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RADIO OBSERVATIONS OF COMET P/CROMMELIN

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ABSTRACT. The upper limits of the radio continuum and line measurements at ~ 22 GHz of comet P/Crommelin are presented briefly. The results may be valuable in programming the observations of comet P/Halley.

Key words; radio - comet continuum - line emission.

I. INTRODUCTION

After the success of the observations of comets IRAS-Araki-Alcock (1983d) and Sugano-Saigusa-Fujikawa (1983c) (Irvine et al., 1984), coordinated by the International Halley Watch (IHW) Radio Science Net, the IHW decided that a second trial run should be undertaken by the network during 1984.

Two comets were suggested: P/Enke and P/Crommelin, the last one being selected due to the fact that P/Enke should be hardly visible in view of the Sun-Comet-Earth configuration, which was confirmed during its passage.

The expectatives towards P/Crommelin were not much better than those for P/Enke, because the former had a long story of faint apparitions. Many passages of P/Crommelin were missed due to extremely poor viewing conditions, and when it was observed it was only during a few days. The IHW decided to go ahead using the later comet to test communication network, quality of data and data reduction, etc. The period of 25-31 March, 1984, was selected as the trial run days.

In this paper we present the radio continuum results as well as the water vapour spectrum of P/Crommelin, obtained during February and March at the Itapetinga Radio Observatory, using a 13.7 meter radome enclosed radio telescope.

II. THE ORBIT OF P/CROMMELIN

On Figure 1 we have plotted the heliocentric distance (R) and geocentric distance (DELTA) in Astronomical Units for the period Feb 1 to Apr 15, 1984.

The ephemeris of the comet was computed by Yeomans (1984) by using the orbital elements derived by Marsdem (1982), using fifty observations of P/Crommelin recorded in the period 1873-1956.

III. CONTINUUM RESULTS

For the continuum observations at 22 GHz, an uncooled receiver with system temperature of 900 K and bandwidth of 500 MHz was used. The aperture efficiency was of the order of 0.45 and the HPBW of 4.5 arc minutes. Virgo A was used as calibrator and the relation between antenna temperature and flux density resulted to be 65 Jy per degree Kelvin. Observations were made by scanning in azimuth, with each scan covering 60 arc minutes centered at the interpolated coordinate and lasting for 20 seconds. Each set of observations lasted for 10 minutes and consisted of 30 consecutive scans. This process was repeated continuously during the observing periods. Upper limits of the observations are given on Table I.

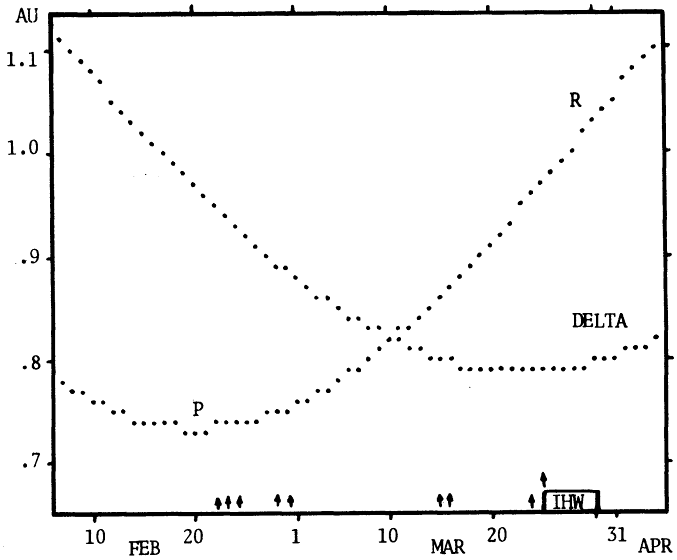

FIGURE 1. Distance of P/Crommelin to the Sun (R) and to the Earth (DELTA) in AU for the period February-April 1984. Arrows indicated the dates when observations were made. P stands for perihelion.

Two different periods of observation were choosen in addition to the IHW days. The first period (Feb 22-29) starts at the time of perihelion passage. The observing conditions, except for one day (Feb 28), were excelent and our results show no emission stronger than 250 mJy. The second period coincides with its closest approach to the Earth. The weather conditions were worst in this period degrading our minimum detection limit. A strong rain front passed by our site during the IHW period and no observations were made.

