

The EVN: present and future

J. Anton Zensus

Richard W. Porcas, Eduardo Ros

EVN Symposium, Cagliari, Oct 2014

THE PAST

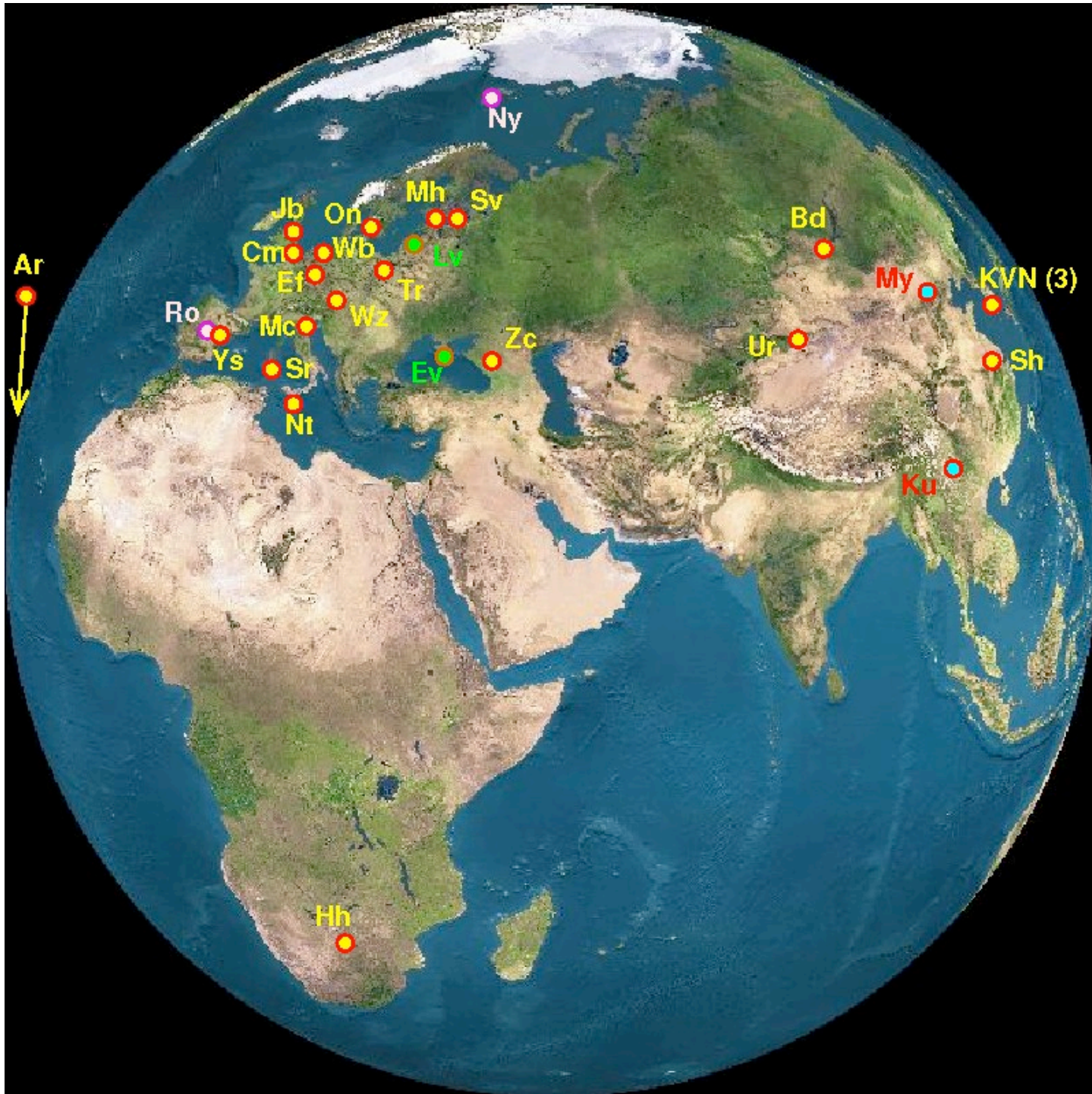


EVN History

- Early discussions and contacts starting in 1975
- Founded on 05mar1980 (MPIfR, IRA, ASTRON, OSO, JBO): program committee, first regular observations, correlation at MPIfR
- EVN Consortium founded in 1984
- JIVE established in 1993, correlator dedicated in 1998
- Continuous inclusion of new stations
 - Starting: Effelsberg, Onsala, WSRT & Dwingeloo, Jodrell
 - Additions: Medicina (1984), Wettzell (1995), Noto (1989), Shanghai (1990), Metsähovi (1990), Yebes-14m (1994), Cambridge-32m (1990), Urumqi (1994), Torun-32m (1996), Arecibo (2001), Hartebeesthoek (2001), Yebes-40m (2008), KVAZAR: Svetloe, Zelenchukskaya & Badary (2009), KVN: Yonsei, Ulsan & Tamna (2014), Sardinia-64m (2015), Tianma-65m (2015)
- Constant improvement of capabilities
 - Tapes: Mk II, Mk III, Mk IV / Disks: Mk IV, Mk V, ... / eVLBI
 - Data rate: from 4 Mbps (Mk II) in 1980 to 2 Gbps (soon)

See R. Porcas, EVN Symposium 2010

THE PRESENT



Institutes/obs.:

- Effelsberg
- Jodrell Bank
- KVAZAR:Svetloe/
- Zelenchukskaya/
- Badary
- KVN:Yonsei/Ulsan/
- Tamna
- IRA:Medicina/Noto
- Metsähovi
- Onsala
- Shanghai
- Urumqi
- Torun
- Westerbork
- Yebe
- Hartebeesthoek
- Arecibo
- Wettzell

Non-EVN:

