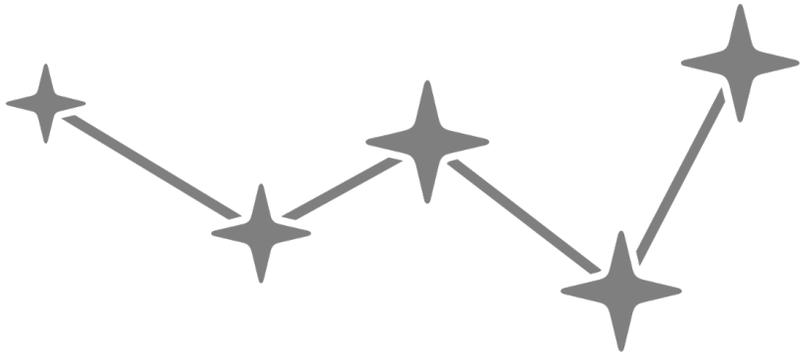


FRANCI 2021

Chair of Astronomy and
Astrophysics

Karl Mannheim



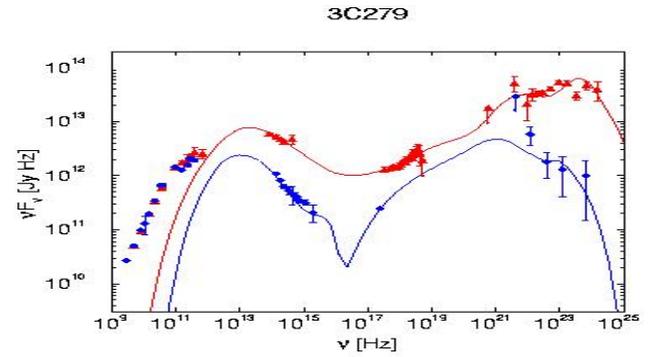
ASTRO WÜRZBURG



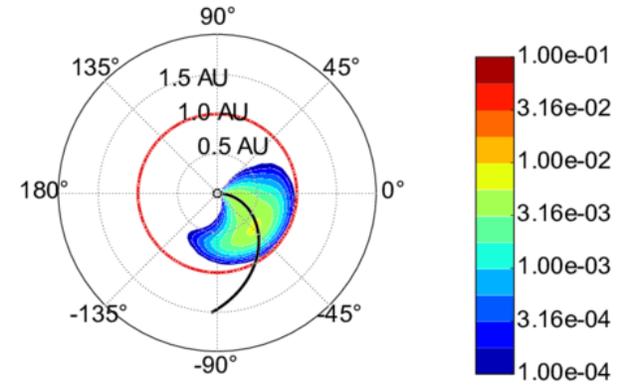
Blazing group leaders



Christian Fromm



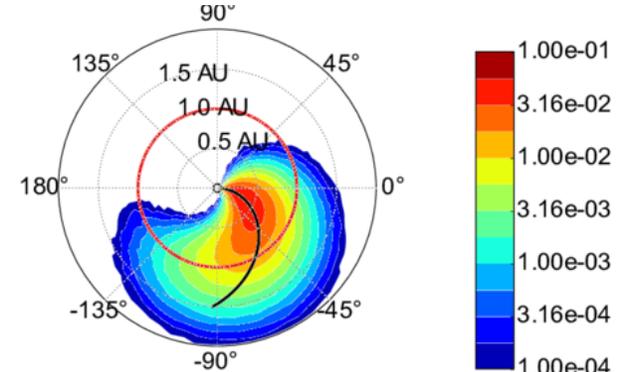
