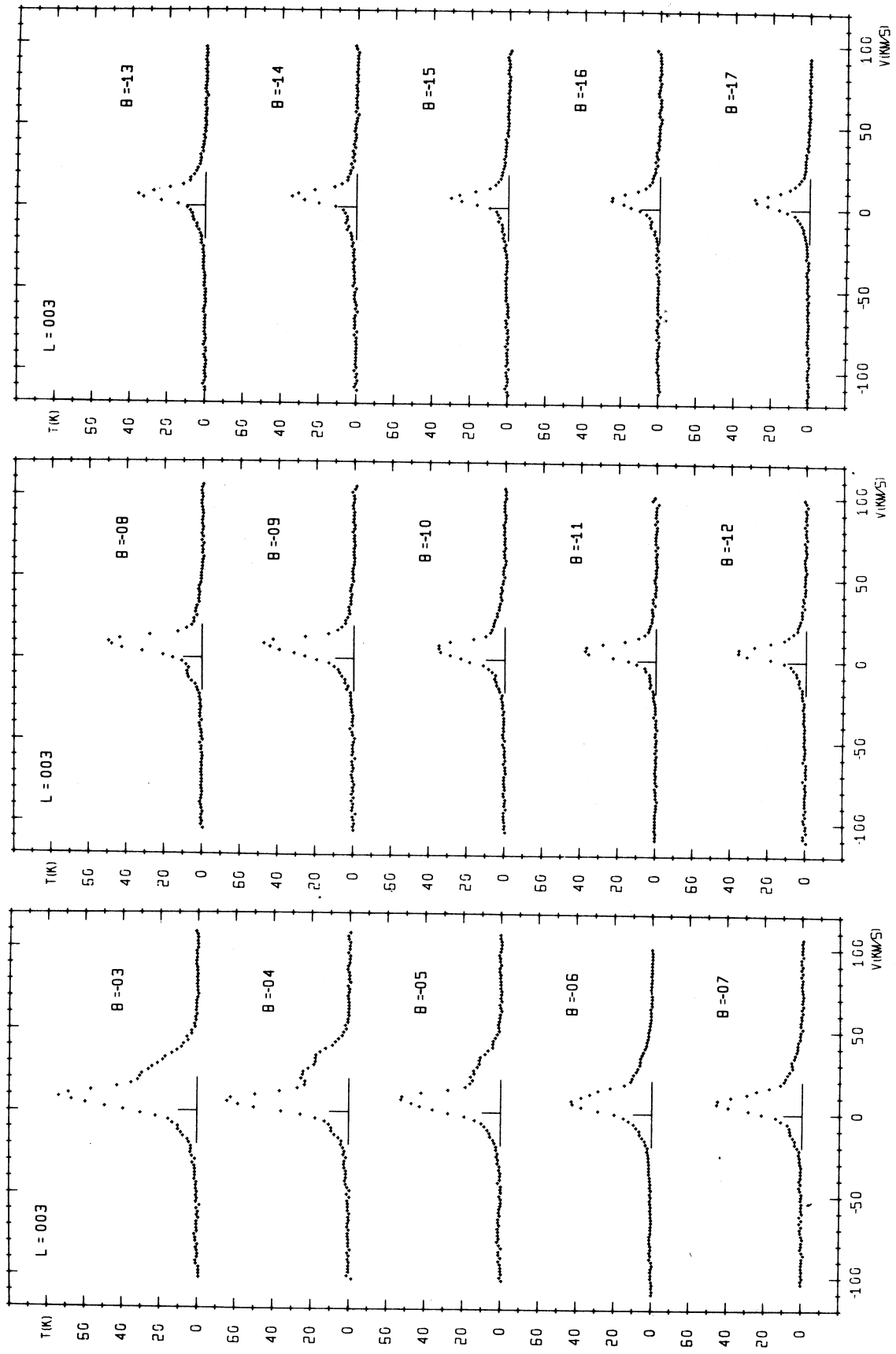


Fig. 28. Observed profiles for l = 3°

Fig. 29. Observed profiles for l = 3°

Fig. 30. Observed profiles for l = 3°

