

# The ODE experiment on 3C236

## 2 October 1976

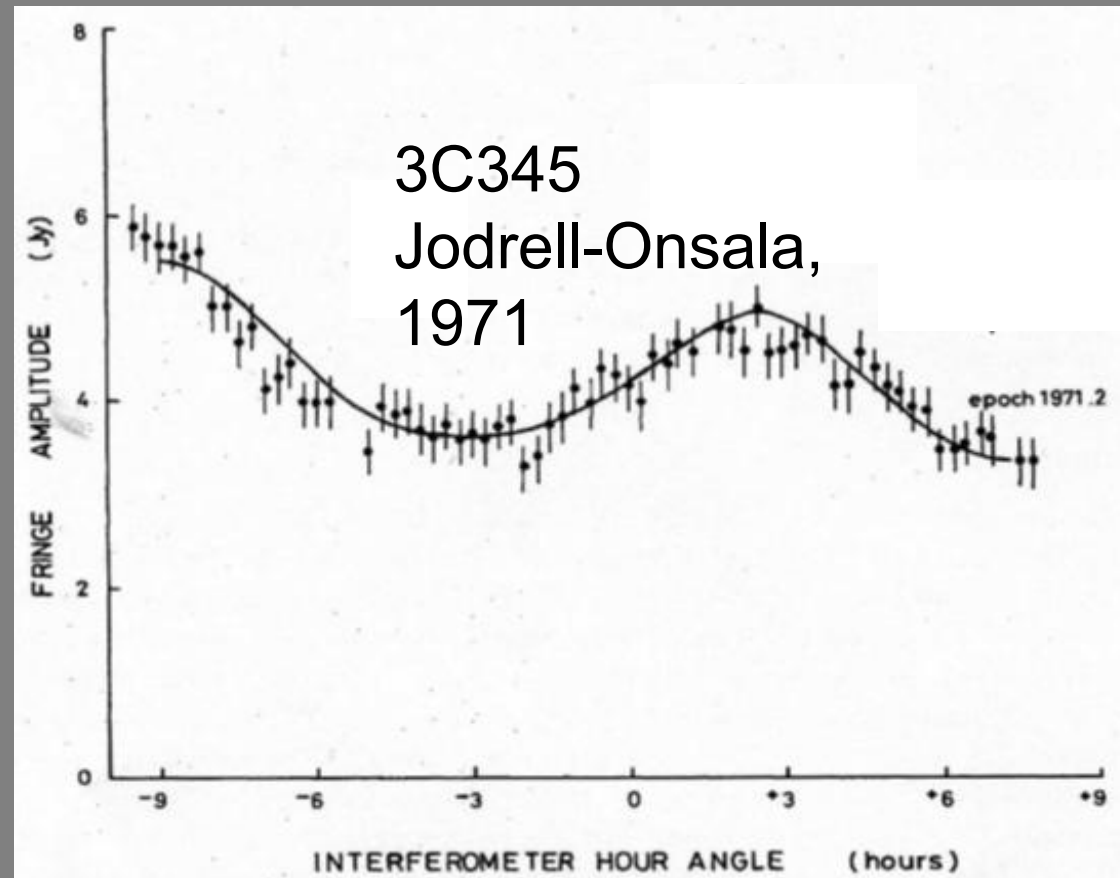
Richard Schilizzi

University of Manchester

# Key developments in VLBI in Europe in the 1970s

- first 2-station European observations
  - first discussions of intra-European VLBI
  - US VLBI Network Users Group formed
  - first 3-station European VLBI observations (ODE)
  - MPIfR 3-station MkII correlator in operation
  - first MKIII recording at Onsala and Effelsberg
  - Satellite-linked VLBI experiment (US-Canada), ESA Study in Europe
  - Phased array at Westerbork in operation
- } See Arnold's talk

**1971** First intra-European observations (Jodrell-Onsala) – Dave Fort, Bryan Anderson  
published in Fort, 1971, Ph.D. thesis, and Stannard et al, 1980



## First VLBI at MPIfR in June 1973 at 13 cm

### July 1973: Observations at 2.8 cm together with Green Bank, Fort Davis and Owens Valley

"Observations with a VLB Array. I. Introduction and Procedures", M.H. Cohen, A.T. Moffet, J.D. Romney, R.T. Schilizzi, D.B. Shaffer, K.I. Kellermann, G.H. Purcell, G. Grove, G.W. Swenson, J.L. Yen, I.I.K. Pauliny-Toth, E. Preuss, A. Witzel and D. Graham (1975) Ap.J., **201**, 249-255.

