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STUDY OF THE VARIABILITY OF THE NUCLEUS OF CENTAURUS A

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ABSTRACT. This work consists in the study of the variability of the nucleus of the peculiar galaxy NGC 5128 (Centaurus A) at the radio continuum frequency of 43 GHz. The data were obtained with the 13.7 m Itapetinga Radiotelescope. The radio source presents a pair of inner radio lobes and a compact variable nucleus. The observational technique used was scans through the inner radio lobes and the nucleus. The quasi-simultaneous measurements of the flux density of each source allowed us to derive accurately the relative flux between them, and to obtain the real variability of the nucleus.

RESUMO. Este trabalho consiste no estudo da variabilidade do núcleo da galáxia peculiar NGC 5128 (Centaurus A) no contínuo de rádio na freqüência de 43 GHz. Os dados foram obtidos com o Radiotelescópio do Itapetinga. A radio fonte apresenta um par de lóbulos internos e um núcleo compacto variável. A técnica observacional utilizada foi a de varreduras passando pelos lóbulos e pelo núcleo. As medidas quase simultâneas da densidade de fluxo de cada fonte permitiu obter precisamente o fluxo relativo entre elas e a variabilidade real do núcleo.

Key words: GALAXIES-RADIO

I. INTRODUCTION

Centaurus A (NGC 5128) is the nearest radio galaxy, and it was one of the first to be identified. Its large-scale radio structure has been studied extensively. It consists of a broad double halo with a separation between components of several degrees (Wade, 1971) and a much smaller double source with a separation of about 7 arc minutes. Both pairs are approximately centered on NGC 5128, where it is also observed a compact radio nucleus. A prominent dust lane bisects the galaxy and is nearly perpendicular to the major axis of the radio emission. Probably, there is a close connection between the production of radio emission and the formation of a thick disk of dust (Kotanyi and Ekers 1979).

This work consists in the study of the variability of the nucleus of the radio source Centaurus A through observations made at 43 GHz with the Itapetinga Radiotelescope.

II. OBSERVATIONAL TECHNIQUE

The observational technique consisted in scans passing through three points coincident with the nucleus and lobes of the galaxy. The positions were determined from the previous map of Centaurus A at 43 GHz (Tateyama and Abraham, 1986) made also with the Itapetinga Radiotelescope. The direction of the scan is shown in Figure 1.

The quasi-simultaneous measurements of the flux density of each source allowed us to derive accurately the relative intensity between them, eliminating problems like atmospheric fluctuations. Each observation was the average of at least 2 hours of integration.

Virgo A was observed as a calibrator source.

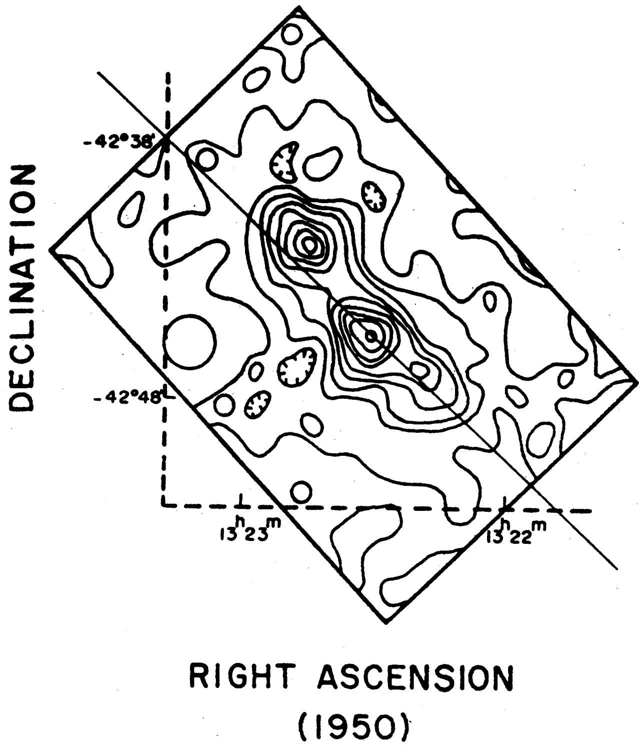

Fig. 1: Radio contour map of Cen A at 43 GHz (Tateyama and Abraham 1986). The solid line indicates the direction of the scan.

