Interactive Public Peer Review™: an innovative approach to scientific quality assurance

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Abstract. Besides providing open access to the article, Copernicus Publications provides open access to the peer review via its Interactive Public Peer Review™. In this process, a public discussion among the author, two independent referees, and interested members of the scientific community builds the core of the peer-review process.

Keywords. Peer review, open access, transparency

1. Introduction

The discussions surrounding peer review are ongoing. Several authors are claiming a crisis of peer review with regard to its length (Nguyen et al. 2015; Powell 2016) and effectiveness (Lee et al. 2013; Walker R. and Rocha da Silva, 2015), and researchers are calling for more openness in the process (Aleksic et al. 2015).

Copernicus Publications already developed a new form of peer review in 2001 (Pöschl 2012). Since then, the process has been implemented in different scientific disciplines and enhanced continuously. Today, 18 open-access journals published by Copernicus Publications apply this form of peer review. In addition, an economy journal also applies this kind of peer review.
In the following, the initial idea and the development of the process of Interactive Public Peer Review™ are described.

2. Interactive Public Peer Review™

When the concept of interactive open-access publishing and Interactive Public Peer Review™ was developed by Ulrich Pöschl and his fellow scientists in 2000, they faced the problem that the traditional journal publication and peer-review process were not sufficient for thorough quality assurance, constructive discussion, and integration of scientific knowledge: the majority of studies did not build on related earlier publications, and some studies were not even self-consistent even though they had been published in reputable journals with high impact factors. After long discussion, Pöschl

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and his colleagues were convinced that public review on the Internet would provide the opportunity to resolve or at least improve many of these issues. With the Nobel Prize winner Paul Crutzen, the new concept found a prominent supporter (Pöschl 2011). Through the rapid publication after a swift access review, scientists receive a fast record of their research as a discussion paper. The process enhances transparency as referee comments, author comments, and the comments of the scientific community are published in the interactive public discussion (online and open access). However, the process meets the criteria of traditional quality insurance as papers undergo revisions and are only published as final revised papers in the journal after final acceptance by the editor. In summary, the process is designed to

- foster scientific discussion;
- maximize the effectiveness and transparency of scientific quality assurance;
- enable rapid publication of new scientific results;
- make scientific publications freely accessible.

Thus, the new process was intended to provide both rapid scientific exchange and thorough quality assurance (Pöschl 2012).

In contrast to post-publication peer review, the process of scientific quality assurance takes place prior to the formal journal publication. The discussion paper is just the manuscript submitted by the authors and therefore the starting point of the peer-review process. In addition, reviewers can disclose their names, but they do not have to do so as in open peer review.

In 2001, the first journal to apply this new peer-review process, *Atmospheric Chemistry and Physics* (*ACP*), was launched by Copernicus Publications with the support of the European Geophysical Society (EGS), which has been part of the European Geosciences Union (EGU) since 2002 (Pöschl 2011). Since 2001, 17 other journals (14 sister journals of *ACP* and 3 journals not affiliated to EGU) have adopted this innovative review process. In addition to the journals published by Copernicus Publications, the *Economic E-Journal* has also adopted this form of peer review. But how does it work?

