Earth System
Open Access Science Discussions
Data

1 # Peer-reviewing for Earth System Science Data as a student
2 # training exercise

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8 **Abstract.** Earth System Science Data (ESSD) is an open-access journal for the publication of interdisciplinary
9 datasets and lends itself well for student peer-review exercises. We discuss in this editorial the experience with
10 ESSD manuscripts of (1) a research group providing a peer-review report to authors; (2) an author receiving a peer-
11 review report from a team of students; and (3) a student participating in a peer-review report. We seek to promote
12 ESSD as a valuable open-source journal for educational purposes, serving as a training set for students with benefits
13 to the students, the authors and the editor.
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16 **Short summary.** This commentary describes using Earth System Science Data's open access review process as an
17 educational exercise for trainees.
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20 **Main text.** The peer review process is an integral part of the scientific endeavour, yet most reviewers have no
21 formal training. The learning process may have occurred by observing what reviewers do and say from experiences
22 as authors or by advice from an advisor. There are resources available from publishers and scientific associations,
23 such as Nature's Focus on Peer Review Masterclass (https://masterclasses.nature.com/online-course-on-peer-
24 review/16507836), American Chemical Society's Reviewer Lab (https://www.acsreviewerlab.org/), Wiley's Peer
25 review training (https://authorservices.wiley.com/Reviewers/journal-reviewers/becoming-a-reviewer.html/peer-
26 review-training.html), and publications such as Learning the Rope of Peer Reviewing
27 (https://www.science.org/content/article/learning-ropes-peer-reviewing). There is also a growing number of outlets
28 to help recognize the reviewer's behind-the-scenes contributions to the peer-review process, such as Publons
29 (https://publons.com/wos-op/) and reviewer awards by journals.
30
31 As an additional tool in the scientist's toolbox, research education professionals can also run reviewer workshops
32 within their groups for a more formal training in the peer-review process. One approach is to use a submitted
33 manuscript as a real training exercise, with the permissions of the editor, the journal, and the authors. Earth System
34 Science Data (ESSD) is an open-access interactive peer-reviewed journal by Copernicus for the publication of
35 interdisciplinary datasets for earth science research and lends itself particularly well to this exercise. Manuscripts are
36 often extensive and so different sections and datasets can be delegated to different trainees to review. We discuss in
37 this editorial the experience of (1) a research group providing a peer-review report to authors; (2) an author
38 receiving a peer-review report from a team of students; and (3) a student participating in a peer-review report, with
39 each case using a different manuscript. The anonymity of the reviews is at the discretion of the student training
40 team.
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42 **Research group providing a peer-review report to authors**
43 One of us is an assistant professor at the University of British Columbia, and recently had a positive experience
44 writing a collaborative review for ESSD. The goal of this workshop was to learn to give constructive criticism while
45 simultaneously building confidence in students' own ability to ask questions and to give critical feedback.
46
47 Concretely, this peer-review workshop was conducted within a research group composed of undergraduate and
48 graduate students. We first contacted the editor and subsequently the authors, who agreed to be part of this exercise.
49 As a group, we independently read the manuscript (Kremser et al., 2021) and came together to discuss each section

50 of the manuscript over two meetings for a total of 3 h. One group member was tasked with putting a slideshow
51 together for each dataset and section within the manuscript (which we later shared with the authors). Another group
52 member was tasked with documenting and listing all the questions and items that were unclear to us during our
53 discussions. When we couldn't come up with a clear answer to someone's question among the group, we concluded
54 that the authors could help clarify and we therefore listed the point as a question to be addressed in our reviewer
55 report. The feedback was therefore recorded with a specific recommendation that was directly actionable. For
56 example, if a data visualization was unclear, we explained why, and then suggested an edit. Another group member
57 downloaded the data, checked the data scripts and made recommendations on additional scripts to add and how to
58 organize the folder for an external reader. At the end of the process, the authors and the editor's feedback were
59 excellent, and the review improved the manuscript. As importantly, the students appreciated the behind-the-scenes
60 look at how a peer-review is conducted. Our group plans to run this exercise yearly. We recommend that authors,
61 reviewers, editors, and readers welcome this peer-reviewing practice to help train the next generation of reviewers.
62
63 **Author receiving a peer-review report from a team of students**
64 Authors of data publications benefit from rigorous peer review, especially in an open access, interactive forum like
65 that of ESSD. Published datasets are intended to be used widely, and interactions with potential users help ensure
66 the products are research- and application-ready. The interactive public discussion style of peer review can provide
67 valuable end-user documentation beyond what is included in the final data paper or product metadata. However, a
68 large earth-science dataset may be challenging to review adequately within the typical time constraints of a
69 publication outlet. As an author of several large geospatial data publications, I have found the group-review
70 assignment capable of providing considerably more discussion than a single-party review within the allotted time.
71 My initial ESSD submission (Short, 2014) was reviewed by a class of graduate students over a six-week period. As
72 a class assignment, the time was clearly spent putting the dataset of over 1.6 million records through its paces.
73 Feedback included thoughtful comments on topics like data format, accessibility, quality control, and utility that I
74 was able to respond to at length in the interactive comment process. From an author's perspective, I would
75 recommend that published discussion as an example of a high-quality group review of a data paper for those wishing
76 to conduct their own.
77
78 **Student participating in a peer-review report**
79 Another of us gained their first review experience as a participant in the collaborative student review of an ESSD
80 dataset manuscript within a 1-credit special topics class convened for this purpose. This class emphasized careful
81 examination and criticism in reviewing scientific methods and products, and challenged the student review group to
82 identify and prototype uses of the dataset. During the weekly meetings of this review class, the professor assigned
83 specific aspects of the dataset, including the quality control process for the data, the organization and useability of
84 the data, and the clarity of the written component. Approaches for addressing these topics were discussed in class,
85 and were implemented by individuals or small groups outside of class. Our observations were then discussed in the
86 subsequent class, and added to a draft of the written review. For example, the student group discussed and defined
87 expectations for a reasonable range and distribution of values in the dataset, and examined values contradictory to
88 these expectations. Examination of unexpected or outlier data challenged the students' knowledge (and application)
89 of statistical tools, and of the underlying science. In addition, the student group considered potential applications,
90 and in my case constituted a comparison between the review dataset and a spatial dataset of soil characteristics.
91 Forming and examining this potential application was a challenge for many of the students in the review class and
92 required technical problem solving as well as creative thought.
93
94 It was instructive to learn to develop constructive criticism of a dataset and of the methods under review. For many
95 of us who participated, this review process was the first time we had formed our own perspective on the quality and
96 validity of data, methods, or findings, rather than treating all scientific products as beyond reproach. This was a key
97 learning milestone in growing into an independent scientist. Writing the review thus pushed us to consider
98 assumptions incorporated in the dataset and methods. Overall, the student review group benefited from the
99 opportunity to participate in the process of science, to test their knowledge of earth science and statistical tools, and
100 to practice creative thinking and technical problem solving.
101
102 **Call to increased open-access data and review**
103 Overall, the exposure to both the review process and to the concept of openly-shared quality-assured data is
104 important in training the next generation of researchers as well as promoting critical thinking among our trainees.
105 The concept of open data is necessary to advance knowledge more effectively and participating in all aspects of the

106 open data review process, as a reviewer, author and student trainees, ensures continued high quality datasets
107 available in ESSD.
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