- Robledo-DSN

EUROPEAN
VLBI
NETWORK

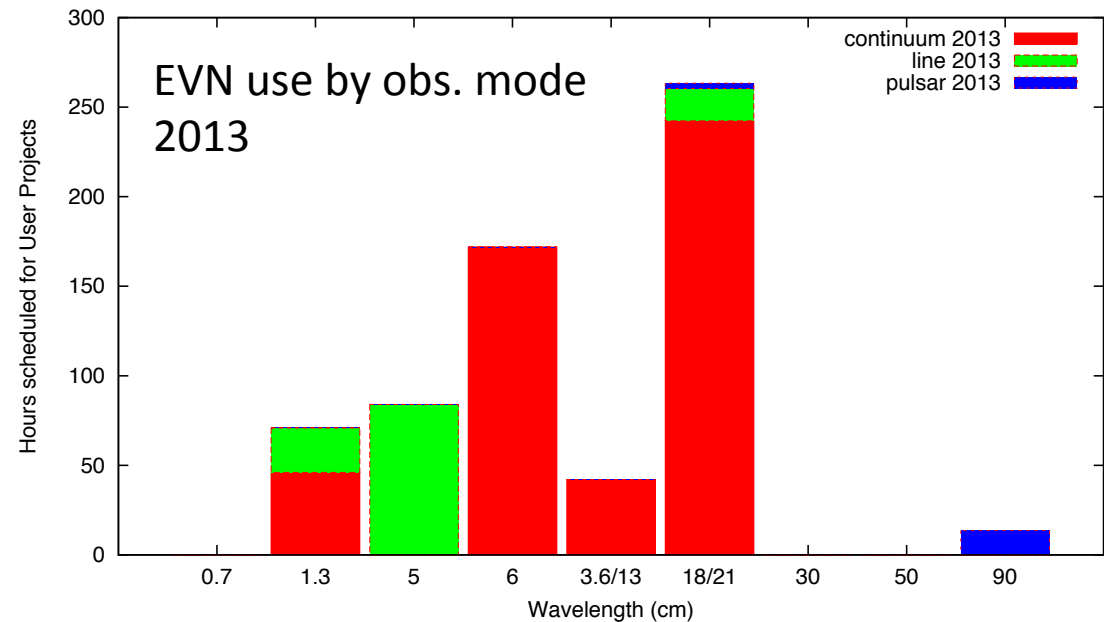
jive
JOINT INSTITUTE FOR VLBI IN EUROPE



EVN Consortium Chair: J. Anton Zensus
EVN PC Chair: Tom Muxlow
EVN Scheduler: Alastair Gunn
EVN TOG Chair: Michael Lindqvist

The present EVN

- Broad science application
 - Galactic to extragalactic
 - Spectroscopy, continuum & pulsar modes

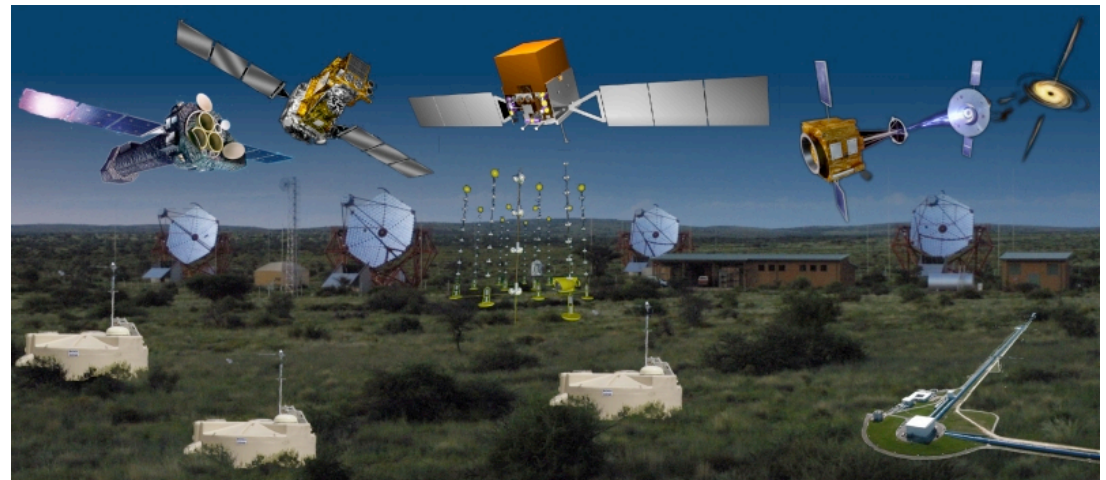


- High fidelity imaging, precision astrometry
 - High sensitivity VLBI observations (esp. in global experiments)
- High-quality user support provided by JIVE

EVN in context

- Trend towards longer wavelengths
 - SKA pathfinders and precursors: EVN/eVLBI, LOFAR
 - SKA-1 coming soon (limited scope)
- Trend towards shorter wavelengths
 - ALMA & Event Horizon Telescope
- Longer baselines: space VLBI
 - RadioAstron project running: key role of EVN as ground array

