SEARCHING FOR VERY DISTANT RADIO SOURCES IN THE MIGHTEE SURVEY

AUTHORS

DAVI BARBOSA, JOSÉ AFONSO, ISRAEL MATUTE, RODRIGO CARVAJAL, STERGIOS AMARANTIDIS

AFFILIATION

INSTITUTO DE ASTROFÍSICA E CIÊNCIAS DO ESPAÇO, FACULDADE DE CIENCIAS DA UNIVERSIDADE DE LISBOA

CONTACT

DBARBOSA@OAL.UL.PT

CIÊNCIAVITAE

CATEGORY

GALACTIC & EXTRAGALACTIC ASTRONOMY

INTRODUCTION

The MeerKAT International Gigahertz Tiered Extragalactic Exploration (MIGHTEE), one of MeerKAT's flagship Large Survey Projects, is a very deep radio survey providing radio continuum, spectral line and polarisation information in order to investigate the formation and evolution of galaxies over cosmic time. The sensitivity of MeerKat can be compared with VLA in Fig. 1. It uses over 1000h of observations with MeerKAT's L-band (870 – 1670 MHz), imaging 20 square degree over four extragalactic deep fields, namely COSMOS, the E-CDFS, ELAIS-S1, and the XMM-Newton LSS Field, reaching the confusion limit approximately 2 uJy/beam. We describe the Early Science dataset, covering COSMOS and XMM-LSS Field, down to a source detection level of 30 uJy, and our early efforts in identifying robust candidates for very high-redshift radio powerful AGN, capable to reveal the earliest steps of galaxy formation and evolution. Spectral Index considering MeerKat and VLA it's showed at the Fig. 2.

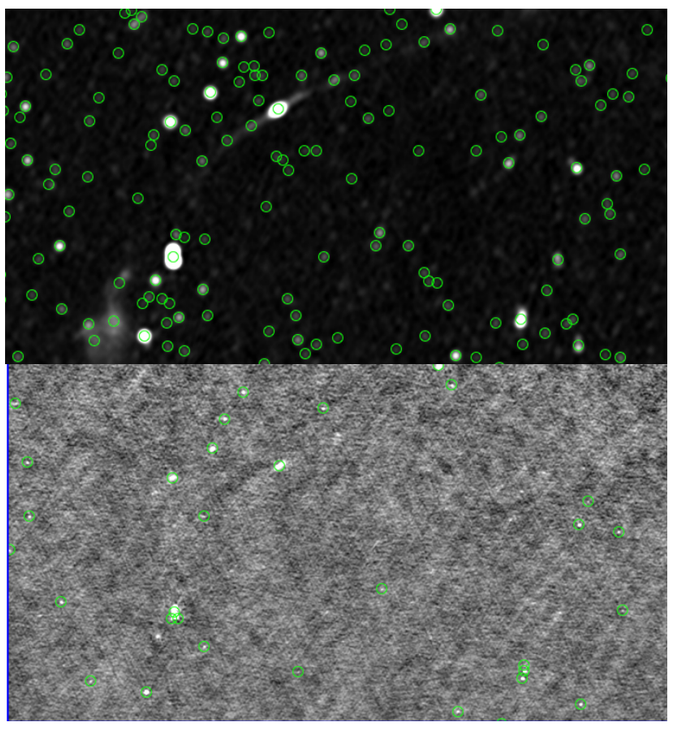

FIGURE 1: Upper panel: MeerKat. Botton panel: VLA 1.4GHz. Both in the same region, size and scale.

