

HHD

I HAVE EXAMINED YOUR EARLY DRAFT ON "STRUCTURE AND POLARIZATION OF JETS IN THE GIANT RADIO GALAXY NGC315", BY BDFWS.

WITH SO MANY AUTHORS, I DOUBT THAT I COULD FIND SOMETHING WRONG!
(I DIDN'T).

LOOKING HARD FOR SMALL THINGS, I FOUND TWO TYPO. ERRORS (III on p. 6, 1b on p. 6) AND 3 PUZZLES (SEE BELOW).

JPV

OBSERVATIONAL QUERY:

THE EXTENDED STUFF PEAKING NEAR $00^{\text{h}}56^{\text{m}}30^{\text{s}}$ ON THE Arecibo MAP AT 0.4 GHz (NATURE PAPER, 267, 179) ALSO SHOWS UP AS LINEARLY POLARISED ON THE Bonn MAP AT 2.7 GHz, AND SOMEWHAT EXTENDED ON THE WESTERBORK MAP AT 0.6 GHz. WOULD YOU ACCEPT THIS STUFF AS RELATED TO NGC315, MUCH AS THE SOUTHERN STUFF IS (AT $00^{\text{h}}55^{\text{m}}29^{\text{s}}$)?

WOULD YOU CONSIDER THIS SOUTHERN STUFF AS "GRAVITATIONALLY INFALLING" TOWARDS NGC315 (IF THE JET WAS AIMED THERE BEFORE)?

PHYSICAL QUERY:

THE GALACTIC ROTATION MEASURE IN THAT $2''_{\text{b}} 2''_{\text{II}}$ AREA IS ABOUT -90 ± 30 RADIANS M^{-2} (K+SN '78, IAU SYMP. 84), WHILE THE OBSERVED RM IS ABOUT -106 RADIANS M^{-2} NEAR $10''$ FROM THE NUCLEUS IN THE JET (PA = 18° AT $\lambda 6\text{cm}$, PA(JET) = -50° , PA(MAG. FIELD) $\equiv 90^\circ +$ PA(JET) $\equiv 40^\circ$). THE INTRINSIC RM (OBSERVED MINUS GALACTIC), THE CHANNEL WIDTH THERE (1600 pc) AND THE TYPICAL MAGNETIC FIELD OF 3×10^{-4} g IN THE H+B JET MODEL WOULD YIELD THE THERMAL DENSITY ($4 \times 10^{-5} \text{cm}^{-3}$) VALUE WITHIN THE JET. TAKING 3×10^{-6} g WOULD YIELD $4 \times 10^{-3} \text{cm}^{-3}$. WOULD YOU CONSIDER THESE THERMAL DENSITIES A BIT LARGE?

COULD A PLOT BE MADE OF PHYSICAL QUANTITIES AS A FUNCTION OF DISTANCE FROM GALAXY (ALONG JET), e.g. POL (0.6 GHz), CHANNEL WIDTH (KPC), FLUX INTEGRATED ACROSS WIDTH?

THEORETICAL QUERY:

SINCE MOST OF THE COLLIMATION OCCURS IN THE FIRST 50 KPC, AND SINCE THE OPTICAL MAJOR AXIS IS ABOUT 50 KPC, COULD SUPERNOVA/STELLAR-WIND EFFECTS HELP COLLIMATE THE JET? IF EACH STAR HAS A WIND, MATTER JUST ABOVE THE GALACTIC PLANE WILL BE PUSHED ROUGHLY PERPENDICULAR TO THE OPTICAL MAJOR AXIS, UP TO A DISTANCE WHERE THE GALAXY SUBSTANDS A SMALL ANGLE (I.E. 50 KPC OR SO).

IN THE H+B JET MODEL, IS THERE A PLACE HALFWAY ALONG THE LENGTH OF THE JET WHERE THE TWO POLAR MAGNETIC FIELD LINES CROSS AT RIGHT ANGLE? ZERO POL.?



