



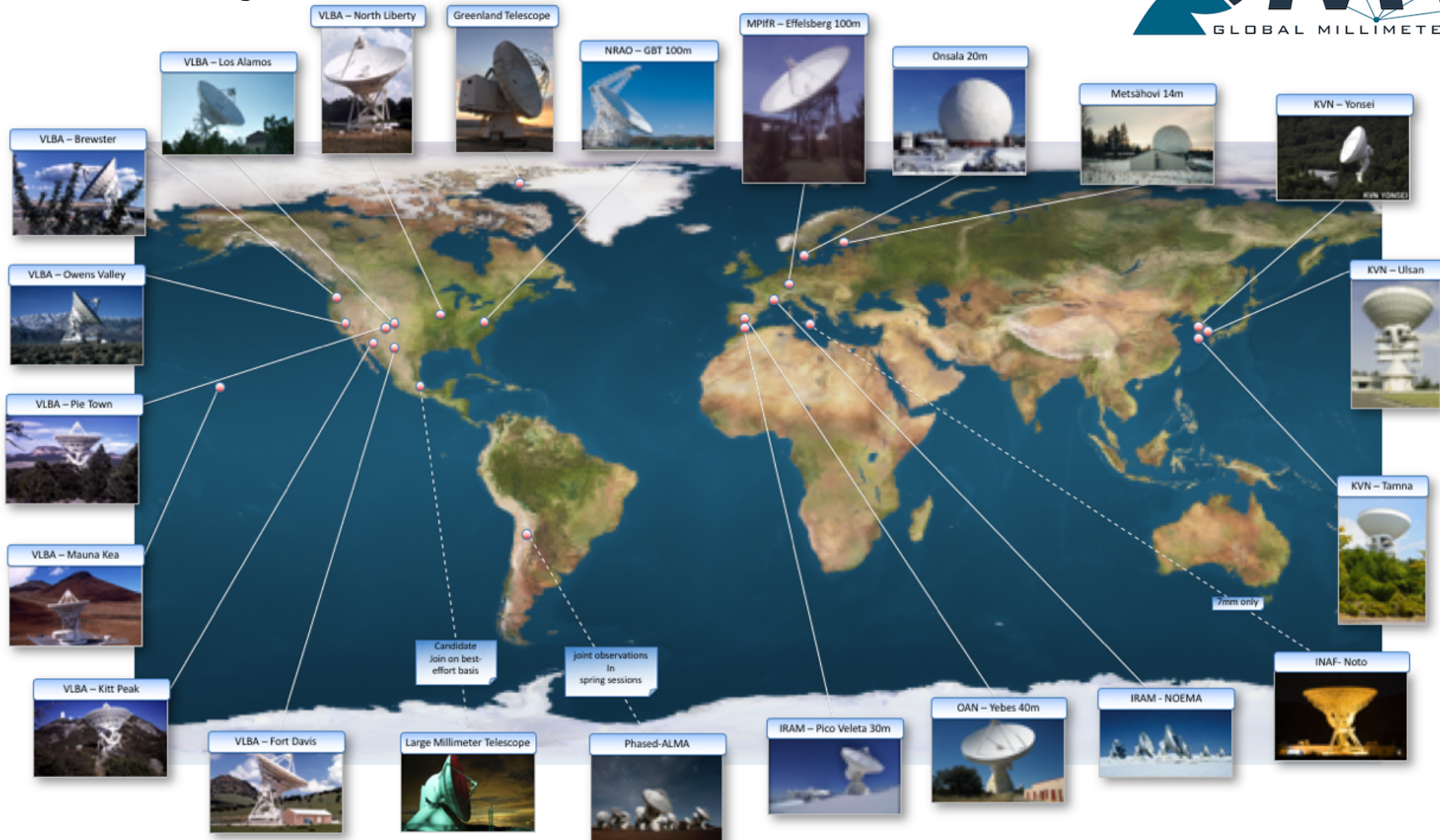
GVA Meeting, 03feb2021

Eduardo Ros, MPIfR, European GMVA Scheduler

# Background

- Memorandum of Understanding concerning VLBI observations at 3.5 mm wavelength agreed on 2003 August
  - US NRAO (for VLBA), IRAM (for Pico Veleta and Plateau de Bure), MPIfR (for Effelsberg), Onsala Space Obs. (for 20-m antenna), and Metsähovi Radio Obs. (for 14-m antenna)
  - Joined later: IRA/INAF (Noto at 7mm), GBT (cannot commit to 2 × 5-day p.a.), KVN, and Yebes
  - Not member: ALMA (governance concept for VLBI mode co-developed), LMT (joining on best-effort basis), and GLT (idem)
- Possible expansion: Kitt Peak 12-m, JCMT, Haystack 37-m
- Open sky, user-oriented policy on best-effort basis

# The array



Picture: H. Rottmann, MPIfR

# Open skies, user-oriented infrastructure



- 3.5-mm observations, 4 Gbps, two 5-day sessions per year
  - March/April (including ALMA since 2017)
  - September/October
- Time allocation based on consensus from TAC ratings of observatories
- Science
  - AGN central regions
  - Spectral-line VLBI of absorbing systems
  - Masers in stellar objects and AGN
  - Astrometry in Milky Way and Beyond
  - Micro-quasars and other compact objects
  - Synergy with EHT, space-VLBI
- People:
  - Directors of MoU institutions
    - Brinken, Conway, de Vicente, Schuster, Tammi, Jung, Venturi, Zensus
  - GMVA Schedulers
    - Claussen (USA) & Ros (Europe)
  - GMVA Technical Group and MPIfR Corr. Head
    - Rottmann
  - GMVA Operations and Pre-Calibration:
    - Krichbaum
  - GMVA Support scientist:
    - Pidopryhora
  - Schedulers and Friends of VLBI at telescopes
    - Zanichelli, Byun, Kallunki, Sánchez, Torne, Bremer, Messias, Lindqvist, González García, Tercero, Kraus, Bach, Asada, Matsushita, Minter, etc.
    - ALMA Phasing team: Crew, Matthews, Rottmann