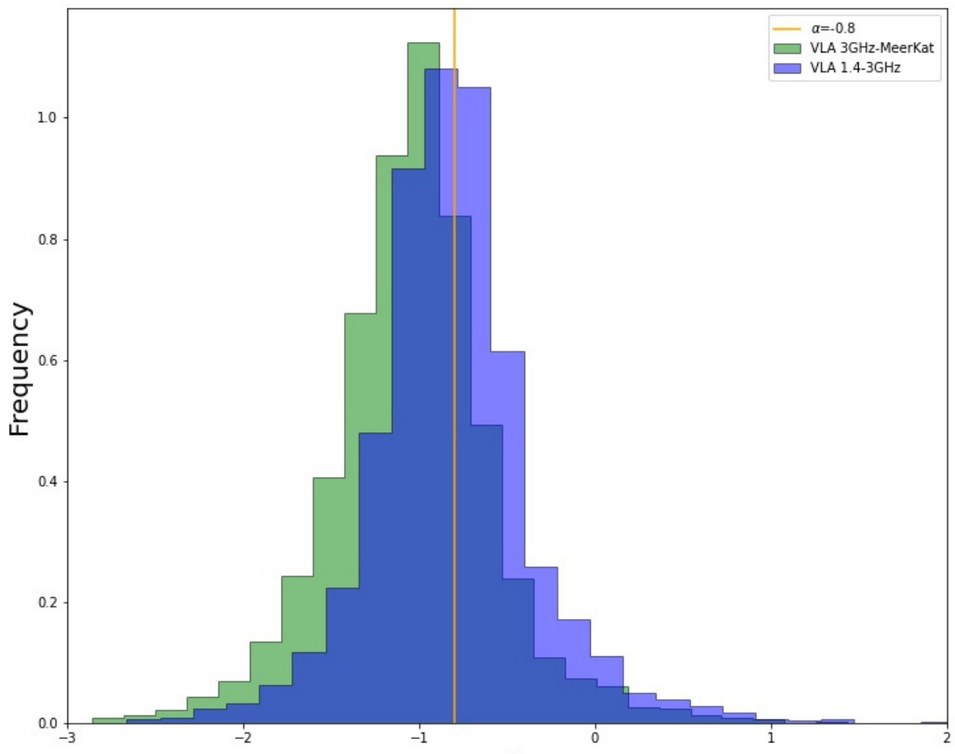

FIGURE 2: Histogram of Spectral index between VLA (1.4-3GHz) and between VLA 1.4GHz and MeerKat (1.28GHz). The yellow line represent the medium value of spectral index found on the literature.

