

FRO radio galaxies

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Study of radio and multi-band properties of the abundant population of compact radio galaxies in the local Universe in the framework of accretion, ejection, clustering, and feedback of radio Active Galactic Nuclei.

Status of the project (2023)

- 1. Analysis:** calibration and imaging of datasets EVN, AMI and LOFAR of samples of compact FR0 radio galaxies
- 2. Conferences/visits:**
 - organization of a workshop 'Bologna& Friends: radio galaxies' focusing on extended and compact radio galaxies (March 2023, Bologna, <https://indico.ict.inaf.it/event/2300/>)
 - Attendance at the international conference 'New eyes on the Universe: SKA and ngVLA' (May 2023, Vancouver) where I presented a poster on FR0 radio galaxies
 - Invited seminar at Padova (INAF-OAPd) on FR0 radio galaxies (April, 2023)
 - Collaboration meeting with Dr. Gabriele Bruni (INAF-IAPS) on eMERLIN observations of compact radio galaxies (July 2023, Rome)
 - Workshop 'The importance of jet-induced feedback on galaxy scales' at Lorentz centre where I chaired a session on compact radio AGN (October 2023, Leiden)
 - visit to the [Joint Institute for VLBI ERIC](#) (November 2023, Dwingeloo) to learn data reduction of EVN+eMERLIN observations of FR0s (5 GHz)
- 3. Publications:**
 - 1 publication '[Jets in FR0 radio galaxies](#)' (Giovannini et al 2023, A&A, 672:A104)
 - writing and publication of the A&A review '[The nature of compact radio sources: the case of FR0 radio galaxies](#)' (Baldi 2023)
- 4. Grant:** ~50% of the budget already spent in 2023. In 2024 plan for conferences (possibly IAU symposium in Cape Town) and visits (to INAF-OATo and IAPS) planned



Objectives, future perspectives and criticalities

1. **Main goal:** studying what causes the deficit of the extended jet emission of FRO radio galaxies with respect to the other classes of extended radio galaxies (accretion, ejection, radio feedback on the host galaxies and large and small-scale environment). Multi-band synergy to explore the AGN, host and clustering connection and the role of the FRO population in relation to the other radio AGN populations (see Figure).

2. Near Future:

- new VLA and VLBI observations to study the jet structure on sub-arcsec angular resolution
- exploiting the SRG/eROSITA All-sky Survey to study high-energy emission and clustering properties
- New X-ray proposals (Chandra, XMM)

3. Distant Future:

- LOFAR international baselines to resolve the jet structures at low radio frequencies (150 MHz)
- studying the multi-phase gas (hot, warm, cold) to probe the possible galactic-scale interaction of the compact jet with the interstellar medium.
- numerical simulations of compact jets (synergy with INAF-OaTO)

4. Criticalities:

- little man power (no students)
- reinforce expertise in multi-band analysis (key for exploitation of deep radio surveys)
- difficult to get multi-band observations because of low flux density/long exposures

