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How does the choice of validation data reflects the preferred model-parameters used in initialization of the present-day Greenland Ice Sheet?

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Different strategies can be chosen to initialize an ice-sheet model to a state representing present-day conditions. Here we use a forward approach where the ice-sheet model is forced with a paleo-climatic history and allowed to evolve to its present-day state. Nine model parameters are varied in order to form a large ensemble of possible solutions to the present-day state of the Greenland ice sheet (GrIS). This large ensemble of model solutions is then validated against nine different observational datasets from the GrIS to find the most optimal set of model parameters to initialize the present-day state of GrIS. When combined the nine-validation dataset form a multi-metric validation of the ensemble solutions. The preferred ensemble solutions from the multi-metric validation can then be compared to the solutions preferred by only applying one of the nine observational datasets in the validation. This inter-comparison between the validation datasets shows a clear bias in the preferred model parameter as a result of the chosen validation data. Here, many of the individual datasets are not able to separate between good and less good ensemble solutions when evaluated against the multi-metric validation. Most promising of the individual datasets are the observed borehole temperatures at five deep ice-core sites on the GrIS. More commonly used validation data, such as the total ice-sheet volume, is not able to capture the preferred model parameters by the multi-metric validation. The result suggests that ice-sheet modeling choices in general may be highly sensitive to the applied validation data used to select the preferred initial state of the ice sheet.
Further, forcing the model ensemble with future warming scenarios gives an additional insight in the imprints left from the initialization, and thereby the validation data, in estimates of future sea-level rise.