Dr. E.B. Fomalont,
National Radio Astronomy Observatory,
P.O. Box 2,
Green Bank, W.Va. 24944,
U.S.A.

onze referentie:

uw referentie:

Feb. 20, 1976

Dear Ed,

We have carefully gone over the draft of the NGC 315 article. Basically it is acceptable to us in the present form but we do feel that reference should be made to the recent paper by Fanti et al. in the January 1976 MNRAS (176, 5P), which gives an extensive discussion about the compact source within the optical galaxy. We have therefore rewritten those parts of the paper where the Fanti et al. paper is relevant to the present discussion. Note especially that we can say more about the spectrum of the central point component.

Our other main reservation concerns the statistical discussion of the properties of giant radio sources, particularly in section 4. There, and occasionally elsewhere in the paper, 3C 236, DA 240 and Cen A are consistently referred to as if they were the only other giant radio galaxies yet detected. However, in Mem. R.A.S. 79, part 1, Schilizzi lists several sources which, if he had used 50 instead of 100 km s⁻¹ Mpc for H₀, would have intrinsic sizes of ≈ 1.5 Mpc or greater. Since we don't refer to his work, we have removed statements like "all giant radio galaxies...", etc., and replaced them with "the well studied radio galaxies...", etc. There is more data available on the 4 giant sources we have been studying, so this seems to us justified.

We were also surprised that in Table 3 you do not list the flux densities measured at Arecibo on NGC 315. Such data are rather fundamental, we think, and should be included. As for the Westerbork data, we feel it is better to wait for the full synthesis, particularly as the primary beam attenuation is important. Other comments --

Figures: (a) We go along with the suggestion that only the high resolution Westerbork map should be published in its entirety. However, we have inserted the lower resolution map of the South-East lobe since it is almost completely resolved out in the other map.

(b) Could you or Mike Davis please check that the contour levels listed in the Fig. 1 caption are correct? A few seem rather strange.

Journal: Basically, Nature is fine, but we wonder if Nature would accept it as an article, as you seem to intend. It's rather long to be a letter (particularly in view of the figures and tables) and might have to be substantially shortened. Might Ap.J. Letters be a better place? However, whatever you decide is fine with us.

We are sending our figure, plus a retyped manuscript, to you under separate cover. Also, a copy of this letter and the manuscript to Alan.

Bijlage(n):

Yours,

Richard & Tony

RADIOSTERRENWACHT DWINGELOO
Dwingeloo, tel. 05219-7244

RADIOSTERRENWACHT WESTERBORK
post Hooghalen, tel. 05939-421



Drs. A. Bridle and E.B. Fomalont,
National Radio Astronomy Observatory,
Green Bank
W. Va .
U.S.A.

onze referentie:
uw referentie:

Dwingeloo, 24 december 1975.

Dear Alan and Ed,

Tony Willis and I have now produced the best possible map of NGC 315 using our 50 cm data. This is with a larger (2'x4') beam, to bring up the large scale features. Much of the sf component is apparent in the map. The np component is somewhat different from your map, but this may be the result of our limited u,v-plane coverage. We must remake the 1'x2' resolution map, as the one enclosed was made accidentally from data which do not include the longest baselines. Still, it probably is a reasonable representation of the final map. I doubt that it is worthwhile correcting for primary beam attenuation since the map is noisy.

Tony and I feel it would be best to publish all the data together, and I am sending suggested changes to your draft. What do you think about publishing the 2'x4' map of the entire source, and the higher resolution one showing details of the center? I will have these drawn up and, depending on what you decide, will send the appropriate ones.

The outer regions of the central source are probably linearly polarized by \sim 5%-10%, though it is too tentative to mention in this paper.

We have received 50 cm time for this January. Tony and I can take care of the initial reduction, and perhaps some of you will be over here for the I.A.U. so we could work on it then.

Please note my change of address.