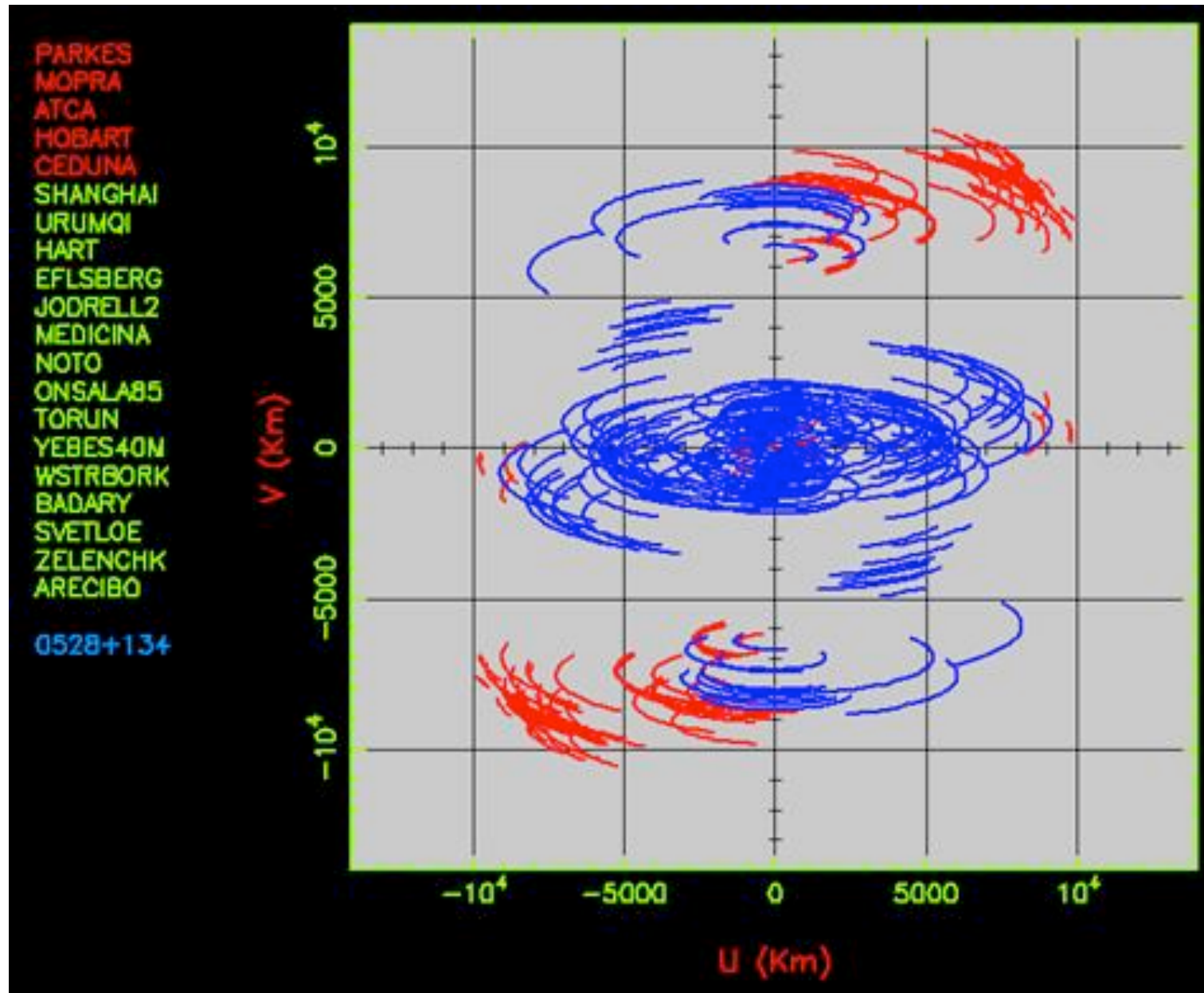
Multi-Messenger
Astronomy



Observing

- Deadlines
 - 01feb, 01jun, 01oct
- Sessions 2015
 - S1 Feb16-Mar19
 - S2 May28-Jun18
 - S3 Oct15-Nov05
- Next eVLBI sessions:
 - 2014nov18-19
 - 2014dec02-03
 - 2015jan13-14
 - 2015feb10-11
 - 2015mar24-25
- Globals up to 1 Gbps
- RadioAstron ground array
 - Now AO2:
2014jul01-2015jun30a
- EVN+LBA possible*
- Sardinia telescope available on 'best effort basis' from S1 2015
- Tianma-65m in 2015
- Out-of-session 144 hr/yr

EVN+LBA run on 0528+134, 2012



<http://www.jive.nl/jivewiki/doku.php?id=evnnews:evnnews>



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Users meeting

Thursday afternoon

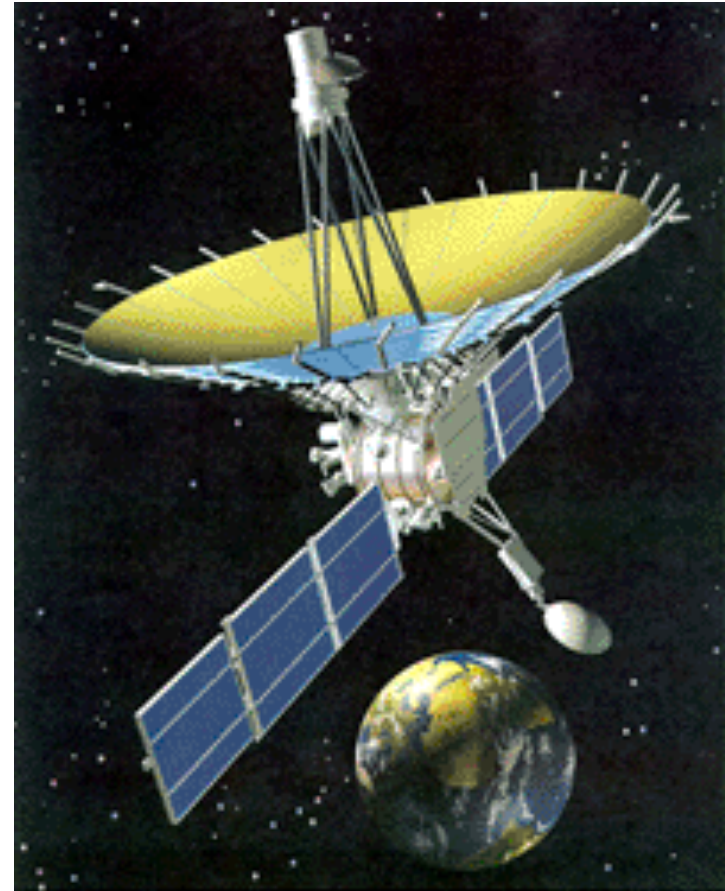
2014: KVN joins the EVN

- 3× 21m telescopes
- KVN can perform simultaneous observations at 22/43/86/129 GHz



EVN + RadioAstron

- High sensitivity & high resolution observations
- Correlated in Moscow, Bonn & Dwingeloo



See RadioAstron talks

EVN Structure

- EVN Consortium Chair: J. Anton Zensus
- EVN Program Committee Chair: T. Muxlow
- EVN Scheduler: A. Gunn
- EVN TOG Chair: M. Lindqvist

New UniBoard Correlator at JIVE

- 4 Gbps operations demonstrated successfully
- Supported by RadioNet3 JRA UniBoard2
- 32 stations, 64 MHz BW, 0.022s-1s integration time, 15.625 kHz freq. resolution



UniBoard Units

Picture: A. Szomoru

New radome for OSO

- Replacement of 20-m radome
- Top cap of 50 panels replaced in one piece, remaining 570 changed one by one