Sara Buson



Matthias Kadler



Wolfgang Dröge



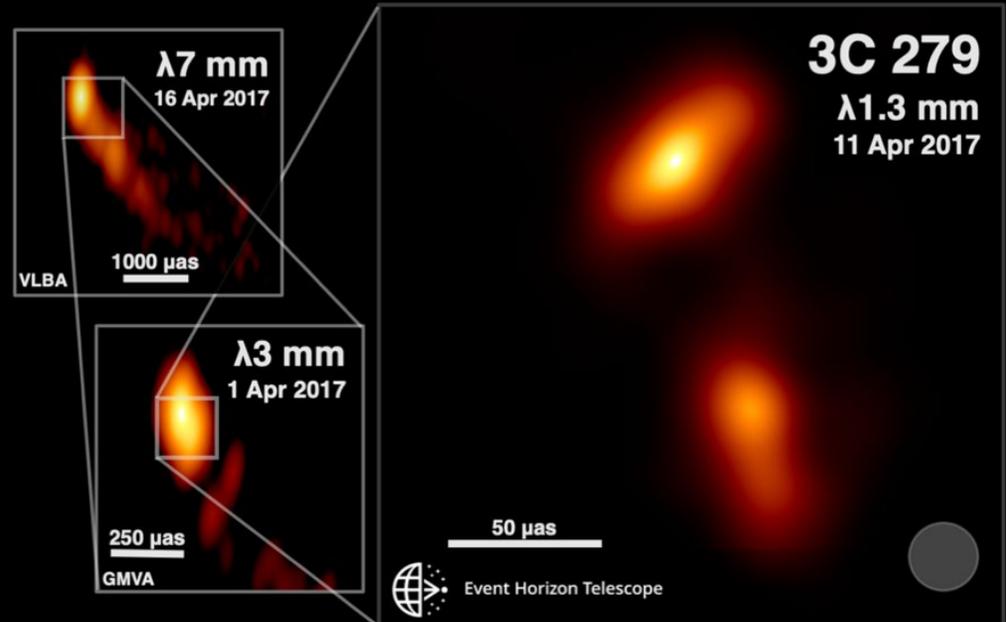
Daniela Dorner

nature astronomy

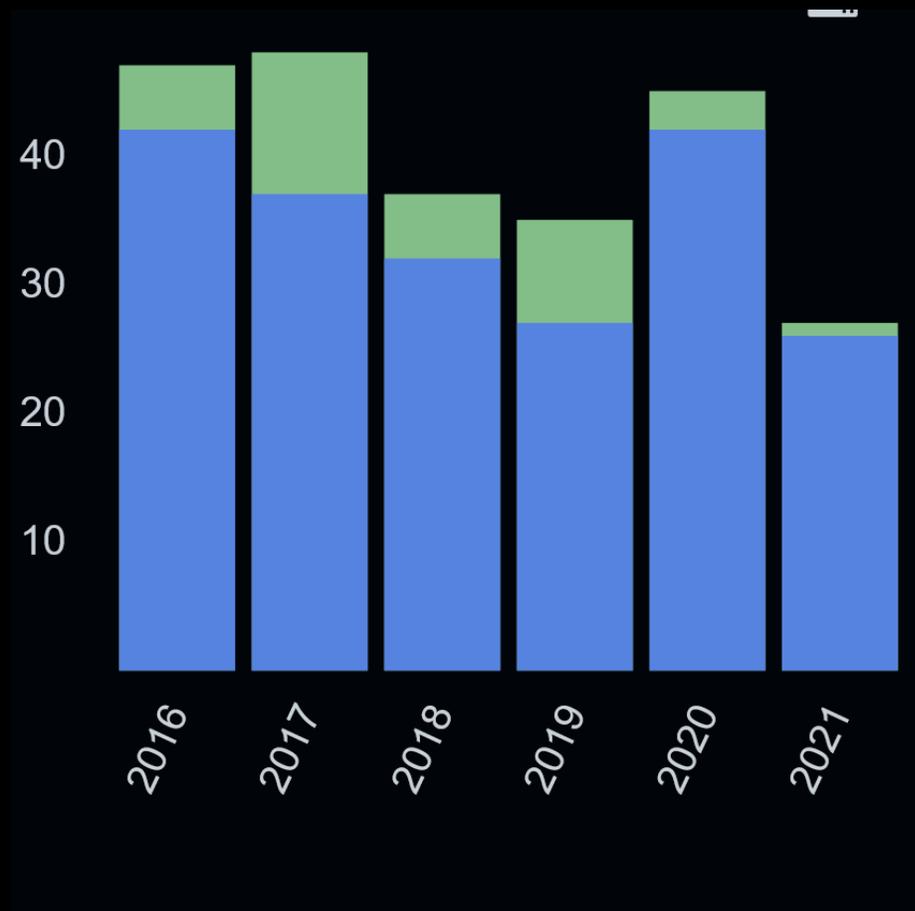
Nearest radio
galaxy tuned in

Cen A

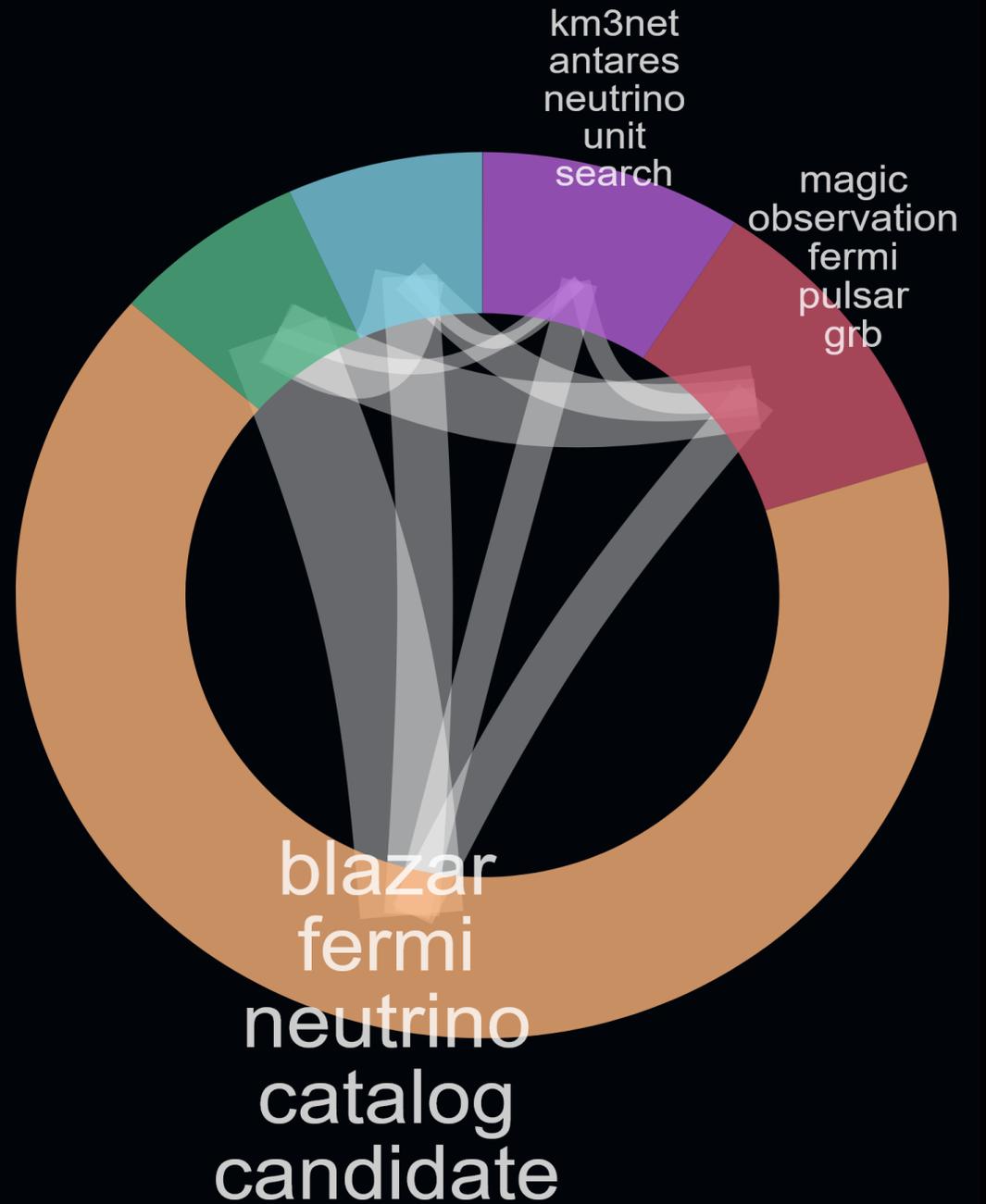
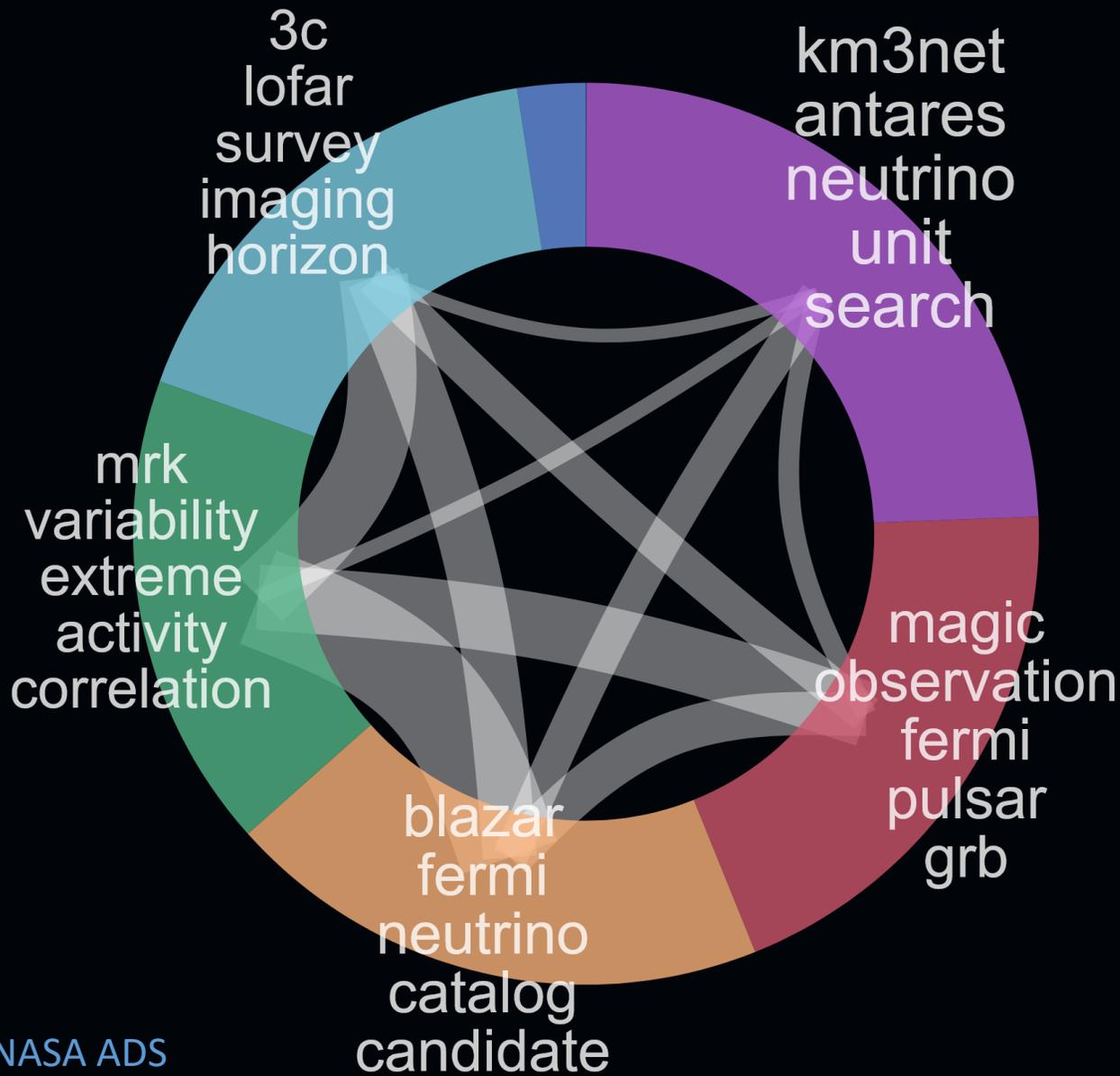
M87