"Observations with a VLB Array. II. The Sources 4C39.25, NRAO150, VRO42.22.01, 3C345, and 3C454.3", D.B. Shaffer, M.H. Cohen, J.D. Romney, R.T. Schilizzi, K.I. Kellermann, G.W. Swenson, J.L. Yen and R. Rinehart (1975) Ap.J., **201**, 256-262.

"Observations with a VLB Array. III. The Sources 3C120, 3C273B, 2134+004 and 3C84", R.T. Schilizzi, M.H. Cohen, J.D. Romney, D.B. Shaffer, K.I. Kellermann, G.W. Swenson, J.L. Yen and R. Rinehart (1975) Ap.J. **201**, 263-274. **My first first-author VLBI paper!**

# First moves towards a European VLBI Network

1975

(April)

Coffee table discussion at MPIfR –  
Roy Booth (JBO), Ivan Pauliny-Toth (MPIfR),  
Eugen Preuss (MPIfR), George Miley (Leiden)

(September)

MPIfR- First meeting of interested astronomers from  
Germany, Italy, NL, Sweden, UK



Roy



Ivan



Eugen



George

# Report on September 1975 meeting on V.L.B.I. in Europe, by Roy Booth

## V.L.B.I. in EUROPE

On September 26th 1975 an informal meeting on the possibilities for very long baseline interferometry in Europe took place at the Max Planck Institut für Radioastronomie in Bonn. The following 8 point statement was agreed by the participants (list enclosed).

1. There is great interest in setting up a European VLBI network and several observatories are considering the installation of VLBI terminals.
2. The funding of these projects in individual observatories is not yet clear.
3. The possibility of approaching national and international bodies for support will be explored with the heads of individual observatories.
4. We should go ahead with the NRAO Mk II VLBI system at present, especially since Bonn and Onsala already have Mk II terminals.
5. We want to encourage the Onsala Observatory to complete their processor and we will examine ways of helping the venture.
6. We should keep in touch with MIT and NRAO in terms of Mk III development.
7. Some European VLBI projects have been started and we should continue with these and propose new ones.
8. We should meet again in a few months. Provisionally Friday, February 6th in Bonn.

R.S. Booth  
October 1975



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**sterrewacht leiden** *Rich*

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To: The SRZM Program Committee

From: A. van Ardenne, B. Baud, G.K. Miley and  
R. Schilizzi

Subject: VLBI with Dwingeloo/1612 MHz/up to 60 hours

Leiden, September 10, 1976

Enclosed is a copy of an observing proposal submitted to the program committees or relevant authorities at the M.P.I., Bonn and Chalmers, Onsala. The informal reaction from both institutions has been favourable and there is a strong possibility that we will obtain observing time with the 100 m telescope at Bonn about 1-2 October.

## First EVN proposal

Proposal for VLBI experiment between Dwingeloo, Effelsberg and Onsala at 1612 MHz

from

A. van Ardenne, B. Baud, G.K. Miley and R. Schilizzi

### Introduction

We propose to carry out VLBI between the telescopes at Dwingeloo, Effelsberg and Onsala in order to study the structure of (i) the nuclear component of the giant radio galaxy 3C236 and (ii) OH maser emission from the infra red star NML Cygnus. A secondary object of this experiment is to give engineers and astronomers in the Netherlands experience of VLBI work so that they can participate in the proposed European VLBI network.

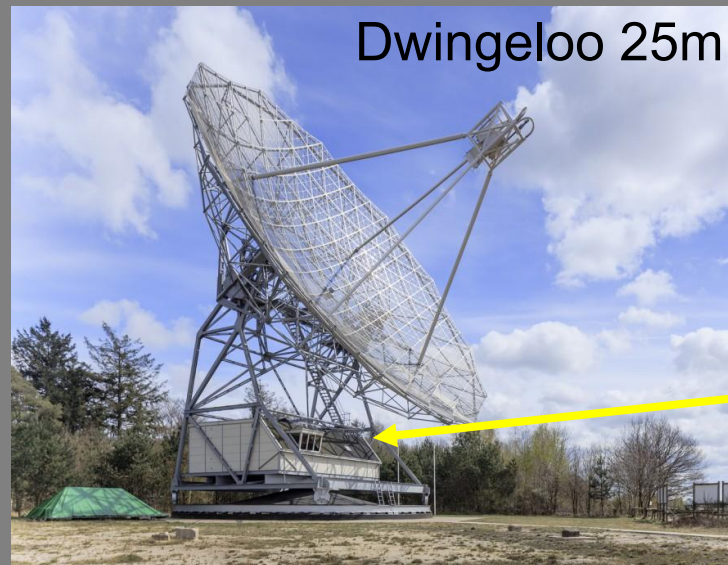
It is hoped that a transportable NRAO Mk IIc recording terminal can be borrowed from Onsala for this experiment. (It is expected that a permanent Mark II terminal will become available in Dwingeloo during 1977).