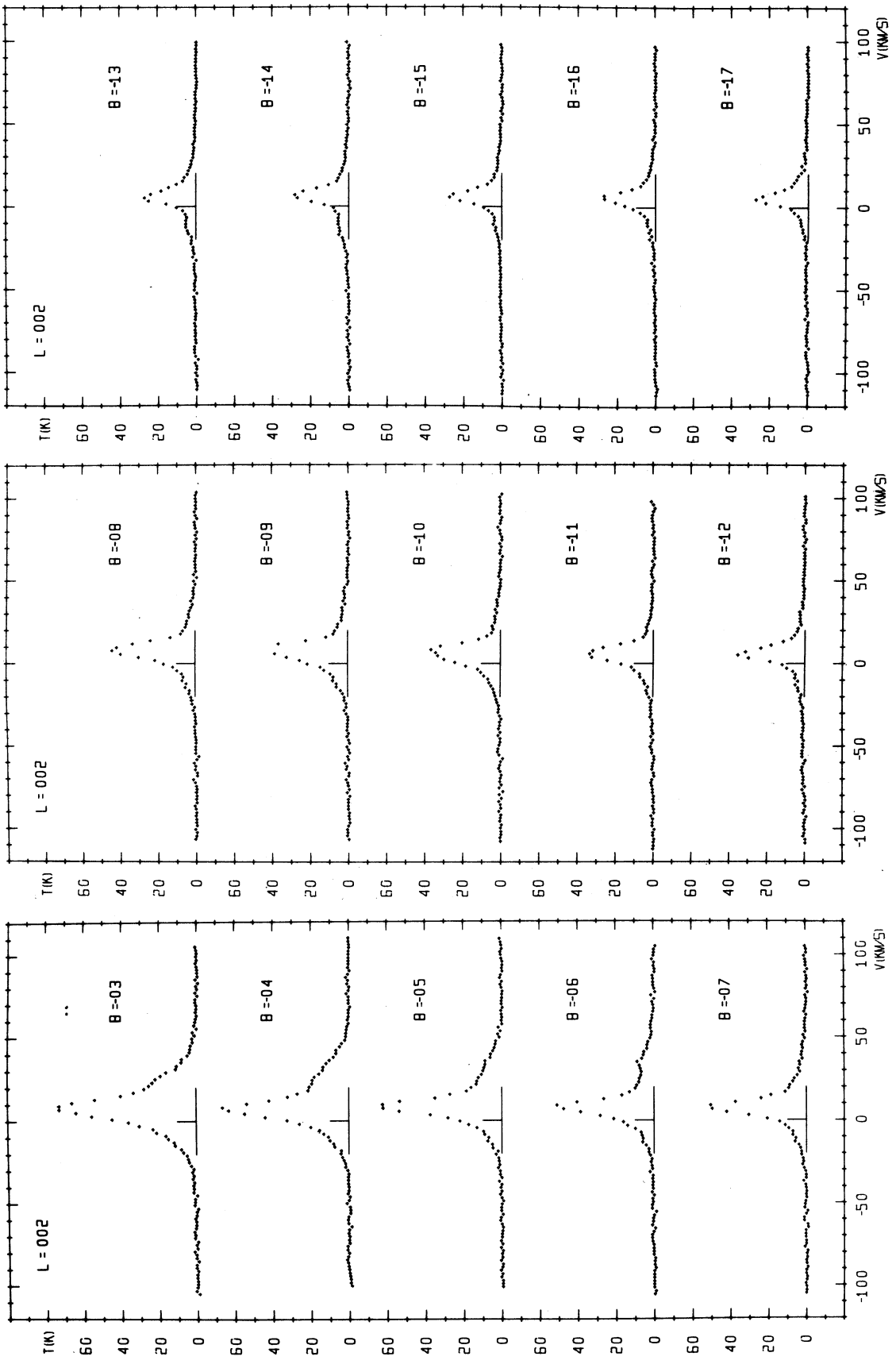


Fig. 31. Observed profiles for l = 2°

Fig. 32. Observed profiles for l = 2°