DEVELOPMENT

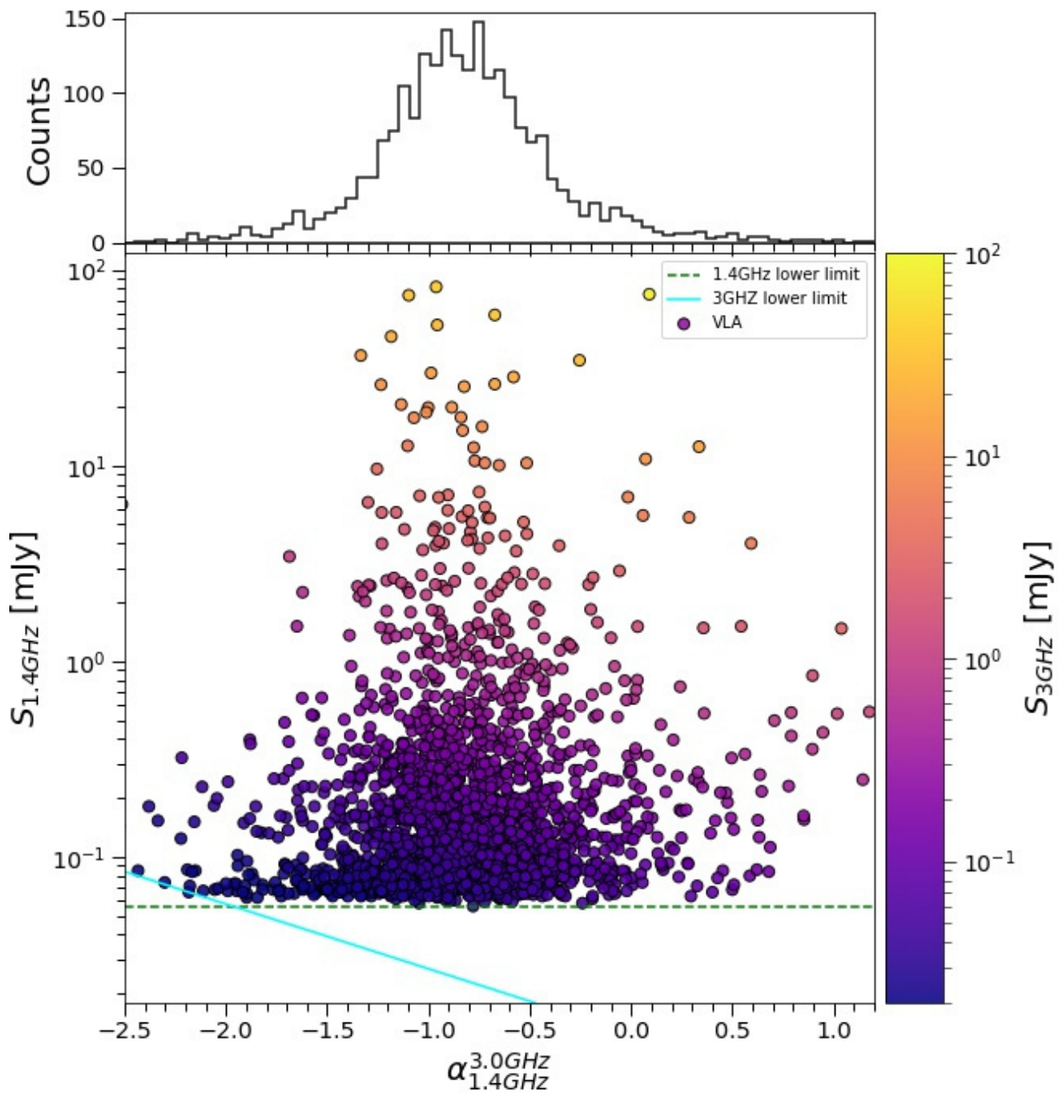

FIGURE 3: Flux density at 1.4 GHz vs. radio spectral index by faint radio sources. Sources are color coded by to their 3 GHz radio flux density. Green dashed line represents the adopted lower limit for S1.4 GHz , while cyan solid line shows the locus of points with S3 GHz (e.g., **Afonso+2011**).

The first step to select high redshift candidates in a new catalog is to understand the selection methods of more consolidated catalogues. When we compare between MeerKat, VLA 3GHz, and VLA 1.4GHz, MIGHTEE reveals a higher sensitivity in COSMOS, showing significantly more radio sources. A robust selection method can help us finding. The important of a robust selection of that sources are in help us find early galaxies in order to understand the early universe. A theoretical framework for the existence of supermassive black holes at z>~7 will be used, following the recent exploitation of current models by our team (Amarantidis et al. 2019).

ON-GOING AND FUTURE WORK

In the nexts steps of this work we will on using selection criteria aimed at the highest redshift ranges (e.g., Afonso et al. 2011, 2015; Amarantidis et al. 2019), and are currently working to strengthen this search with a more powerful objective criteria. By analysing the different criteria, using the deepest astronomical observations available, and guided by their initial exploitation of the most recent galaxy formation models (Amarantidis et al. 2019), work will aim to establish new, efficient ways to detect the highest redshift radio galaxies, candidates. This might have fundamental repercussions in the development use of the next generation of deep radio surveys, and to the planning of the SKA itself.

BIBLIOGRAPHY

Afonso, J., Bizzocchi, L., Ibar, E., et al. 2011, ApJ, 743, 122

Afonso, J., Casanellas, J., Prandoni, I., et al. 2015, Advancing Astrophysics with the Square Kilometre Array (AASKA14), 71

Amarantidis, S., Afonso, J., Messias, H., et al. 2019, MNRAS, 485, 2694

ACKNOWLEDGMENTS

THIS WORK WAS SUPPORTED BY FUNDAÇÃO PARA A CIÊNCIA E A TECNOLOGIA (FCT) THROUGH THE RESEARCH GRANTS UIDB/04434/2020 AND UIDP/04434/2020