RADIO GALAXIES

LoTSS of giants

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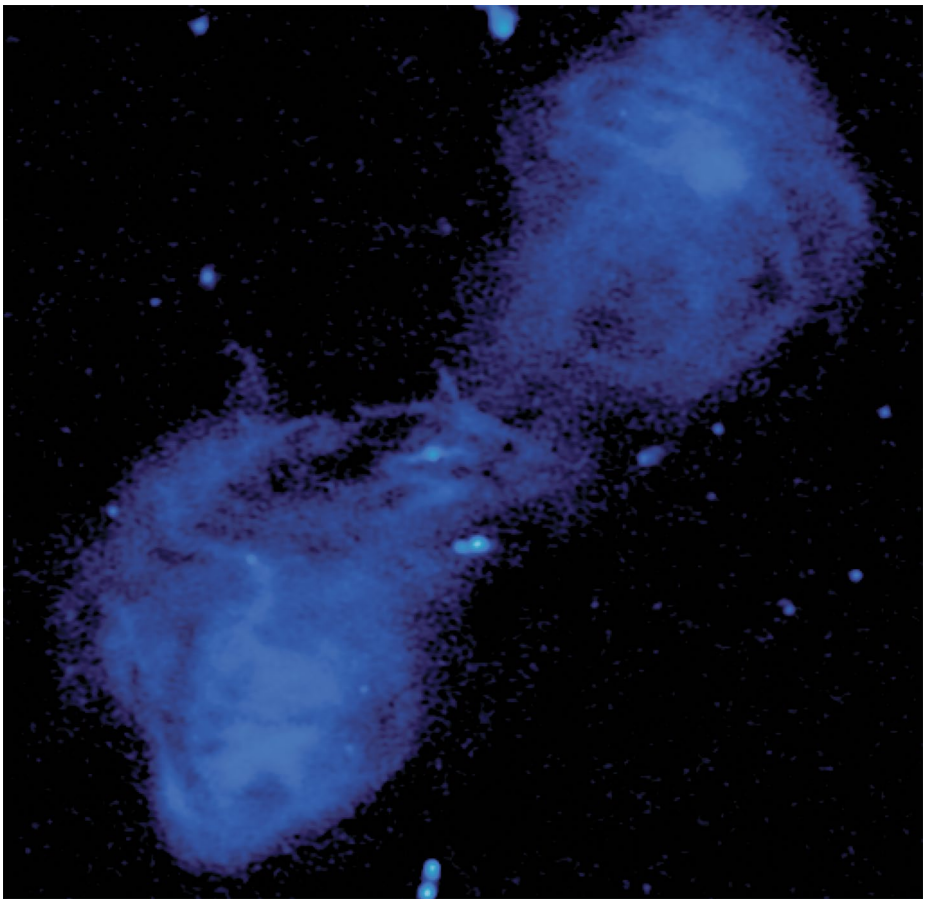

Credit: Maya Horton and the LOFAR surveys team

Giant radio galaxies (GRGs) are sources larger than 0.7 Mpc, of which 350 are known. J0349+7511 (pictured) is huge, at 2.1 Mpc, though the record is 4.69 Mpc for J1420–0545. But how did they grow so big? Have they been growing for ages? Are the jets (powered by a supermassive black hole) particularly strong or efficient? Or does it have something to do with a low-density environment? To address these questions, Pratik Dabhade et al. used the Low-Frequency Array (LOFAR) to conduct a sky survey, the LOFAR Two-metre Sky Survey (LoTSS), finding 239 GRGs (225 of them new) after covering just 2% of the northern sky.

With high spatial resolution and sensitivity, the LoTSS survey has revealed the morphologies of the GRGs (cores, jets, hotspots and diffuse emission) in unprecedented detail. Roughly 90% of these GRGs are Fanaroff–Riley type-II, meaning their lobes are brighter than the nucleus, and hence have strong jets (type-I are brighter centrally). Six have rare hybrid type-I/type-II morphologies with asymmetric lobe brightness. Combining radio and optical data, Dabhade et al. conclude that none of the hosts is a spiral galaxy. Rather, GRGs are found in elliptical galaxies, sometimes within clusters of galaxies; 40 of these GRGs are powered by quasars; another 20 GRGs reside in dense cluster environments, though not in the highest mass clusters; fourteen GRGs are 'double-double' radio galaxies with two pairs of lobes, with the second set due to restarted jets. Despite the rarity of GRGs, their spectral index is similar to that of regular radio galaxies, implying that GRGs are part of the same active galaxy population. In tandem with more LoTSS coverage, deeper optical data for resolving the host galaxies will help us understand their properties.

May Chiao

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