# Duties



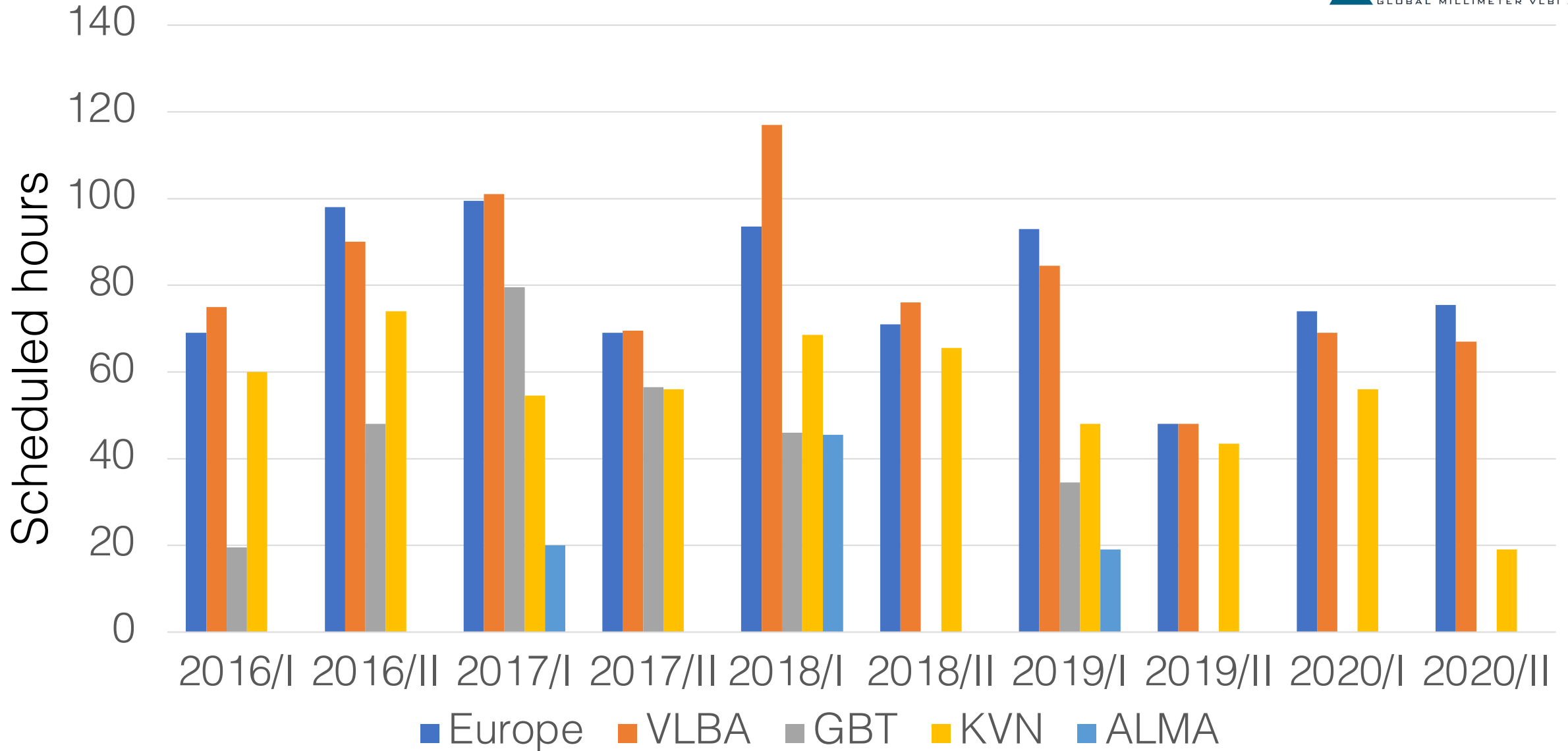
## GMVA provides

- Session coordination
- Proposal handling via NRAO tool
- Data recording at telescopes
- Correlation and data proof
- User support and archiving
  - Technical advice at proposal stage
  - Schedule made for observers
  - Observing & correlation in absentia
  - Amplitude calibration collected and reformatted
- Media generally purchased by MPIfR

