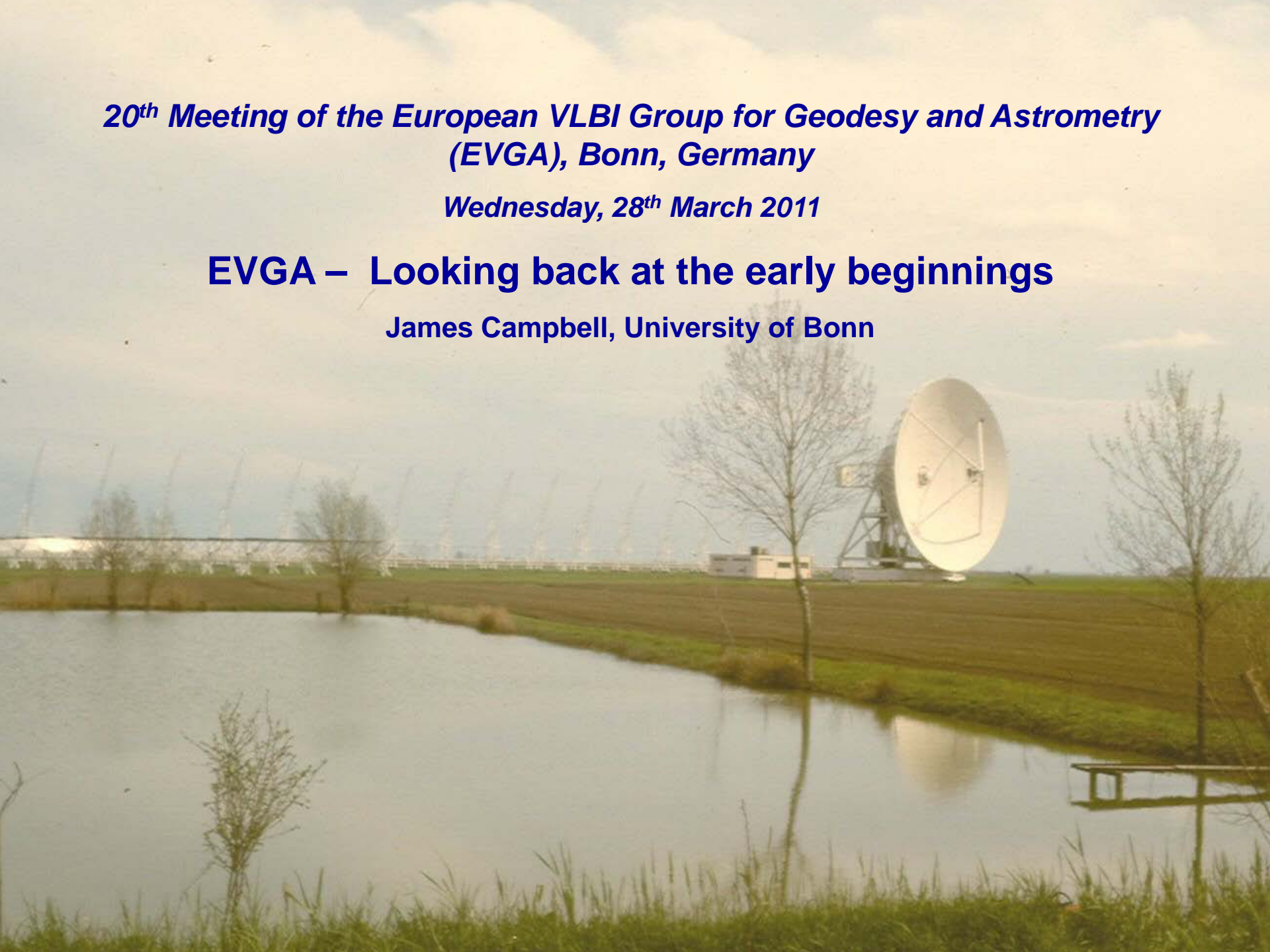


***20<sup>th</sup> Meeting of the European VLBI Group for Geodesy and Astrometry  
(EVGA), Bonn, Germany***

***Wednesday, 28<sup>th</sup> March 2011***

**EVGA – Looking back at the early beginnings**

**James Campbell, University of Bonn**



3<sup>rd</sup>

ACCOUNT OF THE WORKING MEETING  
ON  
EUROPEAN VLBI FOR GEODESY AND ASTROMETRY

UNDER THE AUSPICES OF THE  
NETHERLANDS GEODETIC COMMISSION

HELD AT THE  
DEPARTMENT OF GEODESY  
DELFT UNIVERSITY OF TECHNOLOGY

ON 3 - 4 NOVEMBER 1983

EDITED BY FRITS J.J. BROUWER

Nov. 1983

4<sup>th</sup>



PROCEEDINGS OF THE 4<sup>th</sup> WORKING MEETING ON  
EUROPEAN VLBI FOR GEODESY AND ASTROMETRY  
HELD AT  
ONSALA SPACE OBSERVATORY, SWEDEN  
3 JUNE 1985

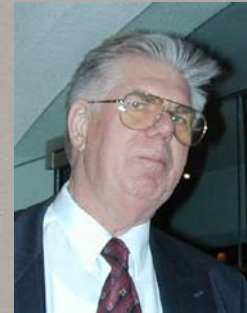
Edited by B. Rönnäng and G. Tang

June 1985

# 1<sup>st</sup> Meeting

## European VLBI for Geodesy and Astrometry

Informal Meeting held at the Geodetic Institute  
in Bonn 28-29 April 1980



### I. Introduction and general Status, Projects

1. At the opening of the meeting Prof. H. Seeger, director of the Bonn Geodetic Institute, summarized the status of the project of a dedicated geodetic VLBI telescope, which is to be built at the satellite tracking station of Wettzell in Southern Germany. This project will be supported jointly by geodesists in Munich, Francfort and Bonn with a combined funding by the German Science Foundation (Deutsche Forschungsgemeinschaft) and the Federal Government. The 20-25 m telescope will be equipped with receivers for the commonly used VLBI frequencies including the NASA S- and X-bands. A Mk III