

UNI  
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# Wetterstein Millimeter Telescope

Technische  
Universität  
München

TUM

LMU

LUDWIG-  
MAXIMILIANS-  
UNIVERSITÄT  
MÜNCHEN



MAX-PLANCK-GESELLSCHAFT

UMWELT  
FORSCHUNGSSTATION  
SCHNEEFERNERHAUS



Bild: Chianti

**M. Kadler, K. Mannheim, C. Fromm, H. Kayal, G. Dietl (JMU Würzburg)**

**U. Hugentobler, A. Neidhardt, F. Seitz (TU München)**

**T. Birnstiel (LMU München)**

**J. A. Zensus (MPIfR Bonn)**

**S. Vegetti (MPA Garching)**

**P. Hartogh (MPS Göttingen)**

**F. Walter (MPIA Heidelberg)**

# Concept under Discussion: LEVERAGE



M. Kadler, F. Eppel, C. M. Fromm, K. Mannheim (JMU Würzburg)

J. Agarwal (TU Braunschweig)

F. Bertoldi (Uni Bonn)

D. Bomans, K. Weis (RUB Bochum)

D. Elsässer (TU Dortmund)

M. Brüggem (Uni Hamburg)

S. Wolf (Uni Kiel)

D. A. Riechers (Uni Köln)

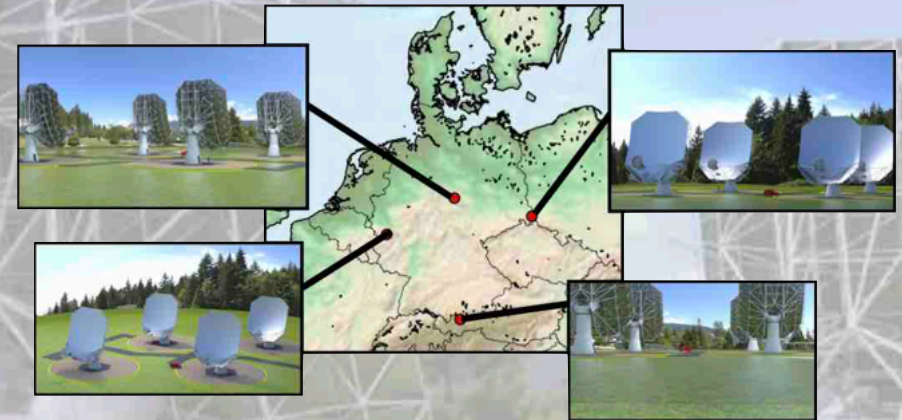
T. Birnstiel (LMU Munich)

L. Fuhrmann (FHR Wachtberg)

A. K. Baczko, B. Boccardi, A. Brunthaler, Y. Y. Kovalev,  
A. P. Lobanov, E. Ros, J. A. Zensus (MPIfR Bonn)

S. Vegetti (MPA Garching)

M. Flock, F. Walter (MPIA Heidelberg)



C. L. Carilli, E. J. Murphy, V. Rosero, R. C. Walker (NRAO)

R. P. Deane (Wits/Pretoria)

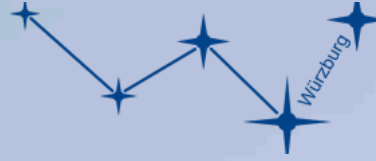
J. P. McKean (Kapteyn/SARAO/JIVE)