Fig. 33. Observed profiles for l = 2°

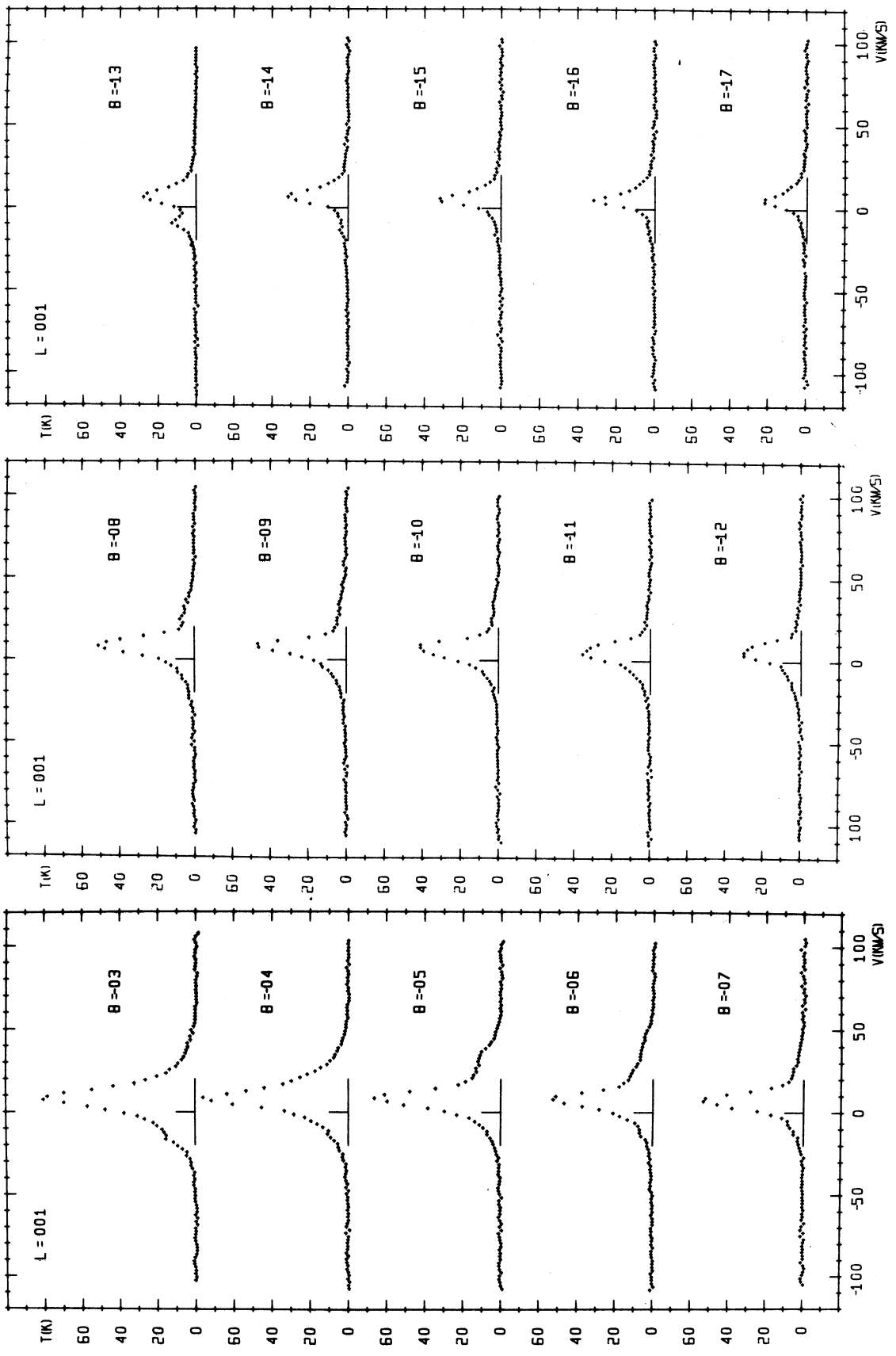


Fig. 36. Observed profiles for l = 1°

Fig. 35. Observed profiles for l = 1°

