



EDITORIAL

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Key Points:

- This Editorial presents principles that guide *Journal of Advances in Modeling Earth Systems'* editors in realizing the journal's mission

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Aims and Scope of *JAMES*

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Abstract The mission of AGU's *Journal of Advances in Modeling Earth Systems (JAMES)* is to publish original research papers that advance the science underlying Earth system models and emerging from their use. *JAMES'* scope encompasses the outer envelope of the Earth system including the atmosphere, oceans, land surface, and cryosphere. It publishes papers that expand capabilities to model, understand, and predict the Earth system and the physical, chemical, and biological processes shaping it. 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. This document serves as an update to Griffies et al. (2021), <https://doi.org/10.1029/2021MS002567>.

1. Principles and Aspirations

Numerical models are a core part of 21st century Earth system science. They enable numerical experimentation with and exploration of fundamental processes and their role within the dynamical Earth system, and they are the foundation of Earth system predictions. Models instantiate theories of how the Earth system works, and they can be informed by, or even driven by, data. They offer a framework to test theories within the context of multi-scale and multi-component interactions and phenomena emerging from these interactions. Models can be tested by confronting them with data from global observations (e.g., satellites) or in situ field and laboratory measurements. *Journal of Advances in Modeling Earth Systems (JAMES)* papers aim to enhance the rigor, transparency, and reproducibility of a hierarchy of Earth system models and their various components.

Modeling is the process of developing and applying a mathematical representation of phenomena and fundamental processes for the purpose of research and prediction. Reproducible Earth system modeling is a result of foundational science, robust numerical methods, creative experimental design, penetrating analysis, and detailed documentation in the scientific literature. *JAMES* papers cover various aspects of modeling, from individual components and fundamental processes to high-end coupled Earth system models, prediction systems, and state and parameter estimates.

Since its beginning in 2009, *JAMES* has become a leading venue for publishing model-based concepts and methods while deepening a scientific understanding of how the Earth system works. Initially, *JAMES* primarily focused on the needs of atmosphere and land modeling (e.g., Fisher & Koven, 2020). However, 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 (Griffies et al., 2021).

2. Sampling *JAMES'* Scope

JAMES' scope includes the examination of how relatively small-scale processes, such as clouds, soil physics, and ocean turbulence, 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 (e.g., Jeevanjee et al., 2017). Further specific topics include theories and methods for how to simulate, predict, and estimate the state of the Earth system through improved representation of physical, chemical, or biological processes, or via improved numerical and/or mathematical methods and algorithms; novel approaches to parameterize unresolved processes through physically informed or data-driven closures (e.g., Yuval et al., 2021); coupling between explicitly resolved and parameterized subgrid processes as well as the coupling between components of the Earth system; development

of model hierarchies and analysis methods that enhance our ability to mechanistically understand and describe the Earth system.

For the year 2023 and beyond, the editors envision a continued role for *JAMES* as a journal that seeks to publish and promote ideas at the forefront of understanding and modeling the Earth system. Many emerging topics are within the journal's scope, including:

- Novel methods for parameterizing and/or representing processes using physically informed machine learning approaches;
- 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, thus supporting mechanistic research into 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;
- Advances in modeling the impact of anthropogenic activities (including agriculture and forest management) on land surface properties and biophysical and biogeochemical functioning;
- Mathematical and numerical methods that advance computational capabilities;
- Theories and methods development related to data assimilation, state and parameter estimation, and dynamical systems spanning all media occurring in the Earth's outer envelope;
- Facets of how component models are coupled to enable the investigation of phenomena emerging from such coupling;
- Application of novel methods, such as those listed above, for an improved understanding of earth system dynamics.

3. Further Details on *JAMES*' Scope

- *JAMES* papers advance the field of Earth system models and modeling. A 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 collections 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. Crucially, the study must advance our ability to model the earth system, or our understanding of the earth system itself.
- Model description and development papers are within scope if they contain a science component while expressing why and how the model differs from its predecessors and what improvements or novel opportunities are offered by the new model. Examples include the scientific descriptions of new versions of climate or Earth system models.
- Model description/development papers should present a synthetic and candid view of the development process, why the development was needed, and how new developments improve modeling or understanding of the earth system, thus teaching lessons that extend to other 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 are often advanced with idealizations and model hierarchies. Papers are encouraged that propose new idealizations and hierarchies targeted at specific processes or the use of clearly defined experiments to enhance process understanding and identify mechanisms.
- State and parameter 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 online version of record.

4. Scientific Elements of a *JAMES* Paper

- *JAMES* publishes 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, along with reproducibility and generality of results. *JAMES* papers clearly articulate what was learned as a result of performing the research. These attributes extend from the paper's summaries (both the scientific abstract and plain language abstract) to the methods, results, discussion, conclusions, appendices, and supplements, with each element serving to enhance the paper's longevity, impact, and readability.
- *JAMES* is home to deep knowledge of 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.

5. Publication Aspects 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, including those whose grant funding has expired or prohibits allocation to open access 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 or article splitting. Even so, supplemental material such as code samples, images, and visualizations are published at no additional charge.
- *JAMES* aspires to inclusively represent all people and communities. As such, the journal welcomes manuscripts from across the international scientific community, particularly from underrepresented regions and groups as per the [AGU publications statement on diversity, equity, inclusion, and accessibility](#).

6. *JAMES* and the AGU Data and Software Policy

- *JAMES* supports free and open data and software accessibility and sharing across the international community as per [AGU's Data + Software Policy](#). Doing so ensures the science reported in a *JAMES* paper can be readily cross-examined by readers, thus allowing for replicability of both the conceptual ideas and the quantitative results.
- The software portion of AGU's Data + Software Policy is central to *JAMES*, in which software supporting the science of a *JAMES* paper should be openly available to readers on an archive and properly cited, ideally with a DOI.
- *JAMES* papers must have an Open Research statement that points to specific web locations where data and software, central to the science of the paper, are freely available.
- Analysis software/scripts and model outputs (at the temporal or spatial resolution presented in the analysis) that are central to the science presented in a paper (e.g., figures) must be openly available via an archive.
- The AGU software policy aims for code transparency but does not require user support for that code. If a paper describes a novel scheme that is part of a larger model (e.g., a convection scheme in a weather forecast model),

then it is that scheme that is relevant for the *JAMES* paper, and so should be available to readers, whereas the full atmospheric model or forecast system is not directly relevant.

7. Topics Typically Falling Outside *JAMES*' Scope

- Manuscripts describing specific applications and targeted analyses are better suited to topical journals. Such manuscripts include the development, tuning, evaluation, or assessment of a forecasting system, statistical model, data science method, or integrated assessment model, as well as the use of geophysical data to drive statistical, engineering, or similar models.
- Papers describing new model implementations without a novel scientific or modeling component are outside *JAMES*' scope (see above text on model development papers).
- Manuscripts focused on model evaluation or model inter-comparison are generally outside *JAMES*' scope, in particular when the manuscript is not part of the development of mechanistic models, scientific theory, or novel analysis methods targeting scientific insight. In particular, stand-alone studies that focus on model characterization, including sensitivity analyses, tests of spin-up and initialization, evaluations of case studies, or preliminary performance of a new method or parameterization scheme, are generally outside *JAMES*' scope. Many of these manuscripts are better suited to journals with greater emphasis on disciplinary 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.
- Papers focused on data products without a dynamical modeling component typically fall outside the scope of *JAMES*, unless there is a specific analysis that demonstrates, in depth, how the product can be used to further improve modeling of earth system processes.
- *JAMES* generally does not publish research concerned with topics in solid earth geophysics or space physics.
- *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.

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