

EDITORIAL

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Key Point:

- The editors of *JAMES* describe their strategy in realizing the journal's mission





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Concerning the Aims and Scope for *JAMES*

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Abstract In this editorial, we present general principles as well as specific notions that guide the strategy of *JAMES'* editors in realizing the journal's mission.

The mission for AGU's *Journal of Advances in Modeling the Earth System (JAMES)* is to publish original research papers that advance the science that underlies Earth system models and emerges from their use. *JAMES'* scope concerns the outer envelope of the Earth system including the atmosphere, oceans, land surface, and cryosphere, and with research focusing on the attendant physics, chemistry, and biology. *JAMES* considers models as instantiations of scientific theories and concepts, and the journal publishes papers that expand our capabilities to model, understand, and predict the Earth system. In this editorial, we present general principles as well as specific notions that guide the strategy of *JAMES'* editors in realizing the journal's mission.

1. Principles and Aspirations

Numerical models are a core part of 21st century Earth system science. They fulfill their role by enabling numerical experimentation with and exploration of fundamental processes and within the dynamical Earth system. In doing so, models instantiate theories of how the Earth system works. They offer a framework to test those theories within the context of multi-scale and possibly multi-component interactions and emergent phenomena and by confronting these theories with data from field and laboratory measurements. *JAMES* papers aim to enhance the rigor, transparency, and reproducibility of a hierarchy of Earth system models and their various components. Example topics within *JAMES'* scope include: (a) theories and methods for how to simulate, predict, and estimate the state of the Earth system through the improved representation of physical, chemical, or biological processes, or via improved numerical and/or mathematical methods and algorithms; (b) novel approaches to parameterize unresolved processes through physically informed closures; (c) the coupling between explicitly resolved and parameterized subgrid processes as well as the coupling between components of the Earth system; and (d) the development of model hierarchies and analysis methods that enhance our ability to mechanistically understand and describe the Earth system.

Modeling is the process of developing and applying a mathematical representation of phenomena and processes to study and predict them. Scientifically reproducible Earth system modeling is a result of sound science, experimental design, and analysis. *JAMES* papers cover aspects of modeling, from individual components and fundamental processes to high-end coupled Earth system models, prediction systems, and state estimates. Example topics within *JAMES'* modeling scope include the examination of how relatively small-scale processes, such as clouds, soil physics, and ocean eddies, impact larger-scale climate; studies of how fundamental physical, chemical, and biological processes and/or individual model components interact across the Earth system to affect climate and its variations; and the probing of Earth system processes through hierarchies of models to better understand and quantify climate change and emergent properties such as climate sensitivity.

Since its beginning in 2009, *JAMES* has become a leading venue for publishing model-based concepts and methods concerning the Earth system. Initially, *JAMES* primarily focused on the needs of atmosphere and land surface science; since 2018, *JAMES* has enthusiastically embraced the ocean and cryosphere. *JAMES*

today serves the multi-faceted needs of Earth system modeling science ranging from the oceans' abyss to the outer limits of the atmosphere.

For the year 2021 and beyond, the editors envision a continued role for *JAMES* as a journal that seeks to publish and promote ideas directly relevant to understanding and modeling the Earth system. Many emerging topics are within the journal's scope, with an incomplete list including: novel methods for parameterizing and/or representing processes using physically informed machine learning tools; leading-edge simulations of fundamental physical, chemical, or biological processes spanning the atmosphere, ocean, land, and cryosphere, aiming at expanding our basic understanding of how these processes operate and affect the Earth's climate; the development of model hierarchies, from analytical theories to global numerical models, which support mechanistic research of how the Earth system works; developments that advance model capabilities in simulating the interface processes active between different components such as aerosol-cloud-climate interactions, and interactions among land, atmosphere, ocean, and cryosphere; mathematical and numerical methods for advancing component model dynamical cores; deeper understanding and capabilities related to data assimilation and state estimation spanning all media occurring in the Earth's outer envelope; and the many facets of how component models are coupled to enable the investigation of phenomena emerging from such coupling. Further topics certainly will emerge within the coming years, with *JAMES* hoping to play a central role in bringing these ideas to the press.

