has been developed which appears to be in accord with all known observations.

A significant trend in the financial support given to the Association is evidenced by the large increase, relative to the general subscription income, in the specific contributions by industrial groups to specially sponsored programmes. This, to a great extent, reflects the wish of members, especially the larger ones, to exercise a greater measure of control over the application of the funds which they provide than is possible if they simply contribute to general funds through membership subscriptions.

J. GREIG

DISTRIBUTION AND MOTIONS OF OH NEAR THE GALACTIC CENTRE

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MEASUREMENTS with the Australian 210-ft. telescope have shown[1] a wide and deep absorption by OH in the radio spectrum of Sagittarius *A*. The absorption occurred over a region the angular extent of which was much less than that of the whole Sagittarius *A* source, and it appeared likely that only the 'core' component[2,3] of the source was being absorbed. However, the original observation did not reveal the overall angular extent of the absorbing gas.

We have since observed OH absorption in other parts of the Sagittarius *A* complex at 1,667 Mc/s, 1,665 Mc/s and at 1,612 Mc/s, the frequency of one of the recently detected[4] satellite lines of OH. Absorption has been detected at all longitudes between $l^{II} = 358°\ 30'$ and $l^{II} = 2°\ 30'$, and for latitudes between $b^{II} = +10'$ and $b^{II} = -30'$. As was found[1,4] for the central source of Sagittarius *A*, only some of the components of the continuum radiation were absorbed, and the ratios of the intensities of the lines were smaller than the theoretical values. The OH is distributed in apparently discrete clouds with characteristic velocities. An unexpected result was that the velocities of the various clouds are constant over a range of galactic longitude, in contrast with the velocity distribution deduced from 21-cm measurements of neutral hydrogen.

Observations at intervals of 10′ arc were made at 1,665 and 1,667 Mc/s using a modified receiver with 48 channels[5] of band-width 37 kc/s. Absorption was found at radial velocities from +160 to −200 km/s. Partially resolved minima in the profiles at a number of discrete velocities can be traced continuously over one to two degrees in longitude. An example is given in Fig. 1; contours of the 'apparent opacity', at 1,667 Mc/s, of the gas with radial velocity near −135 km/s are superimposed on a map of the continuum at 1,670 Mc/s. (The continuum measurements were made during the present survey with a wide-band section of the receiver). The apparent opacity is defined as the amplitude of the observed absorption divided by the continuum temperature in the same direction; as in general only part of the continuum radiation is absorbed, this ratio will be a lower limit to the true opacity. The gas responsible for absorption near −135 km/s extends south of the galactic plane in a band 20′ arc wide, the opacity being appreciable between $l^{II} \doteqdot 359°\ 10'$ and $l^{II} \doteqdot 0°\ 30'$. No contours are shown for the weaker absorption outside this longitude range. The apparent opacity reaches peak values of about 0·4, corresponding to an optical depth of at least 0·5.

Clouds of similar extent are observed at a number of other velocities. At negative velocities the gas is found mainly south of the plane in the longitude range from 358° 30′ to 1°. For positive velocities the clouds are observed to lie close to the plane, in the longitude range $l^{II} = 359°\ 50'$ to $l^{II} = 2°\ 30'$. These clouds have dimensions of approximately 200 parsecs at the distance of the galactic centre.