recording terminal has been ordered and a H-maser frequency standard for Wettzell is under construction at Ebauches S.A. in Switzerland. The principal activities of the future VLBI station will be concentrated on the participation in global as well as regional geodynamics programs.
2. A brief overview concerning the situation of geodetic and astrometric VLBI in Europe was given by J. Campbell. Since the inception of VLBI about 10 years ago there have been some sporadic geodetic VLBI activities in Europe; in particular the close cooperation between the Onsala Space Observatory (Sweden) and the MIT-Haystack-Group using the Mk I bandwidth synthesis system: this resulted e.g. in the measurement of the baseline Haystack-Onsala with an accuracy of half a decimeter in length.

# 2<sup>nd</sup> Meeting

## European VLBI meeting for Geodesy and Astrometry

Madrid 3-4 December 1981

### Geodetic VLBI Using the MkII-BWS-Technique

#### 1. Geodetic VLBI-Experiments

##### a) Observed experiments:

- MEO 1 (Madrid - Effelsberg - Onsala) 27/28 July '80 at X-Band 8.4 GHz, 40 MHz BWS (failed due to technical problems).
- MEO 2 (Madrid - Effelsberg - Onsala) 26/27 Sept. '80 at X-Band 8.4 GHz, 40 MHz BWS (partial success on Madrid-Onsala-baseline. To be recorrelated at MPI processor).
- WEJO 1 (Effelsberg - Metsähovi) 5/6 Oct. '80 at 5 GHz, 20 MHz BWS (data reduction completed).
- WEJO 2 (Westerbork - Effelsberg - Jodrell Bank - Onsala - Chilbolton) 12/13 April '81 at 5 GHz (Chilbolton and Onsala lost ~ 50 % of time due to equipment mal-function. Correlation at MPI and JPL completed. Final reduction in progress). 40 MHz BWS.

