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On the future of journal publications in hydrology

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Editors from several journals in the field of hydrology met during the Assembly of the International Association of Hydrological Sciences in Gothenburg in July 2013 to share thoughts on the future of journal publishing in hydrology. The group of Editors reviewed the current status of the journals and the publication process, and discussed future strategies for responding to changes in the global publication arena in a proactive way. In the meeting, a number of possible actions was identified to help strengthen journal publications and research in hydrology as a whole. These are communicated in this Joint Editorial published in the journals *Hydrological Sciences Journal*, *Hydrology and Earth System Sciences*, *Hydrology Research*, *Journal of Hydrology*, and *Water Resources Research*.

All five journals bear testimony to the substantial progress that has been achieved. Comparing a present day journal issue with those published decades ago clearly shows that the overall body of knowledge has increased dramatically. Also, in addition to the rapid developments resulting from advances in computing power and information technology, there has been real progress in terms of the research questions being addressed, the instrumentation being used today, and the methods of data analysis. In the hydrological community, there is increasing appreciation of the value of data, the nature of process complexity, scale issues, uncertainties, and the significance of studying change and its mechanisms, including human activities. These contribute to an emerging mandate to put the science of hydrology into the context of societal needs.

There has also been a substantial increase in productivity, which has resulted in a major increase in the number of submissions. In 2013 alone, the five journals received a total of about 5000 submissions, and almost 2000 articles were published. This surge in submissions is related to a culture change in academic institutions worldwide. There is a greater emphasis on bibliometric indices related to international journal publications as the main indicator of research performance.

The increase in submissions also has downsides. With the higher number of submissions, it is often hard for editors to find a sufficient number of competent reviewers willing to undertake the task. Recognizing that authors and reviewers are members of the same peer group, we would like to stress that, if it is normal to have two or three reviews per submitted paper, authors should also be willing to accept on average two or three times as many review assignments as the number of papers they submit. It is a shared responsibility to assure the quality of our peer review system, so we hope authors will more readily accept review requests, thus helping other authors who will, in turn, help them.

The increase in submissions has not been equally distributed over the different regions of the world. Furthermore, some regions have developed a more advanced culture of publication than others, as a result of their heritage of public debate and communication. Both, the number of submissions and the quality of presentation therefore vary greatly between authors from different parts of the world. A concerted effort will be needed to strengthen the publication culture in some regions of the world. This is an effort for which the global hydrological community must be responsible, an effort that is particularly relevant if hydrology is to address global societal needs [Montanari et al., 2013].

There have also been changes in the way hydrological science is undertaken. International collaboration has expanded greatly (e.g., via research programmes of the European Union) and typical group sizes have increased. However, this increased coherence of the research process is not fully reflected by the coherence of the community research output. Often, research papers in the field of hydrology focus on a particular catchment. Results are sometimes of local interest only and difficult to generalize. It is clear that generalization is more difficult in hydrology than in disciplines such as physics, where the objects of study are more universal. Yet, for advancing the science of hydrology, knowledge accumulation at the community level is needed. *Blöschl et al.* [2013, pp. 386] noted that published research outcomes need to be generalizable to make them useful to the reader. Hydrology journals need to play a proactive role in building a coherent science by more tightly relating different studies. Some of the journals are currently considering requesting authors to include unique catchment identifiers in their papers that would connect to a searchable database of publications on the same catchment. Ultimately, one may envisage full links to published hydrological information on a geo-referenced basis, which will help authors to avoid reinventing the wheel and allow them to more effectively benefit from each other's work.

Another development in the hydrological journal literature during recent decades is that models are becoming more complex and data sets more comprehensive. Because of their sheer volume, the model structure, parameters, and the input data can no longer be included with papers and are often unavailable to the reader. The analyses presented in many papers can therefore no longer be repeated by other scientists. This is at odds with the generic scientific approach that builds on repeatability, both for quality assurance and for scientific progress. Some of the five journals are therefore currently revising their data policies. The new policies encourage authors to make the data and the computer codes used in their papers freely available to readers, either as electronic supplements or through public data repositories, where data permanence is guaranteed. In practice, this may be difficult if proprietary data or models are used, as is often the case in hydrology. It is likely that in the longer term, many scientific journals will require full disclosure of all data and models used before acceptance of manuscripts, to ensure consistently high research quality and to foster advancements in the field. Further discussions will be needed to address issues of proprietary data or models. Progress may be achieved by making data sources citable as an incentive for providing free access to data.