TABLE 1. Radio continuum results of P/Crommelin at 22 GHz.

YR MO DA	PERIOD OBSERVATION ST	FLUX (mJy) upper limits
84 02 22	0220 - 0610	< 260
84 02 23	2201 - 0510	< 200
84 02 24	2200 - 0158	< 450
84 02 28	2310 - 0006	< 1000
84 02 29	2212 - 0307	< 260
84 03 14	0336 - 0537	< 325
84 03 15	0420 - 0519	< 585
84 03 24	0014 - 0325	< 355
84 03 25	2125 - 0350	< 390
	0528 - 0750	

IV. WATER LINE OBSERVATIONS

The observations were carried out on March 23-24 when the comet was moving closer to the Earth, however it should be noted that the on-on beam switching technique was used in this period.

On Figure 2 we have the average of fifteen twenty-minute observations made with a room temperature mixer with equivalent system temperature of the order of 1800 K. The resolution of the filterbank was 100 kHz which corresponds to 1,35 km s^{-1} at the water line frequency. We can see no line emission in the velocity range of 75 km s^{-1} observed.

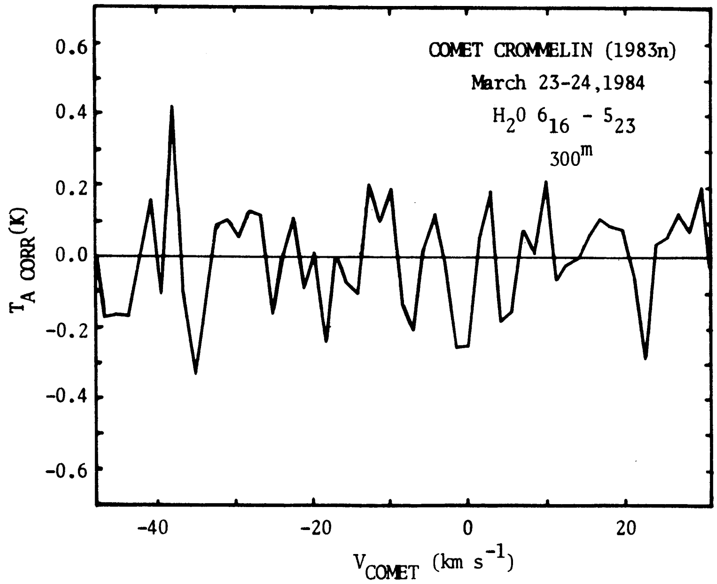

FIGURE 2. Water vapour spectrum of P/Crommelin averaged after 300 minutes integration on March 23-24, 1984.

V. CONCLUSIONS

The objectives of this trial run, to test the systems at each site and coordination of the network by IHW, was completely achieved. The negative results were expected because no weak emission could be detected with the system used in these observations from a comet as P/Crommelin. The tracking programs and data acquisition system for cometary observations were extensively tested and found to be satisfactory and are ready for any future observations in particular for P/Halley.

A cooled receiver will be used for line observations for the IHW radio program together with new acousto-optical spectrometers.

REFERENCES

Irvine, W.M., Abraham, Z., A'hearn, M., Altenhoff, W., Andersson, Ch., Bally, J., Batrla, W., Baudry, A., Bockelée-Morvan, D., Chin, G., Crovisier, J., de Pater, I., Despois, D., Ekelund, L., Gerard, E., Hasegawa, T., Heiles, C., Hollis, J.M., Hutchtmeier, W., Kaifu, N., Levreault, R., Masson, C.R., Palmer, P., Perault, M., Rickard, L.J., Sargent, A.I., Scalise, E., Schloerb, F.P., Schmidt, J., Stark, A.A., Stevens, M., Stumpff, P., Sutton, E.C., Swade, D., Sykes, M., Turner, B., Wade, C., Walmsley, M., Webber, J., Winnberg, A., and Wootten, A., 1984, *Icarus,* 60, 215.

Marsden, B.F., 1982, Catalogue of Cometary orbits, Minor Planet Center, Cambridge, MA.

Yeomans, D.K., 1984, *Int. Halley Watch Newsletter,* 4, 38.

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