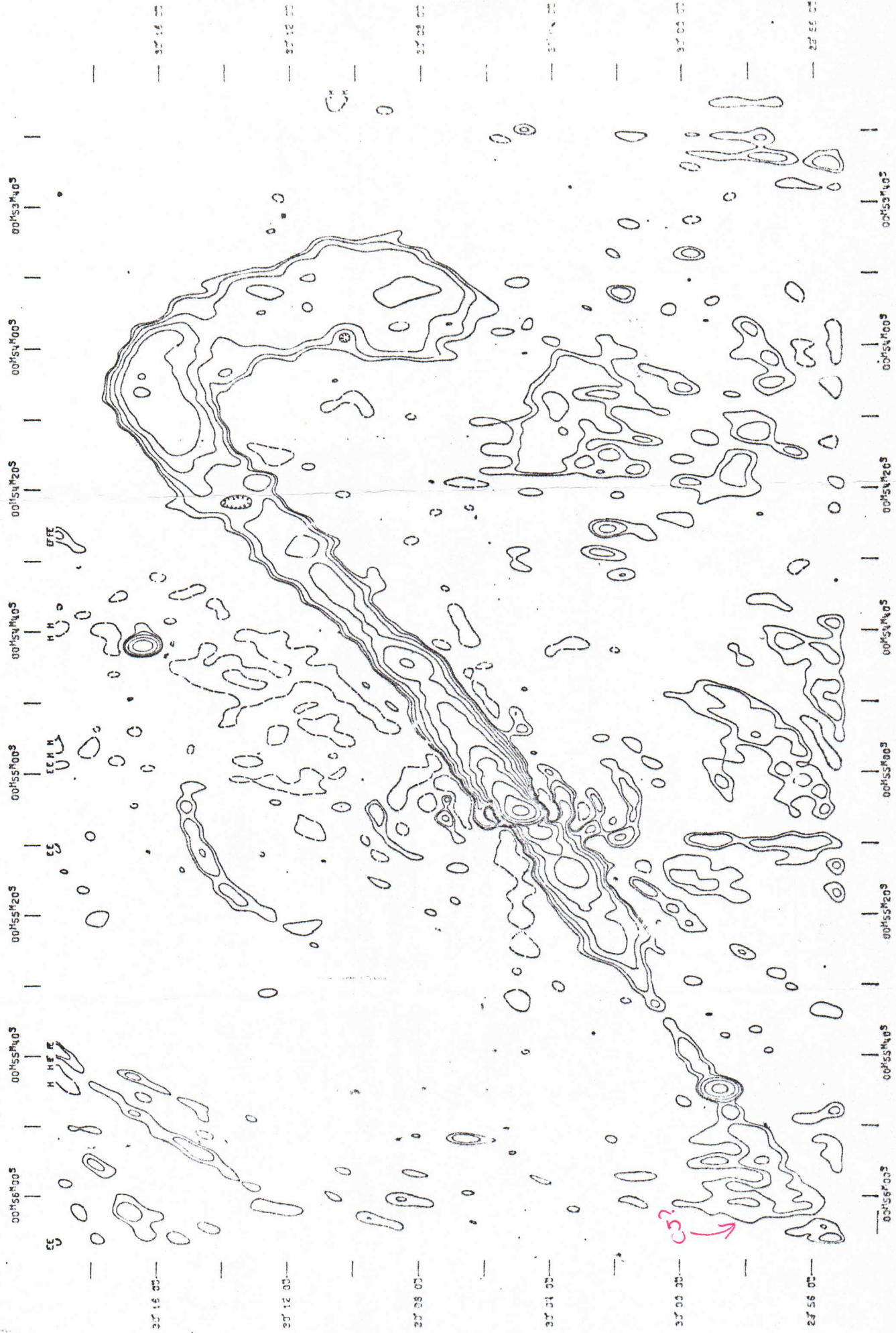
Yours,

Richard

Richard Strom.

P.S. I am sending a copy of everything to Queen's, but in view of the recent postal strike I don't know when that will arrive...

1415 MHz WSRT map
proposed Fig 1b



* - PER CHIFT

To:



Queen's University Memorandum

From:

Date:

Subject:

Dear Mike,

We heard from Skam, and received their preliminary maps, as enclosed. The workbook data doesn't add much (anything?) to our present conclusions, but as they are prepared to do the leg-work on the complete synthesis' early reductions we should maybe let them in on this paper. I enclose their suggested modifications to the paper.