Fig. 34. Observed profiles for l = 1°

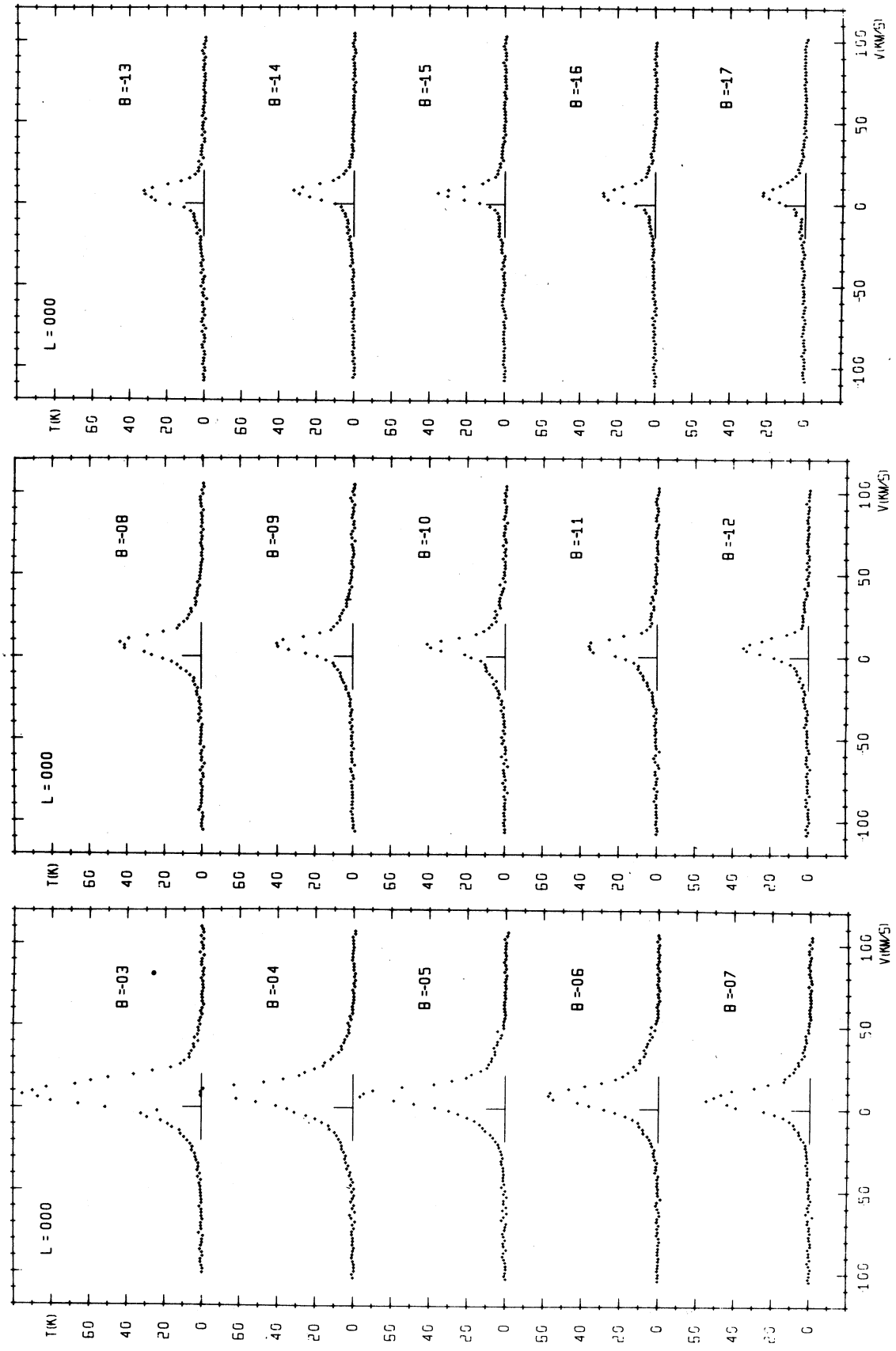
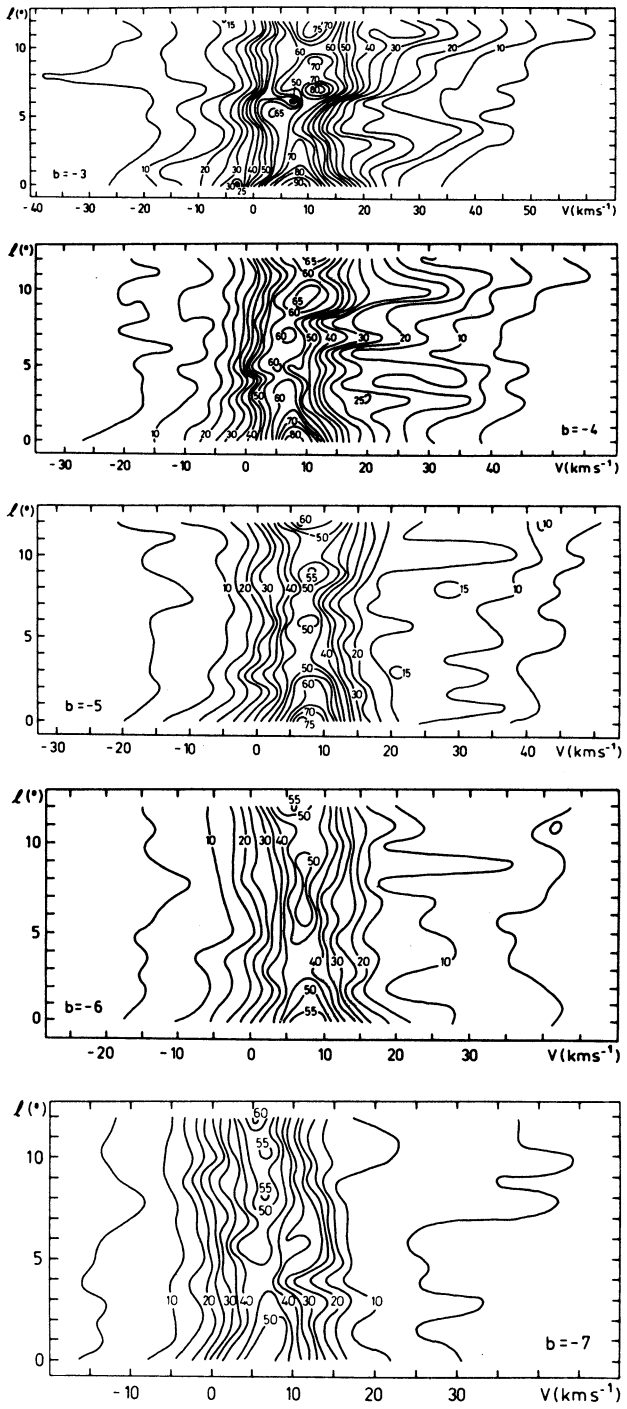


