Dr. Abubakr Y.A. Ibrahim

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Profile

Observational astrophysicist specialising in the multi-wavelength characterisation of ultra-magnetized neutron stars (magnetars) transient activities and search for compact objects. My PhD focused on the broadband X-ray spectral and timing analysis using XMM-Newton, NuSTAR, NICER, and Swift, with radio follow-up via VLA, ASKAP, and LOFAR. Core competencies: XSPEC spectral fitting, phase-resolved spectroscopy, X-ray transient detection pipelines (Python/HPC), and multi-epoch multi-facility observational campaigns.

Research Highlights

2020 – 2024 **PhD Research in X-ray/radio Transient Astrophysics**, *ICE-CSIC / UAB, Barcelona*.

Swift J1818.0−1607

Multi-wavelength study of a young magnetar's first outburst (Ibrahim et al. 2023, ApJ):

- Led full XMM-Newton & NuSTAR data reduction; performed broadband spectral analysis over multiple epochs.
- Confirmed and characterised extended diffuse X-ray emission component in EPIC-pn imaging; spectral evolution followup over 19 months from the outburst onset.
- Complementary VLA radio campaign: deep limits on coherent radio emission.

SGR J1935+2154

X-ray and radio study of the 2022 reactivation (Ibrahim et al. 2024, ApJ):

- XMM-Newton & NuSTAR data reduction and time-averaged spectral fitting
- Performed **phase-resolved spectroscopy** across the spin cycle; detected spin-phase variations in the power-law photon index, a direct analogue to pulse-profile spectral decomposition used in accreting NSs
- Independently validated NICER timing analysis (NICERsoft, TEMPO2) carried out in parallel

ZTF J1901+1458

Search for radio emission from an isolated magnetic white dwarf pulsar (Ibrahim et al., in prep.):

- Processed ASKAP and VLA archival data; refined dynamic-spectra analysis; first candidate compact WD pulsar search using wide-field radio imaging, directly relevant to WD nova/CV contexts

eBANDERAS

Lead developer of an automated X-ray transient search pipeline (Python, HPC)

Education

2020 – 2024 **PhD, Astrophysics**, *Institute of Space Sciences (ICE-CSIC), UAB, Barcelona*.
Thesis: Search for transient events and pulsars in multi-frequency data
Advisors: Prof. Nanda Rea & Dr. Francesco Coti Zelati.
Viva committee included Dr. Kaustubh Rajwade (Oxford) & Dr. Montserrat Armas Padilla (IAC).
Focus: multi-wavelength monitoring of magnetar outbursts with XMM-Newton, NuSTAR, Swift, NICER, VLA, ASKAP.

2017 – 2019 **M.Sc., Astrophysics & Space Science (NASSP)**, *University of Cape Town*.
Thesis: Dispersion measure variations in pulsar observations with LOFAR
Advisors: Dr. Maciej Serylak (SARAO) & Prof. Shazrene Mohamed (SAAO).

2016 **B.Sc.H., Astrophysics & Space Science**, *University of Cape Town*.
Thesis: Binary black hole mergers, gravitational waves and horizon dynamics.
Advisor: Prof. Denis Pollney, Rhodes University.

2008 – 2012 **B.Sc., Astronomy & Meteorology**, *Omdurman Islamic University, Sudan*.

Technical Skills

X-ray XMM-Newton (SAS: emchain, epchain, espfilt), NuSTAR (nupipeline), Swift, NICER (NICERDAS, NICERsoft); spectral modelling with **XSPEC**; timing with TEMPO2; phase-resolved spectroscopy; X-ray catalogue analysis (3XMM/4XMM-DR)

Radio VLA & ASKAP imaging for transient follow-up (CASA); LOFAR pulsar timing (PSRCHIVE)

Computing **Python** (numpy, astropy, matplotlib, scipy); Bash; HPC (SLURM); pipeline development; Git/GitHub; LaTeX

Publications

in prep **Ibrahim, A.Y.**, Hurley-Walker, N., Rea, N., Woudt, P.A. "Searching for coherent radio emission from the isolated magnetic white dwarf pulsar ZTF J1901+1458." *ASKAP archival data; in final preparation.*

2024 **Ibrahim, A.Y.** et al. (2024). "An X-Ray and Radio View of the 2022 Reactivation of the Magnetar SGR J1935+2154." *ApJ* 965, 87. doi:10.3847/1538-4357/ad293b

2023 **Ibrahim, A.Y.** et al. (2023). "Deep X-Ray and Radio Observations of the First Outburst of the Young Magnetar Swift J1818.0−1607." *ApJ* 943, 20. doi:10.3847/1538-4357/aca528

