

PROMOTION RECOMMENDATION
The University of Michigan
College of Engineering
Department of Climate and Space Sciences and Engineering

Mark G. Flanner, associate professor of climate and space sciences and engineering, with tenure, College of Engineering, and associate professor of Earth and environmental sciences, without tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of climate and space sciences and engineering, with tenure, College of Engineering, and professor of Earth and environmental sciences, without tenure, College of Literatures, Science, and the Arts.

Academic Degrees:

Ph.D. 2007 University of California, Earth System Science, Irvine, CA
B.S. 2002 University of Wisconsin, Biomedical Engineering, Madison, WI

Professional Record:

2015 – present	Associate Professor (with tenure), Climate and Space Sciences and Engineering, University of Michigan
2015 – present	Associate Professor (without tenure), Earth and Environmental Sciences, University of Michigan
2009 – 2015	Assistant Professor, Atmospheric, Oceanic and Space Sciences, University of Michigan
2009 – 2015	Assistant Professor, Earth and Environmental Sciences, University of Michigan
2007 – 2009	Post-Doctoral Fellow, Advanced Study Program (ASP), National Center for Atmospheric Research, Boulder CO

Summary of Evaluation:

Teaching: Professor Flanner is a strong teacher with significant and progressive contributions to student learning at the University of Michigan. He is highly committed to his students, be they graduate or undergraduate. His teaching assessments are excellent, and the student letters recognize his commitment to education and ability to teach difficult concepts and materials. Professor Flanner has graduated six Ph.D. students with another two in progress (with one expected to graduate in 2021). He has participated in experiential learning through REU, UROP and the Greenland Expedition for Undergraduates. These activities require significant time commitments (including the weeks spent in Greenland), and speak to his strong commitment to education.

Research: The impact of Professor Flanner's research falls in understanding the interactions and feedbacks between climate and the cryosphere. He has developed a new tool for modeling spectral snow albedo, which is important for determining the reflectance of the Earth's surface and thereby the thermal balance. He has also quantified the increase in the solar heat input into the Earth system due to the diminishing polar ice cover in the northern hemisphere, a parameter of critical importance to the long-term climate warming predictions. He has contributed to the understanding of how smaller scale, regional effects influence the Arctic climate, which is the one showing the earliest and strongest variations associated with global climate change. He has published over 80 peer-reviewed publications and four book chapters. These works have been cited over 10,500 times with over 1,600 citations in 2019 only (Web of Science); Google Scholar lists over 16,000 citations. These metrics give him an h index of 40 (Web of Science) or 45 (Google Scholar). It is also

noteworthy that he has two publications in *Science*, four in the *Nature* group, and two in the *PNAS*. Many of his works also include undergraduate and graduate students as authors, speaking to his ability to combine his research interests with his educational endeavors. External reviewers emphasize the high scholarly character of his publications. Professor Flanner's research funding forms a sizable portfolio, with five active grants with his share in excess of \$500K. During the past six years he has received over \$700K as part of three grants.

Recent and Significant Publications:

- Fair, Z., Flanner, M., Brunt, K. M., Fricker, H. A., and Gardner, A. S., "Using ICESat-2 and Operation IceBridge altimetry for supraglacial lake depth retrievals," *The Cryosphere*, accepted, in press, 2020.
- Schneider, A., Flanner, M., and Perket, J. (2018), "Multidecadal variability in surface albedo feedback across CMIP5 models," *Geophysical Research Letters*, 45, 1972-1980.
- Flanner, M. G., Huang, X., Chen, X., and Krinner, G. (2018), "Climate response to negative greenhouse gas radiative forcing in polar winter," *Geophysical Research Letters*, 45, 1997–2004.
- Mark G. Flanner, "Arctic climate sensitivity to local black carbon," *Journal of Geophysical Research: Atmospheres*, Vol. 118, 1840–1851, 2013.
- M. G. Flanner, K. M. Shell, M. Barlage, D. K. Perovich and M. A. Tschudi, "Radiative forcing and albedo feedback from the Northern Hemisphere cryosphere between 1979 and 2008." *Nature Geosci*, 4, 151–155 (2011).

Service: Professor Flanner is an active faculty member, who currently serves on five departmental or college committees, in addition to serving on an ADVANCE Launch Committee in Earth and Environmental Sciences. As the chair of the CLaSP Qualifying Exam Oversight Committee, he has been leading the effort to renew the qualifying exam content and structure, which was completed last spring. His efforts in DEI are evident through his committee work awareness of DEI issues in admissions, examinations, and offering educational and professional opportunities to students. Externally, he is the co-chair of the Arctic Monitoring and Assessment Programme expert group on short-lived climate forcers, and a contributor in several chapters on the Intergovernmental Panel on Climate Change assessments.

External Reviewers:

Reviewer A: "While not casting doubt on the quality of any single paper, I find that it is the entire body of work that is compelling. The publications taken as a whole represent a comprehensive and thoughtful inquiry into the mechanisms and magnitude of human influence on the Earth system, with a particular focus, and that picture is unlikely to emerge from a single publication."

Reviewer B: "The technical documentation and *Journal of Advances in Modeling Earth Systems* paper which describe the Community Land Model in which Mark's model is a crucial part have both been cited over one thousand times. Yet, these citation counts fail to capture the importance of this research, which has been massively leveraged by studies of the Earth system using CESM by scientists nationally and internationally."

Reviewer C: "The Snow, Ice, and Aerosol Radiative (SNICAR) model developed by Mark, is widely used in the community including being embedded in many earth system and regional climate models, and being applied in many studies and publications."

Reviewer D: "Beyond his impressive scholarship and wide recognition for his many impacts on the development of radiative transfer in the cryosphere (and beyond), Mark is clearly having an impact on the education and mentoring of successful students who are leaving the University of Michigan with PhDs and being absorbed into fine institutions. He has contributed to a diverse curriculum in climate education and has received good reviews."

Reviewer E: "In my opinion, Mark Flanner has played a leading role in the research efforts to examine the climate impact of aerosols through interaction with the cryosphere processes."

Summary of Recommendation: Professor Flanner works in an area that is at the core of the department's strategy, and his research is of highest quality as demonstrated by the high number of publications and citations. He has a strong externally funded research portfolio, and his international reputation is solid and his scientific impact increasing. It is with the support of the College of Engineering Executive Committee that I recommend Mark G. Flanner for promotion to professor of climate and space sciences and engineering, with tenure, Department of Climate and Space Sciences and Engineering, College of Engineering, and professor of Earth and environmental sciences, without tenure, Department of Earth and Environmental Sciences, College of Literature, Science, and the Arts.



Alec D. Gallimore, Ph.D.
Robert J. Vlasic Dean of Engineering
College of Engineering



Anne Curzan, Dean
Geneva Smitherman Collegiate Professor of
English Language and Literature, Linguistics
and Education
Arthur F. Thurnau Professor
College of Literature, Science, and the Arts

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