

Active galaxies - parsec scale radio emission and the surrounding ISM

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Abstract. We investigate the interplay between active nuclei and their surrounding ISM by interferometric radio continuum and mm line observations at high angular resolution and high sensitivity of a sample of active galaxies (e.g. NGC3718), carried out with MERLIN, EVN and the IRAM Plateau de Bure interferometer. They are part of an ongoing international study - NUGA (NUclei of GALaxies) - about the nature, i.e. basically the fueling mechanisms, of nearby active galaxies. The mm line observations provide information about the distribution and kinematics of the molecular gas in these galaxies, which are regarded to be an important part of the matter feeding the central engine. We find a variety of molecular gas structures in our sample ranging from spirals, bars, warped disks, rings to asymmetric disks. The MERLIN/EVN measurements at 18 cm, as well as 6 cm, allow us to investigate the nature of the central engine itself. Also, the radio observations unveil extended structures on all observed angular scales (from VLA to MERLIN and EVN), like jets, diffuse components, as well as compact features. Moreover, the spectra are flat to steep, depending on the respective source components. The combination of the mm line and radio continuum results allow us to discuss possible interactions between the observed jets and the surrounding interstellar medium.

1. Introduction

For a lot of nearby low-luminous galaxies with so-called Active Galactic Nuclei, like LINERs and Seyferts, it still remains unclear whether their activity is powered by the fueling of a black hole or rather by star formation (Alonso-Herrero et al. 2000). This open question enforces detailed studies of the central engine itself and not only of the accretion mechanisms. Recent high resolution observations of nearby active nuclei of Seyfert and LINER galaxies give strong evidence for the existence of radio jets and non-thermal emission even in these rather radio-weak objects (Falcke et al. 2000). Although the jets are several orders of magnitude smaller and less powerful than those found in more luminous AGN, they are qualitatively similar to them. Only high spatial resolution observations can improve our knowledge and understanding of these processes and distinguish between jet, core or lobe components. Our multiwavelength study (at 18cm and 6cm with EVN and MERLIN) will allow us to determine the spectral indices ($f_\nu \propto \nu^\alpha$) of the respective components and thus to differentiate between them. Jets show a very steep spectrum with $\alpha \approx -1$, whereas the core itself has a rather flat to inverted spectrum, for instance in NGC 3147 (Ulvestad & Ho 2001).

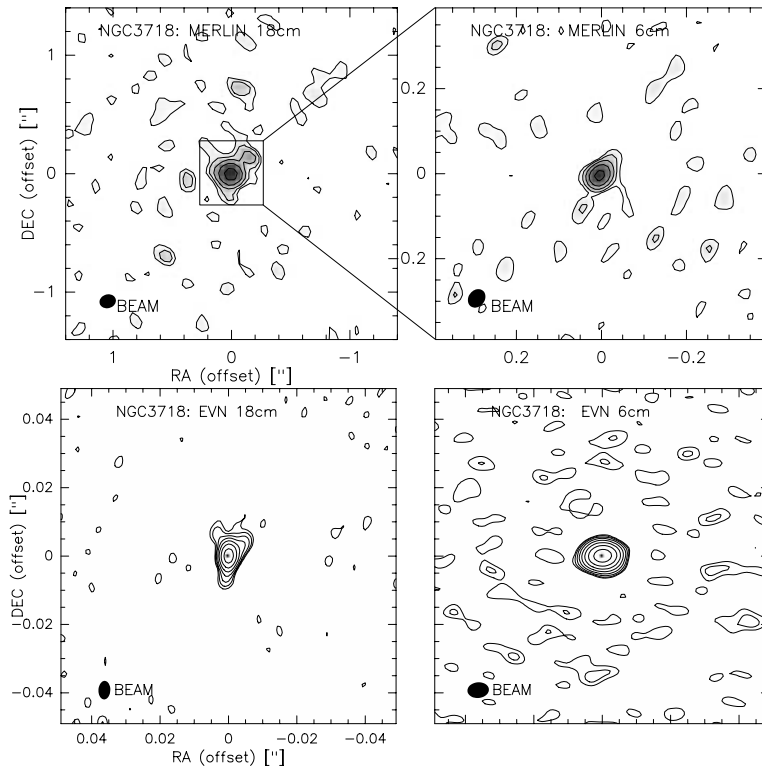


Figure 1. Radio map with MERLIN at 18cm (*upper left*) and 6cm (*upper right*) as well as with EVN at 18cm (*lower left*) and 6cm (*lower right*).

2. First results

We have conducted observations at 18cm and 6cm with MERLIN and EVN for almost all 8 galaxies being part of the NUGA survey (García-Burillo *et al.* 2003). We find indications of extended emission on all scales, as jet-like features for instance. The so far derived spectral indices range from inverted to flat and steep, depending on the respective components. As an example, the radio maps of NGC 3718 are shown in Fig.1. NGC 3718 is a LINER galaxy with a warped dust and gas lane. A close companion and the warp might indicate an ongoing interaction process. The extended emission seen in Fig.1 might be the sign of a weak radio jet in this object. A comparison between the radio continuum results and those obtained from CO analyses (Pott *et al.* 2004, Krips *et al.* in prep.) is still in progress.

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References

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