© Roger Hammagren, OSO

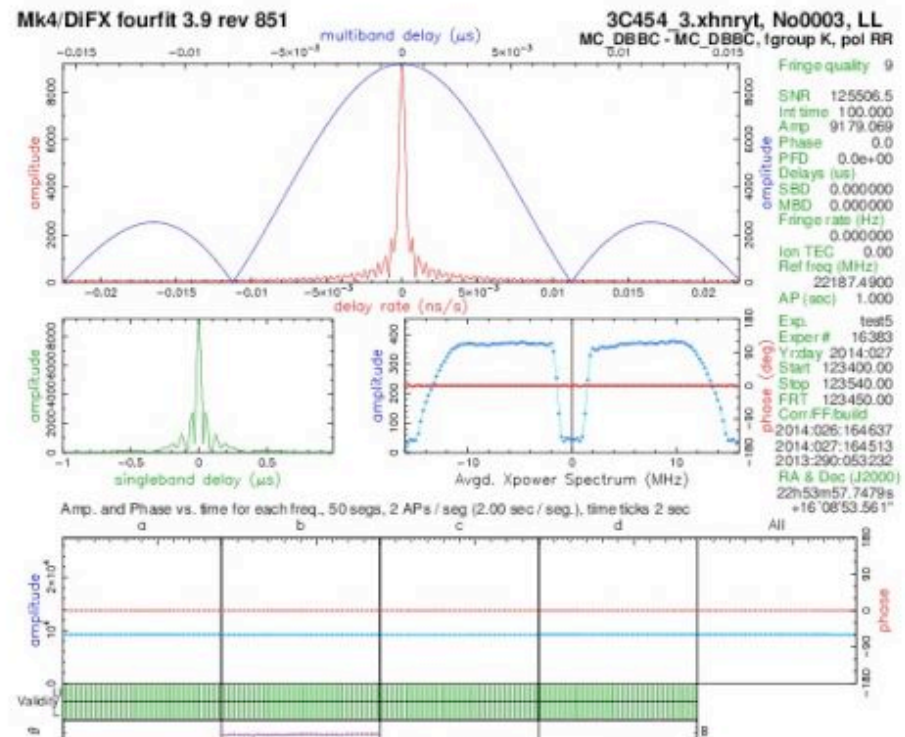
Tianma 65-m

- L/S/X/C/Ku/K/Ka/Q bands
- Adaptive optics
- 1st light 2012oct26
- Fringes with Seshan-25m on 2012nov28
- Fringes with EVN in 2014mar



SRT-64m

- First fringes SRT-Medicina detected in 2014jan27 (IRA DiFX correlator)
- Commissioning in progress
- Best effort basis scheduling in 2015



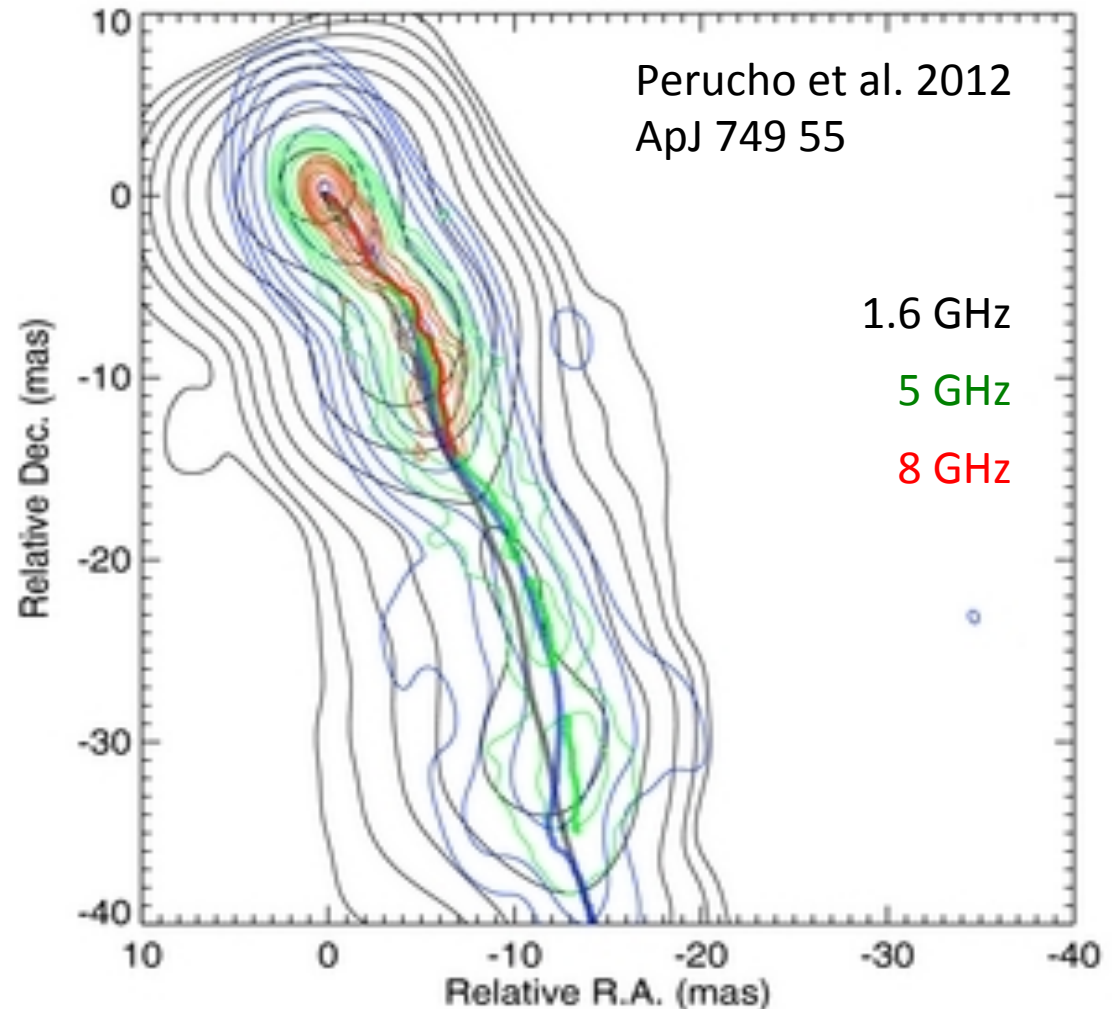
EU Support

- NEXPreS (Novel EXplorations Pushing Robust e-VLBI Services) ended 2013
- RadioNet3 (2013-16)
 - Joint Research Activities
 - UniBoard
 - DIVA
 - TransNational Access: EVN
 - Networking Activities
 - Science working group
 - ERATec