Z. Paragi (JIVE)

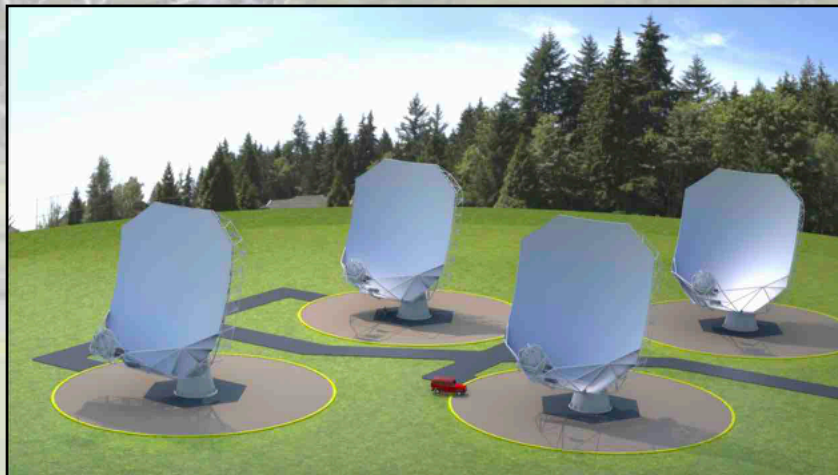
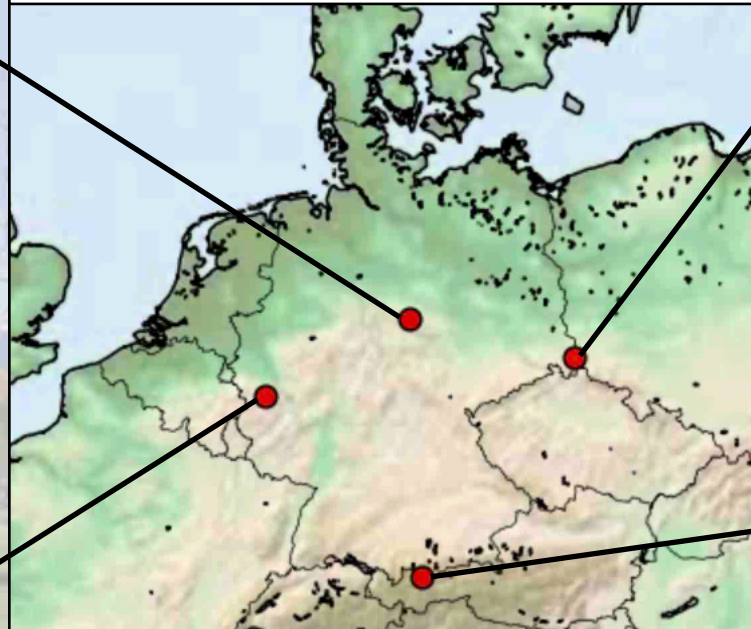
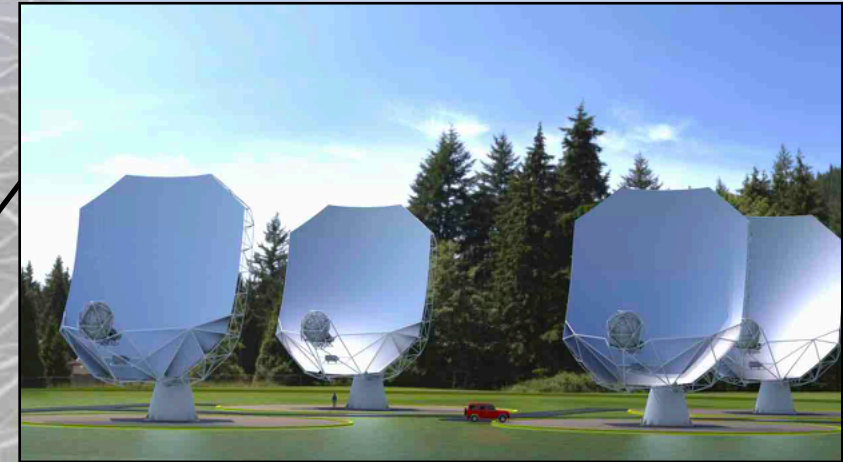
J. F. Radcliffe (Pretoria/Jodrell Bank)

# LEVERAGE

Long-baseline Extension in next-generation VLBI Experiments and  
Rapid-response Array Germany/Europe

