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Map Reproducibility in Geoscientific Publications: Challenges, Criteria, and Opportunities

Reproducibility is a core element of the scientific method. In the Geosciences, knowledge derived from geodata is frequently communicated through maps, and the computational methods used to produce these maps vary in their ease of reproduction. We present the results of a study in which we attempted to reproduce the maps included in geoscientific publications. We collected 27 candidate papers, followed a systematic approach to reproducing the maps they contained, and in four cases we were able to reproduce them successfully. We report on the approach we took, the issues we encountered, and the lessons we learned from attempting to reproduce the maps. We also provide an initial set of criteria for assessing the success of a map reproduction attempt. Building on these findings, we drew additional insights from a separate investigation into the factors that influence the success of map reproduction from a map reading perspective. This complementary study revealed the importance of considering visual differences between original and reproduced maps, and highlighted the need for clear assessment criteria and tools to support the evaluation of map reproductions. Our research provides a comprehensive understanding of the current state of map reproducibility in geoscientific publications, proposes guidelines for improving map reproducibility, and discusses future research directions.

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