The request is for a total of 24 hours observing time including calibration on known point sources.

### 3C236

Small radio cores one now know to occur in the nuclei of most extended radio galaxies and quasars. They are believed to play an important role in producing and maintaining the extended double radio structure. One of the most interesting examples is the giant radio galaxy 3C236. It is the only case where detailed information about the structure of the radio core is available (Fomalont, E.B. and Miley, G.K., 1975, Nature 257, 99). This core has an extent of  $\sim 0.8''$  in a position angle which is within  $4^\circ$  of that of the large outer  $39'$  double source discovered with the Westerbork telescope (Willis, A.G., Strom, R.G. and Wilson, A.S., 1974, Nature 250, 625). The struc-

**1976 ODE** First 3-station European observations, Onsala-Dwingeloo-Effelsberg, 2 Oct 1976, on 3C236  
(and first VLBI experiment at Dwingeloo)



*left to right:* Baudewijn Baud, RTS, George Miley examining the MkII recording terminal borrowed from Onsala

Photo by Arnold van Ardenne

## High Resolution Observations of the Compact Central Component in the Giant Radio Source 3C 236

R. T. Schilizzi<sup>1</sup>, G. K. Miley<sup>2</sup>, A. van Ardenne<sup>1</sup>, B. Baud<sup>2,\*</sup>, L. Bååth<sup>3</sup>, B. O. Rönnäng<sup>3</sup>, and I. I. K. Pauliny-Toth<sup>4</sup>

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<sup>2</sup> Sterrewacht, Huygens Laboratorium, Leiden, The Netherlands

<sup>3</sup> Onsala Space Observatory, Onsala, Sweden

<sup>4</sup> Max Planck Institut für Radioastronomie, Auf dem Hügel 69, D-5300 Bonn 1, Federal Republic of Germany

Received October 16, 1978

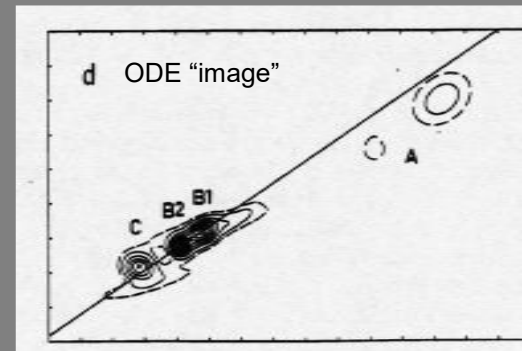
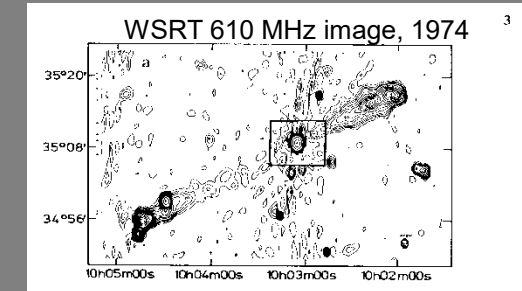
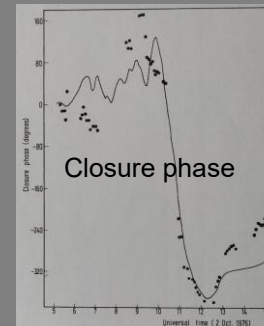
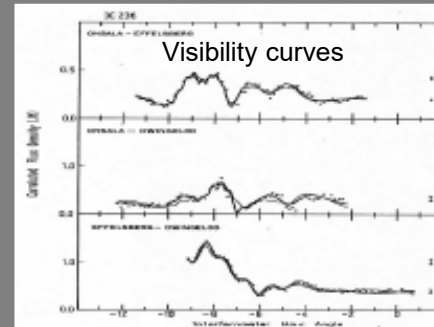
### Observing schedule