Fig. 37. Observed profiles for l = 0°

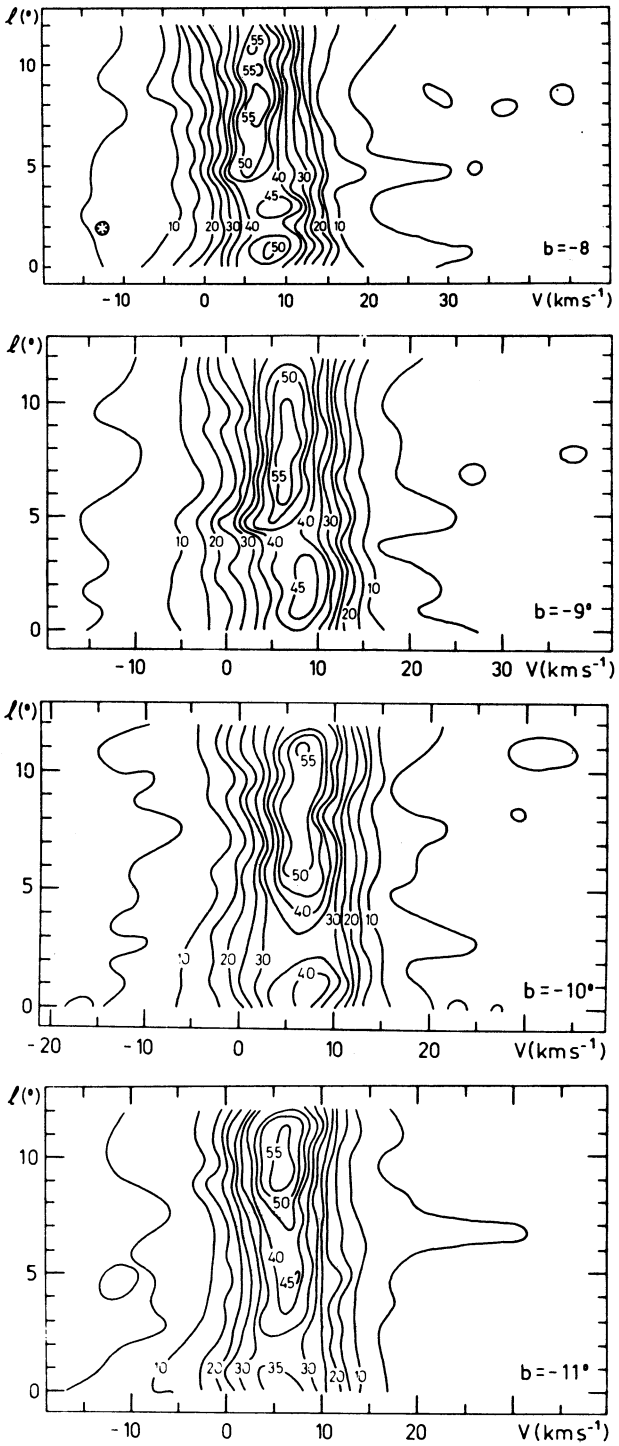
Fig. 38. Observed profiles for l = 0°

Fig. 39. Observed profiles for l = 0°



Figs. 40 to 44 Contour maps in the plane ℓ-v for b = −3°, −4°, 5°, −6° and −7°.

The number of profiles observed in this survey is about 442, representing a net observation time of about 44 hours. The total number of hours required, including the antenna pointings, the oscillator settings, the channel dischargings and most of all, the observations of calibration points in the sky, is longer by a factor of about 2.