##### b) Planned experiments:

- WEJO 3 (Westerbork - Effelsberg - Jodrell Bank - Onsala) 12/13 Dec. '81 at 5 GHz, 40 MHz BWS.
- MEO 3 (Madrid - Weilheim - Johannesburg - Onsala) 1982 at S-Band.
- WEJO 4 (Westerbork - Effelsberg - Jodrell Bank - Onsala) Dec. '82 at 5 GHz, 40 MHz BWS.

#### 2. Processing

## **EVGA- Precursors**

**1976, Oct. 22:** Onsala, Sweden: Third European VLBI Meeting  
(European Radio Astronomy Observatories)

**1977, March 9:** Bonn, Germany: AGRAM (Astrometrische und geodätisch-geophysikalische Nutzung radioastronomischer Methoden) **Meeting on the astrometric and geodetic-geophysical use of radioastronomic techniques**

**1978, Nov. 28:** Bonn, Germany: Second AGRAM Meeting  
(including participants from neighboring European countries)

*The AGRAM meetings were organised by P. Brosche, Astronomical Institute and J. Campbell, Geodetic Institute of the Bonn University*

# Aspects of Eur. VLBI for Astrometry and Geodynamics

- Create a permanent network of fixed stations: observations on a regular basis for

- astrometry (extragalactic inertial system)
- Earth rotation (Polar motion & UT1-variations)
- Earth tides
- Crustal motions (plate stability)
- Reference for mobile stations



- Look at available geodetic VLBI instrumentation at the European VLBI observatories
  - Dual band receivers (S/X) **Compatibility with astro observations?**
  - MkIII wide band backends and recording **High cost, funding?**
  - H - maser frequency standards **High cost, funding?**
  - Alternatives: MkII BWS?
  - Water vapour radiometry

*(2nd AGRAM, Nov. 1978)*



## European astrogodetic VLBI Net (1980)

□ operational

□ planned

Plans for MkIII Correlator at MPIfR Bonn (3 stations completed end of 1982)

<b>Early VLBI experiments in Europe with astro-geodetic background</b>			
Date	Proposed and set up by	Network and Experiment "Name"	Remarks
<b><i>European baselines/networks</i></b>			
24 - 26 Nov. 1979	Haystack-MIT, Onsala, MPIfR (+ Bonn geodetic VLBI group)	<b>Effelsberg-Onsala</b> -Haystack-Greenbank-Owens Valley	First full MkIII S/X Continental Drift experiment
19 - 21 Feb. 1980	Bonn astro-geodetic VLBI group	<b>Effelsberg-Onsala</b> -Green Bank-Johannesburg "JOEN"	MkII 18 cm astro-geodetic pilot experiment
26 - 27 July 1980	Haystack-MIT, Onsala, MPIfR (+ Bonn geodetic VLBI group)	<b>Effelsberg-Onsala</b> -Haystack-Fort Davis-Owens Valley	Second MkIII S/X Continental Drift experiment
26 July 1980	Bonn geodetic VLBI group	<b>Effelsberg - Onsala - Madrid</b> "MEO 1"	MkII-X-band BWS experiment
26 -29 Sept. 1980	Haystack-MIT, Onsala, MPIfR (+ Bonn geodetic VLBI group)	<b>Effelsberg-Onsala</b> -Haystack-Fort Davis-Owens Valley "MERIT 1"	First intercontinental MkIII S/X Earth Rotation experiment
26 -27 Sept. 1980	Bonn geodetic VLBI group	<b>Effelsberg - Onsala - Madrid</b> "MEO 2"	MkII-X-band BWS experiment
4 Oct. 1980	Bonn geodetic VLBI group, Haystack-MIT, NASA GSFC	<b>Werthhoven - Haystack</b>	MkIII- X-band fast slewing experiment (test of Werthhoven facility FGAN)
5 - 6 Oct. 1980	Bonn geodetic VLBI group	<b>Effelsberg-Westerbork-Jodrell Bank-Metsähovi</b> "WEJO 1"	MkII-6 cm BWS experiment (Project ERIDOC)
12-13 Apr. 1981	Bonn geodetic VLBI group (+Geodetic Institute Delft)	<b>Effelsberg-Onsala-Westerbork-Jodrell Bank-Chilbolton</b> "WEJO 2"	MkII-6 cm BWS experiment (Project ERIDOC)
20 July 1983	Bonn geodetic VLBI group, Haystack-MIT, NASA GSFC	First baseline <b>Wetzell-Onsala</b>	MkIII- X-band experiment
<b><i>Local baselines/networks</i></b>			
15 Nov. 1979/81/82	NASA/JPL + INTA + IGM	Madrid DSN Complex, DSS-61, DSS-62, DSS-63	MkII S/X and S BWS experiments
13 Jan. 1981	Onsala VLBI team	600m baseline between OSO 26.5m and OSO 20m	Mk III X-band

