



**JIVE**  
Joint Institute for VLBI  
ERIC



**EVN/JIVE**  
update  
and the  
**Global**  
**VLBI**  
**Alliance**

Paco Colomer  
@jivedirector

# European VLBI Network



<http://www.evlbi.org/>

- Up to 22 radio telescopes, worldwide
  - Including KVN and some CVN (Sh,Ur,Km)
- Operating from 1.4 GHz to 45 GHz
- Disk recording at 2 Gbps
- **Real-time (eEVN)** at 1-2 Gbps.
- 3 sessions per year of ~3 weeks duration + 10 e-VLBI days + OoS
- The **Joint Institute for VLBI ERIC (JIVE)** correlates the EVN data and provides expert support to EVN users.
  - SXFC data processor



Image by Paul Boven (boven@jive.eu). Satellite image: Blue Marble Next Generation, courtesy of Nasa Visible Earth (visibleearth.nasa.gov).



Westerbork 14x15m (the Netherlands)



Effelsberg 100m (Germany)



Jodrell Bank 76m (UK)



Tianma 65m (China)



Yebes 40m (Spain)



Sardinia 64m (Italy)

# European VLBI Network



- EVN is a *research infrastructure*
- **“Open Sky” policy to any astronomer**, based on proposal merit and technical feasibility.
  - Proposal submission by *NorthStar*
- Call for proposals to EVN: deadlines on **Feb/June/Oct 1<sup>st</sup>**
  - JIVE provides support to proposers !
- Proposals active for 1 year, data proprietary for 1 year.

<https://www.jive.eu/proposals>

The European VLBI Network

Providing the sharpest view on the universe

Days Hours Minutes

07 22 39

Current deadline for the next EVN call of proposals. Deadlines are at the 1st of February, June and October.

### About the EVN

The European VLBI Network (EVN) is a network of radio telescopes located primarily in Europe and Asia, with additional antennas in South Africa and Puerto Rico, which performs very high angular resolution observations of cosmic radio sources. The EVN is the most sensitive VLBI array in the world, and the only one capable of real-time observations. Access to the EVN is an "open skies" facility. Astronomers who are not specialised in the VLBI technique are encouraged to make use of the network. Support for proposal preparation, scheduling, and correlation of EVN projects is provided by the Joint Institute for VLBI ERIC (JIVE). JIVE staff are also able to support EVN users with data analysis, for the best science to emerge.

### How to use EVN

The EVN issues three calls for observation proposals every year.

### EVN Newsletter

Edition 54 - September 2019

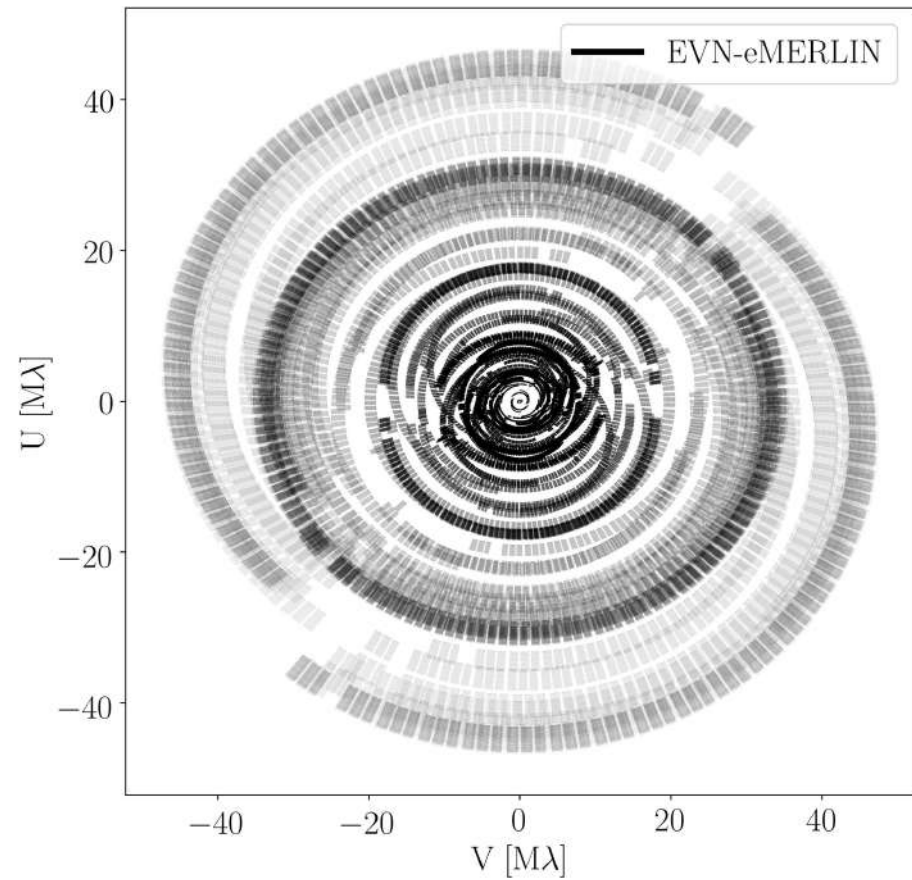
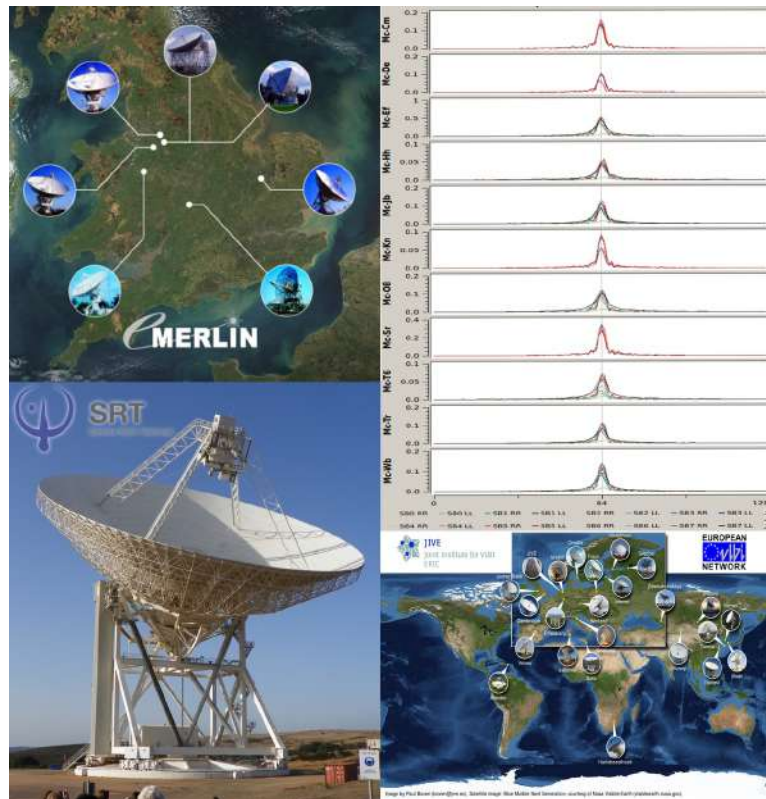
### Call for Proposals

