Spatial Sensitivities of the Greenland Ice Sheet to Environmental Changes (The SeaRISE Project).

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Abstract

The Sea-level Response to Ice Sheet Evolution (SeaRISE) effort explores the sensitivity of the current generation of ice sheet models to external forcing to gain insight into the potential future contribution to sea-level from the Greenland and Antarctic Ice Sheets. All participating models simulated the ice sheet response to three types of external forcings: a change in oceanic condition, a warmer atmospheric environment, and enhanced basal lubrication. Here, an analysis of the spatial response of the Greenland ice sheet is presented and summarized. Although the modeled responses are not always homogeneous, consistent spatial trends emerge from the ensemble analysis, indicating distinct vulnerabilities of the Greenland ice sheet. There are clear response patterns associated with each forcing, and a similar mass loss at the global scale will result in different mass losses at the regional scale, as well as distinct thickness changes over the ice sheet. All forcings lead to an increased mass loss for the coming centuries, with increased basal lubrication and warmer ocean conditions affecting mainly outlet glaciers, while the impacts of atmospheric forcings affect the whole ice sheet.

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