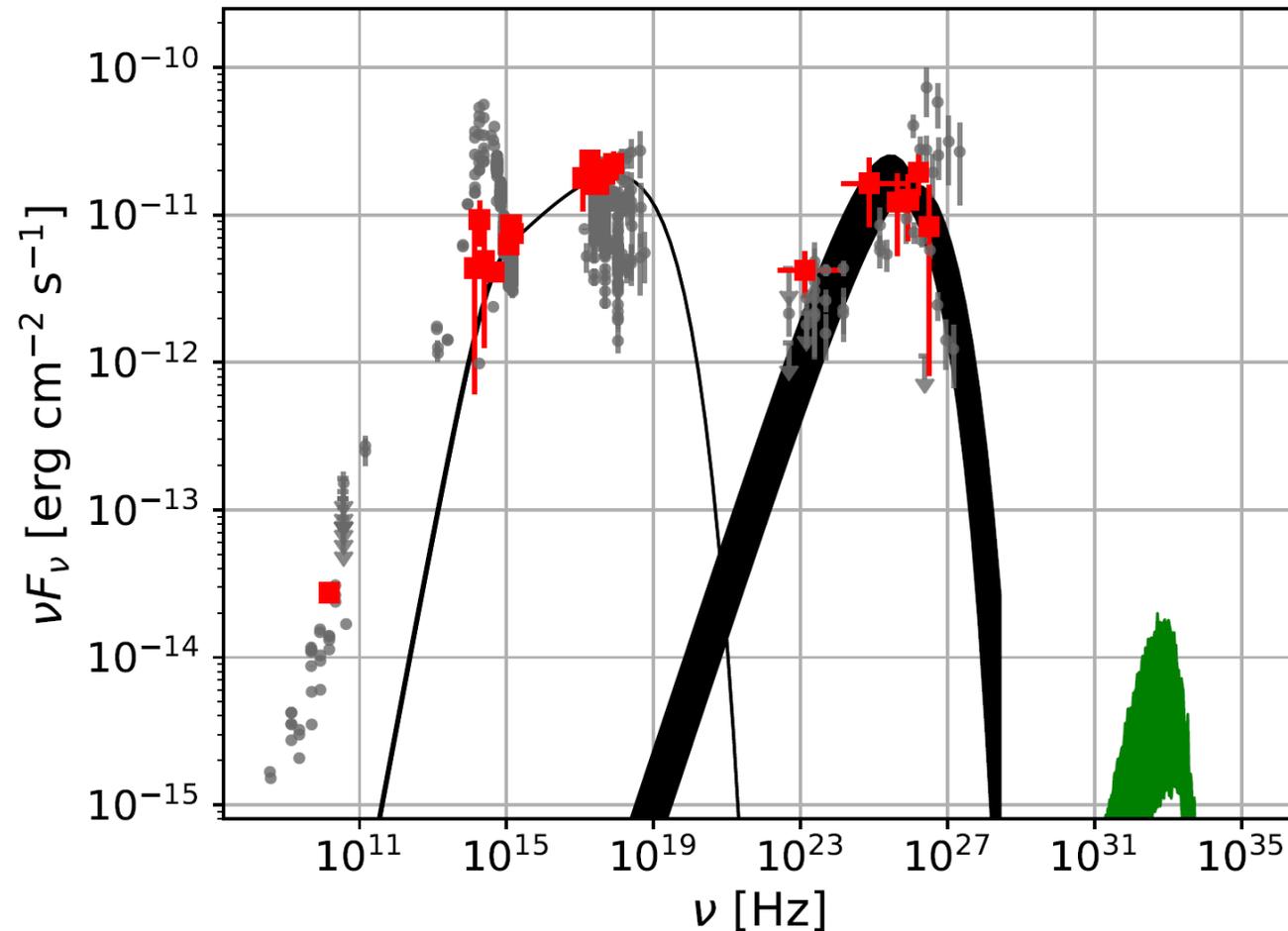
Publications (JMUW astro)



- **Corona:** No major drop of refereed paper output rate due to homeoffice, but decreased rate of conference proceedings
- **Main theme:** Blazar multi-wavelength properties from central engine to parsec scales and multi-messenger connections (e.g., Fermi-LAT, MAGIC, FACT, TANAMI, ANTARES/KM3NeT, X-rays)
- **Key questions:** Blazar variability: stochasticity and periodicity, constraints on emission region, signatures of particle acceleration in vacuum gaps, reconnection regions and due to shocks, hadronic processes, black hole spin, magnetic field, jet scaling properties, solar energetic particles and transport equation

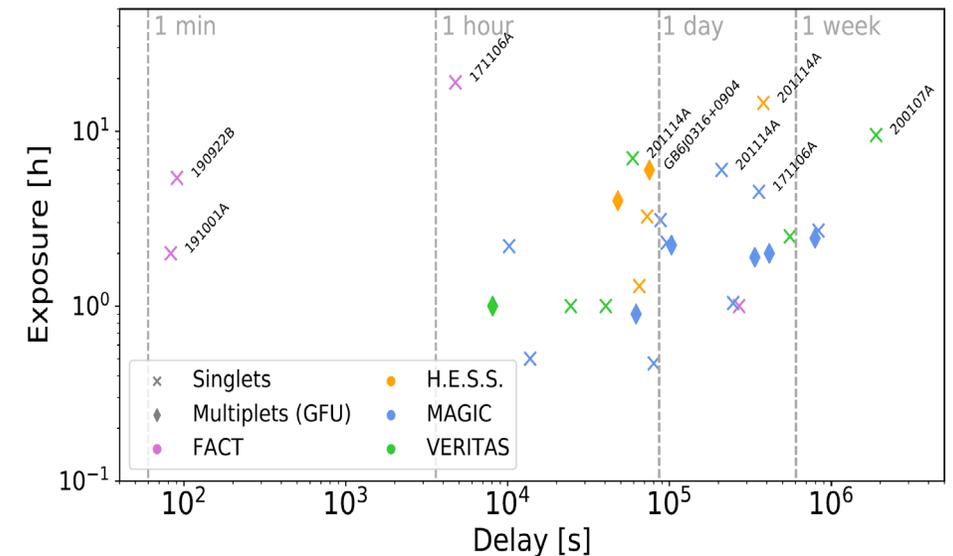


Contemporaneous MWL/MM observations triggered by FACT
 (e.g. INTEGRAL, HAWK, Astrosat, XMM, Swift, IceCube,...)
 (Daniela Dorner, Bernd Schleicher, Roman Iotov, Adelina Kalenski, Laura Eisenberger)



1ES 2344+514.