Click here to go directly to the call.

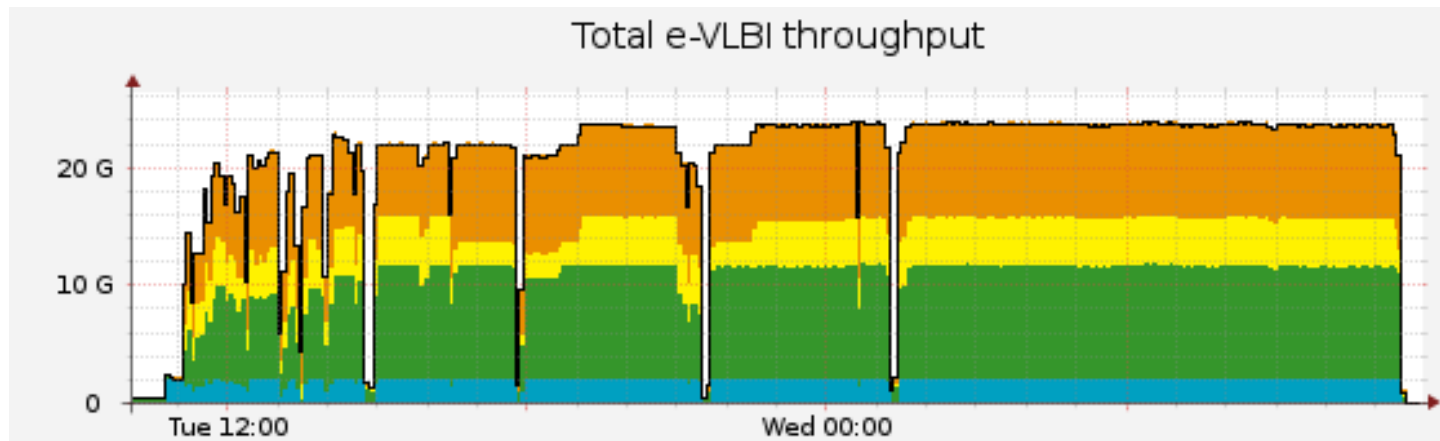
# EVN + e-MERLIN



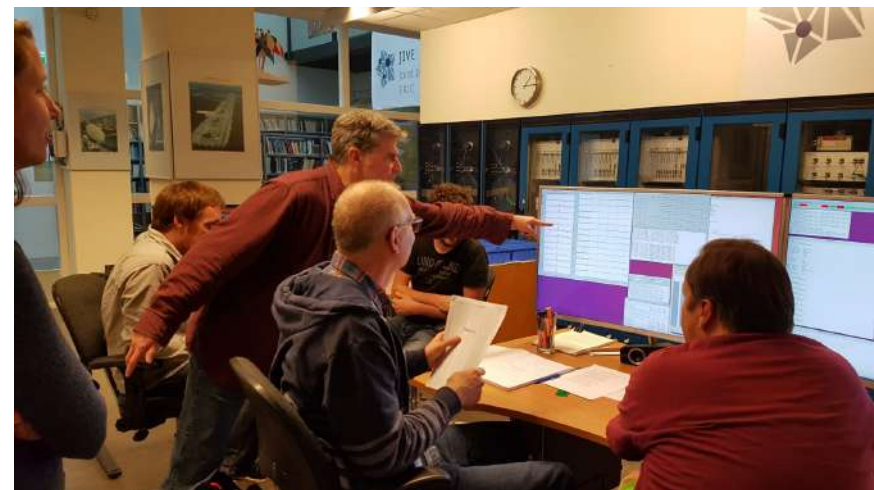
- High sensitivity, excellent uv-coverage !
- Also in real time !



# e-EVN (European VLBI Network - in real time)



- >10 telescopes in 4 continents
- 1-2 Gbps per telescope
- Recent record of total **24+ Gbps**