# Major Projects in Geodesy/Geodynamics

## Global:

**MERIT (IAU/IAG)**

*G.A. Wilkins (RGO) et al.*

**POLARIS (NGS)**

*W.E. Carter et al.*

**CDP (NASA/GSFC)**

*W. Coates, T.A. Clark et al.*

**TEMPO (NASA/JPL)**

*J. Fanselow et al.*



## Regional (Europe):

**ERIDOC (Delft, Bonn)**

*F.J.J. Brouwer, J. Campbell et al.*

1980

**EUROPE (Bonn)**

*J. Campbell et al.*

1983

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1980

1985

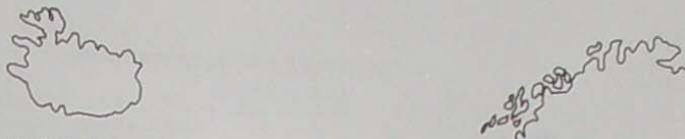


Figure 2: ERIDOC network

- △ = 6cm WEJO VLBI Station
- = ERIDOC Doppler Station



## ERIDOC (Delft, Bonn)

Oct. 1980, April 1981

6 cm MkII 40 MHz BWS

6 VLBI sites, 18 Doppler stations



Processing at Caltech correlator

Geodetic analysis at Bonn and Delft

Decimeter accuracy in comparison Doppler/VLBI

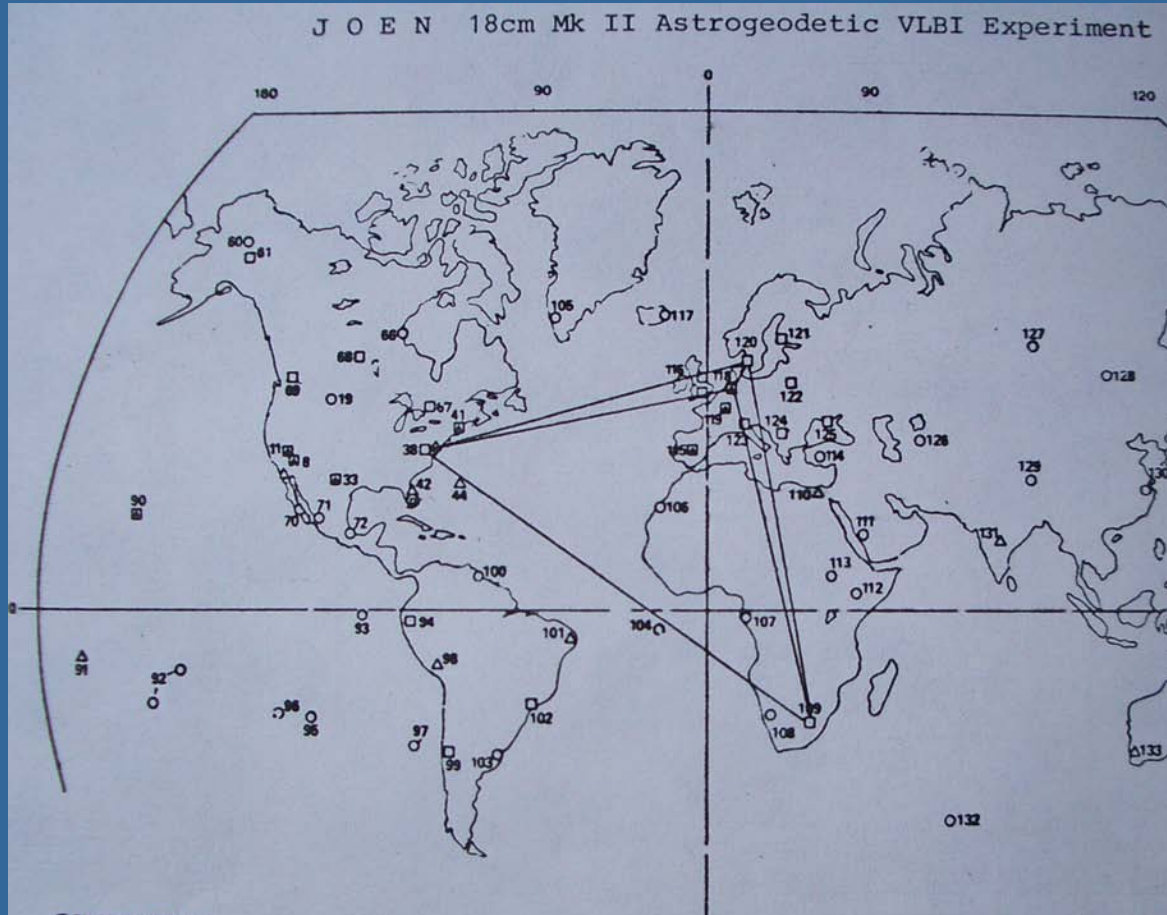
*F.J.J. Brouwer, J. Campbell et al.*

G.D. Nicolson  
A. Nothnagel

# The South-African connection



JOEN 19-21 Feb 1980



□ EXISTING VLBI SITE  
△ EXISTING LASER SITE  
▣ EXISTING VLBI - LASER SITE

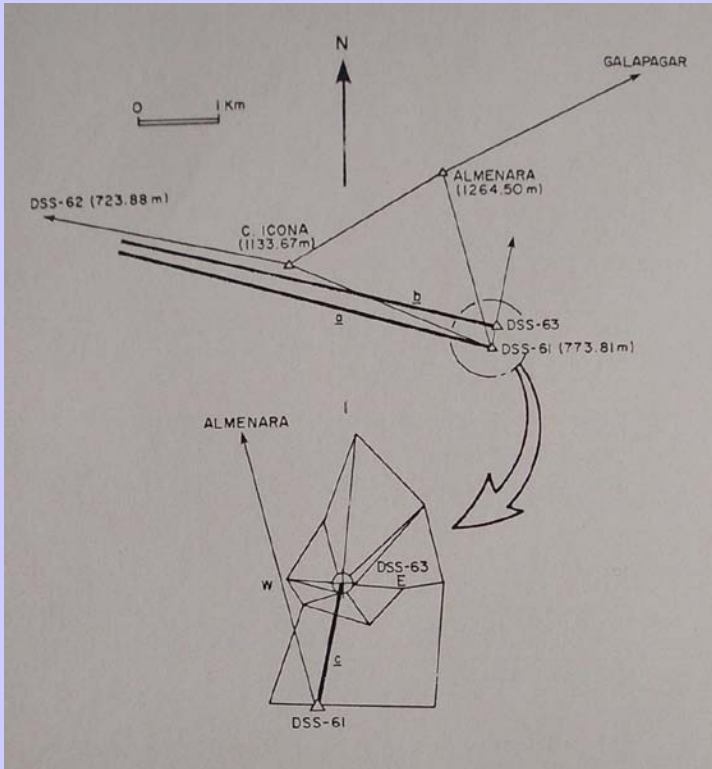
11 OVRO, Big Pine, Owens Valley, California  
38 NRAO, Greenbank, West Virginia