Substantial progress has also been achieved in hydrology, in that there are now much better links with other scientific disciplines than a few decades ago. This is highly conducive to better understanding of the water cycle and the multiple interdisciplinary feedbacks with a broad range of processes. However, the visibility of hydrological journal publications is not on a par with those from some of the other disciplines. One way to measure the importance and visibility of journals is the impact factor. All hydrology journals have an impact factor less than four (for a given year, X , this is a normalized measure of how often papers published in that journal in the previous 2 years were cited in indexed journal papers in year X). For the leading journals in medicine, molecular biology, physics, and chemistry impact factors may be much higher. This may reflect the relatively small size of the hydrological community, the way the community is organized and, importantly, the common and seemingly well-rooted practice of citing relatively old articles. The analyses presented by *Koutsoyiannis and Kundzewicz* [2007] show that the impact factor has many shortcomings when comparing hydrology with other fields. The Editors believe that the impact factor only reflects a partial image of the quality and standing of a journal. Yet, impact factors are widely used in research assessments of individuals and institutions. Individual scientists are now increasingly rated according to their h -index. Regardless of whether one agrees with the use of citation statistics in assessments, the quality of research will be enhanced if authors integrate the most recent findings from the hydrological literature in their papers, in a similar way to other disciplines.

Another, relatively recent, observation is that many journals are moving toward open access publication, i.e., from a "reader pays" model to an "author pays" model. There are many advantages of the latter, including wider visibility and strengthening the coherence of research progress. Some research funding bodies are already requiring that the research they are funding should be published in open access. At present, about half of the recent literature is available in an open access format [*Archambault et al.*, 2013]. All five journals are currently operating some variants of open access. Given the ongoing digital revolution in publishing, the challenge lies in developing and maintaining journal business models that are affordable to all the stakeholders involved. Hydrological research is mainly funded at national level. The business models

need to fit with that funding structure which, however, varies greatly between countries. In the long term, open access is likely to become the backbone of hydrological journal publications worldwide. However, care needs to be taken to render the open access system affordable to authors from financially disadvantaged countries.

In all publication models, the increasing pressure to publish in recent years (as reflected by the meaningful slogan “publish or perish”) has led to an increasing number of cases of plagiarism. Plagiarism comes in several grades of severity. One example is where authors rely heavily on other authors’ publications without proper referencing. This is unacceptable. Another example is where authors recycle their own material and present it as novel work, which is also unethical as it inflates the authors’ publication record. Appropriate action against authors is taken by the Editors and the journal Publishers in serious cases of plagiarism, i.e., where theft of other authors’ intellectual property has occurred. The five journals use dedicated software to detect overlap with prior publications. There are borderline cases of what is considered plagiarism. For example, small fractions of overlap with prior publications of the authors in the methods section may be considered acceptable by some journals. Overlap with unpublished, or not peer reviewed, material of the same authors, such as dissertations, reports, or conference proceedings (e.g., available on the web) is generally acceptable. The five journals have slightly different policies on what is considered prior published material. These policies are published on the respective websites or are available from the Editors on request.

Another publication trend that has been observed by the Editors is where manuscripts rejected by one journal are submitted to another journal without change. Quite frequently these papers are sent to the same reviewers, as the pool of experts in a specialized field is often small. The Editors are aware that the review process is not perfect, so it is possible that reviewers may err in their assessment. However, the Editors strongly believe in the role of the review process as being not just screening manuscripts but constructively improving them. Critical constructive reviews can be of considerable value to authors. Authors of rejected papers are therefore advised to take the suggestions of the referees very seriously and not to submit their papers to another journal without significant improvement. There is always room for improving a paper and this would lead to a win-win situation, being beneficial to authors, journals (and their editors), and the hydrological community at large. Similarly, incremental publishing of the least publishable unit is a pattern the Editors advise against. Each paper is assessed on its merits and whether it constitutes a significant contribution to the field. It is through substantive, high-quality papers that the discipline of hydrology is advanced.

Overall, the meeting of the Editors confirmed that the status of hydrological journal publications is, in general, satisfactory and improving. This is because of the dedication and efforts of the entire hydrological community. Authors are to be commended for submitting cutting edge research to the journals. Reviewers and editorial board members are doing an excellent job, typically providing voluntary and valuable community service. The Editors believe that the hydrological community can be proud of what has been achieved, as measured by the quality and innovation of the journal publication output. Adjustments to the editorial process are needed due to the dynamic nature of the boundary conditions, as discussed above, and these are currently implemented by the five journals in various forms. Comments from authors and readers on the future of the journals are welcomed. All the Editors are motivated to work together to help build an even stronger hydrological community along the lines outlined in this Joint Editorial. Ultimately, our journals reflect achievements of the international hydrological community. Journals are not simply out there and ready-made, they are what we all make them.

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