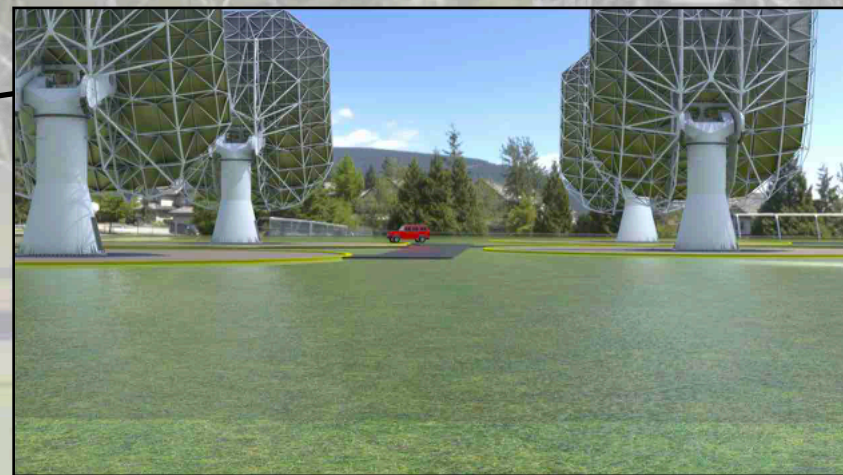


ngVLA-type antennas  
Compatible with SKA-VLBI



Concept presented, e.g., at:

- EVN Symposium, Bonn (Kadler)
- AG Meeting, Cologne (Kadler)
- ngVLA Meeting, Morelia (Lobanov)



