Spencer Wallace

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Education

University of Washington — Seattle, Washington
PhD Astronomy — *Oct 2015 – August 2023*
Thesis: Planetesimal Accretion in the Solar System and Beyond

University of Arizona — Tucson, Arizona
BS Computer Science, Astronomy and Physics — *Aug 2009 – May 2014*
Thesis: Turbulent Entrainment in 1D Stellar Evolution Models

Research Experience

Simulating the assembly of terrestrial planets

University of Washington, Astronomy Department — *Jan 2018 – August 2023*

- Designed, proposed and executed a $450,000 NSF project to model the planet formation process using N-body simulations (Python, Numpy, Pandas, Git)
- Tested, debugged and ran both CPU and GPU-based simulations on a number of HPC clusters, including SDSC Expanse (C++, Git, Bash)
- Extended the large-scale hydrodynamics code ChaNGa to model collisions between solid bodies (C++, Git)
- Led weekly meetings to train and mentor undergraduate researchers to use python data analysis tools, develop modules for our N-body code, and run simulations

Data synthesis from N-body simulations

University of Washington, eScience Institute — *Jan 2023 – August 2023*

- Developed a pipeline to construct initial conditions for planet formation models by training a generative adversarial network (GAN) on existing results (Python, PyTorch, Pandas, Numpy, Git)
- Saved over 900,000 CPU hours by using the GAN to skip the first phase of our simulations

Verifying the robustness of galaxy simulation codes

University of Washington, Astronomy Department — *Oct 2015 – Dec 2016*

- Ran and analyzed a set of hydrodynamics simulations to assess the scientific validity of the most commonly used galaxy simulation codes (C++, Python, Numpy, Bash, Git)
- Worked to implement an energy injection scheme for stellar supernova events that behaves consistently across a number of grid-based and particle-based codes
- Collaborated with a team from over thirty institutions to highlight and understand differences between state-of-the-art galaxy simulation codes

Exploring parallel algorithms for spatial tree traversal

University of Illinois Urbana-Champaign, Computer Science Department — *Jun 2019 – Apr 2021*

- Participated in a interdisciplinary collaboration to develop ParaTreeT, a toolkit for quickly testing and tuning spatial tree traversal algorithms in an HPC environment (C++, Python, Bash, Git)
- Worked with a team of computer scientists to apply and test their algorithms on a number of real-world astronomy applications and reduce force calculation times for our simulations by a factor of 30

Graduate teaching assistant

University of Washington, Astronomy Department — *Oct 2015 – Jun 2020*

- Led weekly discussion sections, graded assignments, preformed lectures and designed homework exercises for undergraduate students
- Collaborated with a team of other teaching assistants to ensure assignments, quizzes and exams were graded consistently and fairly

Skills

Programming: C++, Python, NumPy, Pandas, PyTorch, scikit-learn, matplotlib, Seaborn, SQL

Communication: 3 first-authored publications, 2 co-authored publications, 7 conference talks, 3 conference posters, 20 pop-sci articles published through astrobites

Leadership: Worked on 5 separate science collaboration teams, Mentored and directed research for 6 undergraduate students

Publications

Wallace, S., Quinn, T., "Planetesimal accretion at short orbital periods", **ApJ**, 954(1):61 (2023).

Hutter, J., Szaday, J., Choi, J., Liu, S., Kale, L., Wallace, S., Quinn, T., "ParaTreeT: A Fast, General Framework for Spatial Tree Traversal", **IEEE IPDPS**, 762-772 (2022).

Wallace, S., Quinn, T., Boley, A., "Collision rates of planetesimals near mean-motion resonances", **MNRAS**, 503(4):5409–5424 (2021).

Wallace, S. and Quinn, T., "N-body simulations of terrestrial planet growth with resonant dynamical friction", **MNRAS**, 489(2):2159–2176 (2019).

Kim, J., Agertz, O., Teyssier, R., Butler, M., Ceverino, D., Choi, J., Feldmann, R., Keller, B., Lupi, A., Quinn, T., Revaz, Y., Wallace, S (and 31 more), "The AGORA High-resolution Galaxy Simulations Comparison Project. II. Isolated Disk Test", **ApJ**, 833(2):202 (2016).

Successful Proposals

Contributed to Successful NSF Grant *2020*
In Situ Formation of Short Period Terrestrial Planets

Contributed to Successful XSEDE Computing Proposal *2019, 2020, 2021*
N-body Simulations: Planets to Cosmology

Conference Presentations

241st AAS Meeting, Dissertation Talk	*January 2023*
Exoplanets in Our Backyard II, Poster	*November 2022*
2nd N-body Shop Collaboration Meeting, Contributed Talk	*June 2022*
53rd AAS Division for Dynamical Astronomy Meeting, Contributed Talk	*May 2022*
TESS Science Conference II, Poster	*August 2021*
Sagan Exoplanet Summer Workshop, Poster	*July 2021*
52nd AAS Division for Dynamical Astronomy Meeting, Contributed Talk	*May 2021*
1st N-body Shop Collaboration Meeting, Contributed Talk	*January 2021*
50th AAS Division for Dynamical Astronomy Meeting, Contributed Talk	*June 2019*
49th AAS Division for Dynamical Astronomy Meeting, Contributed Talk	*April 2018*
223rd AAS Meeting, Poster	*January 2014*