Meanwhile, Dick Henriksen and I have been model-building, we think with some success. To let you see what we're up to as soon as possible, I'm sending the enclosed "first draft" of a paper we'd like to send in at the same time as NAC315 — I think the time-scales are realistically similar now. The draft is missing an abstract, the references are chaotic, and the diagrams sketchy, but the science is done. As it's such a mess I'd prefer it if you didn't show it around yet — also the basic idea of the model is so simple that we'd like to keep it under wraps until it's accepted for publication. Other theorists could probably develop it very rapidly given the basic idea, and as we are knee deep in teaching we'd like to preserve whatever lead time we have for as long as possible. Read it over and see what you think; if you like it I'd like to make some discussion of NAC315 in terms of the new model in our paper. Ed has this rough version to look at also.

Best wishes to your airborne spouse and offspring for a happy

New Year,

Ale.

NATIONAL ASTRONOMY AND IONOSPHERE CENTER

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4 September 1975

Dr. A.H. Bridle
Department of Physics
Sterling Hall
Queen's University
Kingston, Ontario K7L 3N6

Dear Alan,

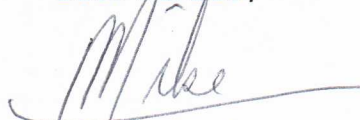
Thanks for your letter; I rather suspect you weren't expecting quite such a quick reply. However, the NAIC data on DW 0055+30 are enclosed as a set of contour maps at 430, 1410 and 2380 MHz. Most of the work was carried out by my Princeton summer student, Debra Meloy, who has just left to start graduate school at U.C. Santa Cruz and Lick Observatory.

As you can see from the contour maps, the region is quite complex. On the large scale 2380 map I've marked the new Westerbork components, which show as extensions on the Arecibo contours. These seem to represent still another scale size, intermediate between the central triple and the outermost two components.

The situation with the south-following component is still somewhat ambiguous, as it does not itself show any extension back towards the central source. However, the clear elongation of the latter directly towards the SF component is nearly conclusive evidence for physical association, which makes the entire source of order a Mpc in extent.

More discussion later; I'd like to have your comments on the contour maps.

Best wishes,



M.M. Davis

MMD:mv.
cc: E.B. Fomalont
encls.



DEPARTMENT OF PHYSICS
STIRLING HALL

Queen's University
Kingston, Canada
K7L 3N6

31 August 1976

Dear Richard,

Thank you for sending the maps of NGC315 and the "interesting" BDFL confused fields. Looking at the NGC315 map confirms my impression that it would be worthwhile making a map to the scale of the Sky Survey putting on only the second-lowest and sixth-lowest of the present contours. It would then be easy to trace an overlay from such a map and see which optical objects should have positions measured. Do you have a facility for writing + 's at the positions of SAO stars on a contour map to aid alignment?

Regarding our conversation about dividing up BDFL identification work: assuming that you and Tony indeed start with the "confused fields", i.e. the low-brightness end, I am concentrating now on the high-brightness (H in Col. 16 of BDFL Table II) sources. We have accurate interferometer positions for most of these now, and my graduate student has optical positions for most of the ID candidates. Hopefully we can soon "meet in the middle" of the brightness regime with a full set of ID's. I'll keep you and Tony informed of our progress, so that we can ensure that we don't needlessly duplicate any work.

Yours,

Alan

P.S. I'm sending a copy of this to Tony also.

DEPARTMENT OF PHYSICS
STIRLING HALL

Queens University
Kingston, Canada
K7L 3N6

11 May 1976

Dear Mike,

Here's the first 'very dirty' 610-MHz 2×12^h synthesis of NGC 315 at Westerbork, which Tony Willis brought here yesterday on his way through. There are problems with one antenna which make the sidelobe levels unusually high around the central source and contribute to general crap in the field but which can be alleviated by editing and CLEANing - the final map should be at least twice as sensitive as this one. Obviously the main features are in excellent agreement with our submitted paper.

