EGU21-3944
https://doi.org/10.5194/egusphere-egu21-3944
EGU General Assembly 2021

Where shall we measure? Results from the second phase of the Ice Thickness Models Intercomparison eXperiment (ITMIX2)

Daniel Farinotti[1] and the ITMIX2 consortium[*]
[1]ETH Zurich, Laboratory of Hydraulics, Hydrology and Glaciology (VAW), Zurich, Switzerland (daniel.farinotti@ethz.ch)
[*]A full list of authors appears at the end of the abstract

Knowing the ice thickness distribution of glaciers and ice caps is of critical importance for a number of studies. However, since measuring ice thickness directly is difficult and time consuming, the availability of such information is generally scarce. Here, we present results from the Second Phase of the Ice Thickness Models Intercomparison eXperiment (ITMIX2) which had a two-fold objective. First, it aimed at characterizing the capability of numerical models to use sparse thickness measurements to their advantage. Second, it aimed at identifying possible strategies for maximizing the information content gained through direct ice thickness surveys.

The experiment was designed around 23 test cases including both real-world and synthetic glaciers, and comprised a set of 16 different experiments per test case simulating different scenarios of data availability. Based on a total of 2,544 individual solutions submitted by 13 different models, our results show that for locations without direct measurements, the ice thickness can be predicted with typical deviations in the order of 16% of the mean ice thickness. Despite large scatter, even limited sets of ice thickness observations are found to be effective in constraining the glacier total volume, particularly when the thickest part of a glacier is surveyed. Other spatial distributions of the ice thickness observations have only a weak influence on the predicted thickness, although surveys restricted to the lowest glacier elevations often result in an underestimation of the glacier's total volume. The response to the various scenarios of data availability is found to be specific to individual models, and while no single best approach emerges, an ensemble-approach based on a combination of models is shown to be beneficial in terms of accuracy and robustness.

ITMIX2 consortium: Douglas J. Brinkerhoff, Johannes J. Fürst, Prateek Gantayat, Fabien Gillet-Chaulet, Matthias Huss, Paul W. Leclercq, Hansruedi Maurer, Mathieu Morlighem, Ankur Pandit, Antoine Rabatel, RAAJ Ramsankaran, Thomas J. Reerink, Ellen Robo, Emmanuel Rouges, Erik Tamre, Ward J.J. van Pelt, Mauro A. Werder, Mohod Farooq Azam, Huilin Li, and Liss M. Andreassen