109 RAO Hartebeesthoek, Johannesburg, South Africa  
118 MPIfR, Effelsberg, Bonn, West Germany  
120 Chalmers Techn. University, Onsala, Sweden



HARTRAO Johannesburg

# Local networks at telescope sites



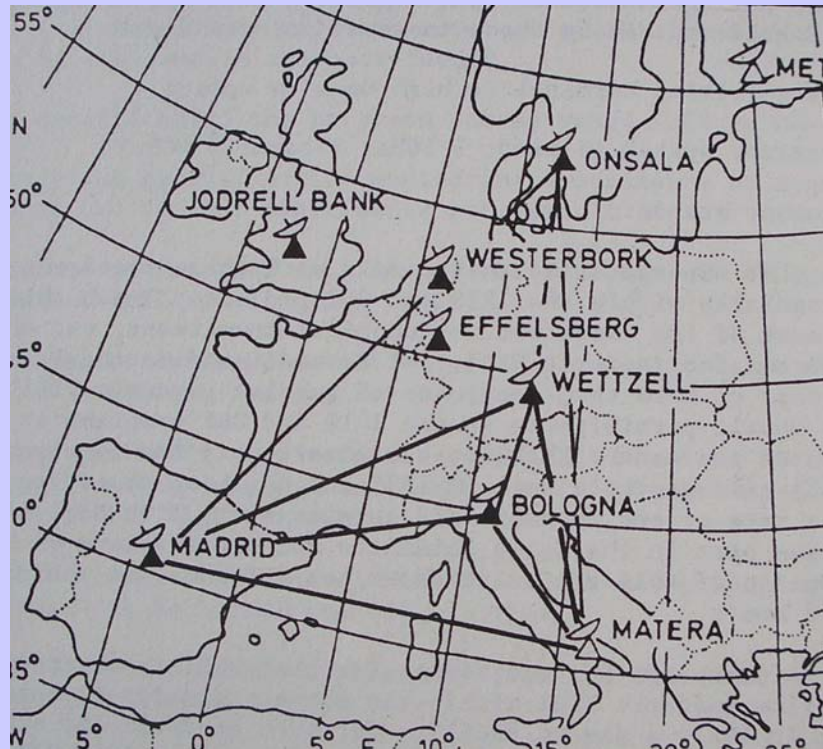
*Effelsberg: J. Campbell et al. 1980*



*Madrid/Robledo: E. Calero, A. Rius 1980*

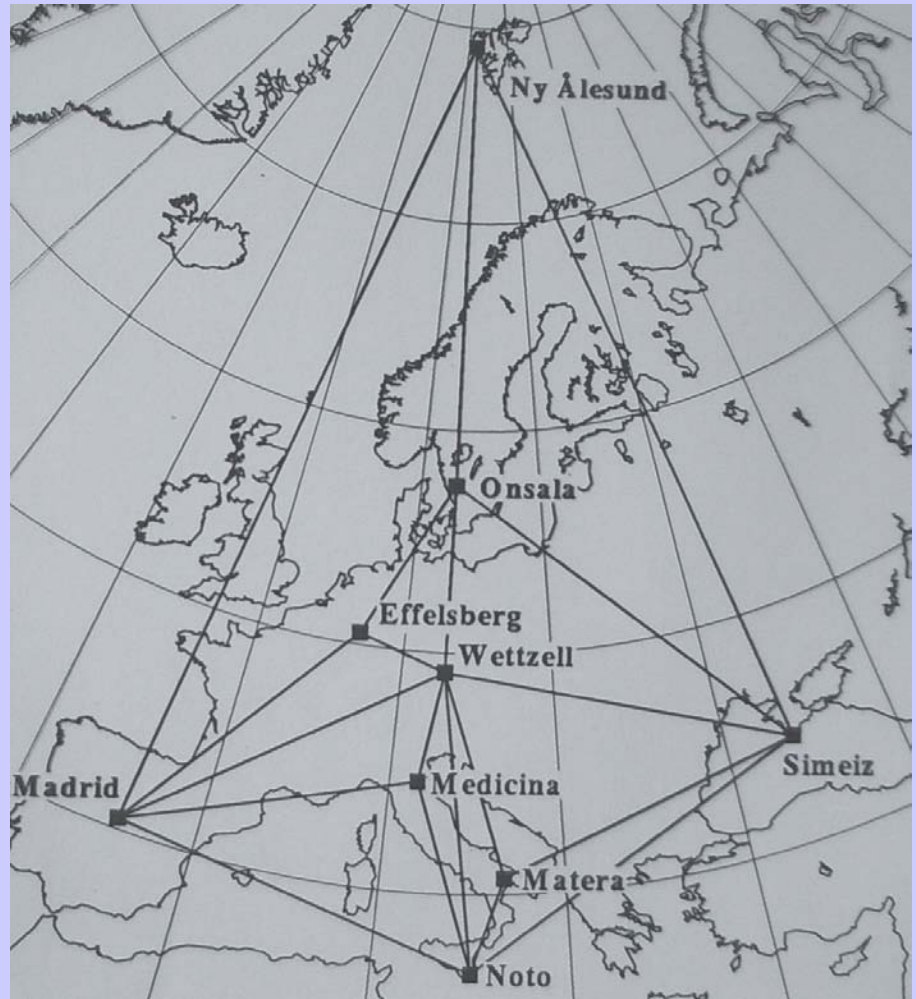