ODE EXPERIMENT

OCTOBER 1, 2

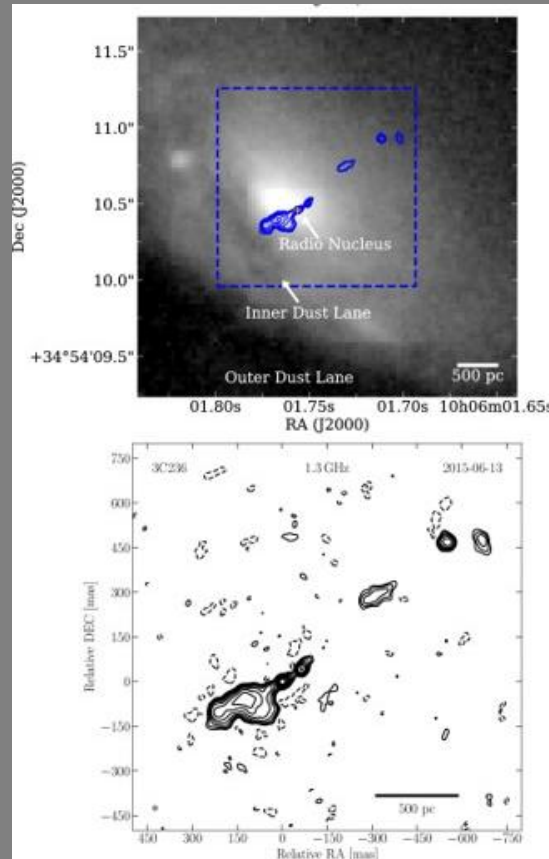
[A] CONTINUUM. F = 1610 MHz. BW = 2 MHz. STATION B = EFFELSBERG, C =

| SOURCE  | SCAN #   | START    | STOP     | TAPES    | SCAN TIMES                               |
|---------|----------|----------|----------|----------|------------------------------------------|
|         |          | B        | C        | A        | B-C A-C A-B                              |
| 3C273   | 275-1530 | 15 02 32 | 14 59 55 | 1500 00  | 15 30 MPI-151 MPI-76 OSO-1 27% 30 27%    |
| 3C315   | -1600    | 15 36 45 | 15 35 55 | 15 33 10 | 16 00 " " " 23% 24 23%                   |
| 4C39.25 | 276-0230 | 02 02 00 | 02 00 00 | 02 01 00 | 02 30 MPI-041 MPI-018 OSO-7 28 29 28     |
| A00235  | -0300    | 02 35 00 | 02 38 06 | 02 35 18 | 03 00 " " " 22 22 25                     |
| 3C22    | -0330    | 03 04 30 | 03 04 40 | 03 03 07 | 03 30 " " " 25% 25% 25%                  |
| 3C 84   | -0400    | 03 35 00 | 03 35 15 | 03 33 15 | 04 00 " " " 25 25 25                     |
| 3C263   | -0430    | 04 07 06 | 04 08 05 | 04 06 20 | 04 30 MPI-042 MPI-019 OSO-8 22 22 23     |
| 4C39.25 | -0500    | 04 40 15 | 04 34 33 | 04 32 15 | 05 00 " " " 20 25% 20                    |
| 3C236   | -0600    | 05 02 30 | 05 04 11 | 05 01 14 | 06 00 " " " 56 56 57%                    |
| "       | -0700    | 06 06 10 | 06 07 46 | 06 05 42 | 07 00 MPI-043 MPI-045 OSO-9 52% 52% 54   |
| "       | -0800    | 07 02 10 | 07 02 33 | 07 00 27 | 08 00 " " " 57% 57% 58                   |
| "       | -0900    | 08 05 00 | 08 08 25 | 08 05 18 | 09 00 MPI-053 MPI-012 OSO-10 51% 51% 55  |
| "       | -1000    | 09 00 00 | 09 02 39 | 09 00 25 | 10 00 " " " 57% 57% 59%                  |
| "       | -1100    | 10 06 30 | 10 09 33 | 10 05 00 | 11 00 MPI-055 MPI-013 OSO-11 50% 50% 53% |
| "       | -1200    | 11 00 00 | 11 03 44 | 11 00 48 | 12 00 " " " 56% 56% 59%                  |
| "       | -1300    | 12 05 30 | 12 07 00 | 12 06 07 | 13 00 MPI-056 MPI-014 OSO-12 53 53 54    |

