



Consistent Evidence of Increasing Antarctic Accumulation with Warming

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The higher moisture holding capacity of warmer air is expected to increase Antarctic precipitation implying a negative contribution to sea level over the 21st century and beyond due to associated changes in the Antarctic Ice Sheet surface mass balance.

However, because of strong natural variability observations over the past decades do not allow for a constraining of the relation between temperature and precipitation changes. In contrast here we show that ice-core data spanning the large temperature change during the last deglaciation (21,000 to 10,000 years ago) can be used to overcome this gap in understanding. The ice-core data and modeling results for the last deglaciation agree in showing uniform local sensitivities of about 6% K⁻¹. In addition, the paleo simulations allow for a continental scale aggregation of accumulation and temperature changes. The associated sensitivity of relative accumulation changes to continental average warming is compared to sensitivities derived from future projections by 35 General Circulation Models (CMIP5), and one high-resolution future simulation to derive a consistent increase in accumulation of $5 \pm 1\%$ K⁻¹.

Because some of the mass gain of the AIS is offset by dynamical losses induced by accumulation, we provide a response function allowing for a translation of accumulation changes into the associated sea-level fall that competes with surface melting and dynamical losses induced by other mechanisms.