MWA Principal Scientist Report

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[1] Dipartimento di fisica e astronomia, Alma Mater Studiorum — Università di Bologna
[2] INAF -- Istituto di Radioastronomia, Bologna
[3] CSIRO Space & Astronomy, Perth

Stefan Duchesne | Deputy Principal Scientist

[1] CSIRO Space & Astronomy, Perth

MWA Project Meeting | July 2023

MWA Papers: by the numbers

➤ New papers:

- ⊙ 18 MWA papers accepted

- ⊙ 6 Collaboration Papers submitted

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        ✳ N(cit) = 14.298 ➢ Δ(cit) ~ 4.077

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Congrats Surajit!

300 ◻ 2023ApJ...943..122M   2023/02   cited: 5

Study of Radio Transients from the Quiet Sun during an Extremely Quiet Time
Mondal, Surajit; Oberoi, Divya;
Biswas, Ayan

MWA (Science) Highlights

MWA Science Working Groups

Epoch of Reionisation (EoR)

credit: Nichole Barry (ICRAR/Curtin)

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Solar, Heliospheric & Ionospheric (SHI)

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Galactic & Extragalactic (GEG)

Centaurus A; McKinley et al. (2021)

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Hyperdrive: ASTRO3D's new open-access calibration software suitable for all MWA uses

HIGHLIGHTS: EOR

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MWA metadata and quality metrics (for EoR)

HIGHLIGHTS: EOR

mwa_hyperdrive documentation

Introduction

mwa_hyperdrive (simply referred to as hyperdrive) is calibration software for the Murchison Widefield Array radio telescope. The documentation contained in this book aims to help understand how to use it and how it works.

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Dr. Kariuki Chege

Credit: K. Chege (via LinkedIn)

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Credit: K. Chege (via LinkedIn)

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Universiteit Leiden

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*Tune in to **Wednesday's** EoR session for more news!*

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TELESCOPE IMAGERY
New Discovery
Rotation Speed 21 minutes

15,000 LIGHT YEARS
Scutum Constellation

MURCHISON WIDEFIELD ARRAY

uGMRT (625 MHz)
uGMRT (575 MHz)
uGMRT (450 MHz)
uGMRT (417 MHz)
uGMRT (383 MHz)
uGMRT (350 MHz)
uGMRT (317 MHz)
MWA (185 MHz)

Janagal et al. 2023

Time(s)

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J0600−5756	2261.35 ms	J0601−0527	395.96 ms	J0614+2229	335.00 ms
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MURCHISON WIDEFIELD ARRAY

XMM-Newton

MeerKAT GTC GMRT MWA ASKAP ATCA PARKES VLA

MeerKAT—Credit: South African Radio Astronomy Observatory (SARAO), **Gran Telescopio Canarias**—Credit: Daniel López/ IAC, **Murchison Widefield Array**—Credit: Marianne Annereau, **Giant Metrewave Radio Telescope**—Credit: NCRA, **Australian SKA Pathfinder**—Credit: CSIRO/Dragonfly Media, **Australia Telescope Compact Array**—Credit: CSIRO, **Parkes Radio Telescope, Murriyang**—Credit: CSIRO, **Very Large Array**—Credit: AUI/NRAO, **XMM-Newton**—Credit: European Space Agency

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MeerKAT   GTC   GMRT   ASKAP   MWA   ATCA   PARKES   VLA

*See talks **today** and on **Friday** for more!*

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14 COMPLETED STUDENT THESES!

Morgan et al. 2023

Highlights: SHI

Minimal scintillation

Some scintillation

More scintillation

Morgan et al. 2023

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Minimal scintillation · Some scintillation · More scintillation

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➤ **CME detection and characterisation via IPS**

- ◉ Unprecedented detail!
- ◉ **33 hours** after launch, **33 degrees** from the Sun!
- ◉ **One single 5-minute** MWA observation

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- ◉ WINQSE
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- ◉ Detecting & grouping by common properties for further study.

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Dokara et al. 2023

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> ◉ Searching for the missing 600
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> ◉ **Multi-wavelength** approach:
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> ◉ SED characterisation

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➤ **Nearby quasar jet/disk-wind interaction**

- ◉ QSO III Zw 2
- ◉ Periodic flaring, unstable periodicity, QP signals…
- ◉ Spectral complexity & variability => substructure!
- ◉ Accretion disk instabilities modulate accretion rate and influence jet launching

HIGHLIGHTS: GEG

Dokara et al. 2023

GLEAM 200 MHz | THOR+VGPS | Effelsberg 11 cm

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Effelsberg 2.7 GHz

Dokara et al. 2023

Wang et al. 2023

MWA
uGMRT
AKASP
Metsähovi
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16 completed student theses!

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Credit: ICRAR/Curtin

Dr. Kathryn Ross

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Legend:
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- ◉ Periodic flaring, unstable periodicity, QP signals…
- ◉ Spectral complexity & variability => substructure!
- ◉ Accretion disk instabilities modulate accretion rate and influence jet launching

HIGHLIGHTS: GEG

Wang et al. 2023

Dokara et al. 2023

GLEAM 200 MHz   THOR+VGPS   Effelsberg 11 cm

➤ **Supernova remnant searches in MW**

- ◉ Searching for the missing 600
- ◉ **Multi-wavelength** approach: **MWA, VLA and Effelsberg**
- ◉ SED characterisation

GLEAM 200 MHz

THOR+VGPS

$\alpha_{FD} = -0.68 \pm 0.11$

Effelsberg 2.7 GHz

Dokara et al. 2023

Flux density (Jy) vs Frequency (Hz)

Credit: ICRAR/Curtin

Dr. Kathryn Ross

16 COMPLETED STUDENT THESES!

*More from GEG **very soon!***

Wang et al. 2023

S_ν(Jy) vs ν(GHz)

- MWA
- uGMRT
- AKASP
- Metsähovi
- OVRO
- Astrogeo

SW

NE

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LOOKING FORWARD TO PHASE III

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Galaxy clusters!

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Abell 194

10 arcmin   200 kpc

MWA   MeerKAT

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Abell 3667

16.2 arcmin = 1 Mpc

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Galactic Plane!

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GALACTIC PLANE!

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Moon

HII   SNR

GC

This: Phase I
(Phase I + II: Student Project: S. Mantovanini)

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${YOUR_SCIENCE_HERE}

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MWA PHASE III ENABLES THIS BY DEFAULT!

Summary

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🐦 @cjriseley   🐦 @mwatelescope

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Thanks for listening.
Questions?

MWA QUIZ...

Which MWA channel [frequency] does the beam pattern represent?

Chan235 [300 MHz]

Chan169 [216 MHz]

Chan145 [185 MHz]

Chan121 [154 MHz]

Chan093 [119 MHz]

Chan069 [88 MHz]