## Telescopes provide

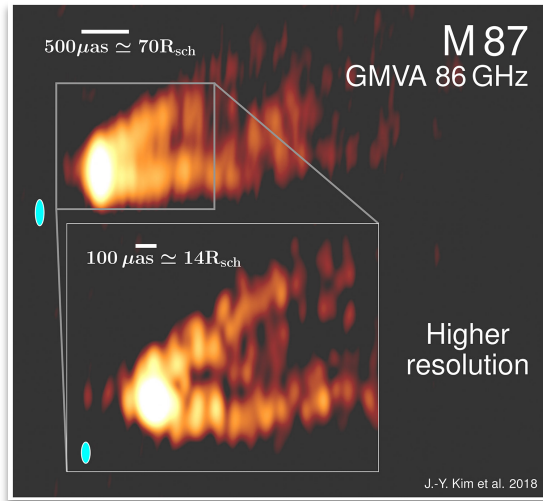
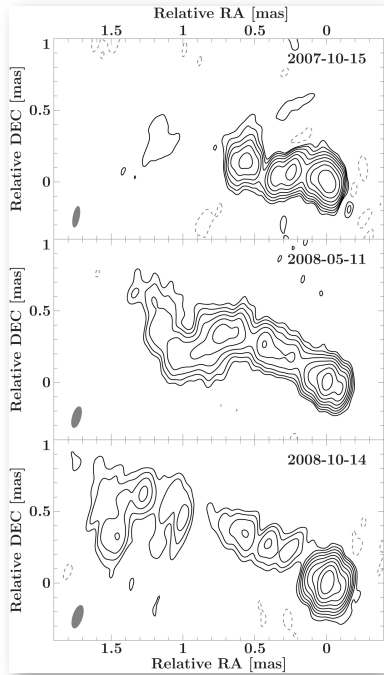
- Friend of VLBI
- Fringe tests
  - Data portions sent for verification during observation
- Local tasks
  - VEX/field system, pointing, coordination, VLBI software maintenance, testing
- Media shipping
- Logs, calibration data, failure report
- Flexbuff for E-transfer
  - Ys, On, Mh, KVN, Eb

