Gregory Cooke

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Education

October 2019 – present

Astrophysics PhD student, University of Leeds, UK

Thesis title: *3D simulations of rocky worlds;* Advisors: Professor Dan Marsh, Dr Catherine Walsh

My thesis focusses on the habitability of rocky worlds. I use the Community Earth System Model (CESM), mostly the Whole Atmosphere Community Climate Model (WACCM) configuration, to simulate the climates paleoclimates and exoplanets. I have simulated early Earth with a younger Sun and with varied atmospheric oxygen concentrations, and now I am performing simulations for tidally-locked M dwarf exoplanets. My research aims to delineate factors that determine the inner habitable zone and how detectable specific planetary properties are using the next generation of telescopes.

October 2015 – June 2019

MPhys integrated masters student, University of Manchester, UK

Two MPhys projects:

1. Investigating and defining habitability metrics for all known exoplanets.
2. Designing an optimized telescope search for habitable exoplanets using the Besançon galactic model.

I achieved a grade average of 81.4% in all core (including laboratory work) and optional courses. Most optional courses taken were related to astrophysics (e.g. Astrophysical plasmas, General relativity, Exoplanets).

Funding

October 2019 – April 2023

STFC studentship

A 3.5-year STFC studentship (approximately worth £75,000)

Publications

- Cooke GJ, Marsh DR, Walsh C, Black B, Lamarque J-F. 2022 A revised lower estimate of ozone columns during Earth's oxygenated history. R. Soc. Open Sci. 9: 211165. https://doi.org/10.1098/rsos.211165
- Cooke et al. (In Review), *Monthly Notices of the Royal Astronomical Society*, Spectral variations of oxygenated Earth-analogue exoplanets

Teaching

October 2019 – present

Lab demonstrating, University of Leeds, UK

I have taught experiments in the Phys 10001 undergraduate laboratory to 1st year students including: the determination of Planck's constant; measurement of Earth's magnetic field, spectrometer measurement of sodium lines; viscosity of glycerine using Stokes Law; electrical circuits; the understanding of random Gaussian measurements using a dartboard experiment. I have also marked lab workbooks and formal reports on several of these experiments.

Virtual talks

- Virtual talk at UK EXOM April 2021

- Virtual talk at CESM Workshop June 2021

Contributed talks

- Virtual seminar at the University of Cambridge, Department of Earth Sciences, May 2021.
- Virtual seminar at the National Center for Atmospheric Research (NCAR), Paleoclimate group, October 2020
- Seminar at University of Leeds for Astrophysics group, March 2020

Posters

- Exoplanets III conference, July 2020
- The Coupling, Energetics, and Dynamics of Atmospheric Regions (CEDAR) workshop, June 2021
- European Astronomical Society Annual Meeting, June – July 2021

Software experience

- Using and developing an open-source model (CESM)
- **Developing open-source Python code in Jupyter Notebook**
- Proficient use of python for atmospheric data analysis, e.g., matplotlib, pandas, numpy, and xarray.
- Coding experience FORTRAN and C++

Organisation

January 2020 – December 2021

Priestley scholar, University of Leeds, UK

I attended multiple seminars on interdisciplinary topics relating to climate change, including transport, climate finance, climate modelling, and climate justice. I co-organised a seminar on climate finance, as well as a monthly journal club focussed on climate science topics.

January 2020 – present

Internal astrophysics group sessions, University of Leeds, UK

I have arranged and chaired internal seminars for the University of Leeds Astrophysics group. Additionally, I have organised and led weekly informal science sessions where members of the group get together to discuss their current work. During this time, I have included a journal club for astronomy session which has run once every three weeks.

May 2017 – May 2018

Treasurer for University of Manchester Men's Hockey Club, UK

I was elected out from a club of approximately 80 members. I managed up to £20,000 in financial transactions between the club, club members, the university's Athletic Union, and between several different organisations.

Public Engagement Activities

- Priestley Scholar Twitter spotlight, 2021. I was retweeted by the Priestley Scholar Twitter account for a whole day as I tweeted about my research and scientific interests.
- Live YouTube talk for the University of Leeds Be Curious festival 2021 on planet habitability (https://www.youtube.com/watch?v=Ei_Tte-BvWo).
- TikTok Video summarizing my research for COP 26 and how it is important for understanding our planet.
- I have written a number of astronomy news articles for the astronomy magazine Popular Astronomy.
- Everything Astronomy virtual session for Xavier Space Solutions, February 2022.

Press interest

University of Leeds press release: https://www.leeds.ac.uk/news-science/news/article/4994/study-reveals-hostile-conditions-on-earth-as-life-evolved