# Joint Institute for VLBI ERIC (JIVE)

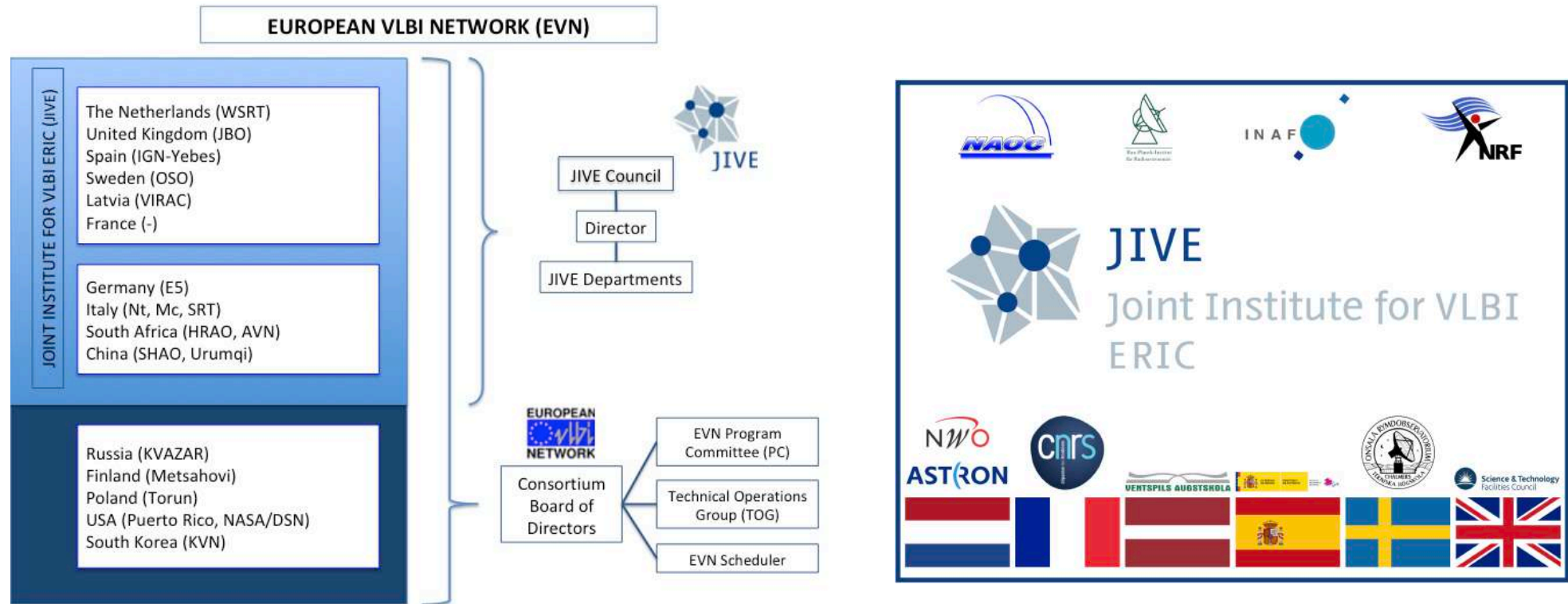


- The European Research Infrastructure Consortium (ERIC) for VLBI
  - 6 partner countries: NL (host), ES, FR, LV, SE, UK
  - 4 associated institutions: INAF (IT), NRF (SA), MPIfR (DE), **NAOC (Cn)**
- Supports the European VLBI Network and users
  - operations
  - data acquisition
  - Correlation
  - data reduction
  - R&D