# ngVLA - LEVERAGE: uv Coverage



## ngVLA alone

### Maximum Baselines:

~8.000km

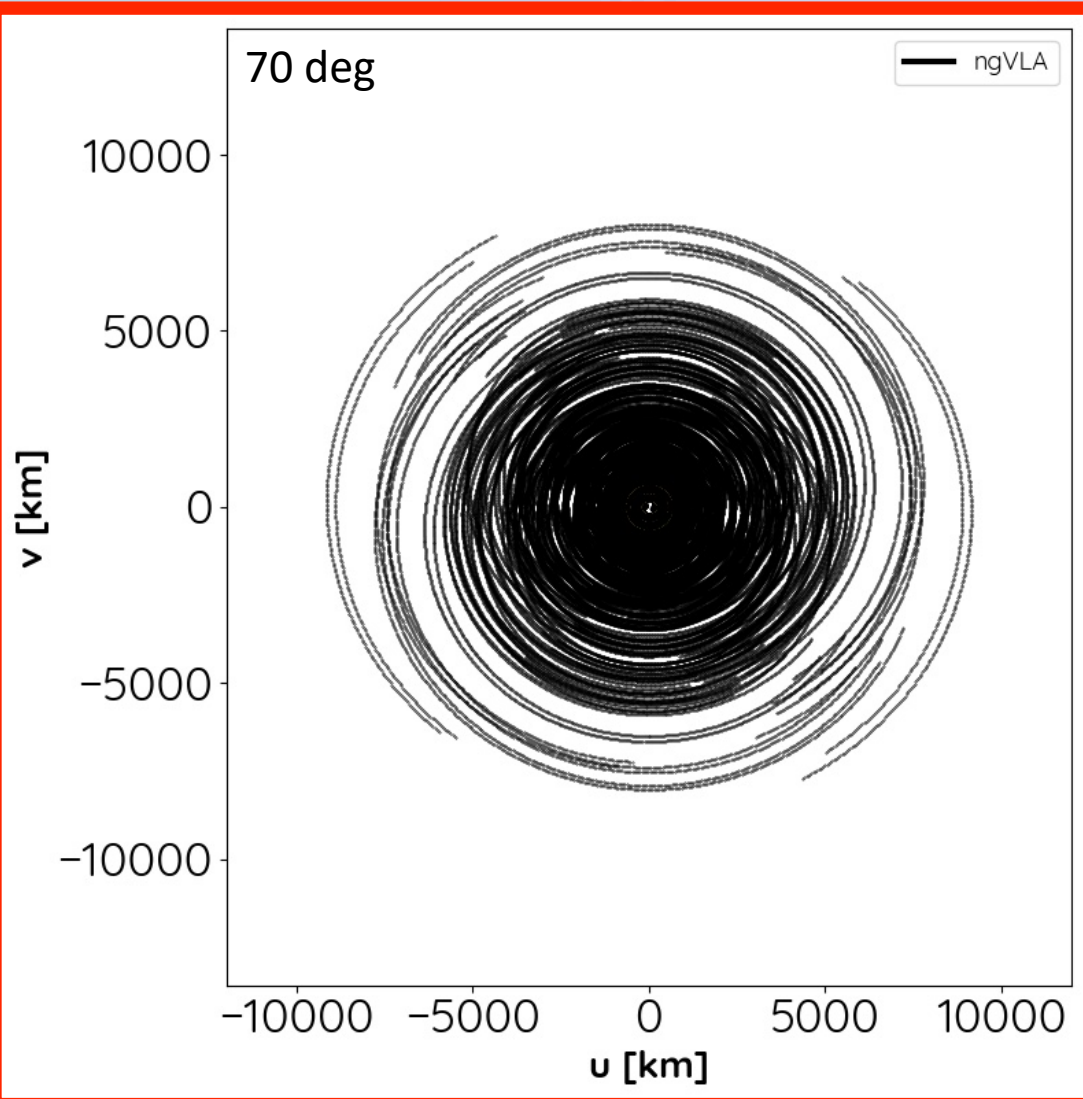
### Transient Visibility

#### Range:

~5-6 hours

### (u,v) Coverage:

Sparse beyond  
~5000km



## ngVLA+LEVERAGE

### Maximum Baselines:

~10.000km

### Transient Visibility

#### Range:

~8-9 hours

### (u,v) Coverage:

More uniform out to  
~8000km

# ngVLA - LEVERAGE: uv Coverage



## ngVLA alone

Maximum Baselines:

