

David J. Turner CV

Email: david.turner@sussex.ac.uk

LinkedIn: david-turner-257271105

GitHub: github.com/DavidT3

A final year PhD student seeking a postdoctoral position to enable research involving the analysis of X-ray emission from galaxy clusters, both real and simulated, as well as other X-ray sources. I have new and novel research ideas, an ability to work quickly and independently, and an enthusiasm for pushing the boundaries of what we can achieve with new and archival data. I can contribute advanced programming skills, over five years of experience in the analysis of X-ray data, and excellent knowledge of cluster science and analysis techniques.

EDUCATION

University of Sussex

Ph.D. in Astronomy, Advisor: Professor Kathy Romer

Brighton, UK

2018–Current

University of Sussex

1st Class MPhys in Astrophysics

Brighton, UK

2014–2018

RELEVANT SKILLS

- **X-ray Expertise:** I have extensive experience of working with, and analysing, X-ray data. I've mostly worked on galaxy clusters, but have also worked on the X-ray emissions of 'Pea' galaxies. I am extremely familiar with *XMM* data products, as well as analysis of photometric and spectroscopic X-ray data.
- **Combining Real Data and Simulations:** My work on creating realistic simulated *XMM* observations of galaxy clusters, as well as the work I do using real observations, has given me a lot of experience leveraging both real and simulated data to produce interesting results. I have made artificial *XMM* observations of Illustris-TNG, the 300 Project, and BAHAMAS clusters.
- **Programming:** With over nine years of experience in coding, seven years of Python experience, and five years of using XSPEC, I am an extremely capable programmer. Not only do I have the ability to write complex code, but I also have the attendant skills in GitHub, writing tests, and writing documentation, that allow me to make a piece of software sustainable and useful to the community.
- **Data Science and Machine Learning:** My PhD funding was provided by the Data Intensive Science Centre, and aims to give Physics PhD researchers skills in data science and machine learning, and as such we've been given extra training in data science, scalable computing, and machine learning.
- **Supervision:** In the second year of my PhD I initiated and supervised a BSc final year research project and dissertation. This both increased my own knowledge and understanding (through explaining aspects of cluster physics and guiding the student), and gave me experience of supervision of someone undertaking original research, and how they need to be supported/helped.

PROJECTS

XMM and *eROSITA* Cluster Comparison

- Performed the first comparison between galaxy cluster measurements performed by XCS and eFEDS. This included quantifying a 25% temperature difference.

X-ray Masses of Galaxy Clusters

- Measuring masses for the XCS catalogue. We have thousands of candidates, so efficiency and automation are important.

XMM: Generate and Analyse ([XGA](#))

- [Documented](#) Python module that enables easy analysis of X-ray objects with *XMM* data. Plan to support other telescopes to make joint analyses routine.

Probing Modified Gravity with Clusters

- Project led by Dr Andrius Tamosiunas, University of Nottingham. I am providing stacked X-ray surface brightness profiles of a DES selected sample.

Locating Pea Galaxies with Machine Learning

- An ensemble approach to identifying Pea Galaxies with SVM + deep learning. Supported by NVIDIA grant.
- X-ray properties to be measured once sample complete.

Simulated *XMM* Observations of Clusters

- Designed to test my mass measurement techniques.
- The observations are realistic, with full chip gaps and spatially varying PSF effects/sensitivity.

Multi-wavelength Cluster Scaling Relations

- Scaling relations (including MORs) using *XMM* and DES data. These feed into DES cluster cosmology efforts, and help prepare for LSST-DESC work.

Shapes of X-ray Clusters

- I initiated and supervised this project, where my BSc student was attempting to test the claims that a shape PDF can be derived from X-ray observations.

TEACHING

- **Course Author and Teaching Assistant** at University of Sussex Spring 2019/2020 & Autumn 2020/2021
Co-authored the new introductory Python course, including assessments and the course book
- **Course Instructor** at DISCUS - University of Sussex Spring 2020
AstroCAST Python Training for Kenyan Government Officials and the Kenyan Red Cross

SCHOLARSHIPS AND AWARDS

- NVIDIA Academic Grant - Quadro RTX 8000 GPU 2021
- DISCNet-STFC PhD Studentship 2018-2022
- Junior Research Associate Funding 2017
- Sussex Funded Research Placement (8 weeks) 2016
- Sussex Funded Research Placement (4 weeks) 2015