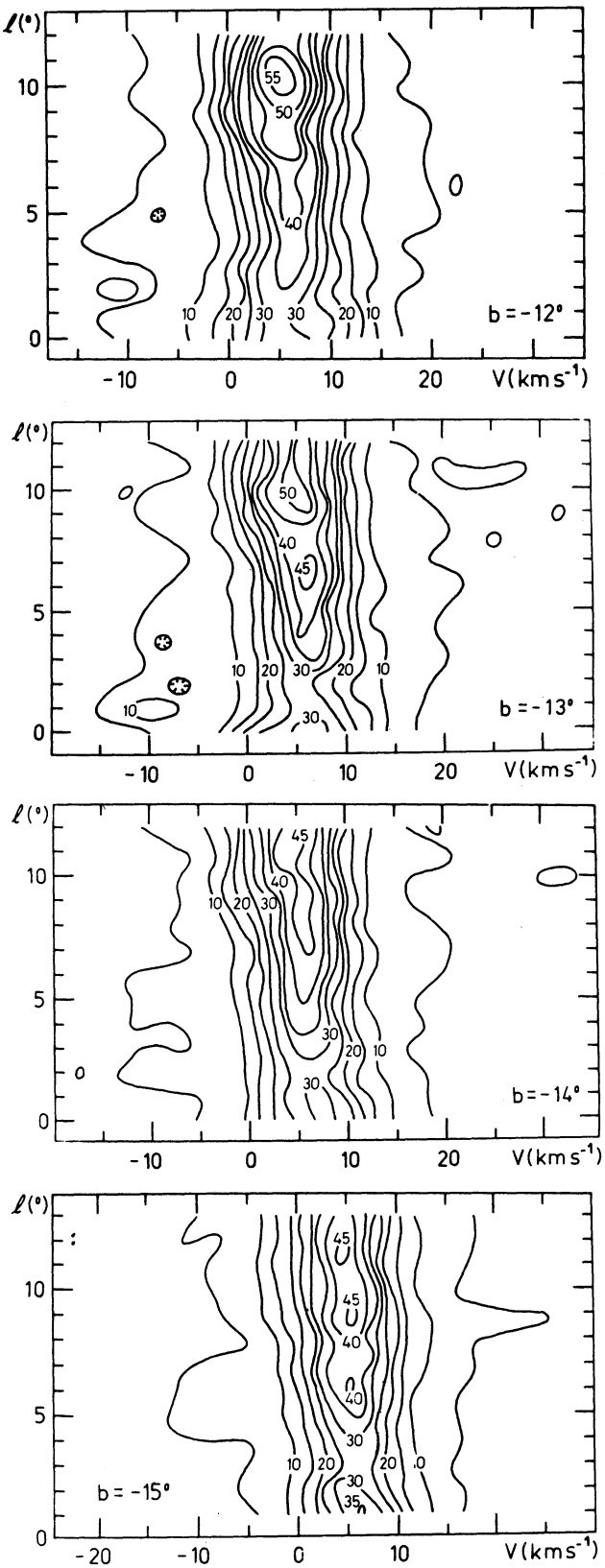


Figs. 45 to 48 Contour maps in the plane ℓ-v for b = −8°, −9°, −10°, and −11°.

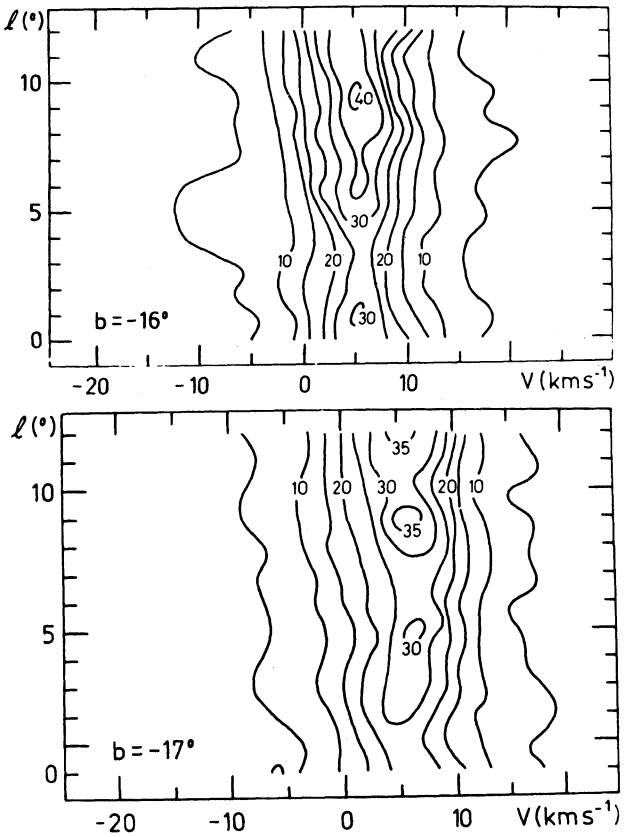
III. OBSERVATIONAL RESULTS

The observations are presented in the following sets of diagrams:

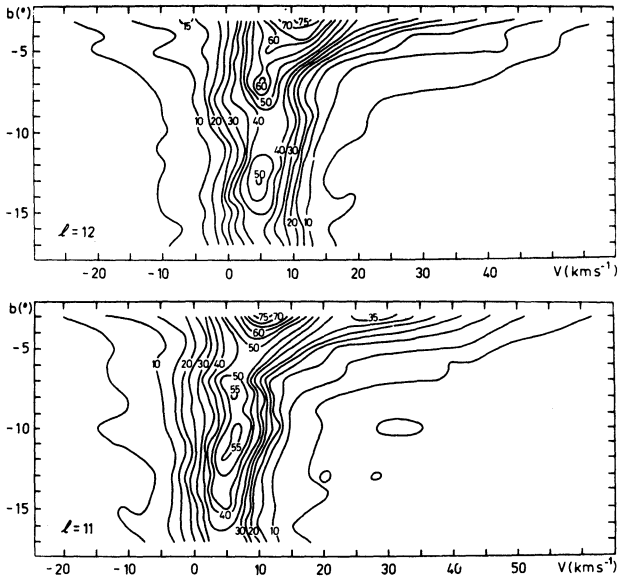
a) 195 averaged profiles arranged in groups of 5 each. These are given in order of decreasing ℓ and b (Figs. 1 to 39.).



Figs. 49 to 52. Contour maps in the plane ℓ-v for b = −12°, −13°, −14°, and −15°.