~8.000km

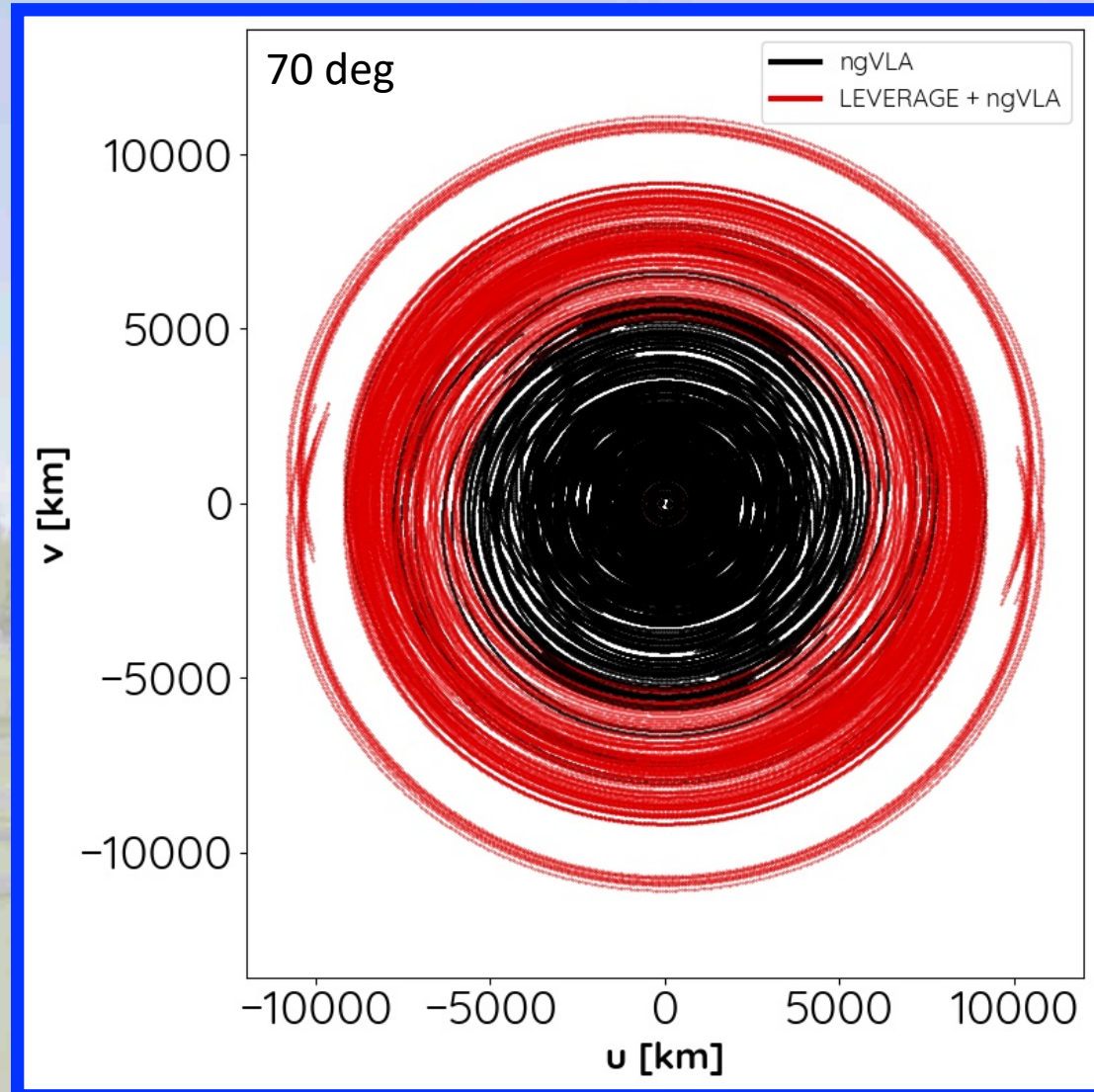
Transient Visibility

Range:

~5-6 hours

(u,v) Coverage:

Sparse beyond  
~5000km



## ngVLA+LEVERAGE

Maximum Baselines:

~10.000km

Transient Visibility

Range:

~8-9 hours

(u,v) Coverage:

More uniform out to  
~8000km

# Wetterstein Millimeter Telescope



## ***Proposal to the Umweltforschungsstation (UFS) Schneefernerhaus***

M. Kadler, G. Dietl, C. M. Fromm, H. Kayal, K. Mannheim, T. Ullmann (***JMU Würzburg***)

T. Birnstiel (***LMU Munich***)

U. Hugentobler, A. Neidhardt, F. Seitz (***TUM Munich***)

L. Fuhrmann (***FHR Wachtberg***)

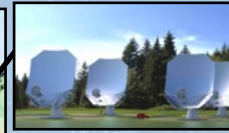
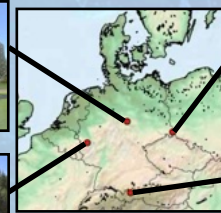
P. Hartogh (***MPS Göttingen***)

S. Vegetti (***MPA Garching***)

F. Walter (***MPIA***)

J. A. Zensus (***MPIfR Bonn***)

T. Rehm (***UFS Schneefernerhaus***)



Freistaat Bayern  
Landesamt für Umwelt



**MPS**



**TUM**

**LMU**

Julius-Maximilians-  
**UNIVERSITÄT  
WÜRZBURG**



## Germany's highest-altitude research station: 2650m

- Communication and conference center
- 11-story building
  - Built as a hotel in 1930
  - Conversion to a research station by the state of Bavaria
  - Start of operations: 1999





München (520 m)

Würzburg ~ 270 km

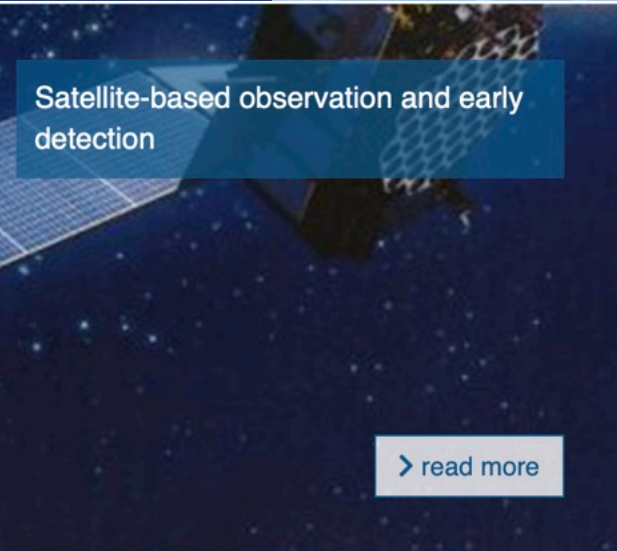
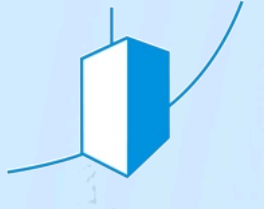
München ~ 90 km

Garmisch-  
Partenkirchen (708 m)

Zugspitze (2962 Meter)

Umweltforschungsstation  
Schneefernerhaus  
(2650 m)