<http://www.jive.eu/>

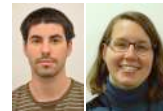
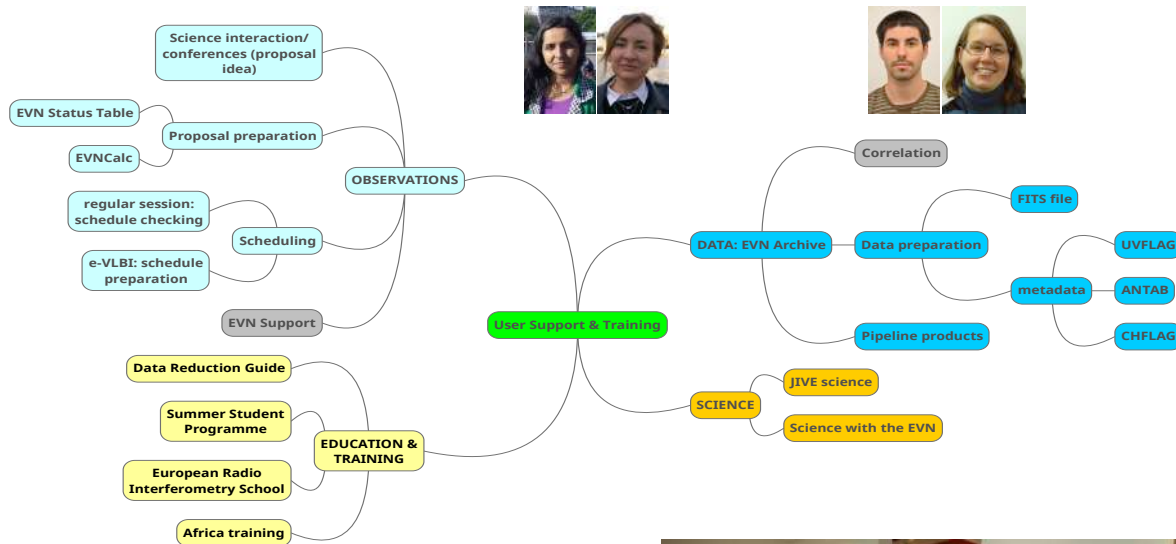


# JIVE and the EVN





# Science support, training and outreach at JIVE

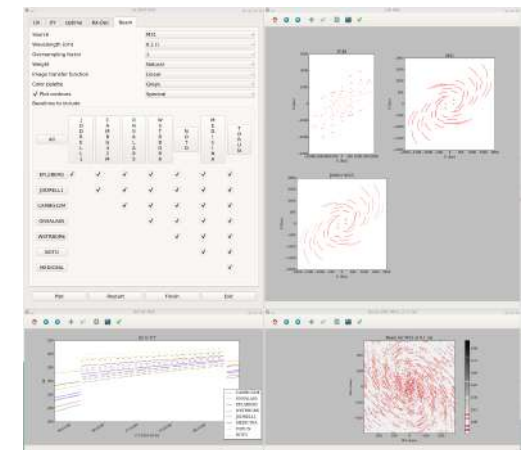
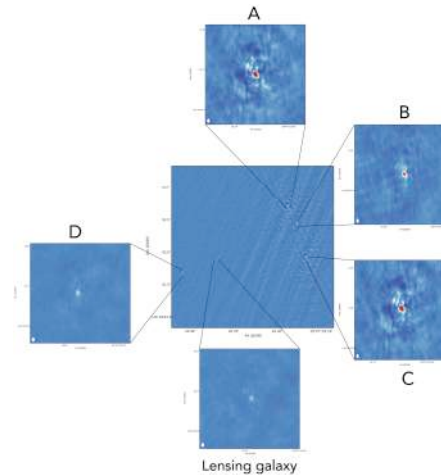


Scientific workshop of the East Asian VLBI Network (EAVN). Mito (Japan), 24-26 September 2019