2. Elements of a *JAMES* Paper

- *JAMES* is a Gold Open Access journal, meaning that all papers are freely available upon publication. Author fees are competitive and special considerations are available for those unable to meet the fees. Authors from certain countries have open access fees waived.
- *JAMES* imposes no page limit (though there are page charges when extending beyond a nominal limit), thus enabling a comprehensive and coherent science story to be published without the need for excessive use of supplements. Even so, supplemental material such as code samples, images, and visualizations are published at no additional charge.
- *JAMES* welcomes original and innovative research articles that present reproducible ideas to advance the science and/or methods that directly support the science. Comprehensive reviews addressing the theory and practice of modeling are also welcome provided they are more focused than those at *Reviews of Geophysics*.
- *JAMES* papers manifest scientific and mathematical rigor, clarity and pedagogy in writing and presentation, and reproducibility and generality of results. These attributes extend from the paper's summaries (both the scientific abstract and plain language description) to the methods, results, discussion, conclusions, appendices and supplements, with each element serving to enhance the paper's longevity, impact, and readability.
- *JAMES* is a hub of deep knowledge on Earth system models and modeling, with papers clearly and thoroughly referencing the foundations upon which they are based.
- *JAMES* editors, associate editors, and reviewers aim to help authors realize the best in each manuscript by clearly exposing the science and by refining the writing. They do so by working collaboratively with authors to ensure broad appeal and high impact for the published paper.
- *JAMES* welcomes manuscripts from across the international scientific community.
- *JAMES* supports free and open data accessibility and sharing across the international community as per AGU's Data Policy. Doing so ensures the science reported in a *JAMES* paper can be readily cross-examined by readers, thus allowing for reproducibility of both the ideas and the results. That said, AGU's Data Policy remains a work-in-progress, with the topic under discussion among the broader geoscience community. We aim for editors and authors to collaboratively realize a meaningful, feasible, and useful outcome concerning the publication of data.

3. Specifics Concerning the Scope of *JAMES*

- *JAMES* papers advance the field of Earth system models and modeling. The fundamental suitability measure for a *JAMES* submission is whether the manuscript's results and ideas are generalizable beyond the specifics of the particular study.
- *JAMES* publishes novel research articles, reviews that intellectually synthesize a topic, as well as invited commentaries and editorials. *JAMES* also organizes special issues that bring together a suite of papers covering a selected topic or subfield.
- Advances may be purely technical, such as new or improved methods or algorithms targeted at improving models or modeling; they may be synthetic, as in the integration of a new modeling or assimilation system; they may be conceptual, offering new theories, idealizations, or modeling hierarchies; or they may be methodological, presenting new approaches for physical analysis of simulations, subgrid parameterizations, dynamical cores, and benchmarking.
- Model description and development papers are within scope if they express why and how the model differs from its predecessors and what improvements or novel opportunities are being offered by the new model. Examples include the scientific descriptions of new versions of climate or Earth system models. Such papers should present a synthetic and candid view of the development process, teaching lessons that extend to allied development efforts. They should do so by articulating how model components and supporting data are integrated into the larger model, and how well the new model addresses shortcomings of the previous generation by offering analyses of tests against benchmarks and/or observational-based measures.
- The practice of modeling and the science of model development is often advanced with idealizations and model hierarchies. Papers are encouraged to propose new idealizations and hierarchies targeted at specific processes or the use of clearly defined experiments to enhance process understanding and identify mechanisms.
- State estimation and data assimilation based on dynamical models are within scope, and *JAMES* welcomes manuscripts that advance their use for the earth system. Manuscripts describing new methods for synthesis and optimization are also in scope when presented directly within the context and needs of earth system models.
- *JAMES* publishes commentaries that amplify research papers published in the journal, explaining the context and importance to a wider audience. Commentaries are invited by editors and are often published across more than one AGU journal.
- *JAMES* publishes corrections directly to the version of the record.

4. Topics Typically Falling Outside the Scope of *JAMES*

- Manuscripts describing specific applications and targeted analyses are better suited to topical journals. Such manuscripts include the development, tuning, or assessment of a forecasting system, as well as the use of geophysical data to drive statistical, engineering, or similar models.
- Manuscripts focused on model evaluation or model inter-comparison are generally outside *JAMES'* scope, in particular when the manuscript is divorced from the development of mechanistic models, scientific theory, or novel analysis methods targeting physical insight. Such manuscripts are better suited to journals with greater emphasis on disciplined research (e.g., *Journal of Geophysical Research*) or on the assessment of model systems (*Earth and Space Science*), with these journals offering particular editorial expertise that can better serve the needs of these manuscripts.
- *JAMES* does not publish uninvited comments that target a specific paper published in *JAMES* or elsewhere.
- For every rule, there is an exception, with editors considering exceptions where they serve the journal's mission.