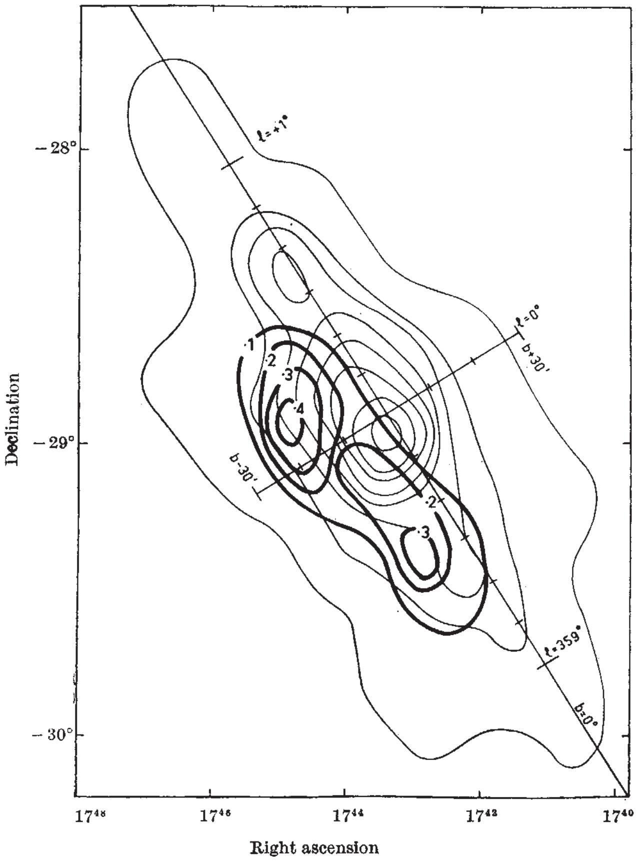

Fig. 1. Contours of the 'apparent opacity' at 1,667 Mc/s of the gas with a radial velocity near −135 km/s (1964·5 co-ordinates)

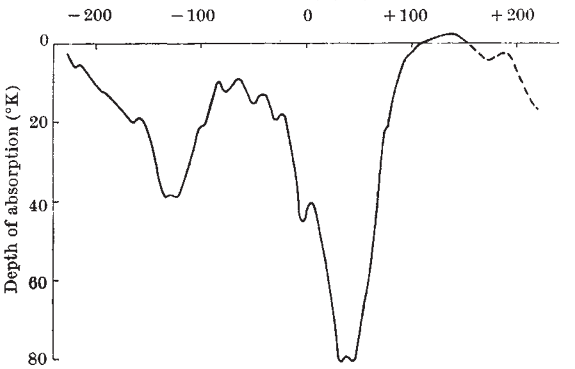

Fig. 2. Absorption profile of Sagittarius *A* at 1,667 Mc/s, measured with a band-width of 37 kc/s. For velocities greater than +150 km/s the profile overlaps that of the 1,665 Mc/s line

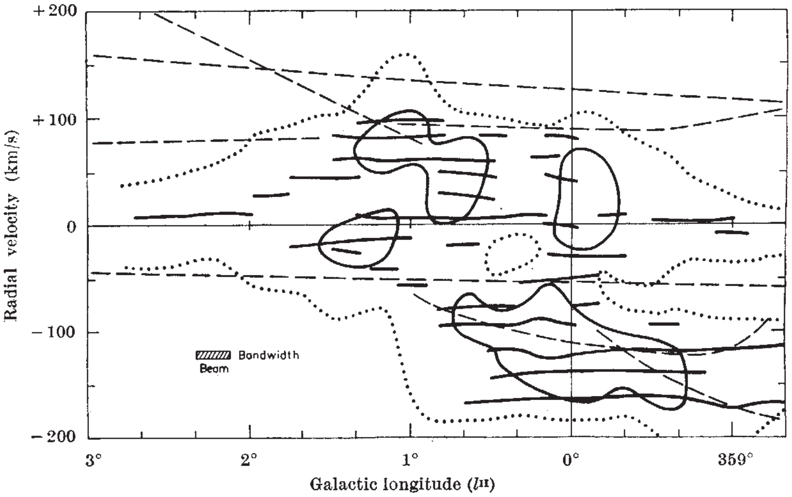

Fig. 3. Galactic longitude *v.* velocity diagram, showing for $b^{II} = -0^\circ 10'$ the areas of strong 1,667-Mc/s absorption (enclosed by contours) and the boundaries of the observed absorption (dotted lines). The thick lines join discrete minima on the profiles, while the dashed lines represent the velocity variation of HI observed[7] at 1,420 Mc/s

Goldstein *et al.*[6], observing the central source of Sagittarius *A* with a 54′ arc beam, found an absorption at −120 km/s of intensity comparable to the deep minimum at +40 km/s. The complete profile for this source, observed with the 12′·5 arc beam at 1,667 Mc/s, is shown in Fig. 2. With the greater resolution the localized[1] absorption near +40 km/s is enhanced relative to that at high negative velocities. Both the strong absorption features are seen to be blends of several components not revealed in the earlier investigations[1,6].