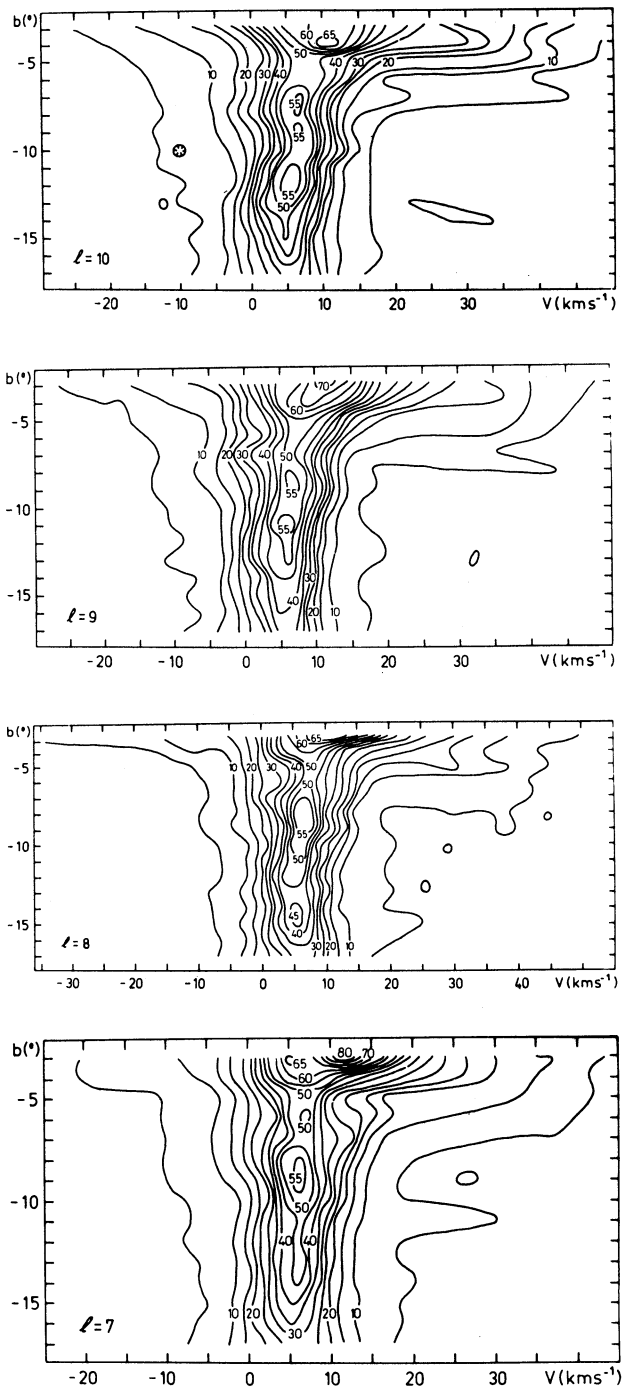
Figs. 53 to 54. Contour maps in the plane ℓ-v for b = −16° and −17°.



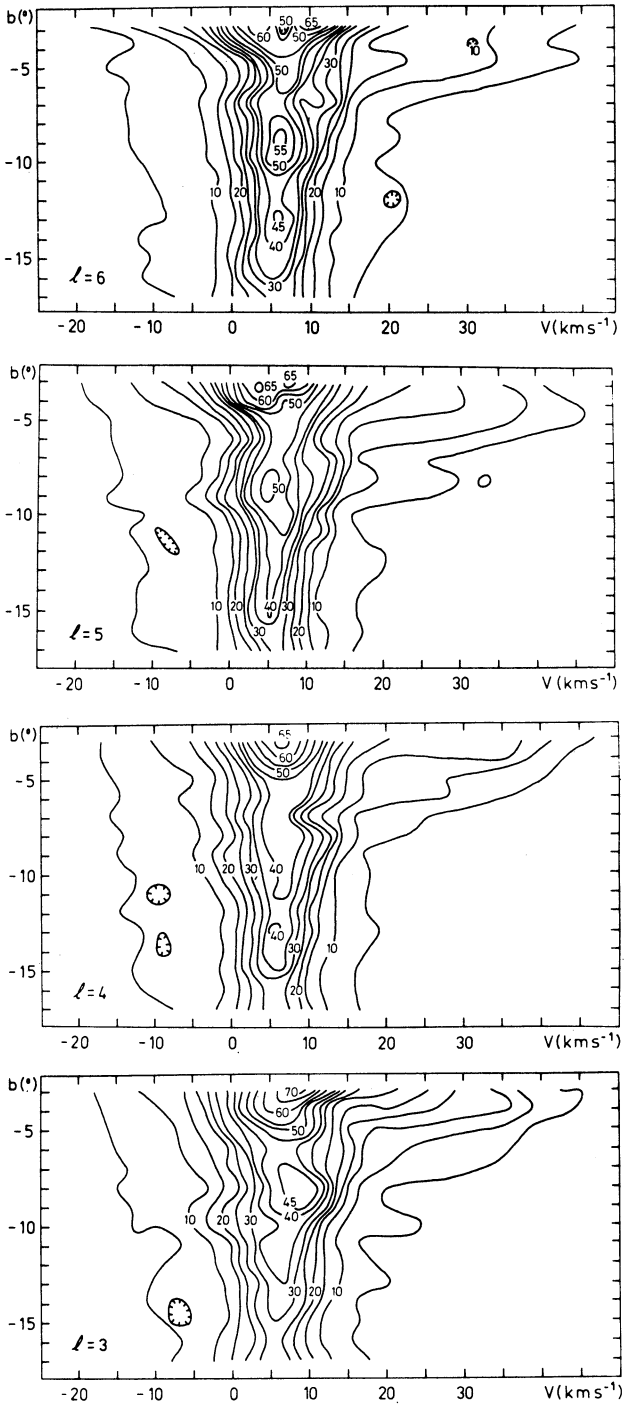
Figs. 55 to 56. Contour maps in the plane b-v for ℓ = 12° and 11°.