*Onsala: G. Lundquist 1981*

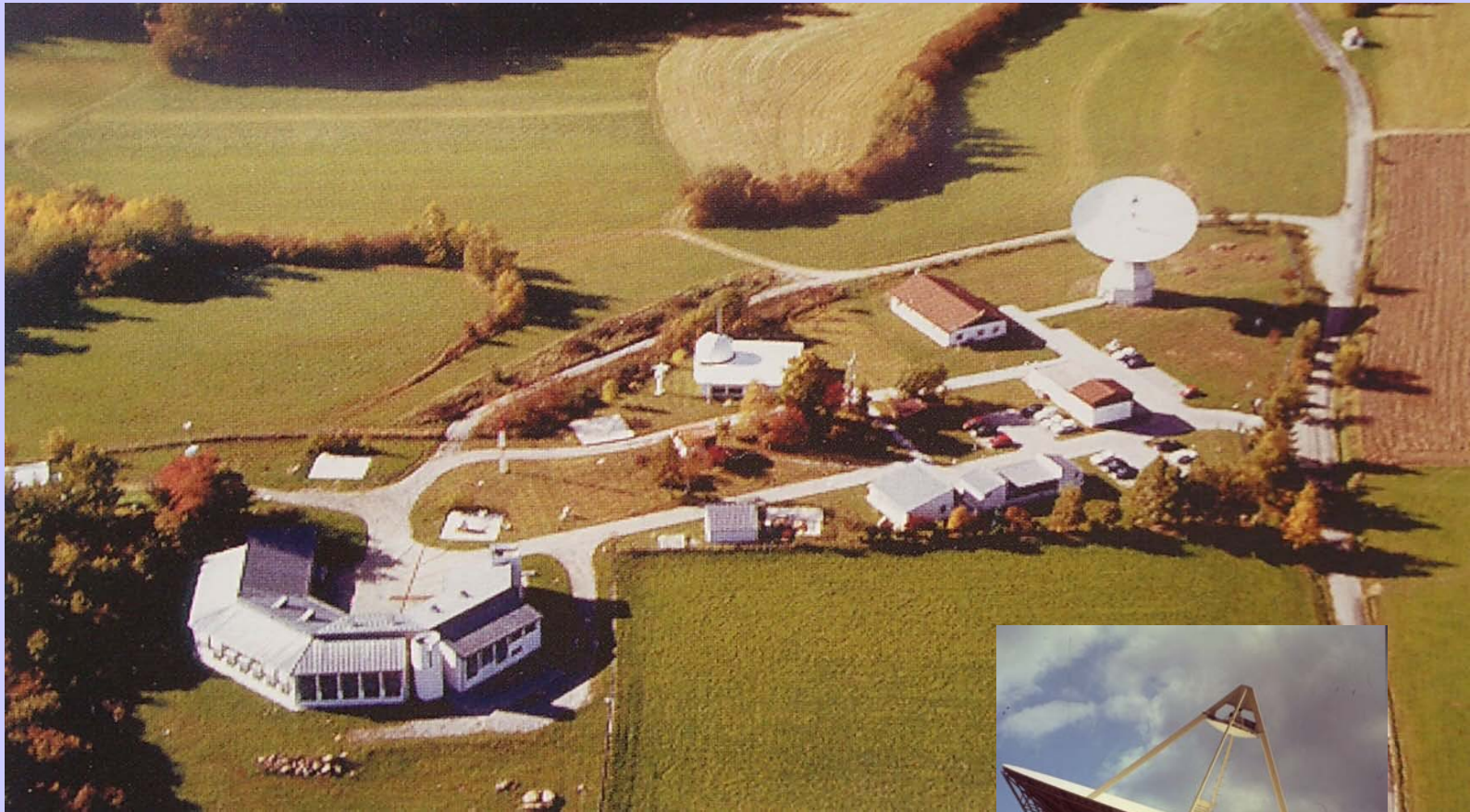


**1985**

**Further evolution of  
the European  
astrogeodetic VLBI Net**



**1991**



## Wettzell:

Concept of a „fundamental station“,  
i.e. combining different geodetic space  
techniques on one site

*E.Flinn (NASA), H. Seeger (BKG), M. Schneider (TUM)*



Wettzell RT  
1983



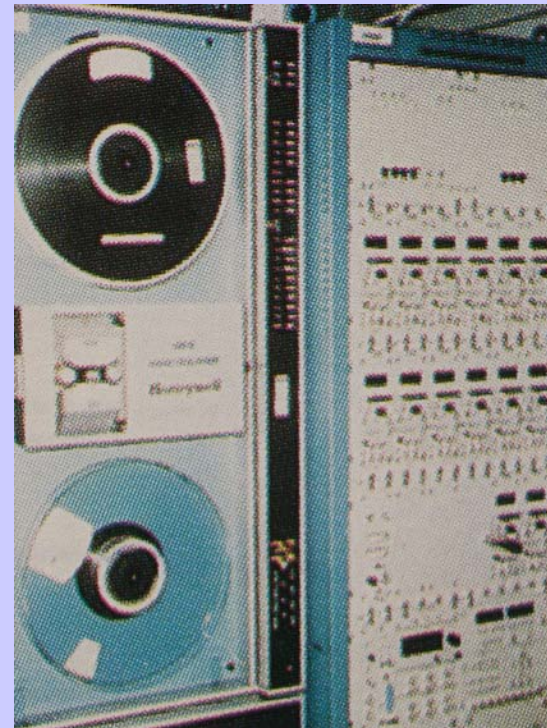
*F. Lochner (MPIfR), G. Reichert (GIUB), R. Kilger,  
D. Kronschnabel (TUM/BKG) at Wettzell , 06/1983*

## Standard geodetic VLBI equipment:

S/X receivers

MkIII Data Acquisition  
Terminals

H-Maser frequ. stand.



**MkIII DAT**



## European site velocity vectors (Wetzell fixed)

TMR Europ. Comm. Publ. on crustal motion (2002)

# Participants in the 1985 Onsala meeting

