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EVOLUTION OF LUMINOUS *IRAS* GALAXIES: RADIO IMAGING

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In a recent study of IRAS galaxies' optical morphologies, we found that luminous IR sources lie in the IR color-luminosity plane in groups which separate out by optical spectroscopic type and also by degree of tidal disturbance. We found that the most luminous steep-IR-spectrum sources are generally galaxies in the initial stages of a major tidal interaction. Galaxies with active nuclei were generally found to have flatter IR spectra, to cover a range of IR luminosity, and to be in the later stages of a tidal interaction. We proposed a sequence of events by which luminous IR sources evolve: they start as interacting or merging galaxies, some develop active nuclei, and most undergo extensive star-formation in their central regions.

Another way to study these objects and their individual evolution is to study their radio morphologies. Radio emission may arise at a detectable level from supernovae in star-forming regions and/or the appearance of an active nucleus can be accompanied by a nuclear radio source (which may develop extended structure). Therefore, the compact radio structure may trace the evolution of the inner regions of IRAS-luminous sources. If the radio sources are triggered by the interactions, we would expect to find the radio morphology related to the optical 'interactivity' of the systems.

Here, we explore using the radio emission of IRAS galaxies as a possible tracer of galaxy evolution. We present and discuss observations of the compact radio morphology of 111 luminous IRAS-selected active galaxies covering a wide range of IR and optical properties.

We find that most IR-luminous sources are weak compact radio sources. Roughly three in four of those sources detected have a compact core source and at least one in five have ring-like structure characteristic of circumnuclear star-formation. The undetected sources tend to be dusty galaxies but are not clearly distinguished from the rest in their optical properties. The radio luminosity increases with IR spectral flatness, which may be a time sequence as dust is evaporated; this also corresponds to an increase in radio luminosity with optical blueness of the galaxy. The size of the radio source may increase with tidal interaction age, again suggesting a time sequence. The spread of the radio properties with optical and IR is large, and indicates that while the radio sources in most of these systems are fairly young, they do not all turn on at the start of the tidal event that we see in the optical and IR: there is a spread ranging over roughly half the characteristic timescale of the tidal event ($\sim 10^8$ years).

Overall, the radio data shows that both nuclear and circumnuclear radio activity is present, the latter being more noticeable in the optically identified LINER and "non-active" galaxy population. The radio flux correlates with both IR and optical fluxes, indicating a connection with the nuclear activity in both cases. The spread of properties, and the small fraction of undetected sources suggests that nuclear radio sources may be activated at stages later than the optical active nucleus in active galaxies.

Details of this work are presented in the *Astronomical Journal,* 1992.