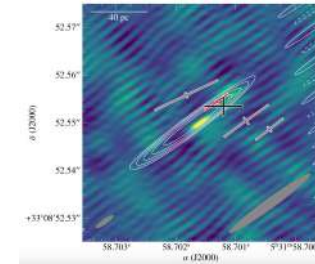
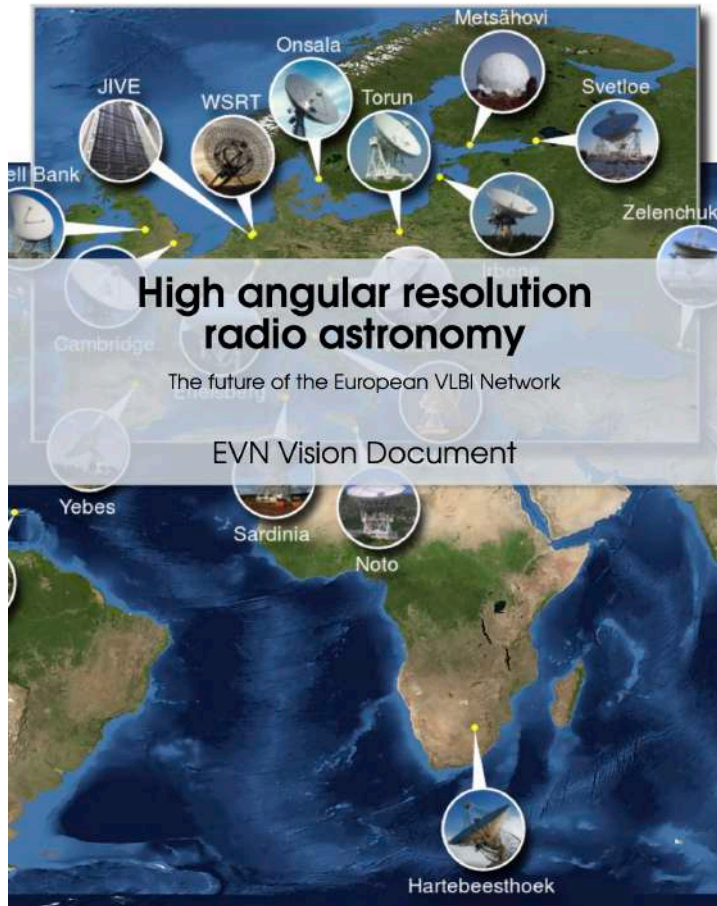
# R&D at JIVE



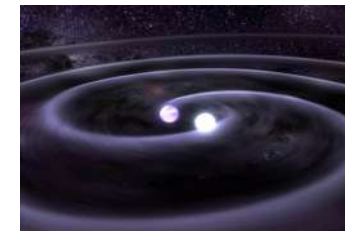
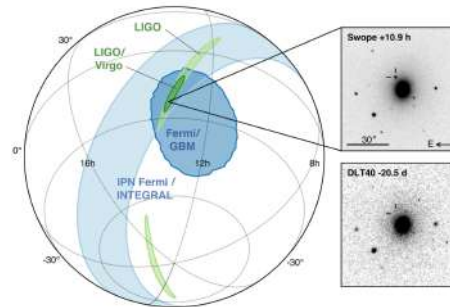
- Software (e-VLBI, CASA 5.3)
- Hardware
- e-VLBI and sync distribution
- *Now also GeoVLBI capable*



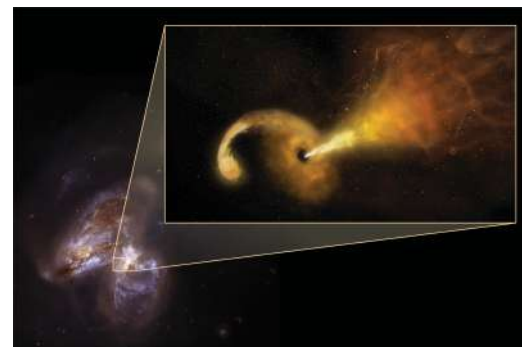
# Updating the EVN Science Vision (2020-)