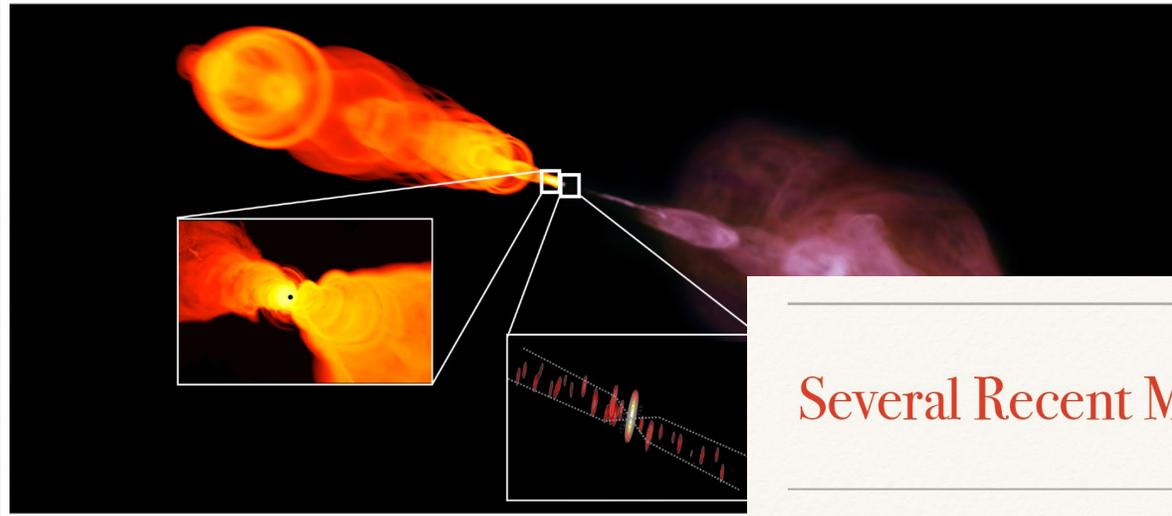
MAGIC Collaboration, MNRAS **496**,
 3912 (2020)



Recent exemplary few-authored papers

- [Kapanadze, B.](#); Gurchumelia, A. ; [Dorner, D.](#) ; Vercellone, S.; Romano, P.; Hughes, P.; Aller, M.; Aller, H. ; Kharshiladze, O.: **Swift Observations of Mrk 421 in Selected Epochs. III. Extreme X-Ray Timing/Spectral Properties and Multiwavelength Lognormality during 2015 December-2018 April**, *ApJS* **247**, 27 (2020)
- [Gokus, A.](#); Paliya, V. S.; [Wagner, S. M.](#); [Buson, S.](#); D'Ammando, F.; Edwards, P. G.; [Kadler, M.](#); Meyer, M.; Ojha, R.; Stevens, J.; [Wilms, J.](#): **The first GeV flare of the radio-loud narrow-line Seyfert 1 galaxy PKS 2004-447**, *A&A* **649**, 77 (2021)
- [Wendel, Christoph](#); Becerra González, Josefa; Shukla, Amit and 2 more: **Gamma-ray signatures from pair cascades in recombination-line radiation fields**, arXiv210802649
- [Wendel, Christoph](#); Shukla, Amit; [Mannheim, Karl](#): **Pair Cascades at the Edge of the Broad-line Region Shaping the Gamma-Ray Spectrum of 3C 279**, *ApJ* **917**, 32 (2021)
- [Wendel, Christoph](#); Becerra González, Josefa; Paneque, David; [Mannheim, Karl](#): **Electron-beam interaction with emission-line clouds in blazars**, *A&A* **646**, 115 (2021)
- Schulz, R.; [Kadler, M.](#); Ros, E.; Perucho, M.; Krichbaum, T. P.; Agudo, I.; [Beuchert, T.](#); Lindqvist, M.; [Mannheim, K.](#); [Wilms, J.](#); Zensus, J. A.: **Sub-millisecond imaging of a bright flare and ejection event in the extragalactic jet 3C 111**, *A&A* **644**, 85 (2020)
- Kreter, M.; [Gokus, A.](#); Krauss, F.; [Kadler, M.](#); Ojha, R.; [Buson, S.](#); [Wilms, J.](#); Böttcher, M.: **Search for High-redshift Blazars with Fermi/LAT**, *ApJ* **903**, 128 (2020)
- Kreter, M.; [Kadler, M.](#); Krauß, F.; [Mannheim, K.](#); [Buson, S.](#); Ojha, R.; [Wilms, J.](#); Böttcher, M.: **On the Detection Potential of Blazar Flares for Current Neutrino Telescopes**, *ApJ*...902..133K (2020)
- [Kartavykh, Y. Y.](#); [Dröge, W.](#); Klecker, B.; Kovaltsov, G. A.; Ostryakov, V. M.: **A Mechanism for the Fractionation of Isotopes in 3He-rich Solar Energetic Particle Events**, *ApJ* **906**, 6 (2021)
- [Burd, Paul R.](#); [Kohlhepp, Luca](#) ; [Wagner, Sarah M.](#) ; [Mannheim, Karl](#) ; [Buson, Sara](#) ; Scargle, Jeffrey D.: **Ornstein-Uhlenbeck parameter extraction from light curves of Fermi-LAT observed blazars**, *A&A* **645**, 62 (2021)