Rotating beams and all, I still don't understand this source. What is the North-preceding bridge? Does the 'North hook' come right back under the source? Tony and Richard Strom are trying to get a 4×12^h synthesis done at 21cm which should help delineate fine structure, if any, in the bridge (which remains unresolved transverse to its length at 610 MHz), and provide polarisation information for comparison with the 610-MHz polarisation (not yet reduced but expected to be strong if this is like the other giant systems). The difficult, but useful, data will be the spectral index distribution, and here the Westerbork people are not confident that comparison between their 610 and 1420-MHz data will be too reliable. Comparison of the final 610-MHz map with a well-calibrated 2380-MHz map from Arecibo may be the best way of getting the spectral distribution. If the pointing corrections, etc. cannot easily be recovered to improve the reliability of the present mapping, I suggest that we try to get a new map with the best possible calibrations at 2380 MHz.

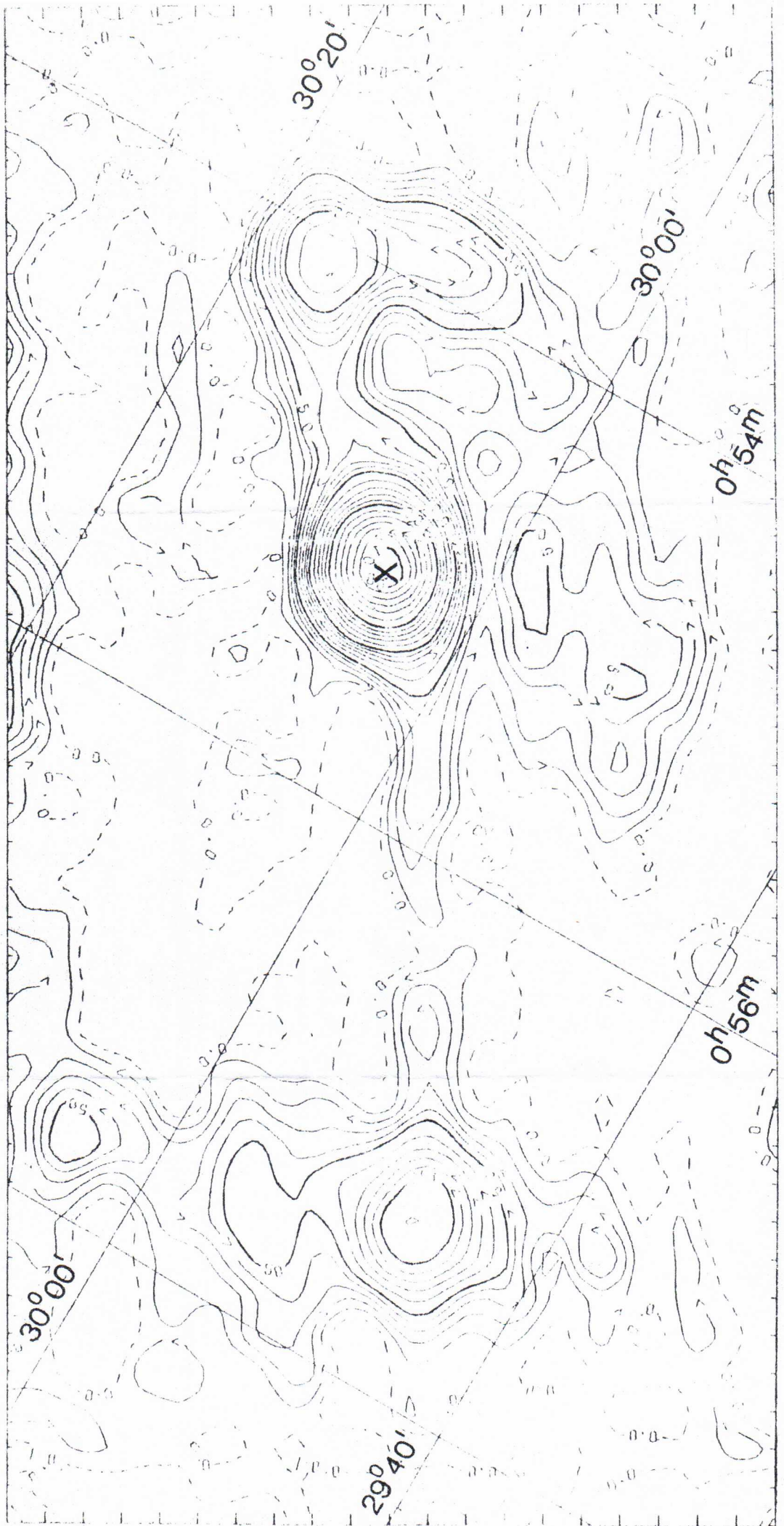
Who are "we"? I hope you're still keen to work on this crazy source. I would like to come to Arecibo to see how it's done down there, but would not wish the tightness of my own schedule between now and the end of September to prevent the observations being made sooner if that were possible. I hope Ed is still keen on pursuing this one (am sending him a copy of the map and this letter). So I hope that we are at least the old trio, perhaps with you getting some real help from your co-authors this time. What say you?