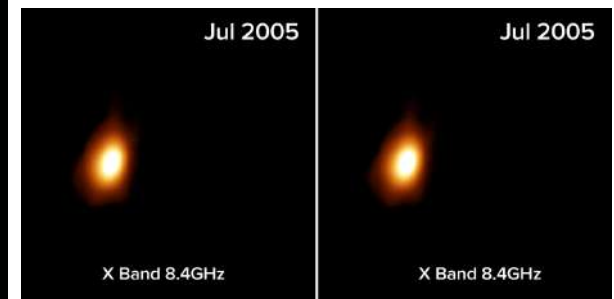
FRBs



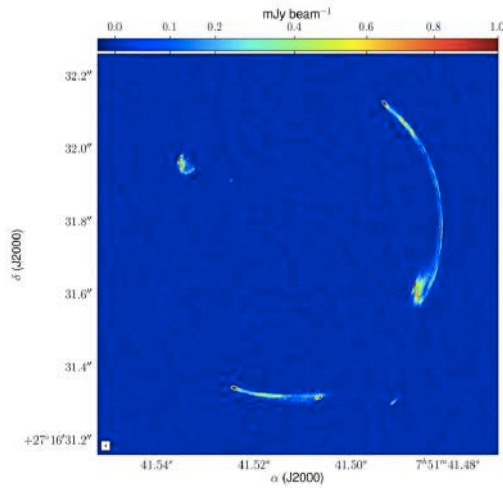
GW counterparts



TDEs

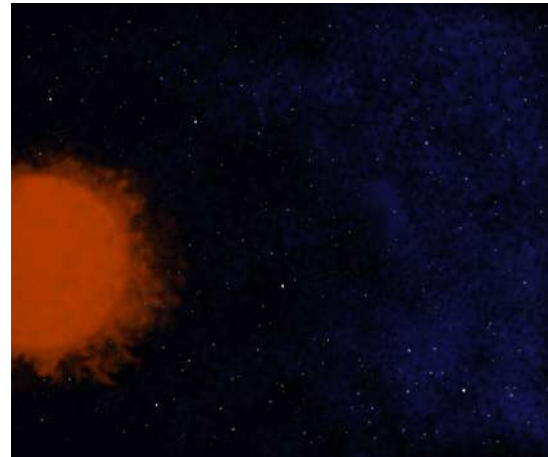
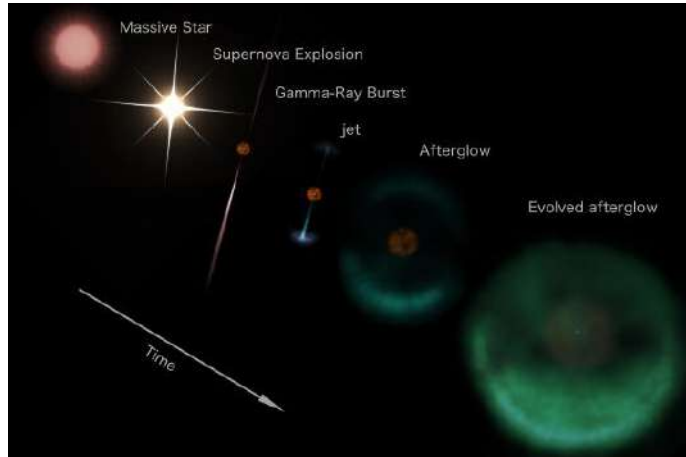
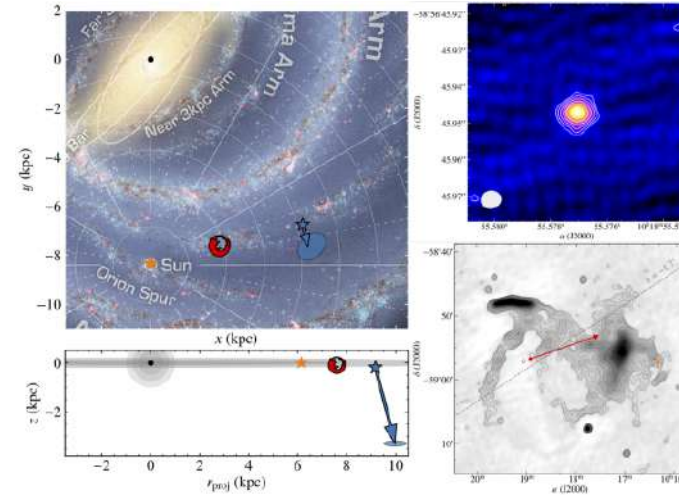