# GMVA Statistics 2016-2020

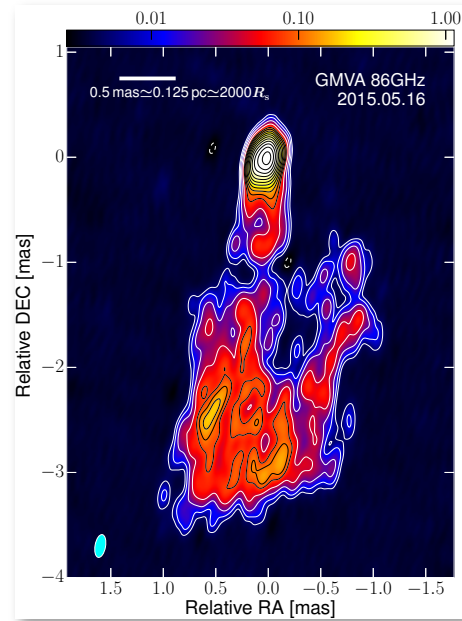




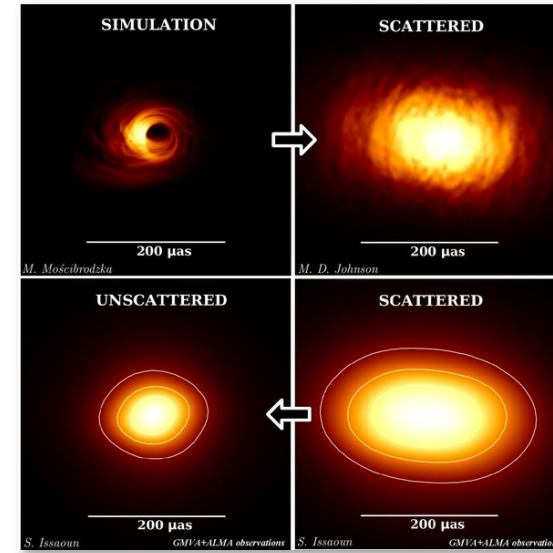
# Recent science highlights



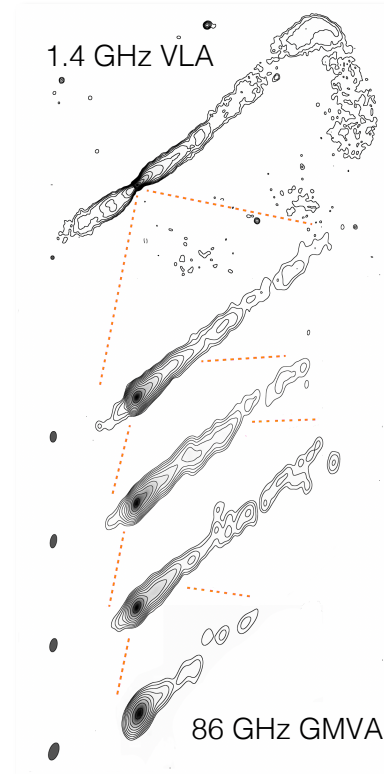
**M 87**  
Kim J.Y. et al. A&A 616 A18 (2018)