Mary's parents are arriving from Ireland on May 17th; we will be around here until about June 2nd, then we will be wandering around Newfoundland for about 10 days. I will be moderately in touch with my office from the 17th to June 2nd, but not on the usual daily basis. Ed and I will probably both be here in the last two weeks of June, getting our galaxy stuff organised for the I.A.U. Then I am teaching summer school here in July and early August. (All this so you can guess where to find me in the near future - don't try General Delivery, Newfoundland as that's a big island and my reputation there is minimal!).

Best wishes to Jean and the other tree-dwellers



NGC 315 11cm



Contours

0, 10 ... 50, 70, ... 150, 200 ... 400, 500 ... mJy/beam.

X

NGC 315 CPTS

	Nuclear	Central	Np	Sf
S_{2380}	0.498		0.55	0.45
Θ_α (min)	$< 1.7 \times 10^{-3}$		5.1	5.5
Θ_δ (min)	$< 1.7 \times 10^{-3}$		4.5	5.9
α	+0.2		-0.52	-0.53
T_b (K)	$> 1.5 \times 10^7$		2.1	1.2
Vol (kpc ³)	$< 5.8 \times 10^{-5}$		1.3×10^6	2.2×10^6
P_{2380} (ly/Hz)	$6^0 \times 10^{23}$		6.6×10^{23}	5.4×10^{23}
L_{10000}^{10} (W)	6.7×10^{33}		6.4×10^{33}	5.2×10^{33}
E_{min} (j)	$> 1.4 \times 10^{46}$		6.0×10^{50}	6.7×10^{50}
B_{eq} (g)	$> 9.5 \times 10^{-4}$		1.3×10^{-6}	1.1×10^{-6}

Pers

Np	00 54 11 ± 1	30 15 30 ± 30	N-Np	15.8 in pa ^(0.45 mpc) 132° ± 1°
Sf	00 57 21 ± 1	29 46 10 ± 30	N-Sf	34.8 in pa ^(0.98 mpc) 122°
Nucl.	00 55 05.64	30 04 56.8	Np-Sf	50.5 in pa ^(1.43 mpc) 125°

3C 236

DA 240

	Np	Sf	W _{est}	E _{ast}
D(Mpc)	606	606	215	215
z	0.0988	0.0988	0.0356	0.0356
S ₂₃₈₀	0.928	0.795	1.46	2.39
θ _x	9	6	6	6
θ ₀	3.5	2	6	6
α	0.6	0.6	.77	.77
T _b	2.6	5.7	3.5	5.7
V _{ol}	2.9 × 10 ⁸	6.8 × 10 ⁷	2.3 × 10 ⁷	2.3 × 10 ⁷
P ₂₃₈₀	4.1 × 10 ²⁵	3.5 × 10 ²⁵	8.1 × 10 ²⁴	1.3 × 10 ²⁵
L ₁₀₀₀₀ ¹⁰	4.3 × 10 ³⁵	3.7 × 10 ³⁵	9.5 × 10 ³⁴	1.6 × 10 ³⁵
E _{min}	7.2 × 10 ⁵²	3.6 × 10 ⁵²	1.2 × 10 ⁵²	1.6 × 10 ⁵²
B _{eq}	9.5 × 10 ⁻⁷	1.4 × 10 ⁻⁶	1.4 × 10 ⁻⁶	1.6 × 10 ⁻⁶
ε	2.5 × 10 ⁴⁴			

