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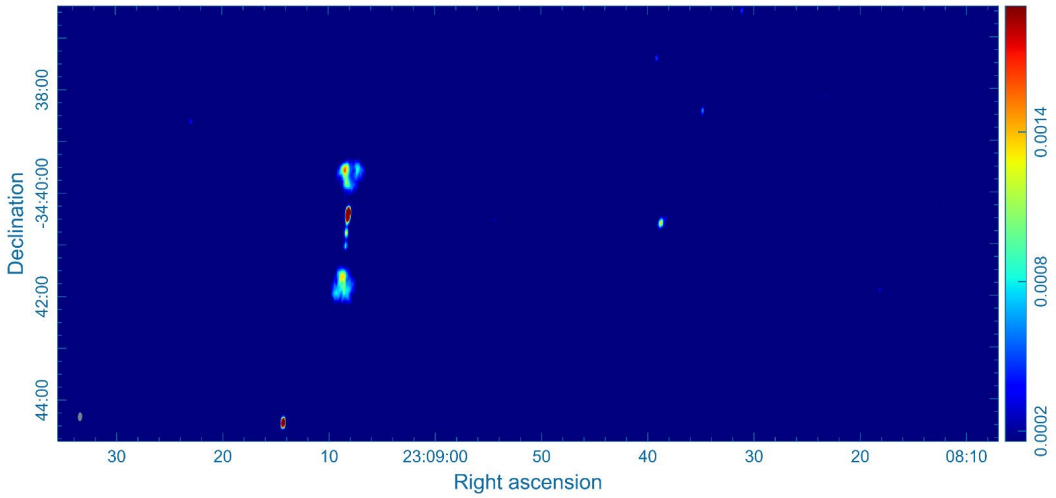
PRESS RELEASE

Sailing to unexplored SHORES: the hidden treasures of faint radio galaxies

Faint radio-emitting galaxies bear the imprints of a cosmic struggle between black hole activity and star formation. The first results from the SHORES radio survey will provide new insights into their properties and evolution.



Trieste, 28 February 2025

There is a cosmic struggle at the heart of faint radio-emitting galaxies. At their core, supermassive black holes launch high-speed jets of particles, while new stars are born in clouds of gas and dust. These processes shape the evolution of galaxies, but much of their activity is often hidden from view by thick interstellar dust. Unlike visible and ultraviolet light, which is absorbed and re-emitted in the far-infrared, radio waves can pass through, allowing astronomers to study these galaxies even in the most obscured environments.

A new study conducted by researchers from INAF-IRA and SISSA has announced the first results of the SHORES (Serendipitous H-ATLAS fields Observations of Radio Extragalactic Sources) project, a radio galaxy survey in total intensity and polarization conducted on the Australian Telescope Compact Array (ATCA), a radio interferometer located in Australia. The survey is centered on sky areas which allow to combine radio data with ancillary multiwavelength observations, so providing new insights into the properties, history and evolution of faint radio-emitting galaxies. Unlike previous surveys that typically cover large contiguous

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regions at uniform sensitivity, SHORES adopts a “multi-pencil beam” approach. This method, based on precise instrumental response measurements, allows for the detection of rare, bright sources (above 0.5 mJy) across 26 square degrees, while also cataloging over 95% of sources brighter than 0.15 mJy in a smaller, 7-square-degree area.

The first results, recently published in *Massardi et al. (2025)* on the international journal “Publication of the Astronomical Society of the Pacific” (PASP), include the analysis of 2,294 galaxies detected in 27 shallow fields. “These findings establish SHORES within the framework of state-of-the-art large-scale radio surveys while extending their reach toward fainter populations and allowing for source characterization via multiwavelength analysis. This will open new exciting avenues for galaxy formation and evolution studies. Furthermore, the inclusion of polarized emission in SHORES adds a unique dimension to the survey, as it carries critical information on cosmic magnetic fields and on the physical processes shaping radio sources.” comments Dr. Marcella Massardi (INAF-IRA and SISSA), PI of the survey.

Two fields have also been observed to greater depth, revealing over 500 additional sources. “This deeper dataset will allow researchers to further investigate the relationship between dust emission linked to star formation, and radio emission which may be driven by either stellar processes or nuclear activity.” explains the SISSA Ph.D. student Meriem Behiri (supervised by Prof. Andrea Lapi and Dr. Marcella Massardi) leading the analysis of these fainter sources.

Finally, faint radio galaxies may constitute a significant source of foreground contamination in polarization observations of the Cosmic Microwave Background, i.e., the relic radiation left over from the Big Bang that provides us a snapshot of the early universe. Understanding their properties is essential for improving component separation efforts in present and future experiments like Simons Observatory, LiteBIRD, and CMB-S4. The polarimetric analysis of SHORES data and its implication for cosmology will be detailed in an upcoming study led by Dr. Vincenzo Galluzzi from INAF-IRA. Meanwhile, targeted follow-up observations of particularly intriguing sources identified in the analysis are ongoing and will extend the survey’s findings and legacy science in the near future.

USEFUL LINKS
Full paper

IMAGE:
Credits: SHORES collaboration

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