Science: high-fidelity imaging

- Helical structures in the jet of 0836+710
- The observed ridgeline corresponds to helically twisted pressure maxima

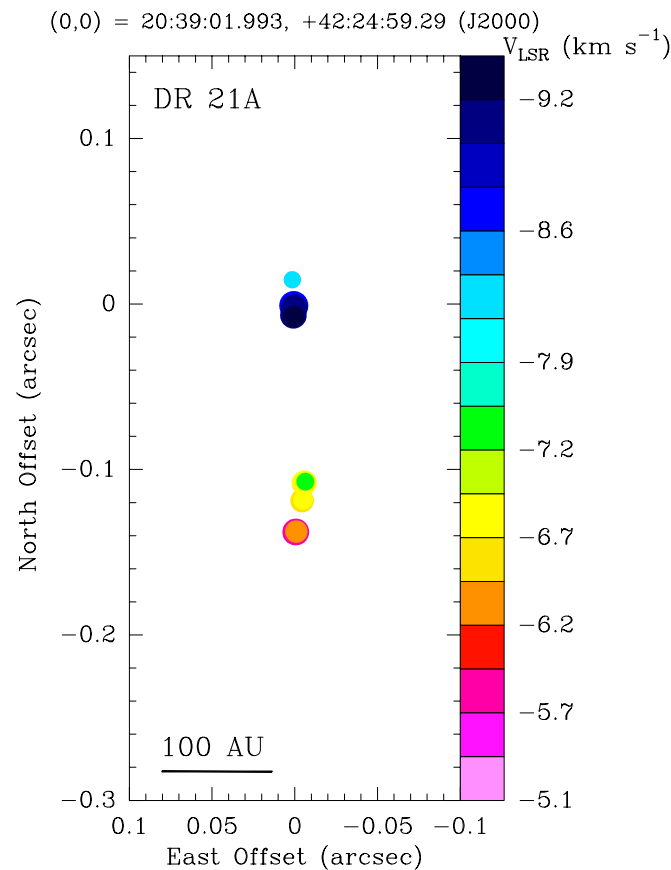


EVN, Global & VLBA data

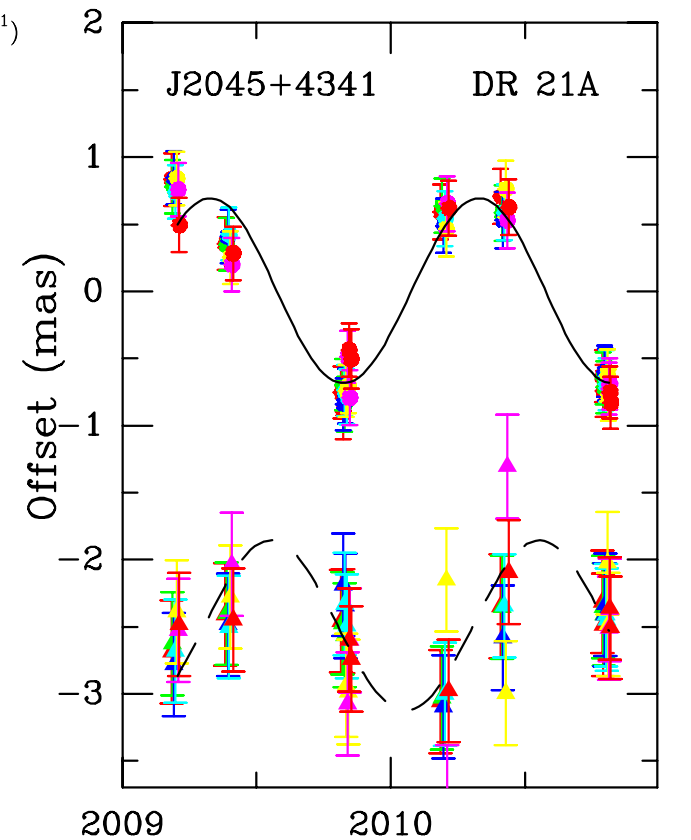
Science: methanol maser astrometry

Parallaxes and proper motions of interstellar masers towards the Cyg X star-forming complex

$$D = 1.50^{+0.08}_{-0.07} \text{ kpc}$$



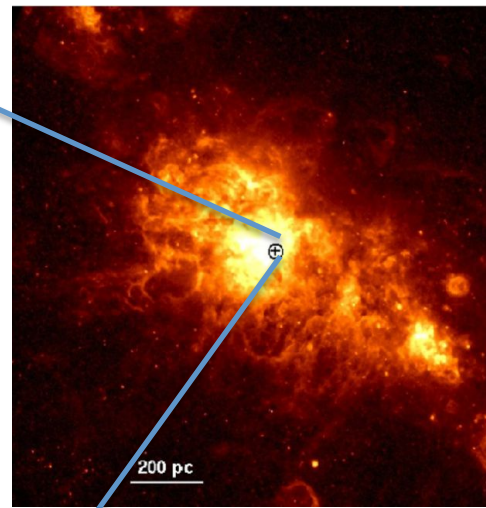
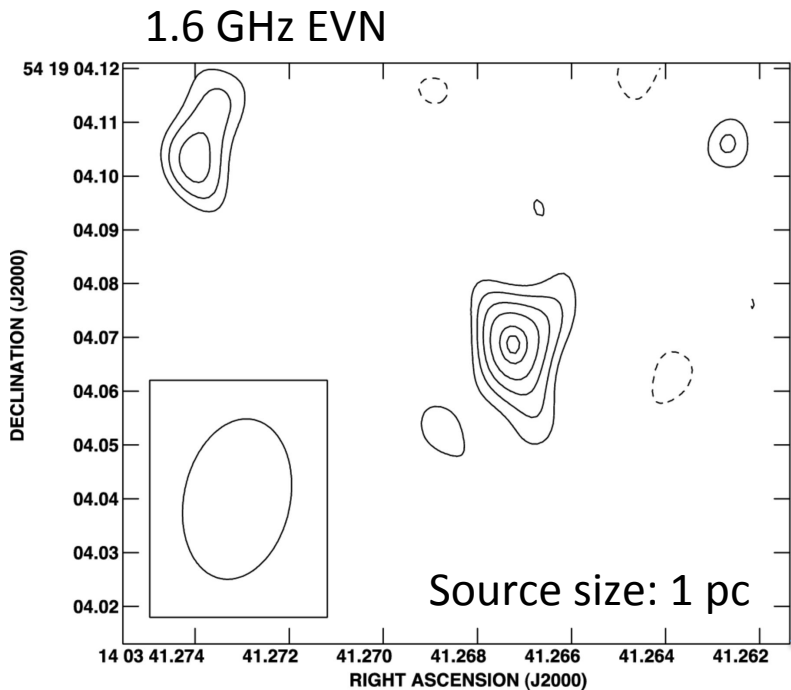
EVN at 5cm