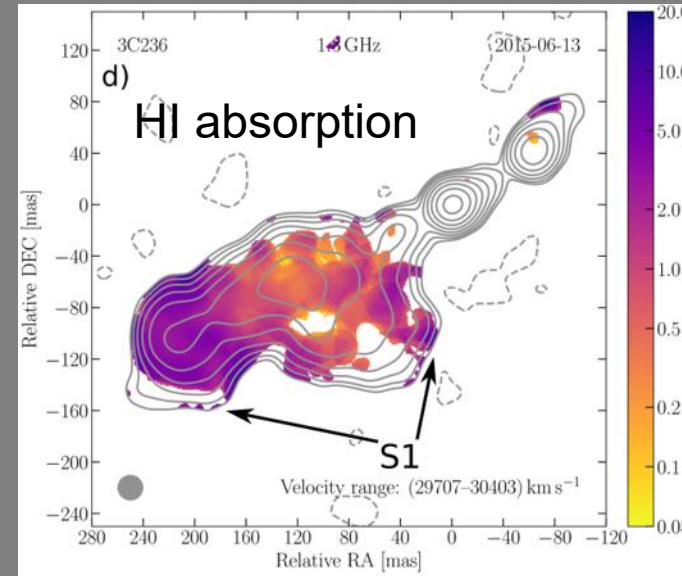


# Most recent results on 3C236

1.3 GHz image  
superimposed on the  
HST V-band image

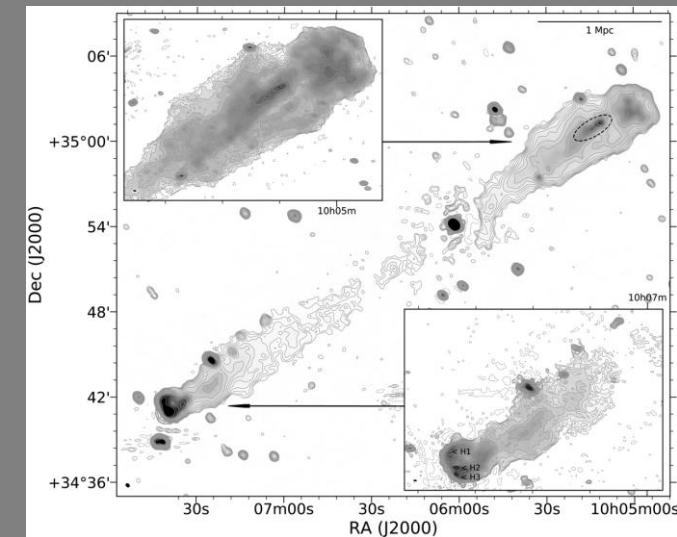


1.3 GHz image with a  
14-station global array



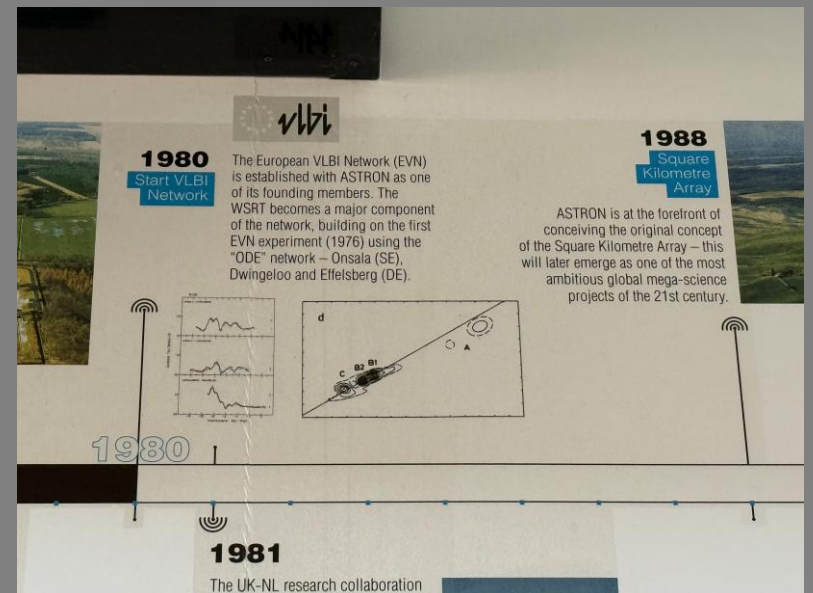
“Mapping the neutral atomic hydrogen gas outflow in the restarted radio galaxy 3C 236”  
R. Schulz, R. Morganti, K. Nyland, Z. Paragi, E. K. Mahony and T. Oosterloo

A&A 617, A38 (2018)



First look at the giant radio galaxy 3C 236 with LOFAR A&A 628, A69 (2019)\*  
A. Shulevski, P. D. Barthel, R. Morganti, J. J. Harwood, M. Brienza, T. W. Shimwell, H.  
J. A. Röttgering, G. J. White, J. R. Callingham, S. Mooney<sup>9</sup> and D. A. Rafferty

# 3C236 on the wall in Dwingeloo



End