Satellite-based observation and early detection

> read more




Regional Climate and Atmosphere

> read more




Cosmic Radiation and Radioactivity

> read more



Hydrology

> read more




Environmental and high-altitude medicine

> read more




Global Atmosphere Watch

> read more



Biosphere and Geosphere

> read more



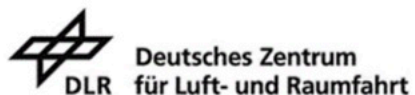
Cloud Dynamics

> read more

# UFS Consortium



Deutscher Wetterdienst



Deutsches Zentrum für  
Luft- und Raumfahrt



Helmholtz Zentrum  
München



Karlsruher Institut für Technologie

Karlsruher Institut für  
Technologie



Ludwig Maximilians  
Universität München



Technische Universität  
München



Umweltbundesamt



MAX-PLANCK-GESELLSCHAFT

Max-Planck-Gesellschaft



Universität  
Augsburg  
University

Universität Augsburg



Freistaat Bayern  
Landesamt für Umwelt



Julius-Maximilians-  
Universität Würzburg

# 33rd Meeting of the UFS Consortium Board (13.11.2024)

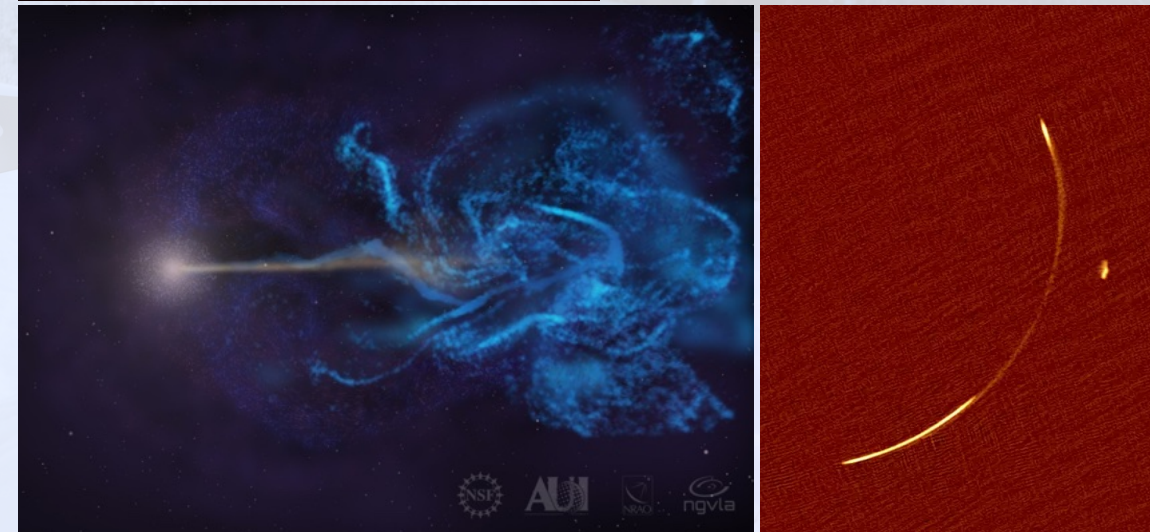
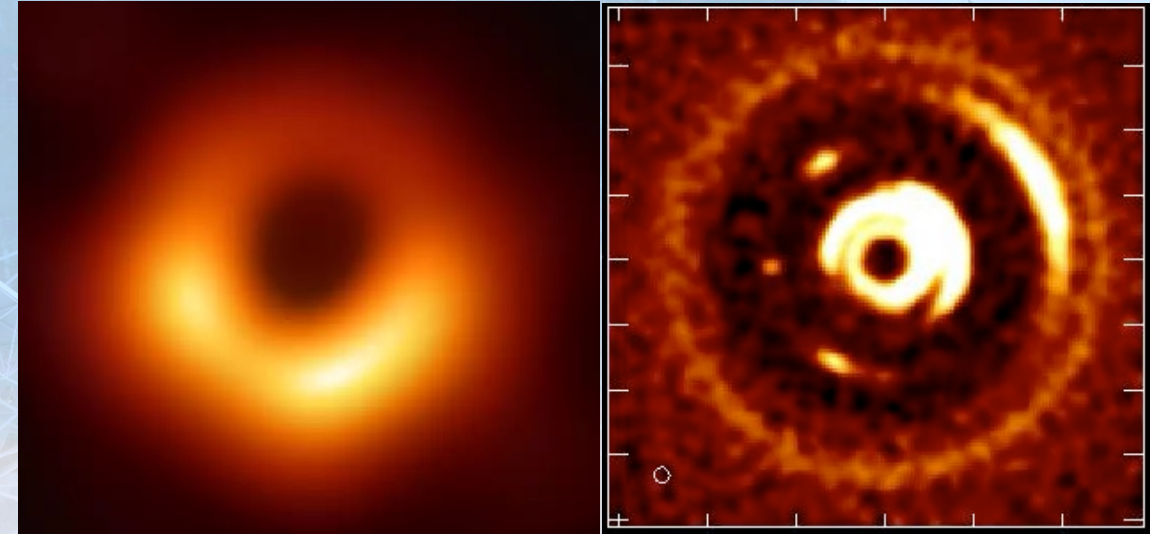