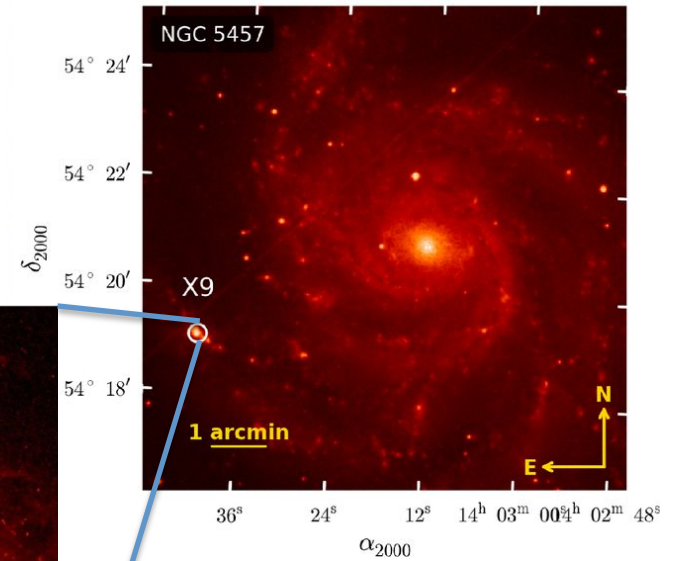
Rygl et al. 2012 A&A 539

Science: high sensitivity, ultraluminous x-ray sources

Intermediate-mass black hole with steady jet emission



HST F658N

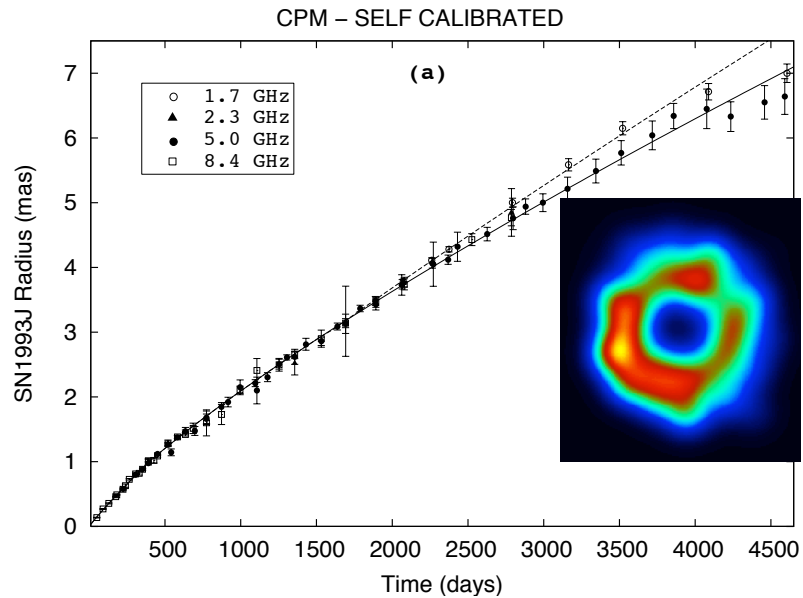


DSS Image (Lasker 1990)

M. Mezcuca et al. 2013 MNRAS 436 1546

Science: radio supernovae

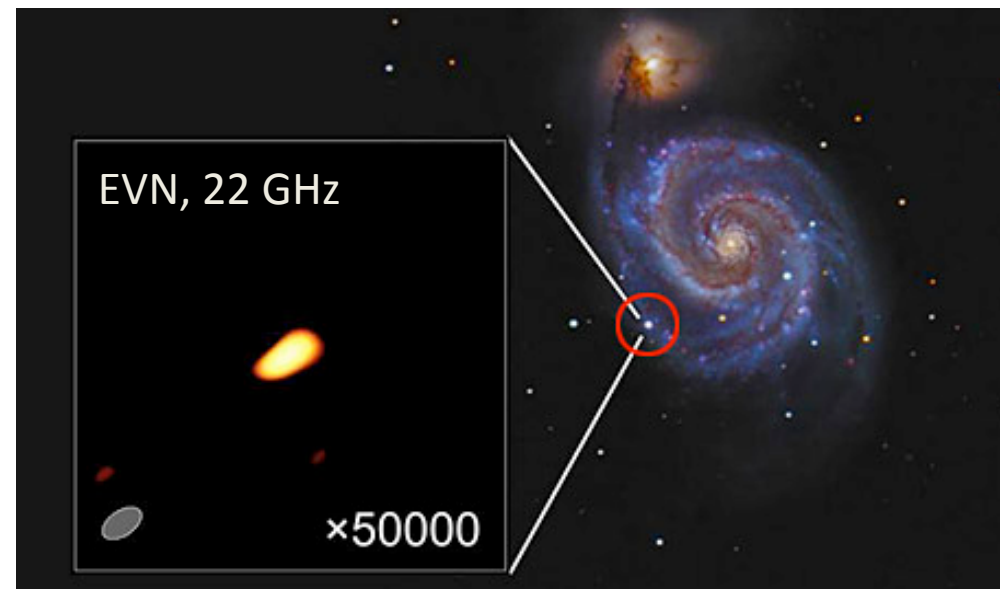
SN1993J expansion, global VLBI



I. Martí-Vidal 2011 A&A 526 A142

SN2011dh

I. Martí-Vidal et al. 2011 A&A 535 L10



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WHAT ARE RIs ?