RELEVANT CONFERENCES AND TALKS GIVEN

- **Talk at AIFA:** Invited to give a talk to the cluster group at Argelander Institute for Astronomy. Focusing on recent work on *eROSITA-XMM* temperature calibrations and cluster mass measurements of an SDSS selected sample.
- **Cluster Mass 2021:** Presented a flash talk/poster on a new sample of SDSS hydrostatic masses measured by XGA.
- **LSST UK 2021 Meeting:** Presented a poster on a new sample of DES-Y3 hydrostatic masses measured by XGA.
- **National Astronomy Meeting 2021:** I organised and convened a session to bring together cluster observers and simulators. It was a great success and attracted talks on cutting edge research from many areas of cluster science.
- **Talk at MPE:** Gave a 40 minute talk to the high-energy astrophysics group at the Max Planck Institute for Extraterrestrial Physics, giving an overview of XCS with a particular focus on my cluster mass measurements.
- **DES Biannual Meeting 2019:** Held at the University of Sussex, and organised by the research group that I am a part of. I gave a two minute ‘spotlight’ talk on my research into the X-ray properties of Pea galaxies.
- **Athena UK 2019 Meeting:** Hosted at MSSL. Attended talks on state of *Athena*, and planned capabilities.
- **New Results in X-ray Astronomy 2019:** Hosted at MSSL. Gave a talk on my artificial observations of simulated clusters, as well as my work on measuring hydrostatic masses and how it could be applied to cluster cosmology.
- **DES Biannual Meeting 2019:** Held at the University of Pennsylvania, I gave a two minute ‘spotlight’ talk presenting some preliminary scaling relations measured from my artificial observations of simulated clusters.
- **National Astronomy Meeting 2019:** Gave a talk on my realistic artificial observations of simulated galaxy clusters, and measurements made from the simulated data. Also attended many of the sessions at this conference.
- **DES Y3KP Meeting 2019:** Attended meeting in Barcelona, where we were preparing for DESY3 cosmology.
- **DES Biannual Meeting 2018:** This took place at Unicamp in Brazil, where I gave a talk to the cluster working group about my work on realistic artificial observations of simulated galaxy clusters.
- **Euclid UK 2017 Meeting:** This meeting took place at the ICG in Portsmouth during the final year of my MPhys, I gave a twenty minute talk about the work I was doing for my research project.

PUBLICATIONS

1. D. J. Turner et al., “The *XMM* Cluster Survey: An independent demonstration of the fidelity of the eFEDS galaxy cluster data products and implications for future studies”, *submitted to MNRAS*, arxiv.org/abs/2109.11807
2. D. J. Turner et al., “XGA - A module for the large-scale scientific exploitation of X-ray data”, *Close to submission*
3. D. J. Turner et al., “The *XMM* Cluster Survey: Hydrostatic masses and scaling relations of very large samples of galaxy clusters I - Methodology and tests”, *in prep., close to submission*
4. D. J. Turner et al., “The *XMM* Cluster Survey: Hydrostatic masses and scaling relations of very large samples of galaxy clusters II - Results for SDSS and ACT selected samples”, *in prep.*
5. D. S. Pillay, et al., “A Multiwavelength Dynamical State Analysis of ACT-CL J0019.6+0336”, *published in MDPI Galaxies - Supplied X-ray data products, contributed to paper, and was made second author.*
6. C. J. Burke, et al., “Variability-Selected Dwarf AGNs in the Dark Energy Survey Deep Fields”, *submitted to MNRAS*, [arXiv:2111.03079](https://arxiv.org/abs/2111.03079) - **Supplied XMM confirmation of AGN, X-ray properties, contributed to text of paper.**
7. P. A. Giles et al., “The *XMM* Cluster Survey: XMM-Newton Observations of the SDSS DR8 redMaPPer Cluster Catalogue”, *submitted to MNRAS* - **Calculated and supplied upper limit X-ray luminosities.**
8. P. A. Giles et al., “XXL: The $L_X-\sigma_v$ relation of galaxy groups and clusters detected in the XXL and GAMA surveys”, *accepted to MNRAS* - **Calculated and supplied upper limit X-ray luminosities.**
9. V. Wetzell et al., “Velocity Dispersions of Clusters in the Dark Energy Survey Y3 redMaPPer Catalog”, *submitted to MNRAS*, arxiv.org/abs/2107.07631 - **Calculated and supplied upper limit X-ray luminosities.**
10. T. M. C. Abbott et al., “The Dark Energy Survey Data Release 2”, *published in ApJ* - **On DES Observing Team**

ADDITIONAL EXPERIENCE

- **Co-founder and Director:** I co-founded a limited company called Grapheel during my undergraduate degree, though we ceased operations last year. It was a not-for-profit company trying to create technologies that would allow blind and visually impaired students/researchers to interact with their work in a more natural manner. Working on our app increased my knowledge of web-based programming languages, and I also had the chance to work with new smart materials in our work to create new actuators. My communication skills benefited from making pitches to investors (we were shortlisted for funding twice) and writing documentation for aspects of the company.
- **Observing:** In my first year as a PhD student I was part of a team from the University of Sussex DES group that was able to run the DES observations on the Blanco telescope at CTIO in Chile. It was my first time observing so I spent most of my time learning the different observing roles, though I was the run manager on one of the nights.
- **Outreach:** I enjoy educating the public about cutting edge research, and have been involved in outreach for DES and JWST. I helped coordinate social media coverage for the DES Y1 Cosmology release in August 2017, and co-organised/ran the DES end of nights social media campaign, marking the end of our observations on DECam. I volunteered for Soapbox Science Brighton, an event where female researchers gave talks to the public about their fields of study to promote women in the sciences.
- **Data Science:** Due to the current pandemic, the Director of Student Experience for the Physics department at the University of Sussex has been running surveys to gauge the feeling in the student body in the autumn term. I was employed by the department to concatenate, reduce, and analyse the results of the surveys so that the faculty members could understand how the students were feeling and adjust their teaching accordingly.

OTHER INTERESTS AND ACHIEVEMENTS

- **Taekwondo**
I hold a 1st dan blackbelt in Taekwondo, and taught a class for two years.
- **Music**
I'm a keen musician, playing Irish Bouzouki, Guitar, Bass, and Piano, as well as singing.
- **Product Design**
I design and build various projects at home using a 3D printer and electronics.

References are available from Professor Kathy Romer (romer@sussex.ac.uk), Dr Paul Giles (p.a.giles@sussex.ac.uk), and Dr Matt Hilton (hiltonm@ukzn.ac.za).