Beaming of Jupiter's decametric radiation

POQUERUSSE AND LECACHEUX[1] reported the first direct measurement of the beaming of Jupiter's decametric radiation based on simultaneous observations of the jovian radio emission made with the Soviet spacecraft Mars 7, and at the ground level at Nancay, France on two different days. On one of them, 15 May 1974, activity was recorded at the spacecraft while none was observed at Nancay or at the University of Colorado site, and it was concluded that this effect was evidence of the narrow beaming of the jovian decametric radiation. We made complementary observations from the Maipú Radio Astronomy Observatory in Chile and from the University of Florida Radio Observatory: strong activity from Jupiter was recorded at the same time at a lower frequency and at a close frequency some 40 min earlier.

Table 1 shows the time and frequencies where the activity was recorded, including the spacecraft, Florida and Maipú. In Florida the emission was detected at 20.0 and 22.2 MHz, while in Maipú, Chile at 13.1, 16.7, 18.0, 22.2 and 27.6 MHz. jovian activity was recorded at 22.2, 18.0 and 16.7 MHz and at the same time the spacecraft detected activity at 30 MHz while that at 27.6 MHz was recorded some 40 min earlier.

The antennas used were linearly polarized Yagis except for those operating at 13.1, 16.7 and 22.2 MHz in Chile, which were crossed polarimeter Yagis. The receiving, recording and calibrating system at both observatories were identical, each channel consisting of a modified commercial communication receiver tuned to the corresponding centre frequency with a fixed bandwidth of 4 kHz, a chart recorder with a time constant close to 1 s was used, although a supplementary recording was available for better resolution of individual bursts. Temperature-limited noise diodes were used as standard calibrator. Occasionally, no calibration was made during the observation—the galactic background noise serving as an auxiliary calibrator.

The flux density for each channel was determined following the standard procedure of the Florida–Chile group[2,3].

The flux densities of mean and peak pulses calculated for the observed activity at Maipú and Florida during 15 May 1974 are also included in Table 1. The emission recorded was mostly of the S-bursts type (millisecond pulses) and right-hand circularly polarized (16.7 and 22.2 MHz, Chile). The minimum detectable flux density (threshold) at Maipú and Florida was of the order of $2.5\times 10^{-22}\ \mathrm{W\,m^{-2}\,Hz^{-1}}$ at 22.2 MHz. The threshold of the University of Colorado spectrograph (7–41 MHz) was reported to be $5\times 10^{-22}\ \mathrm{m^{-2}\,Hz^{-1}}$ (ref. 1), that is well below the flux density of any mean pulse recorded in Chile or Florida (see table 1). The lack of correlation between the data obtained in Maipú and Florida suggests a strong ionospheric disturbance along the line of sight of Jupiter as seen from Florida. The same disturbance also seems to have affected the observations at Colorado, where Jupiter was being observed at a large zenith angle. It might even be possible to consider some scattering produced by field-aligned ionospheric irregularities.

Table 1 Summary of observations, 15 May 1974

Site	Frequency	Activity time UT		Flux density (10^{-22} W m^{-2} Hz^{-1})		Remarks
Spacecraft	30	10.35	11.06	—	80	Ref. 1
Nancay	25–38	—	—	—	—	Ref. 1
Colorado	7–45	—	—	—	—	Observing time: 09.00–12.00
Florida	20.0	11.26	12.00	12.7	48.2	Jupiter transit: 13.03
	22.2	11.19	12.13	21.5	83.0	
Maipú	13.1	10.20	10.40	52.2	205.9	Jupiter transit: 12.11; sunrise: 11.26
	16.7	09.40	11.27	76.3	172.1	Right-hand polarized
	18.0	09.40	11.33	23.2	52.0	
	22.2	09.42	11.25	19.9	45.6	Right-hand polarized
	27.6	09.45	09.55	50.0	202.1	Antenna breakdown at 09.55

Observing frequencies, beginning and ending times of the activity, and mean and peak flux density measurements are given for each site where activity was recorded. At the highest frequency in Maipú (27.6 MHz), the antenna had a major breakdown at 09.55 so that the jovian activity was only recorded up to ~40 min before the spacecraft started recording the emission from Jupiter.

We can thus add to Poquérusse and Lecacheux's result that Jupiter's strong beaming may hold only for a relatively narrow frequency bandwidth. As might be expected, the radiation beam appears wider when all frequencies are considered rather than a single frequency.

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Corticosteroid-binding globulin and corticosterone interaction with progesterone receptors

IN their article[1] Al-Khouri and Greenstein claim to have shown "differences between progesterone receptors and CBG [corticosteroid-binding globulin] distribution in brain and uterus". We would like to point out that, in their studies, they have failed to take into consideration binding of ^{3}H-progesterone to other types of receptor sites, in particular glucocorticoid sites, and that for this reason they cannot conclude that "progesterone, the natural hormone, displaces the tritiated steroid from the receptor in brain and uterine cytosols more potently than does R5020".

In the conditions used by Al-Khouri and Greenstein (non-ovariectomized animals, not primed with oestrogens), progestin-binding sites (PR) are occupied by endogenous progesterone which cannot be exchanged with ^{3}H-progesterone within 2 h at 0 °C without loss of sites by degradation. Furthermore, even in the perfused brain and in optimal experimental conditions, the number of PR is low compared with the concentration of glucocorticoid binding sites (GR) and CBG. In the non-perfused uterus the relative quantity of PR compared with GR and CBG must be even smaller and ^{3}H-progesterone binding corresponds to the total binding of PR, GR and CBG and not to PR uniquely. Thus, in the displacement studies, cold R5020 displaces ^{3}H-progesterone primarily from PR and to a lesser extent from GR (note that competition of progesterone for GR is underestimated in screening assays because of trapping of progesterone by CBG) and cold corticosterone displaces ^{3}H-progesterone from GR and CBG. This explains why corticosterone is more effective in the non-perfused uterus still rich in CBG.

The results would have been completely different with ^{3}H-R5020 because, on account of its specificity, its absence of CBG binding and its much higher affinity for PR (slower dissociation of the receptor complex), progesterone can be nearly totally exchanged within 2 h at 0 °C.

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