Research Reproducibility in Geosciences: Current Landscape, Practices and Perspectives

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Reproducibility of research can gauge the validity of its findings. Yet currently we lack understanding of how much of a problem research reproducibility is in geosciences. We developed an online survey on faculty and graduate students in geosciences, and received 136 responses from research institutions and universities in Americas, Asia, Europe and other parts of the world.

This survey examined (1) the current state of research reproducibility in geosciences by asking researchers' experiences with unsuccessful replication work, and what obstacles that lead to their replication failures; (2) the current reproducibility practices in community by asking what efforts researchers made to try to reproduce other's work and make their own work reproducible, and what the underlying factors that contribute to irreproducibility are; (3) the perspectives on reproducibility by collecting researcher's thoughts and opinions on this issue.

The survey result indicated that nearly 80% of respondents who had ever reproduced a published study had failed at least one time in reproducing. Only one third of the respondents received helpful feedbacks when they contacted the authors of a published study for data, code, or other information. The primary factors that lead to unsuccessful replication attempts are insufficient details of instructions in published literature, and inaccessibility of data, code and tools needed in the study. Our findings suggest a remarkable lack of research reproducibility in geoscience. Changing the incentive mechanism in academia, as well as developing policies and tools that facilitate open data and code sharing are the promising ways for geosciences community to alleviate this reproducibility problem.