b) Contour maps in the plane ℓ-v, at constant values of b and for T = 5 K, 10 K, 15 K, ... (Figs. 40 to 54).

c) Contour maps in the plane b-v, at constant values of ℓ and for T = 5 K, 10 K, 15 K, ... (Figs. 55 to 67).



Figs. 57 to 60. Contour maps in the plane b-v for $\ell = 10°$, 9°, 8°, and 7°.

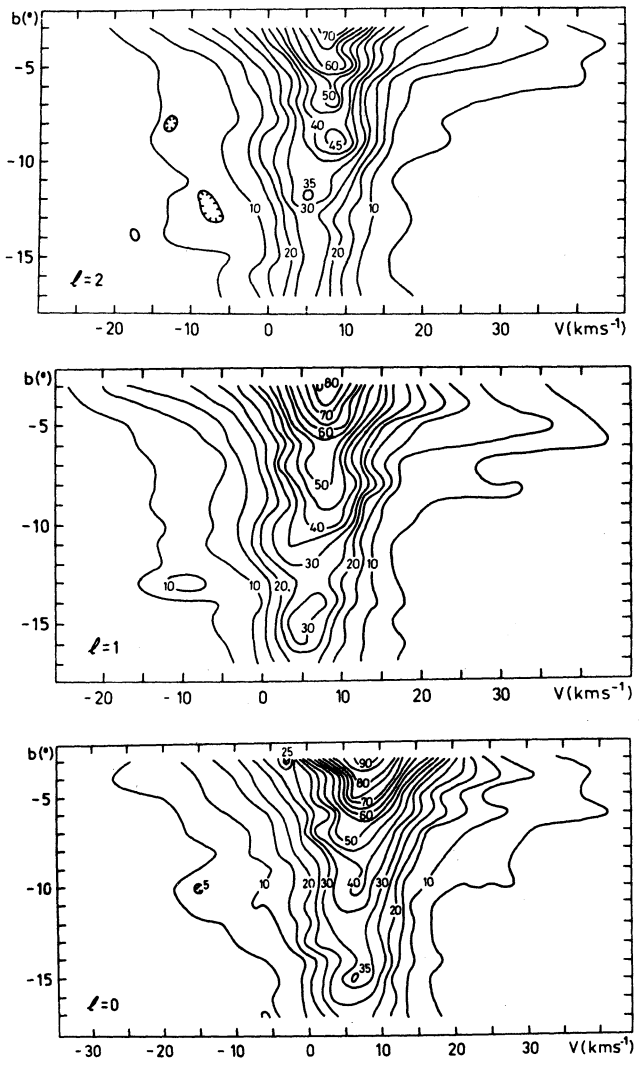


Figs. 61 to 64. Countour maps in the plane b-v for $\ell = 6°$, 5°, 4°, and 3°.

The coordinates used throughout these diagrams are galactic longitude ℓ and latitude b, radial velocity V_r reduced to the LSR, and brightness temperature T.

IV. COMMENTS ON THE RESULTS

The region which we are considering belongs to the first galactic quadrant. Inspection of the contour lines (Figs. 40 to 67) shows an intense ridge-like feature of low positive velocities of constant width and centered approximately between +5 and +10 km s^{-1}. The central velocity does not change systematically with ℓ (Figs. 40 to 54), but it decreases slightly with increasing | b |



Figs. 65 to 67. Contour maps in the plane b-v for $\ell = 2°$, 1°, and 0°.

(Figs. 55 to 67). On the other hand, the intensity of the ridge, as measured by T decreases with increasing $|b|$.

A comparison with the contour lines of Pöppel and Vieira (1974) for the same values of ℓ, but positive values of b, shows that the ridge is also present there. As a consequence, we can apply the conclusions of Franco and Pöppel (1978) and identify the ridge with gas related to Gould's belt (cf. the references given above), i.e., our data correspond predominantly to local gas, which is not strictly moving on circular orbits around the galactic center.

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The computational work has been done at the University of La Plata (ULP), Argentina, as well as at the Data Processing Center of the UFRGS in Porto Alegre, Brazil. Mr. Luiz Fernando Porto (UFRGS) and Mrs. Lina Dimier (IAR) collaborated in auxiliary work. Mrs. Margarita Trotz (IAR) made the drawings and Mr. Jorge Fernández (IAFE) and Mr. Guillermo Sierra (FCAyGF, UNLP) the photographic work.

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