

# Good Scientific Practice at the MPI-M

The MPI-M Collegium

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This document outlines the policy for good scientific practice at the Max Planck Institute for Meteorology (MPI-M). It adds disciplinary and institutional specificity to the guidelines adopted by the Senate of the Max Planck Society<sup>1</sup> and the German Science Foundation<sup>2</sup>.

Specificity is added in three respects. First, good scientific practice requires that the *primary data* used in a scientific study, be archived to assure replicability of its results. To meet this requirement, and also help satisfy similar requests by journals, it is thus necessary to define what constitutes the *primary data*, and how this should be archived. Second, responsible handling of *authorship* is of particular importance. This document provides additional guidelines concerning this sensitive topic. Finally, specificity is added concerning the quality control procedures (and their motivation) that employees must follow before submitting a paper for publication.

## Primary Data

In accord with standards of good scientific practice, the MPI-M requires that all *primary data* for an investigation be archived for a period of at least ten years. The MPI-M accepts responsibility for maintaining this archive and making it available upon request.

Primary data is that information which is necessary for others to replicate the main ideas of a study. This includes data collected in the field, in the form of notes or, more typically, measurements. For numerical investigations the primary data is a documentation of the methods and tools used, in ways that would allow the ideas of a study to be reproduced. In many cases it may be more efficient, and less mistake-prone, to meet this requirement by archiving the code or scripts used in a study, and documenting how they were executed. Model output is not primary data and need not be archived, although doing so, can be helpful, as discussed below.

The corresponding author of a manuscript is responsible for describing how access to primary data is ensured. This description can be self-contained within the paper, or provided as an electronic supplement archived in the MPG publication system PuRe<sup>3</sup>, which ensures that it is archived for the requisite period. Such a supplement can take the form of an expository text, which more fully describes the methods than may have been possible to include in the published paper, or by creating a small and self-described archive which includes data, model code, and appropriate references (i.e. any form of persistent identifier (PID)) to any primary data that are externally maintained, by trusted sources or repositories. For instance, the DKRZ maintains facilities for archiving large data sets, and this can serve as an external repository which the electronic supplement links to.

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<sup>1</sup><https://www.mpg.de/197494/rulesScientificPractice.pdf>

<sup>2</sup>[https://www.dfg.de/download/pdf/foerderung/rechtliche\\_rahmenbedingungen/gute\\_wissenschaftliche\\_praxis/kodex\\_gwp.pdf](https://www.dfg.de/download/pdf/foerderung/rechtliche_rahmenbedingungen/gute_wissenschaftliche_praxis/kodex_gwp.pdf)

<sup>3</sup><https://pure.mpg.de/>

A great deal of the work at the institute is based on the analysis of complex models. Because our investigations often lead us to modify the models we use, it can be helpful to document code changes by forming a versioned branch for each model configuration that was used. As in this case, simply documenting the branch, or branches, upon which calculations are based will ensure that this part of the primary data is automatically maintained by the MPI-M versioning system, and thus can be pointed to as an external repository. Alternatively, changes to a standard branch can be documented separately. In cases where models are not maintained as part of an institute maintained code repository, it is important to save the model code itself and the configuration specifications as part of the primary data archive, which would then be provided to the institute either as part of the electronic supplement, or in the form of a PID serving as link to an external repository where it is stored by a trusted source (i.e., DKRZ).

The MPI-M also encourages investigators to consider archiving additional (secondary) data that might ease the reproduction of some aspects of their study or be helpful in subsequent studies. Model output is an example of secondary data, as is post-processed data, or output, that may have been used to construct particular figures.

Additional information is provided in the "Guideline for Publishing at MPI-M"<sup>4</sup>.

## Authorship

The MPI-M maintains highest standards for authorship of scientific papers. The corresponding author for a published study is responsible for ensuring that their study complies with these guidelines for good scientific practice.

An author is anyone who has made a genuine, comprehensible contribution to a published study. All authors agree to the final version of the work to be published and are responsible for the content. This usually implies that when considering authorship the intellectual origin of the underlying *ideas* or of other *substantive contributions* should be clear - these will determine the selection of the authors. Honorary authorship is not permitted.