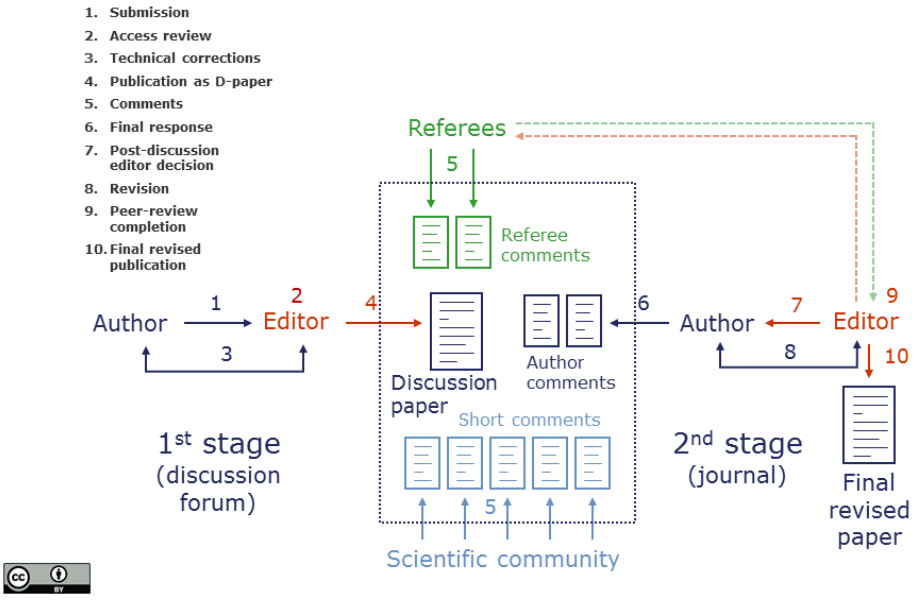

Figure 1. Example workflow of Interactive Public Peer Review™

2.1 Access review

After submission, the manuscript is swiftly reviewed by the topical editor who agreed to handle the review process. In this first assessment, the topical editor decides whether to start the discussion or not. Reasons for not starting the discussion might be a lack of basic scientific or language quality or the manuscript is not within the journal's scope. Some journals provide the possibility to request the feedback of independent referees already at this stage. However, experience shows that consulting referees at this point unnecessarily prolongs the process. In addition, referees who are not used to the process sometimes already provide full referee reports, which are not needed prior to the discussion. During this stage, only technical corrections or minor revisions can be requested.

2.2 Interactive public discussion

After a positive outcome of the access review, the author's manuscript is published as a discussion paper. At least two independent referees – who are nominated by the topical editor – review the manuscript and post their referee reports as referee comments (RCs) on an online discussion forum. This forum is openly accessible on the Internet. While the reports are open access, the referees can decide whether they want to disclose their names during the discussion or not. Research shows that about 80% of the referees decide to stay anonymous during the Interactive Public Peer Review™, while ca. 20% of them decide to disclose their name. In addition to the referees, the scientific community is invited to participate in the discussion and to post short comments (SCs). The authors of short comments have to register, and their names and contact details are shown in the discussion (Pöschl 2012). Usually, the interactive public discussion lasts 6–8 weeks depending on the journal. Before a discussion can be closed, at least the two RCs have to be published alongside the discussion paper. The author can decide to answer each comment individually or to address all comments collectively.

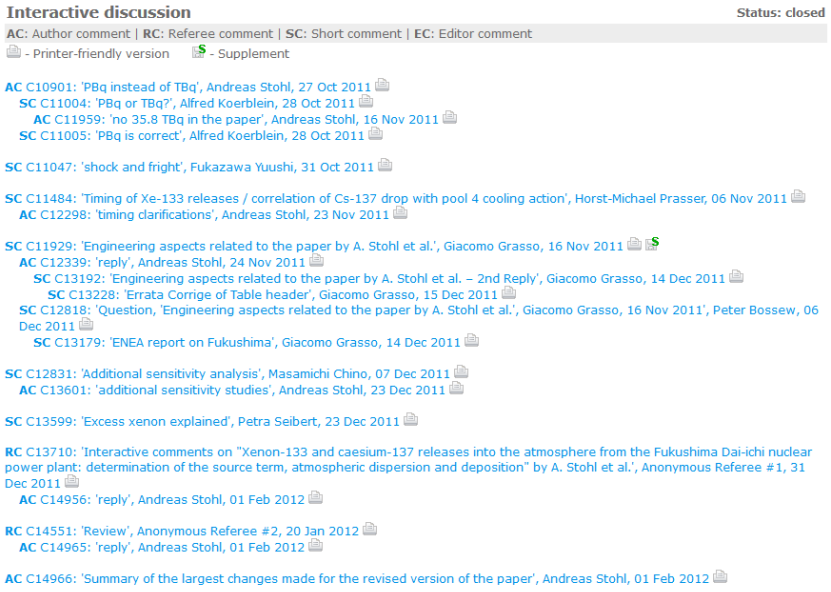

Figure 2. Example of an interactive public discussion

To guarantee the author's publication precedence and to provide a lasting record of the review process, every discussion paper and its comments remain online and are individually citable (Pöschl 2012). This occurs regardless of whether or not a manuscript is accepted for publication as a final revised paper in the journal.

2.2 Final response and peer-review completion

After the discussion has ended, the author should address all comments in a final response, if he or she did not do so during the open discussion. During this stage also the editor has the opportunity to post comments and suggestions (Pöschl 2012). Formal editorial recommendations and decisions shall be made only after the authors have had an opportunity to respond to all comments, or if they request editorial advice before responding.

Depending on the journal, the next step is one of the following:

- The authors submit their revised manuscript. In this case, the topical editor – in view of the access peer review and interactive public discussion – either directly accepts/rejects the revised manuscript for publication in the journal or consults referees in the same way as during the completion of the traditional peer-review process. If necessary, additional revisions may be requested during peer-review completion until a final decision about acceptance/rejection for the journal is reached (Atmospheric Chemistry and Physics, website, 2016).
- The topical editor makes a post-discussion decision in which he or she, based on the responses, either invites the authors to submit a revised manuscript or directly rejects the manuscript. If necessary, he or she may also consult referees in the same way as during the completion of the traditional peer- review process (Biogeosciences, website, 2016).

