

# Radio-continuum study of the Nearby sculptor group galaxies. Part 1: NGC 300 at $\lambda = 20$ cm

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**Abstract** A series of new radio-continuum ( $\lambda = 20$  cm) mosaic images focused on the NGC 300 galactic system were produced using archived observational data from the VLA and/or ATCA. These new images are both very sensitive (rms = 60  $\mu$ Jy) and feature high angular resolution ( $<10''$ ). The most prominent new feature is the galaxy's extended radio-continuum emission, which does not match its optical appearance. Using these newly created images a number of previously unidentified discrete sources have been discovered. Furthermore, we demonstrate that a joint deconvolution approach to imaging this complete data-set is inferior when compared to an IMMERGE approach.

**Keywords** Galaxies: general · Galaxies: NGC 300 · Radio continuum: galaxies

## 1 Introduction

At  $\sim 1.9$  Mpc away (Rizzi et al. 2006), NGC 300 is the closest spiral galaxy of the nearby Sculptor Group. This proximity is an advantage because it allows for this galaxy to be examined in great detail. Previous radio-continuum and optical studies of NGC 300 (Pannuti et al. 2000; Payne et al. 2004; Millar et al. 2011) utilised either the Australia Telescope Compact Array (ATCA) or the Very Large Array (VLA) as their primary instrument. However, these past studies suffer from either low resolution, poor sensitivity or both.

Until the next generation radio telescopes, such as the Australian Square Kilometre Array Pathfinder (ASKAP), Karoo Array Telescope (KAT & MeerKAT) and Square Kilometre Array (SKA), become operational we are restricted to consolidating a selection of NGC 300 radio observations. In this paper, we reexamine all available archived radio-continuum observations performed at ATCA and VLA at  $\lambda = 20$  cm ( $\nu = 1.4$  GHz) with the intention of merging these observations into a single radio-continuum image. By combining a large amount of existing data using the latest generation of computer power we can create new images that feature both high angular resolution and excellent sensitivity. The newly constructed images are analysed and the difference between the various NGC 300 images created at 20 cm are discussed.

In Sect. 2 we describe the observational data and reduction techniques. In Sect. 3 we present our new maps, a brief discussion is given in Sects. 4, and Sect. 5 is the conclusion.

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