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The uncertainty of modeled accumulation estimates

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Model estimates of the accumulation (precipitation minus evaporation, PE), on the ice sheets of Greenland and Antarctica are of great value because in-situ or remote sensing methods do not provide ice sheet integrated estimates. However, how reliable are those model estimates and how is this uncertainty quantified? A complicating factor for an error analysis is the limited number and irregular distribution of in-situ observations. In 2008, a method that quantified the uncertainty in model output was proposed based on statistical considerations. Here, we present an improved version of this method and show that the method is robust.

To verify this claim, 13 model estimates of PE from 4 different regional climate models for the Greenland Ice Sheet are cross-evaluated. In a cross-evaluation step, one model estimate of PE is considered as the truth and the other model estimates are evaluated against it. Using model values co-located with actual PE observations, the local and ice sheet integrated model uncertainties are calculated. We show that the derived uncertainties correctly assess the deviation between the reference model estimate of PE and the tested model estimates.

Using this method we assess how accurate these 13 model estimates are and discuss which model estimate best represents the PE patterns over Greenland.