Authorship can often be a grey area. When the model or the data constitute the main idea of the study (for instance in model description papers) the core contributors to the development of the model or the collection and curation of the data merit consideration as authors.

When a model, or data, that is not previously documented in the literature is used in a study, then it is incumbent on the authors of a study to describe the model or the data. In this case the model and data become part of the scientific contribution of a particular study and co-authorship by the model developers and data providers would be appropriate. But if the model or data being used is described elsewhere, then the model or data should be appropriately cited, and further technical help should be mentioned in the acknowledgement section.

Individuals who contribute to a study by providing the (financial) means to conduct the study, or the rendering of technical assistance (for instance by aiding in scripting, plotting or technical writing) should be mentioned in the acknowledgement. Institute contributions through IT or administrative services or even technical help are acknowledged through the author's affiliation.

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<sup>4</sup>[https://mpimet.mpg.de/fileadmin/publikationen/Formulare/Guideline\\_for\\_Publishing.pdf](https://mpimet.mpg.de/fileadmin/publikationen/Formulare/Guideline_for_Publishing.pdf)

There will always remain areas, where the basis for authorship is unclear. In these cases the corresponding author should ask whether or not the proposed author contributed to important ideas that are presented in the study. Can the proposed author be considered as a co-owner of the ideas? If so then the individual in question should be considered as a co-author. Authors may also consider to delineate contributions for a study in the acknowledgement section of a paper, particularly when the contributions of the various authors are limited to only a subset of a particular study.

In all cases the corresponding author is expected to discuss his or her basis for deciding who to include as authors. The internal reviewer should feel free to ask whether or not the varied contributions to the study were appropriately acknowledged.

## Quality Control

Publications are fundamental for the communication of scientific advances. To ensure highest scientific standards, MPI-M requires an internal review prior to submission to a journal if MPI-M is the first (or corresponding) author's primary affiliation. This quality control concerns not only the scientific contents of the paper, but also its readability and compliance with the institute policies regarding authorship and the archival of primary data.

For the internal review the authors of a publication agree with an MPI-M scientist to act as internal reviewer. To have a fresh view, the internal reviewer should scientifically be sufficiently distant from the study, particularly concerning its preparation. MPI-M maintains a special approval form for documenting the internal review process.<sup>5</sup> If the publication is ready for submission, the internal reviewer signs the form and the authors hand the entire package (final manuscript, review, and approval form) to their department director for final quality control and approval. Note that a co-author of a paper not led by MPI-M still needs approval by the department director, but an internal review is not required.

Ideally a scientific paper should fully describe the methods used to enable the study to be reproduced by others. This includes, as appropriate, documentation of the model version used, sources of other primary data, configuration and input data, analysis algorithms and methods. The institute archive of model primary data is not a substitute for clear scientific writing. For this reason the institute also requires that the reproducibility of a study be considered as a factor in the internal review. The reviewer should ask if the paper sufficiently details the methods employed for someone else to reasonably replicate the study. If information that would be required to reproduce a study is not adequately documented in the draft paper, then the author should be asked why. In the case that key information cannot (for whatever reason) be provided in the paper documenting the study itself, then it is the obligation of the internal reviewer to note this in the internal review and request this information as part of the associated archive of primary and supplementary data that the institute will maintain for this publication.

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<sup>5</sup>[https://mpimet.mpg.de/fileadmin/publikationen/Formulare/Approval\\_form\\_for\\_Publications.pdf](https://mpimet.mpg.de/fileadmin/publikationen/Formulare/Approval_form_for_Publications.pdf)

## Final remarks

In case of doubt or conflict concerning good scientific practice the institute ombudsperson may be contacted. Following the guidelines of the Max Planck Society,<sup>1</sup> an ombudsperson is elected at regular intervals among the scientific staff. In this capacity the ombudsperson is independent of orders from superiors and obliged to strict confidentiality.

This policy is effective December 1, 2019. It replaces the guidelines for “Good scientific practice at the MPI-M” of April 28, 2015.