2024 Sathyaprakash, R., et al. (incl. **Ibrahim, A.Y.**) (2024). "Long-term Study of the 2020 Magnetar-like Outburst of PSR J1846−0258 in Kes 75." *ApJ* 976, 56. doi:10.3847/1538-4357/ad8226

2021 Borghese, A., et al. (incl. **Ibrahim, A.Y.**) (2021). "The X-ray evolution and geometry of the 2018 outburst of XTE J1810−197." *MNRAS* 504, 5244. doi:10.1093/mnras/stab1236

Selected Conferences & Oral Presentations

Nov 2026 *Oral:* IAU Symposium 409, *Innovative Research and Techniques in Astronomy Communication*, NAOJ – *Oral*, Tokyo, Japan: "Resilient astronomy communication: Multilingual outreach under infrastructure constraints"

June 2026 *Virtual attendance:* International Coordination of the Time-Domain and Multi-Messenger Sky: New Opportunities and New Challenges, Görlitz, Germany

Jun 2026 **Invited Speaker**, Sustaining Science in Crisis: Physics, Conflict and International Cooperation, University of Sussex, UK. Invited by Dr. Kate Shaw to speak on science continuity under conflict conditions.

June 2026 *In person attendance:* NewAthena Rising: SWG4, ICE-CSIC, Barcelona

June 2024 *Oral:* The X-ray Mysteries of Neutron Stars and White Dwarfs, ESAC, Madrid

June 2023 *Oral:* The X-Ray Universe 2023, Athens, Greece

May 2023 *Oral:* The Transient Universe 2023 School, Cargèse, France

Nov 2022 *Oral:* Exploring the Hot and Energetic Universe: Athena X-ray Observatory Conference, Barcelona

Academic & Teaching Experience

Oct 2024–Mar 2026 **Period of administrative inactivity**.
Residence permit (TIE) renewal delayed by administrative complications arising from the armed conflict in Sudan; return to Sudan was not possible during this period. During this period I led initiatives to support students and researchers during conflict, and collaborating in the ZTF J1901+1458 manuscript continued throughout.

Sep 2012 – Present **Tutor** → **Teaching Assistant** → **Lecturer**, *Omdurman Islamic University, Dept. of Astronomy & Meteorology, Sudan*.
Teaching Astronomical Applications, General Astrophysics, GIS and Remote Sensing at 2nd–5th year undergraduate level. Currently supervising final year B.Sc. project aiming at using AI for astronomical data analysis.

Fellowships & Awards

2016 – 2019 NASSP Honours and Master's Scholarships, University of Cape Town.

Mar 2021 **Featured in Forbes Science**. Profiled in Forbes Science in the article *"This Sudanese Astronomer Studies Pulsars, The Lighthouses In Space"*, highlighting both pulsar research and science communication activities for a global audience.

Programme Coordination & International Networks

2023–Present **Co-founder & General Manager**, Photon Scientific Centre for Natural Sciences and Metaphysics. Building a bridge between Sudanese scientific talent and the international community through training, mentorship, collaboration, and institutional partnerships.

Jul–Aug 2026 **General Coordinator**, ICTP – Physics Without Frontiers, *Expanding Horizons in Physics in Sudan II*. Coordinated a nine-day international online workshop on density functional theory and computational materials science, bringing together international speakers and Sudanese participants for theoretical and hands-on training using Quantum ESPRESSO, Python, and ASE.

June–July 2025 **Lead Coordinator**, Physics Without Frontiers – Sudan, ICTP. Coordinated an international educational programme, recruiting volunteer scientists, organising 12 online seminars, and engaging more than 90 Sudanese students and researchers.

2022–Present **Vice Manager**, IAU Office for Astronomy Outreach – Sudan activities. Coordinate national astronomy outreach initiatives within the IAU framework; helped secure a telescope for Sudan through the *100 Hours of Astronomy 2022* campaign.

Sep 2026–Present **Mentor**, SudanBridge Mentoring Programme. Support professional development, knowledge-sharing, and networking among Sudanese students and early-career professionals.

2023 – present **Founder & Director**, Zool Astro, Arabic-language astronomy outreach platform (active social media community, Sudan/MENA).

2023–2024 Member, Magnet Alliance Outreach Program, ICE-CSIC, Barcelona.

Languages

Arabic (Native) **English (Fluent)** **Spanish (Basic)**

Referees

Prof. Nanda Rea, ICE-CSIC, Barcelona, rea@ice.csic.es

Dr. Francesco Coti Zelati, ICE-CSIC, Barcelona, cotizelati@ice.csic.es

Dr. Maciej Serylak, SKAO, UK, mserylak@gmail.com & m.serylak@skatelescope.org