2.3 Publication of final revised paper

In the case of acceptance, the final revised paper is typeset and proofread. Then it is published on the journal's website, and the preceding discussion paper and the interactive discussion are displayed in a "peer-review tab" alongside the article. In addition, many journals display all referee and associate editor reports, the authors' response, as well as the different manuscript versions of the peer-review completion. All publications (original paper, interactive comments, and final revised paper) are permanently archived and remain accessible to the public via the Internet, and final revised papers are also available as print copies. The articles are also distributed via various abstracting and indexing services as well as other databases worldwide.

2.4 Interactive Public Peer Review™ in various disciplines

This model is mainly utilized in the geosciences. However, it is also applied to other disciplines such as drinking water engineering and wind energy science.
In the table below all journals published by Copernicus Publications that apply the Interactive Public Peer Review™ are listed. One can see that it is applied in various subdisciplines within the geosciences ranging from geophysics to atmospheric sciences:

Table 1. Journals applying the Interactive Public Peer Review™ published by Copernicus Publications

Title	Access review with referee quick reports	Post-discussion editor decision
Atmospheric Chemistry and Physics (ACP)	yes	no
Atmospheric Measurement Techniques (AMT)	yes	no
Biogeosciences (BG)	yes	yes
Climate of the Past (CP)	no	yes
Drinking Water Engineering and Science (DWES)	no	yes
Earth Surface Dynamics (ESurf)	no	no
Earth System Dynamics (ESD)	no	no
Earth System Science Data (ESSD)	no	no
Geoscientific Instrumentation, Methods and Data Systems (GI)	yes	no

Geoscientific Model Development (GMD)	no	no
Hydrology and Earth System Sciences (HESS)	no	yes
Natural Hazards and Earth System Sciences (NHESS)	no	yes
Nonlinear Processes in Geophysics (NPG)	no	no
Ocean Science (OS)	yes	no
SOIL (SOIL)	no	yes
Solid Earth (SE)	no	no
The Cryosphere (TC)	no	no
Wind Energy Science (WES)	no	yes

In the past years, a range of journals have switched from the traditional peer- review model to public peer review.

In many cases, the interactive public discussion only consists of two referee comments and the author's reply. However, providing the scientific community withthe opportunity to contribute to the discussion is a crucial aspect. Other papers on "hot topics" such as climate change or radioactivity sometimes receive 30–100 comments. There is an overview of these "most commented papers" in each journal's online library.

Prior to the discussion (i.e. during the access the review) rejection rates vary among journals and are found to be 8–37%. After the discussion, which aims to improve the quality of the manuscripts, the rejection rate is only 8% on average.

3. Recent developments

After the implementation of the accelerated access review (i.e. the access review without the possibility of consulting referees), the launch of the post-discussion editor decision (more guidance for authors after the discussion), and the adoption of the post- discussion report publication by most journals (i.e. disclosure of all reports from peer- review completion after final acceptance), a major adjustment to the concept was the decision to no longer typeset discussion papers from 2016 onwards and to merge the libraries of discussion papers and final revised papers.

Thus, discussion papers now look less like a publication and more like pre-print papers. The discussion paper is the PDF uploaded by the author, with an added header indicating the journal to which the manuscript was submitted for review. The manuscript is still citable, but the citation will indicate that the paper is under review (Copernicus Publications 2015). The discussion papers do not receive a subsequent pagination anymore, but a DOI is still registered for them.

In order to emphasize that the discussion paper is only the first step to the final paper, discussion papers are no longer archived in volumes and issues in a separate online library. With the new concept, a final revised paper and its corresponding discussion paper are archived together. There is a main page that includes all the information relating to the paper in separate tabs, such as metrics, related articles, and the list of peer-review comments and the discussion paper (Copernicus Publications, 2015)

These actions should address two main obstacles which occurred in the past: on the one hand, it should prevent authors from citing the discussion paper instead of the final paper; on the other hand, it should help authors whose discussion papers were rejected by indicating more clearly that discussion papers are not to be regarded as formal publications and thus can be submitted to other journals.

With the new concept for our interactive journals, we also introduced a new payment concept. Before 2016, authors were obliged to pay solely for the publication of their discussion paper if the respective journal had APCs. This concept is now obsolete since we no longer provide formatting services for discussion papers. Furthermore, funders welcome the new payment concept since now they are paying for the final revised paper and hence the version of record.

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