MAP of RIs

THE EUROPEAN LANDSCAPE

EU FINANCIAL SUPPORT

ERIC-LEGAL FRAMEWORK

SYNERGIES - EU INITIATIVES

INTERNATIONAL COOPERATION

HIGHLIGHTS

ESFRI Roadmap update 2016 will be launched at a workshop on 25th September, in Trieste

On 25th September 2014 ESFRI will launch the third Roadmap update at a workshop in Trieste, Italy. The objective of the Roadmap launch workshop is to raise awareness of the scientific community about the next roadmap update in 2015-2016, and the associated landscape analysis of research infrastructures within their specific scientific fields. The workshop is organised by CoPoRI in close cooperation with ESFRI and the European Commission.

[More information and Registration](#) to the workshop

Information on the Roadmap update

Cosmological standard candles not standard anymore?

15 September 2014



A study, carried out in the framework of the [RadioNet3](#) project, discards the possibility that the progenitor of the type Ia SN 2014J might have stemmed from the explosions of a white dwarf nourished by a normal star. Were these conclusions to become generalized, the use of type Ia supernovae "cosmological standard candles" might need to be revised.

See Press release in [English](#)  186 KB

Galaxy M82 in which the supernova exploded Credit: NASA, ESA, & Hubble Heritage

EVENTS

ESFRI Roadmap update

[Research Headlines - A fourth generation laser that pushing research boundaries](#) | 23.07.2014

[Events - Commenting the Science and Innovation Strategy - 29 January 2015.](#)

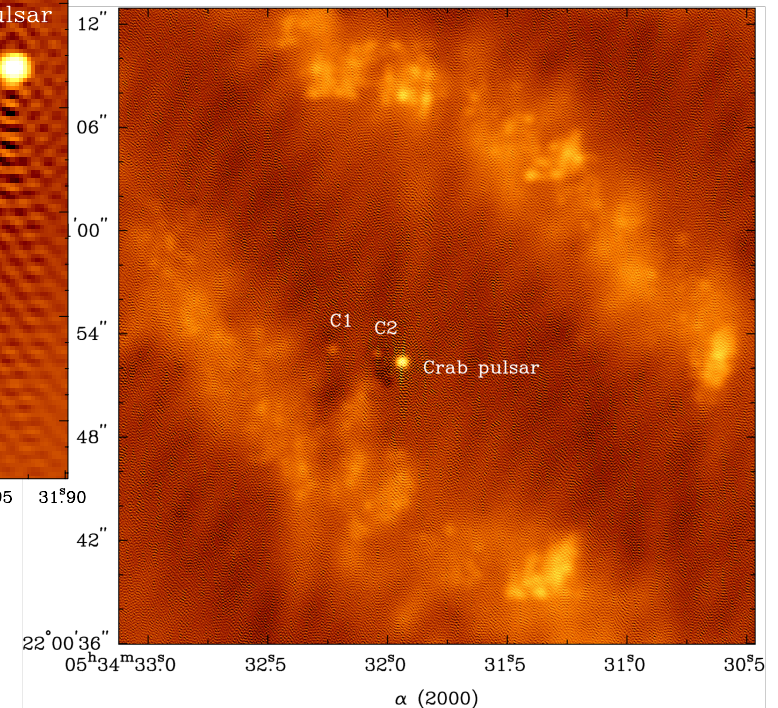
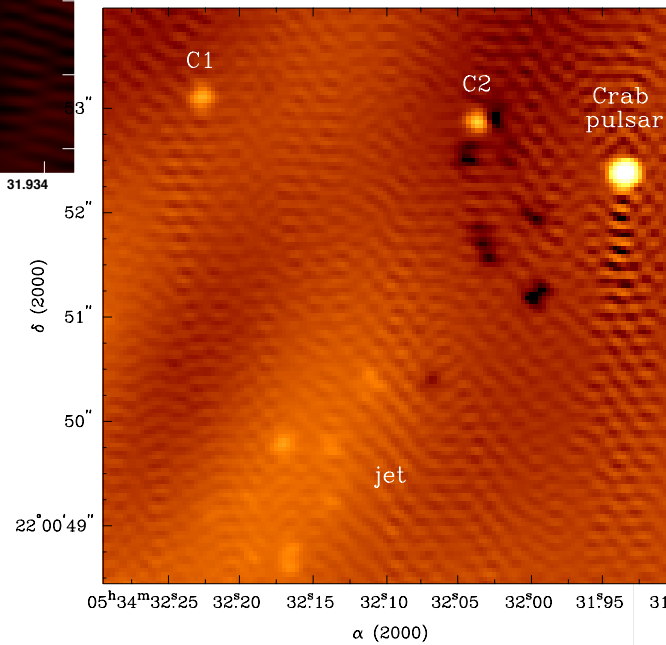
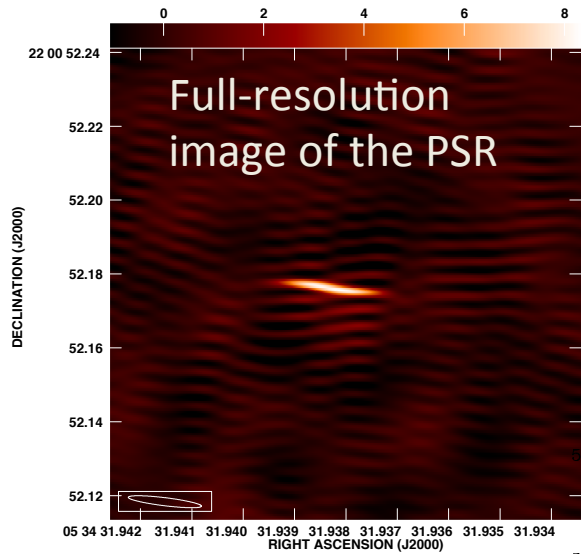


SN2014J
Emission
upper
limit

Last update: 17/09/2014 | [Top](#)