# Updating the EVN Science Vision (2020-)



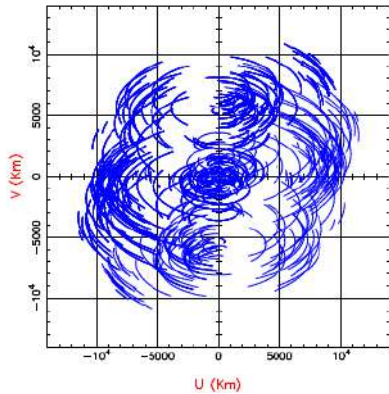
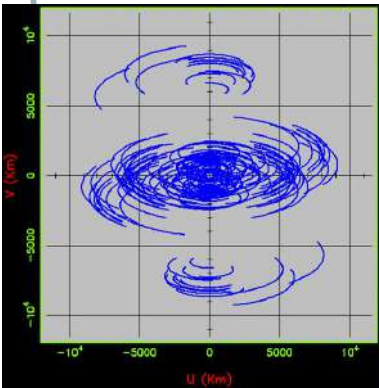
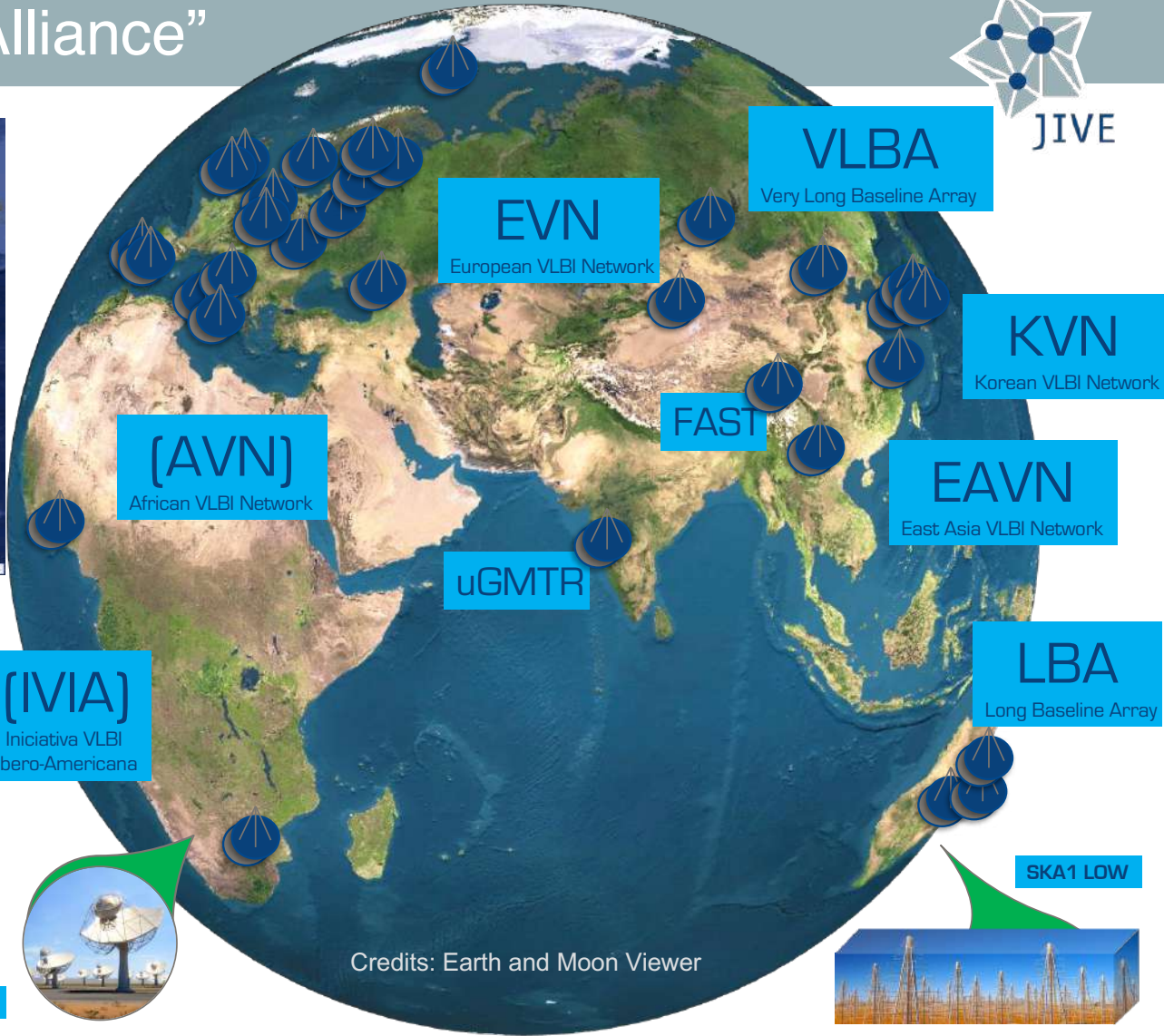
Imaging gravitational lenses

Astrometry



Orphan gamma-ray burst afterglow

# Towards a "Global VLBI Alliance"

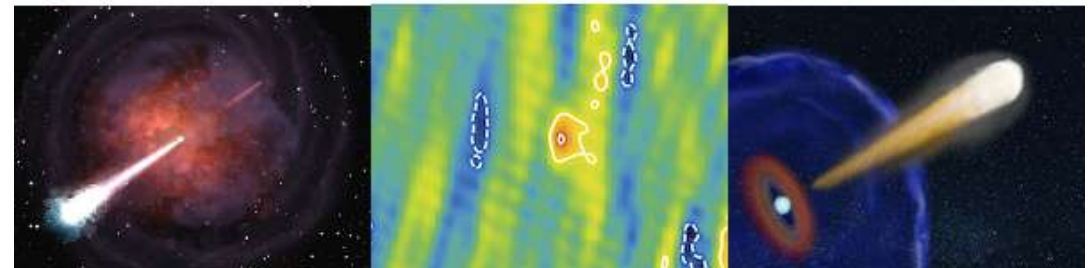


Credits: Earth and Moon Viewer

# Towards a “Global VLBI Alliance” (II)



- **Coordination forum**
  - Technical (TOG, IVTW, etc)
  - Governance, (complementary) strategies
- **Logistics**
  - Align proposal deadlines
  - Common access point and proposal tools
- **Global VLBI observations**
  - 22/43/(86) GHz global campaign
- **User support**
  - Of any user in any network
- **Scientific cooperation**
  - Facilitate attendance to conferences
    - Next EVN symposium 2020 in Ireland



*“A global network of radio telescopes exposes the aftermath of a violent merger of neutron stars”  
(Guirlanda et al. 2019)*

