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Hidden Water: Investigating the Greenland firn aquifer and implications for sea level

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Southeast Greenland's high melt and precipitation rates provide a unique setting for meltwater retention in ice sheets. Although firn aquifers and lateral water transport have been discovered in this area, the final destination of the volume of water that they hold is still generally unknown due to our limited understanding of the en-glacial hydrologic system. Recent analysis of Operation IceBridge (OIB) airborne data has shown that this firn aquifer is extending inland and growing over the past 20 years. We can connect the lateral extent of firn aquifers to surface height changes attributed to surface mass balance (SMB) and firn processes. These processes can be represented by combining observations of accumulation derived from OIB snow radar, density profiles from SUMup, altimetry data from OIB and digital elevation models, and model output from $RACMO_2$ and MAR. However, very few accumulation measurements can be derived from OIB snow radar due to meltwater obstructing the stratigraphy in these areas and in-situ observations of density and accumulation are limited. Therefore, we must put a more emphasis on model output to understand the components of surface height change and how firn microstructure is impacted by the presence of water in this aquifer region.