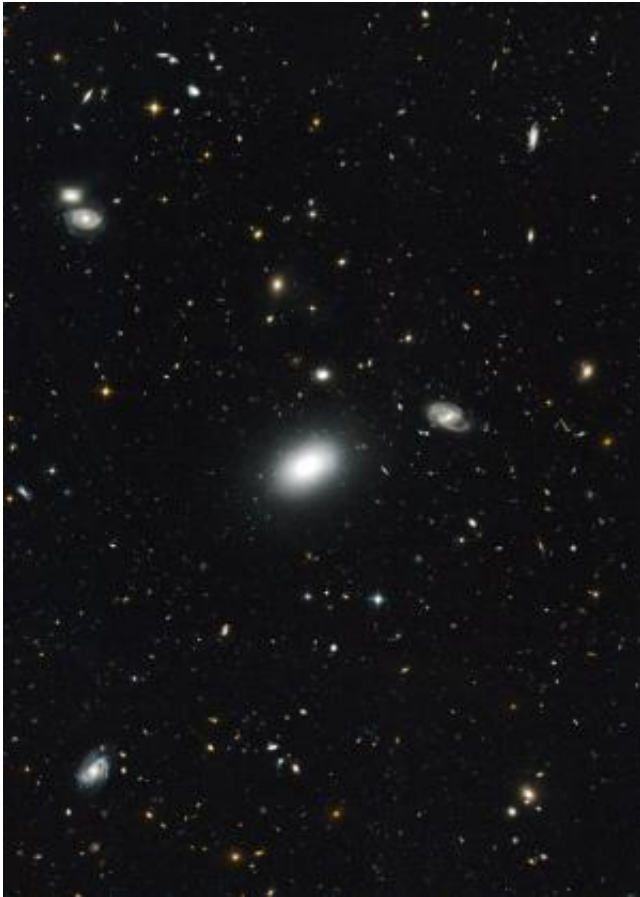


Radio galaxies in the distant universe

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A small section from a Hubble image of distant galaxies. A new paper has detected and studied infrared counterparts to all the galaxies in the main image with strong radio emission, the first time such a complete sample has been obtained. Credit: NASA/Hubble

(Phys.org) -- For over a decade astronomers have been probing a region of the northern sky, not far from the handle of the Big Dipper, that is

relatively free of bright stars and the diffuse glow of the Milky Way. The scientists want to take advantage of the clarity of the sky there to peer beyond our galaxy to study remote galaxies in the distant universe. This region, about half the angular size of the full moon, is now known to have over 50,000 galaxies.

CfA astronomers Steve Willner, Matt Ashby, and Jia-Sheng Huang and their colleagues studied the region using the SAO-led [Infrared Array Camera](#) (IRAC) on the [Spitzer Space Telescope](#). Surveys have detected 1122 galaxies in this region that emit strongly at [radio wavelengths](#), a consequence of their undergoing active star formation or of hosting active supermassive black holes at their nuclei. Since the radio observations alone are unable to estimate the distances to the galaxies or unravel the precise mechanisms powering their emission, the team undertook to use infrared data to provide that information.

In a paper to appear in the *Astrophysical Journal*, the team reports that it has detected essentially 100% of the [radio galaxies](#) in their infrared images. This is the first sample of the deep sky that has been able to completely associate radio galaxies with infrared counterparts, and it means that the conclusions they reach will be much more reliable. The team finds that 10-15% of the galaxies, most of them within a few billion light-years of us, are undergoing bursts of star formation. Roughly another quarter of the galaxies have [supermassive black holes](#) that are actively accreting matter; this group lies at greater distances (light from the most distant ones has been traveling for over eleven billion years). The remainder of the galaxies are still of uncertain nature, but now that both radio and infrared observations are available for all of them, future follow-up studies will have a strong basis for proceeding.

Provided by Harvard-Smithsonian Center for Astrophysics

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