## Astronomy:

- Black Holes and Relativistic Jets (JMU, MPIfR)
- Protoplanetary Discs (LMU)
- Dark Matter (MPA)
- Galaxy Evolution (MPIA)

Additional partnerships invited!



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# WMT as a German Contribution to the ngVLA

ngvla



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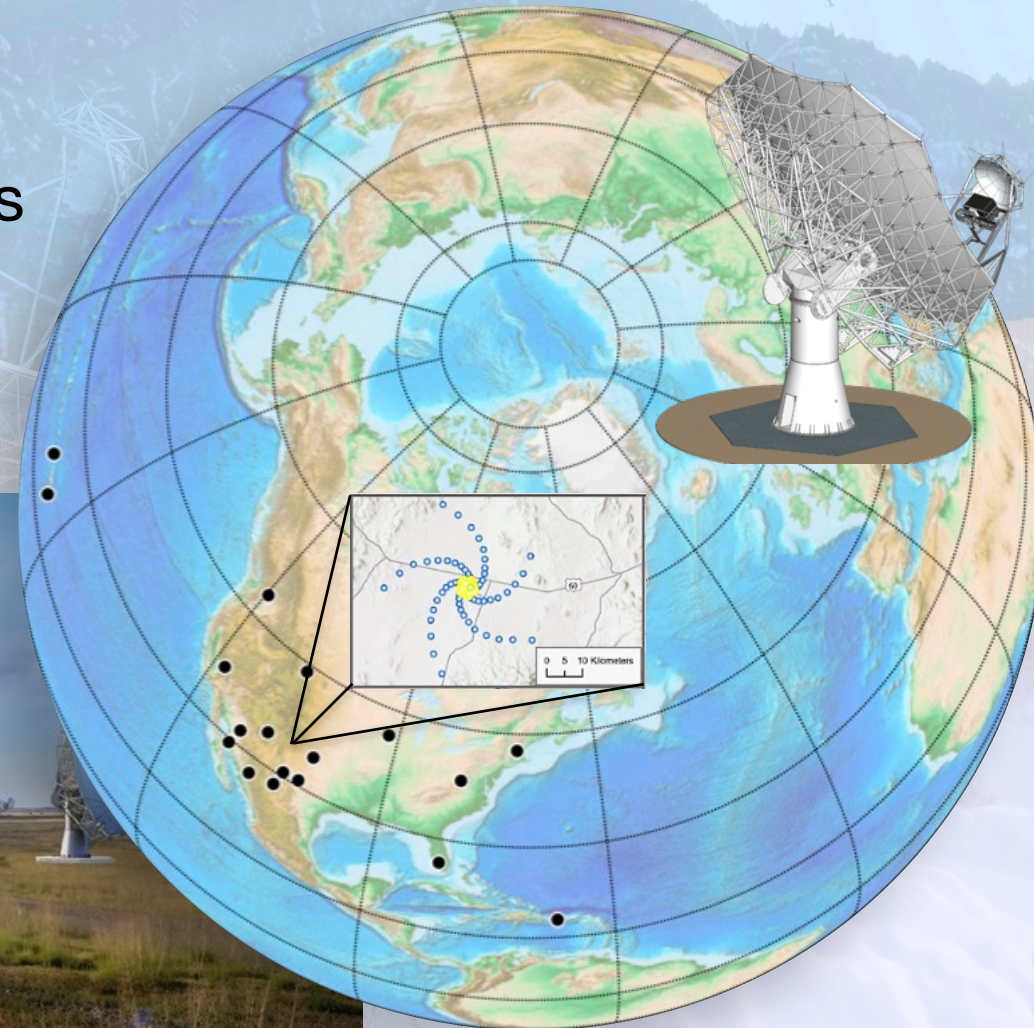