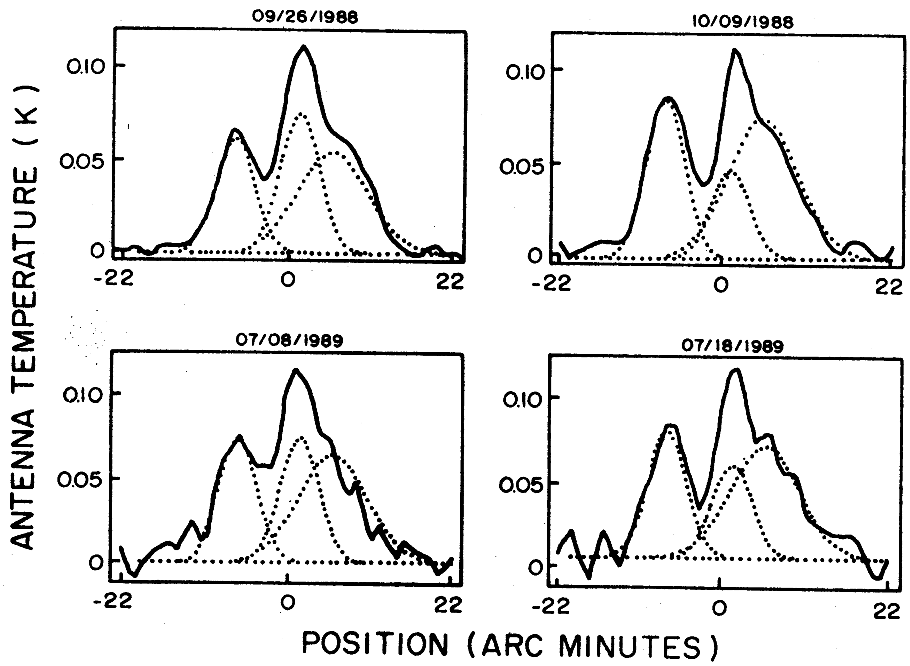

Fig. 2: Profiles of Cen A at 43 GHz (solid line) and fitting of three gaussians to separate the central source (dashed lines).

[. RESULTS

The observations for four epochs are presented in Figure 2 as a full line. The ;olution of the Itapetinga Radiotelescope is 2.4 arc minutes at 43 GHz, not enough to Lly separate the nucleus from the right component. A gaussian fitting was used to determine : relative intensity of the three components. Five parameters were fixed, the HPW of the ıtral component, since the nucleus is compact relative to the HPBW of the telescope, the :io between the antenna temperatures of the left and right side components since they are ı-variable, and the central positions of the three sources.

In Figure 3 we present the intensity of the nucleus relative to the intensity of : left component. The strongest variability occurred between Oct/09/88 and Jul/08/89 when : relative intensity increased from 0.55 to 1.01 (82%). From Sep/26/88 to Oct/09/88 the :ensity decreased by 55% and from Jul/08/1989 to Jul/18/89 decreased by 27%. The estimated :or in the gaussian fittings is about 20% confirming the variability of the compact nucleus Centaurus A in agreement with Kellerman (1974), Kaufmann et al. (1977) and Beall et al.)78).

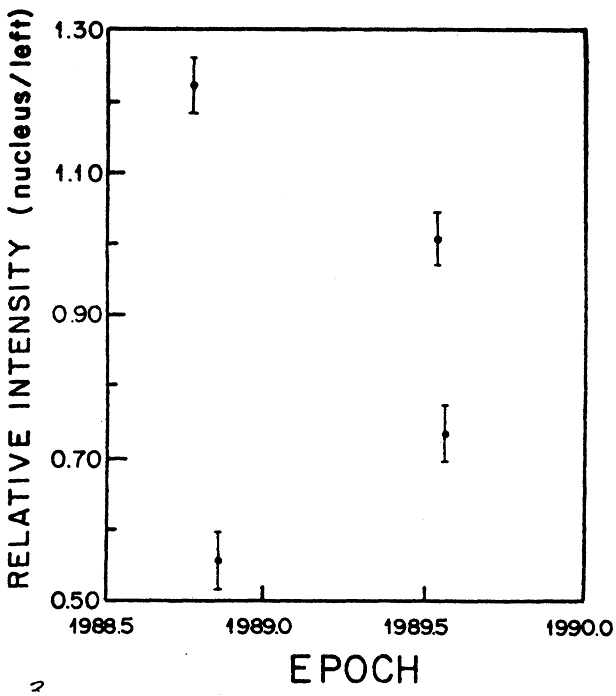

Fig. 3: Relative intensity between the antenna temperature of the nucleus and the left side component of Cen A in different epochs.

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