DFG FOR 5195

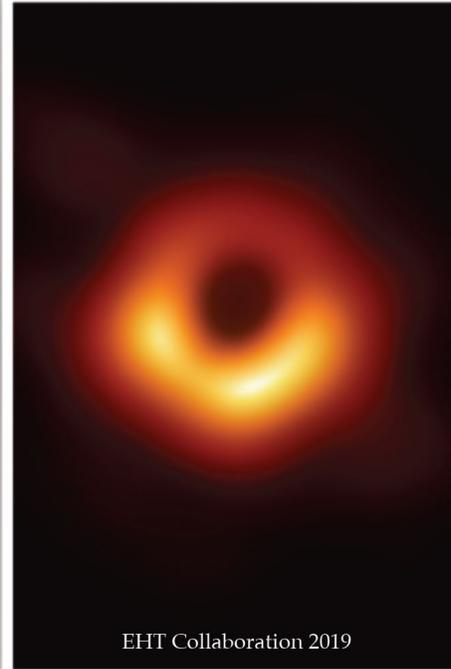


Several Recent Major Breakthroughs Are Closely Related to Jets

DFG Research Unit - FOR 5195

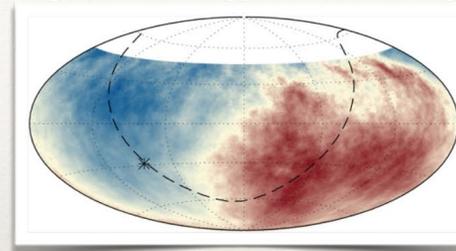
Relativistic Jets in Active Galaxies

Black Hole Shadow in M87



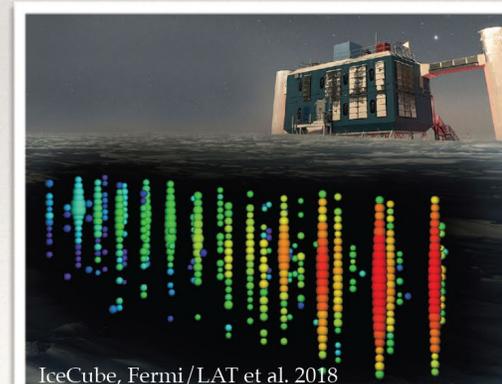
Spokesperson:
Matthias Kadler

Highest-Energy Cosmic Rays



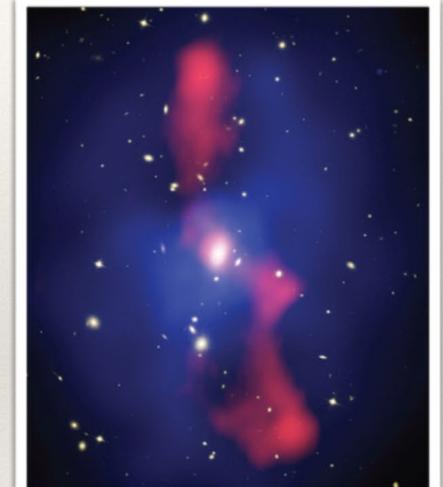
Pierre Auger Collaboration 2017

Neutrino-Blazar Associations



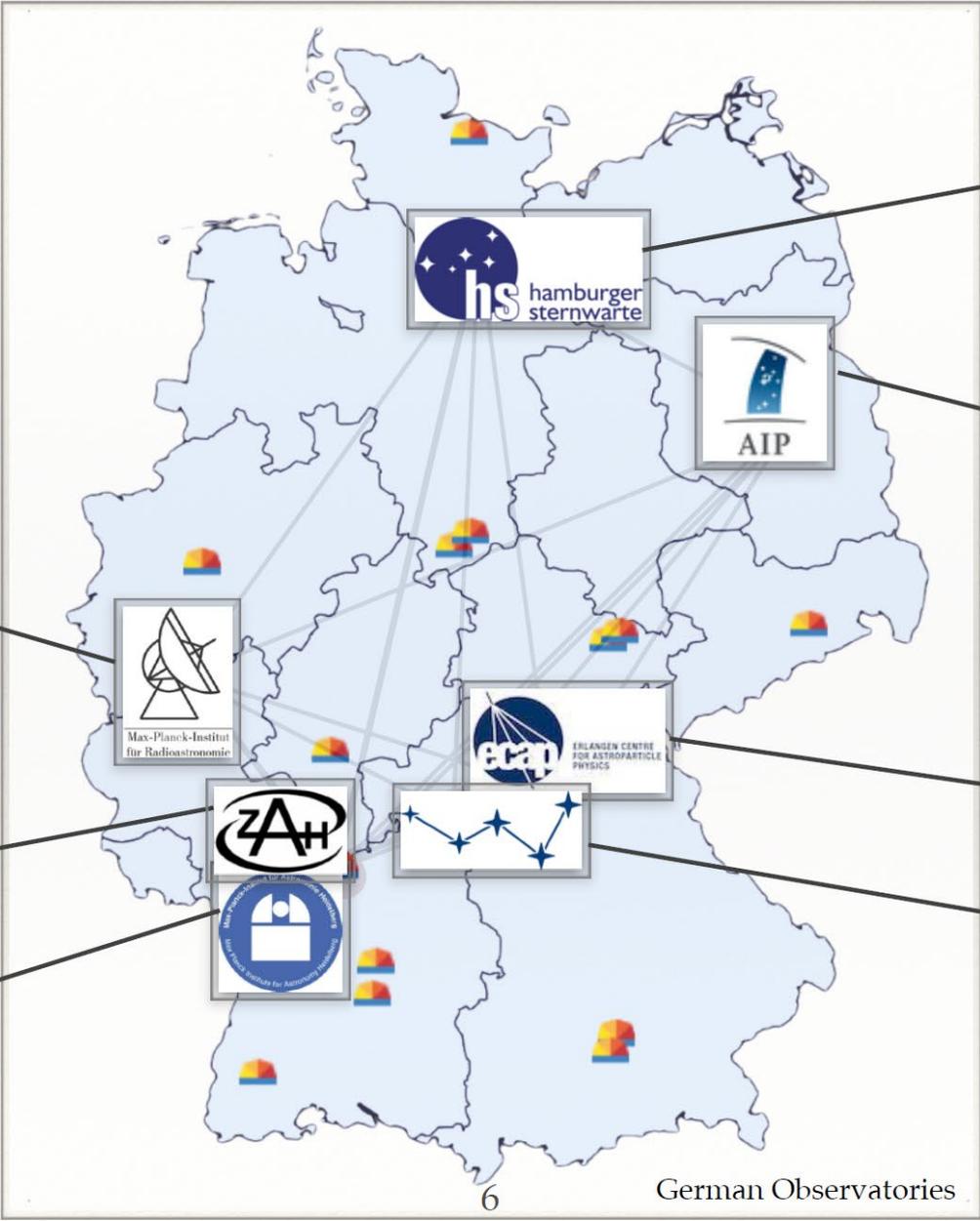
IceCube, Fermi/LAT et al. 2018

NASA/ESA/CXC/NRAO/STScI (McNamara)