# SKA-VLBI

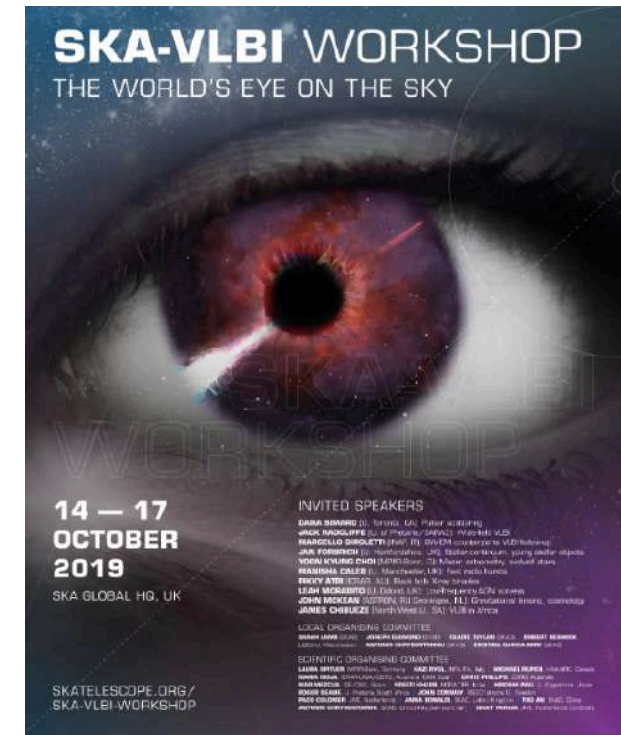


- SKA-1 will lack **very long baselines**, which are provided by VLBI.
- Performed first VLBI tests with EVN and SKA precursor *MeerKAT*



Science Goal	SWG	Objective	SWG Rank	VLBI with:
1	CD/EoR	Physics of the early universe IGM - I. Imaging	1/3	
2	CD/EoR	Physics of the early universe IGM - II. Power spectrum	2/3	
4	Pulsars	Reveal pulsar population and MSPs for gravity tests and Gravitational Wave detection	1/3	
5	Pulsars	High precision timing for testing gravity and GW detection	1/3	
13	HI	Resolved HI kinematics and morphology of $\sim 10^{10} M_{\odot}$ spiral galaxies out to $z \sim 0.8$	1/5	LOW/MID
14	HI	High spatial resolution studies of the ISM in the nearby Universe.	2/5	LOW/MID
15	HI	Multi-resolution mapping studies of the ISM in our Galaxy	3/5	
18	Transients	Solve missing baryon problem at $z \sim 2$ and determine the Dark Energy Equation of State	1/4	MID
22	Cradle of Life	Map dust grain growth in the terrestrial planet forming zones at a distance of 100 pc	1/5	MID
27	Magnetism	The resolved all-Sky characterisation of the interstellar and intergalactic magnetic fields	1/5	
32	Cosmology	Constraints on primordial non-Gaussianity and tests of gravity on super-horizon scales.	1/5	
33	Cosmology	Angular correlation functions to probe non-Gaussianity and the matter dipole	2/5	
37 + 38	Continuum	Star formation history of the Universe (SFU) - HI. Non-thermal & Thermal processes	1+2/8	MID

Also note: VLBI science = SKA2 science!



<https://indico.skatelescope.org/event/539/>

# Conclusions



- VLBI, providing the highest angular resolution in astronomy, is in the core of major and new radio astronomy instruments (EVN, EHT, EAVN, SKA, IVS...)
- JIVE is the European institute for VLBI and related techniques, central hub of the European VLBI Network (EVN)
- The e-EVN is a pathfinder of SKA; JIVE and partners develop SKA-VLBI, essential for SKA-1
- A Global VLBI Alliance is needed:
  - to ensure good information flow between networks, coordination of technical developments
  - and better scientific collaboration and support of users



# Contact



support@jive.eu



www.jive.eu



@jivevlbi / @jivedirector



@JIVERIC



*Next EVN proposal  
deadline **1 October***



## NEWSLETTER

September 2019  
Edition 54

### Call for Proposals - September 2019

Deadline: 01 October 2019, 23:59:59 UTC

#### Science Highlights

An 'orphan' gamma-ray  
burst afterglow

page 4

New jet-maser in the  
nucleus of the Seyfert 2  
galaxy IRAS15480-0344  
revealed

page 5

Origin of the off-pulse  
emission from pulsars

page 6

#### Technical Highlights

A CASA-based fully  
automated Very Long  
Baseline Interferometry  
calibration and imaging  
pipeline

page 7

EVN Technical Operation  
Meeting at Jodrell Bank  
Observatory

page 9

#### Network Highlights

Dwingeloo fringes using  
the Westerbork H-maser

page 10

Enabling new Very Long  
Baseline Interferometry  
equipment at the Atacama  
Observatory

page 12

Integration of e-MERLIN  
telescopes into the  
European VLBI Network

page 14

University of Tasmania and  
JIVE sign a Memorandum  
of Understanding

page 14

#### Meetings

SKA-VLBI Key Science Projects and Operations Workshop  
14-17 October 2019, Jodrell Bank, United Kingdom

The Eighth International VLBI Technology Workshop  
18-20 November 2019, ATNF headquarters, Sydney, Australia

Astronomical Data Analysis Software and Systems (ADASS) Con-  
ference Series  
6-10 October 2019, Groningen, The Netherlands

#### JUMPING JIVE update

page 16

<http://www.jive.eu/newsletter>