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SCHNEEFERNERHAUS

## NRAO:

- Strong scientific support in discussions with Bavarian state ministry
- „The WMT will open the door for full German partnership in ngVLA.“

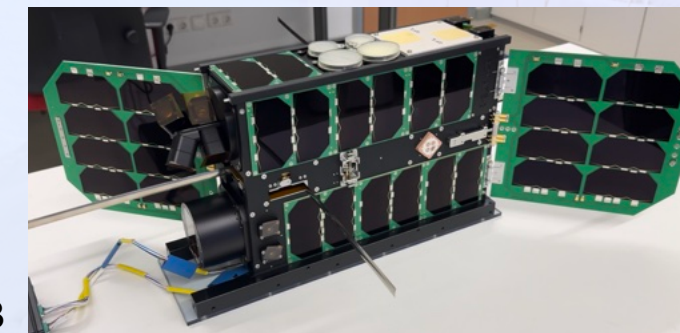
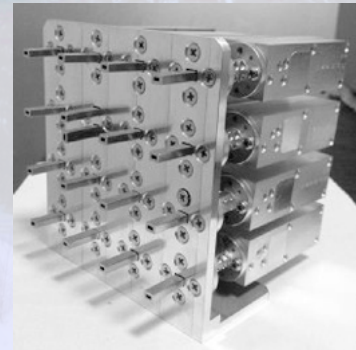
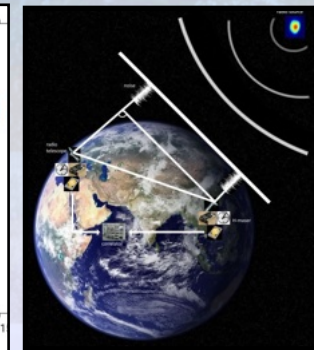
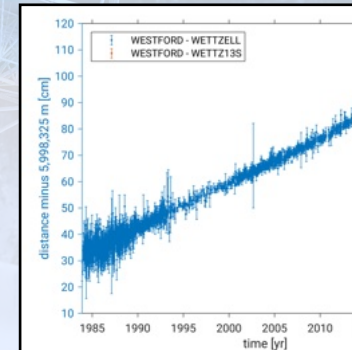
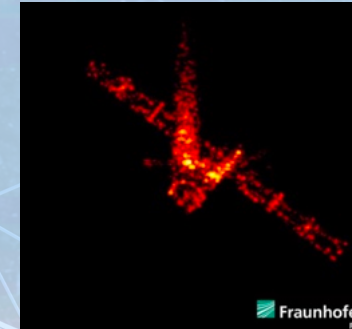


# WMT Research Program



## Interdisciplinary Topics and Environmental Research:

- Satellite Communication (JMU, LMU)
- Space Situational Awareness (FHR)
- Geodesy (TUM)
- Atmospheric Physics (MPS, DLR)
- Tests of novel RF and Receiver Technology (RUB, JMU)
- Data Science, Green IT, etc.



Technische Universität München **TUM**

**LMU** LUDWIG-MAXIMILIANS-UNIVERSITÄT MÜNCHEN

MAX-PLANCK-GESELLSCHAFT

UMWELT FORSCHUNGSSTATION SCHNEEFERNERHAUS

**Fraunhofer** FHR

RUHR UNIVERSITÄT BOCHUM **RUB**

# Next Step: WMT Site-Selection Study



## Site-Selection Criteria:

- Altitude
- Distance to UFS (infrastructure: power, data, maintenance, synergies with other UFS experiments)
- RFI situation
- Building costs (incl. potential modifications to antenna design)
- Environmental aspects
- Local groups (Staatsforsten, Gemeinden)

⇒ **Feasibility, costs, etc.**



Bild: Michael J. Zirbes