AGN Jet Feedback

P. Grandi, M. Perucho



M. Brüggem
M. Meyer

C. Pfrommer

J.A. Zensus,
E. Ros et al.
B. Boccardi

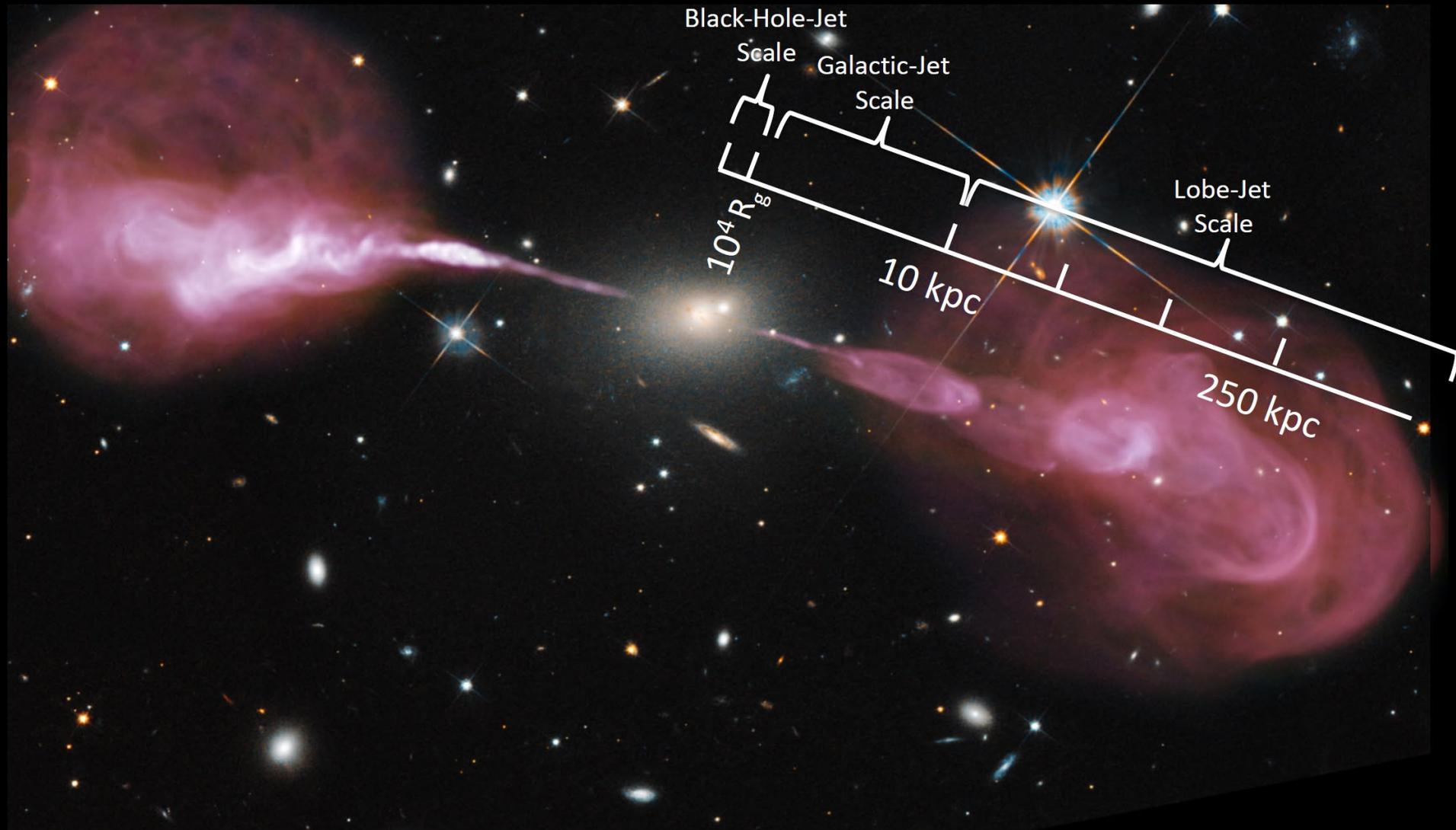
J. Wilms
T. Dauser

S. Wagner

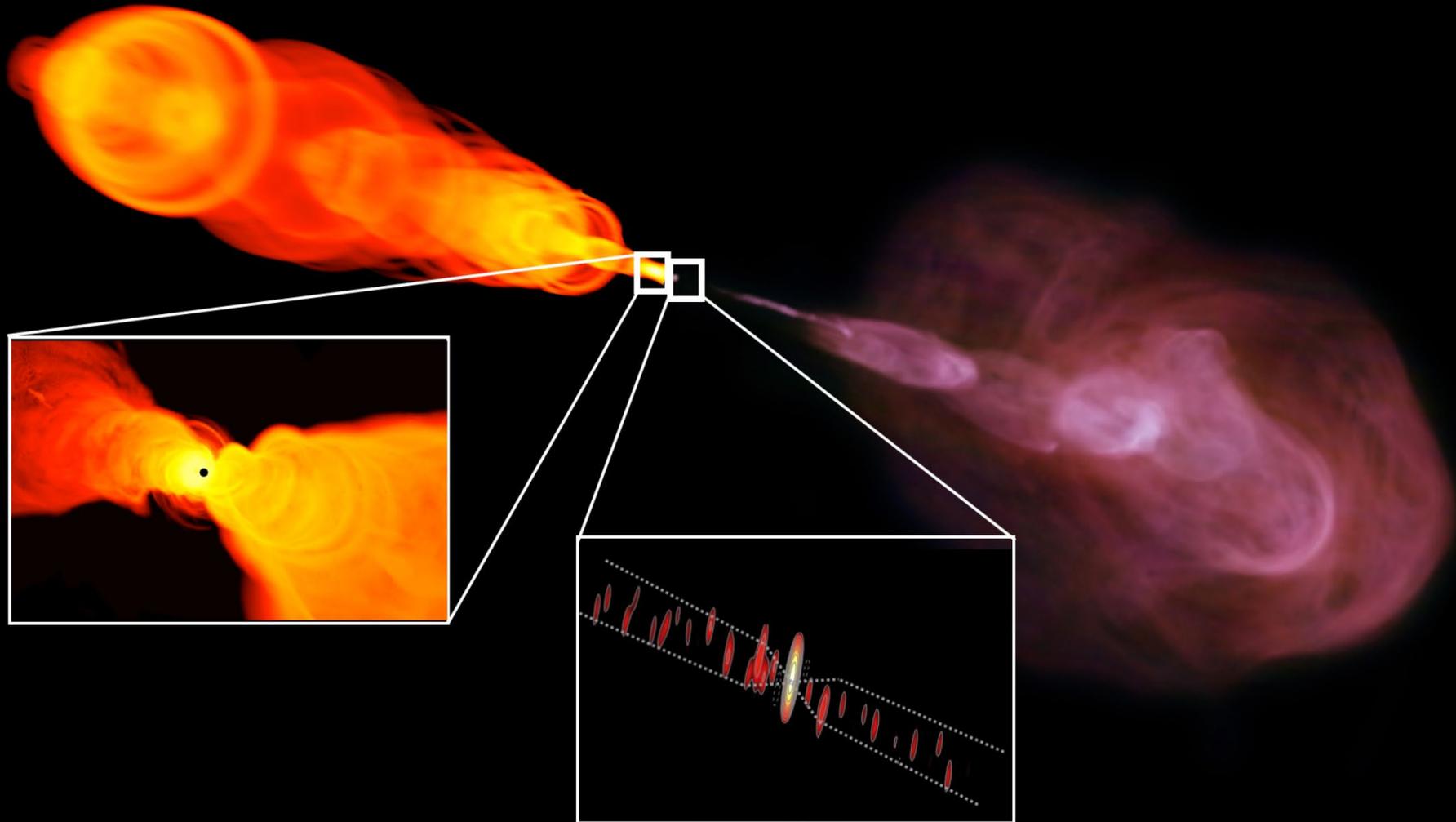
S. Buson
C. Fromm
M. Kadler
K. Mannheim

C. Fendt

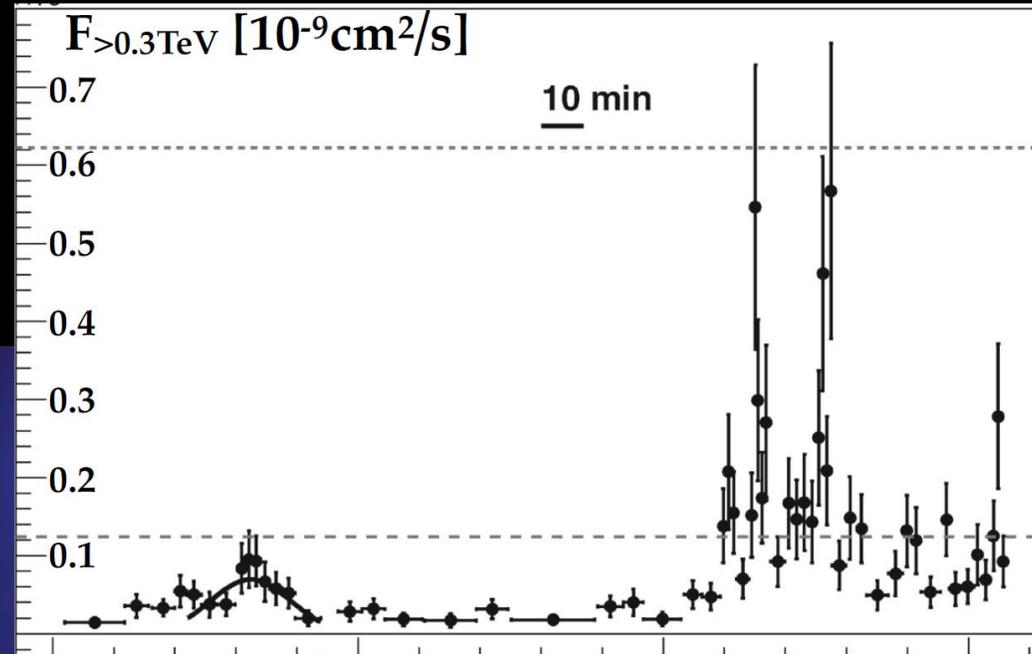
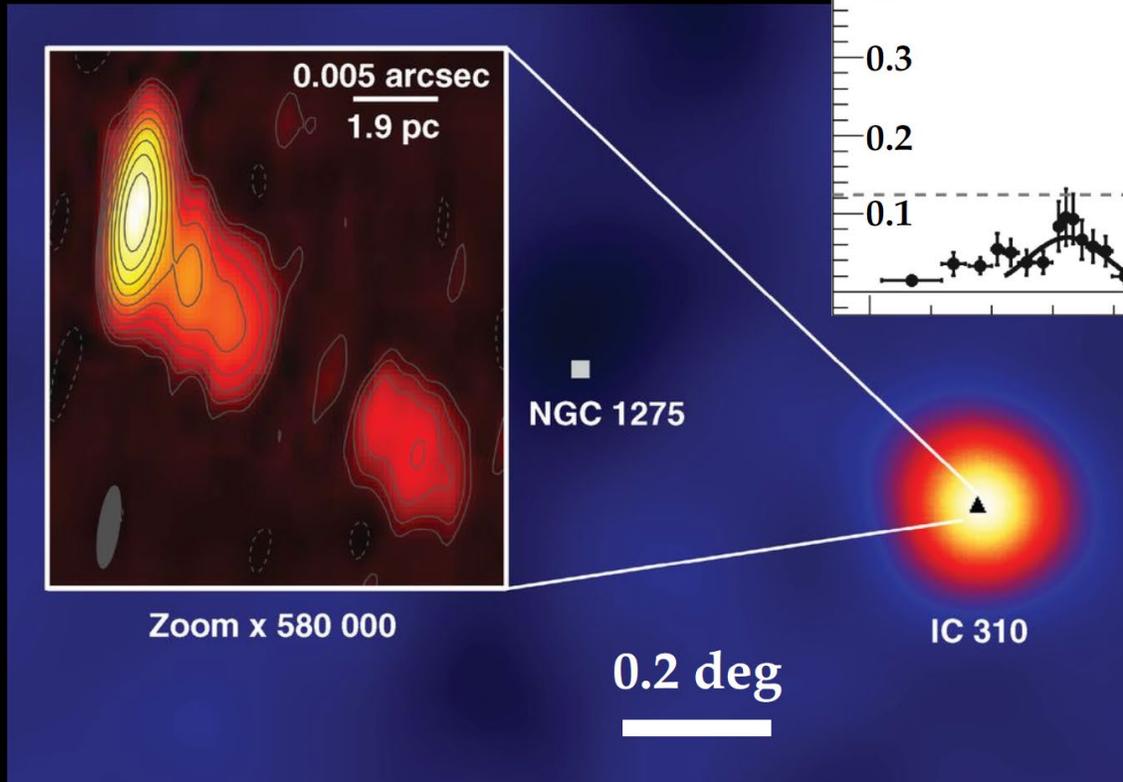
1- Links Across Scales



2 - Links Theory & Modeling With Observations

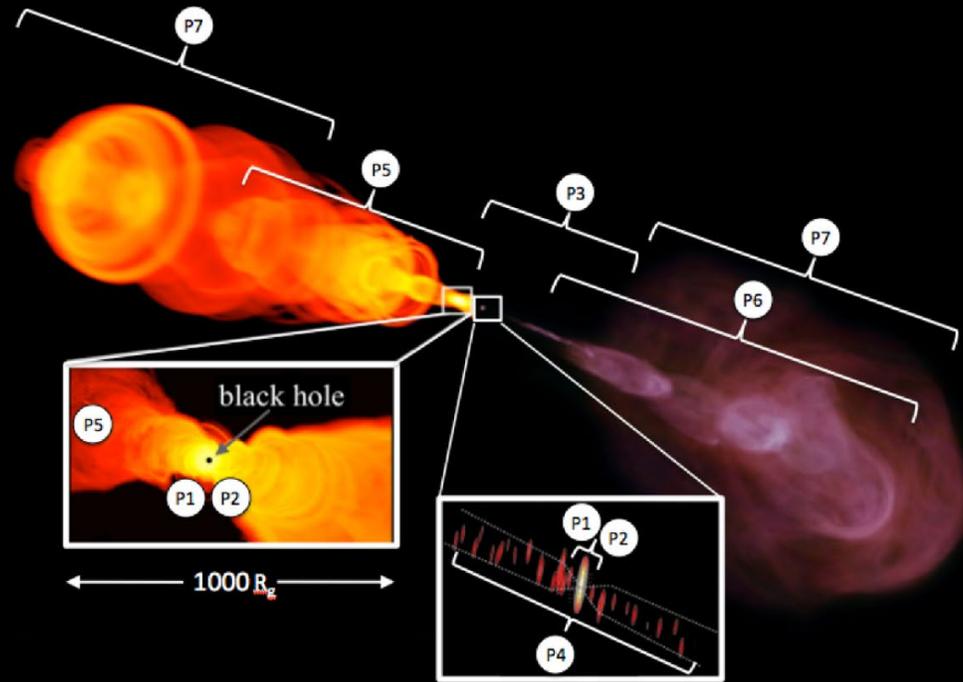


3 - Links Across Wavelengths



Credit: Aleksić et al. 2014, Science 346, 1080

Project Plan



Project Code	Project Leader	co-Applicant	Project Title
P 1	Fromm/Kadler	Zensus/Ros	Jet Physics on Event Horizon Scales and Beyond
P 2	Wilms	Dauser	Jet Lamp-Post Models for Radio-Loud AGN
P 3	Buson/Wagner		Flaring and Time-Dependent Modeling of Blazars
P 4	Boccardi	Zensus	mm-VLBI Studies of Γ -Ray Bright Radio Galaxies
P 5	Mannheim/Fendt		Jet Composition under Scrutiny
P 6	Kadler	Brüggen	Large-Scale Blazar Jets: Clues on High-Energy Emission from Low-Frequency Radio Observations
P 7	Brüggen/Pfrommer		Jet Feedback on Groups and Galaxy Clusters

LST/MAGIC/FACT
Volcano eruption!