Science: high-sensitivity, Crab nebula

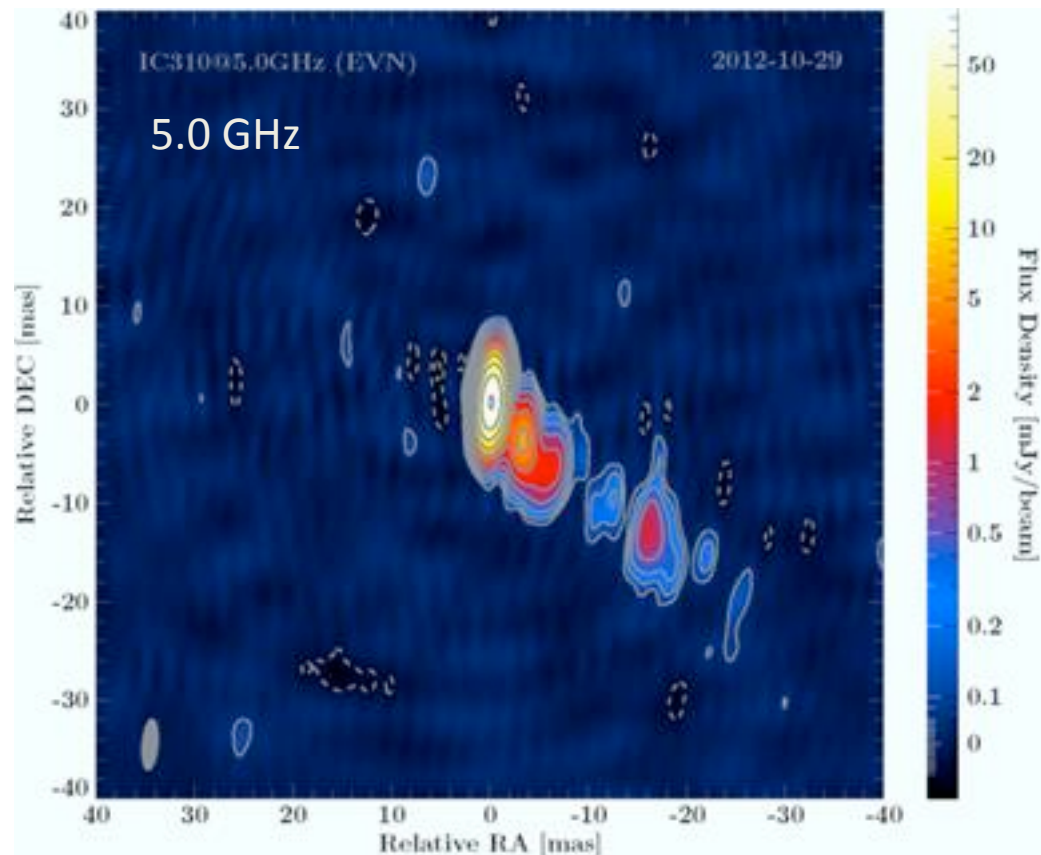
Post high-energy flare observations of the Crab nebula at 1.6 & 5 GHz
VLBI detection of wisps



Science: high-energy blazars

- Multiwavelength program on IC310 (Perseus cluster) including EVN
- Blazar-like core-jet structure
- Variable TeV emission

EVN Newsletter #37



See R. Schulz's poster

THE FUTURE

JIV-ERIC

- JIVE established in 1993
- Board:
 - Agencies: NWO & ASTRON, NL; CNRS, FR; MPIfR, DE; INAF, IT; NAOC, CN; IGN, ES; OSO, SE; STFC, UK
 - Members: Feretti (chair), Charlot (vice-chair), Conway, Gómez González, Zensus, Garrett, Hong, Garrington, Combrink (interim)
- Changes to European Research Infrastructure Consortium



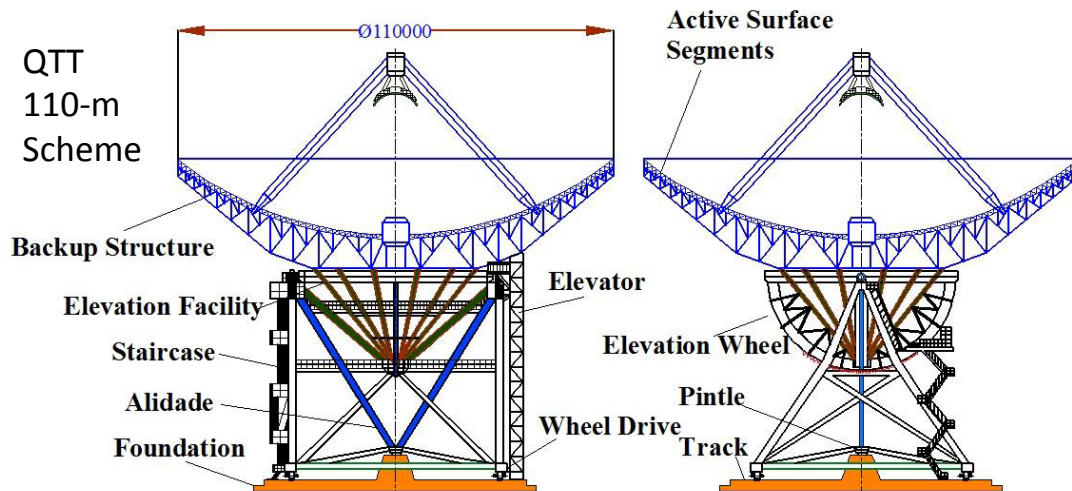
New Stations

- GO EAST!!

- KVAZAR network (3×32m) since 2009
- Korean VLBI Network (3×21m) since 2014
- Tianma 65-m
- Qitai 110m Urumqi telescope ?
- FAST 500m ?

- GO SOUTH!!

- Phased MeerKAT
- African Array



MeerKAT
Artist's
Impression



New frontiers

- Multi-messenger astronomy
- Transients
- Strive for higher resolution and precision
 - Millimetre VLBI
 - Space VLBI
- Astrometry in the GAIA era
- Synergies with mm and sub-mm VLBI
 - Complementary observations beyond 3.5mm including phased ALMA



THANK YOU - GRAZIE!