**3C 84**  
Kim J.Y. et al. A&A 522 A196 (2019)

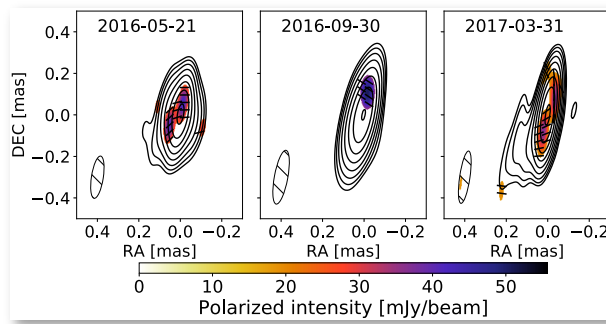


**Sgr A\***  
Issaoun et al. ApJ 871 30 (2019)

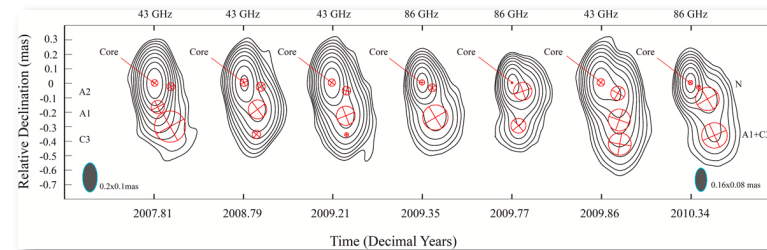


**NGC 315**  
Boccardi et al. A&A in press (2021)

**3C 111**  
Schulz et al. A&A 644 A85 (2020)



**CTA 102**  
Casadio et al. A&A 622 A158 (2020)



**TXS 2013+370**  
Traianou et al. A&A 634 A112 (2020)

# Science Output (cont.)

## PhD Theses Since 2014

- Traianou, Efthalia, *High Resolution Millimeter VLBI Studies of the Blazars TXS 2013+370, OJ 287, and 3C 454.3*, Univ. of Cologne, 2020.
- Baczko, Anne-Kathrin, *Multi-Frequency VLBI Observations of the Active Galaxy NGC 1052*, Univ. of Cologne, 2019.
- Nair, Dhanya, G., *Global Millimeter VLBI Array Survey of Ultracompact Extragalactic Radio Sources at 86 GHz*, Univ. of Cologne, 2018
- Kim, Jae-Young\*, *High Spatial Resolution Millimeter VLBI Studies of the Nearby Radio Galaxies M 87 and 3C 84*, Univ. of Cologne, 2018.
- Boccardi, Biagina\*, *The two-sided relativistic outflow in Cygnus A: extragalactic jet physics at extreme spatial resolution*, Univ. of Cologne, 2015.
- Karamanavis, Vassileios, *Zooming into gamma-ray loud galactic nuclei: broadband emission and structure dynamics of the blazar PKS 1502+106 and the narrow-line Seyfert1 1H 0323+342*, Univ. of Cologne, 2015.
- Hodgson, Jeffrey, *Ultra-high resolution observations of selected blazars*, Univ. of Cologne, 2014.
- Rani, Bindu\*, *Broad band study of selected Gamma-ray active blazars*, Univ. of Cologne, 2014

## Oncoming publications

- NGC 315 Boccardi et al. (in press)
- Sgr A\* Issaoun et al. (submitted)
- M 87 Lu et al. (in prep) w/ ALMA
- 3C 273 Okino et al. (in prep) w/ ALMA
- 3C 84 Paraschos et al.
- 3C 454.3 Traianou et al.
- OJ 287 Gómez et al. (in prep) w/ALMA
- NGC 1052 imaging Baczko et al. (in prep)
- NGC 1052 spectral line Kim DJ et al. (in prep)
- TXS 0506+056 Kadler et al. (in prep)
- Extreme blazars Kadler et al. (in prep)
- Cygnus A Bach et al. (in prep)
- 1803+784 Cui et al. (in prep)
- Mrk 501 Koyama et al. (in prep)
- NGC 6251 Kim JY et al. (in prep)

\*: Otto Hahn Medal of Max Planck Society

Eduardo Ros - GVA Teleconference

03feb2021