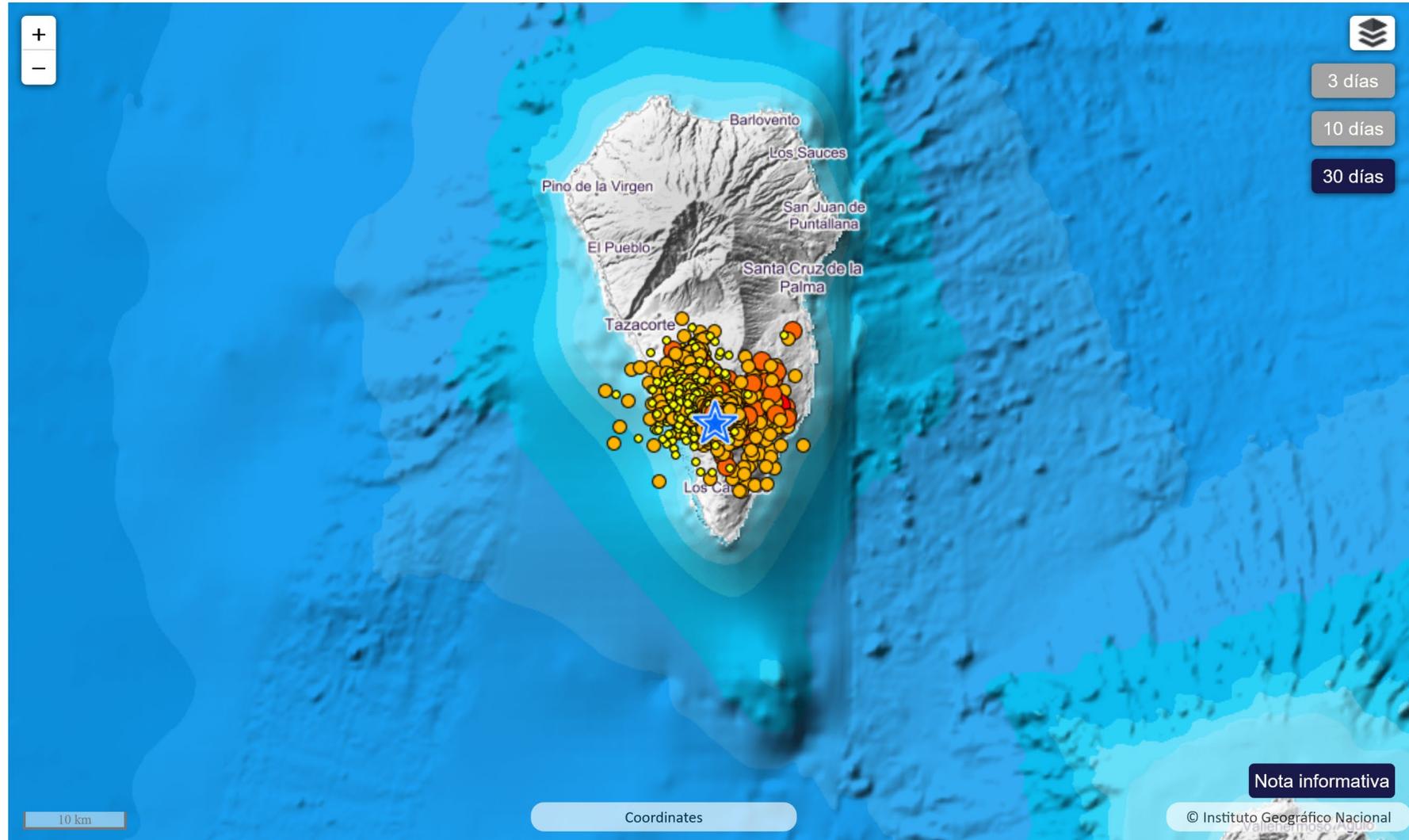
Magnitud	Localización	Prof.	+info
Fecha y Hora UTC *	Int. [máx]		
3.2 mbLg	N FUENCALIENTE DE LA PALMA.ILP 2021/10/13 19:46:00	9	+info
2.5 mbLg	NE FUENCALIENTE DE LA PALMA.IL 2021/10/13 17:46:14	12	+info
2.5 mbLg	N FUENCALIENTE DE LA PALMA.ILP 2021/10/13 17:10:32	10	+info
3.4 mbLg	SW VILLA DE MAZO.ILP 2021/10/13 16:17:14	III	+info
2.9 mbLg	SW VILLA DE MAZO.ILP 2021/10/13 15:47:13	10	+info
2.8 mbLg	NE FUENCALIENTE DE LA PALMA.IL 2021/10/13 15:04:23	33	+info
4.4 mbLg	SW VILLA DE MAZO.ILP 2021/10/13 14:33:48	III-IV	+info
2.9 mbLg	E FUENCALIENTE DE LA PALMA.ILP 2021/10/13 14:30:15	28	+info
2.6 mbLg	E FUENCALIENTE DE LA PALMA.ILP 2021/10/13 13:51:38	29	+info
3.3 mbLg	NE FUENCALIENTE DE LA PALMA.IL 2021/10/13 13:19:40	14	+info
3.3 mbLg	NE FUENCALIENTE DE LA PALMA.IL 2021/10/13 12:22:04	13	+info
2.6 mbLg	NE FUENCALIENTE DE LA PALMA.IL 2021/10/13 11:51:04	11	+info

Solamente se muestran terremotos de magnitud igual o superior a 1.5 o sentidos.

*Verano (Hora Oficial = Hora UTC + 2 horas).

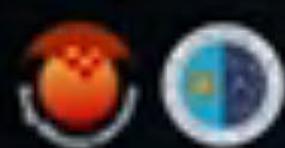
*Invierno (Hora Oficial = Hora UTC + 1 Hora).

*(La hora oficial en Canarias es una hora menos que en el resto de España)



Nota informativa

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OBSERVATORIO DEL ROQUE DE LOS MUCHACHOS
GARAFÍA, LA PALMA (ISLAS CANARIAS, ESPAÑA)



2021-09-22 UTC 19:13:08



OBSERVATORIO DEL ROQUE DE LOS MUCHACHOS
GARAFÍA, LA PALMA (ISLAS CANARIAS, ESPAÑA)





OBSERVATORIO DEL ROQUE DE LOS TENEDEROS
GARAFÍA, LA PALMA (ILAS CANARIAS, ESPAÑA)





OBSERVATORIO DEL ROQUE DE LOS MUCHACHOS
GARAFÍA, LA PALMA (ISLAS CANARIAS, ESPAÑA)



Summary

- Multi-scale, multi-wavelength, multi-messenger approach
- Focus on supermassive black hole – extragalactic jets physics
- Increasing efforts for high-resolution radio observations and monitoring (cm, mm)
- Toward CTA-North completion - provided volcano allows us to do so
- Hybrid theory GRMHD – kinetic and radiative processes
- In perspective:
 - Dark matter – ergosphere connection
 - Stellar mass scale jet systems (microquasars), positron physics, nuclear astrophysics connection to cosmic rays