An impression of the motions of the gas may be gained from the radial velocity *v.* galactic longitude plot at $b^{II} = -0^\circ 10'$ given in Fig. 3. The diagrams for other latitudes are similar. The extent of the absorption is indicated by the four closed contours, delineating areas where the absorption is greater than 7° K, and by the dotted lines showing where absorption can no longer be detected. The thick lines running across the diagram join the radial velocities of discrete minima on the profiles; for clarity no attempt has been made to indicate the intensity at the minima. The resolutions in angle and radial velocity are shown on Fig. 3. For comparison, the dashed lines indicate the behaviour of the main emission features of neutral hydrogen, for $|V| > 50$ km/s, as deduced by Rougoor[7] from 21-cm observations with a beam-width of 34′ arc.

A striking characteristic of the diagram is the constancy of the velocity of the absorption features. A close correspondence between the OH and HI velocities is seen between +90 and 100 km/s, and near −50 km/s. For velocities greater than +100 km/s no marked OH absorption is seen; the hydrogen at these velocities also shows no appreciable absorption[8], and is believed to lie beyond the centre and to be moving away from it. However, the OH observed between 0 and +100 km/s must lie in front of the centre and be moving inwards.

At higher negative values, up to −170 km/s, the constancy of velocity of the several partially resolved minima of the OH profiles (Fig. 2) contrasts with the 21-cm observations. The latter show steep gradients of velocity with longitude, interpreted[7] as a "rapidly rotating disk" and a "contracting or expanding arm at −110 km/s". The presence of apparently discrete velocities conflicts with the model proposed by Rougoor and Oort[8] for the motions of the gas in the central region. It is clear that radial motion is as marked as any component of rotation about the centre. The 21-cm measurements have possibly suffered from confusion of a mixture of emission and absorption, and inadequate resolution. In this survey no OH emission greater than 2° K was found, so that the absorption stands out clearly.

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INTERACTION BETWEEN LOWER AND UPPER TROPICAL TROPOSPHERES

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ATTENTION has been directed by a number of workers to the concentration of easterly winds in the upper troposphere (150–100 mb levels) over the tropics into maxima, exhibiting jet stream characteristics. Such maxima in easterlies generally occur and are most prominent in the northern summer (July and August) along the southern periphery of the immense anticyclones over south Asia and north Africa. Occurrence of easterly wind maxima has also been noted in the Caribbean. These are sporadic and have been described as the return current of west wind maxima around the periphery of the sub-tropical anticyclone over the North Atlantic (Bermuda high).

Upper divergence in the favourable regions of the east-wind maxima over the tropics has been utilized in explaining low-level weather sequences on a cause-and-effect basis. In a case study, Alaka[1] cites examples of vertical motion associated with an easterly jet being directly favourable for organized convection over the Caribbean and western part of the Gulf of Mexico. In explaining conditions leading to the onset of the summer monsoon over India, monsoon rains as well as intensification of monsoon depressions, Koteswaram[2] visualizes the pre-existence of favourable regions of vertical motions in the upper troposphere brought about by east-wind maxima, perturbations in the upper easterlies and their movements. Summarizing the applications of similar mechanisms, Reiter[3] states that "the Indian monsoonal rains and the rainy season in equatorial Africa are dependent on the 'Tropical Easterly Jet' and its position and not so much on the zenithal march of the Sun". These are instances of extension to the tropics and near