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Interpolation of data gaps in geodetic glacier elevation change and related uncertainties

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Nowadays, geodetic methods are frequently used as a reference for local, regional or global glacier mass balances estimates, especially in remote areas of the globe. Data gaps in digital elevation models derived from remote sensing data are a very common occurrence over glacierized terrain. These can be due to clouds, failure of stereoscopic correlation where images lack contrast (snowfield, shadows, ...), or simply out of instrument swath. These data gaps propagate in maps of elevation change and need to be filled when computing glacier volume change and, ultimately, glacier-wide and region-wide mass balances.
Thus, the robustness of interpolation methods and their uncertainty for volume change estimates are key to an improved assessment of glacier mass change by allowing optimal use of limited coverage data. However, the dependence of these methods on the spatial distribution of data gaps has been studied to a limited extent.
In this study, we simulate gaps over numerous glacier elevation change maps of different regions and with various characteristics to assess and improve the robustness of existing methods of void interpolation. We also investigate formal uncertainties related to these interpolation methods which are poorly known and conservatively estimated in the literature.
While depending strongly on the distribution of data voids, glacier-wide hypsometric interpolation methods yield satisfying results given their simplicity. Other methods and related uncertainties are also investigated.