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Melting of Northern Greenland during the last interglaciation

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The Greenland ice sheet (GrIS) is losing mass at an increasing rate, making it the primary contributor to global eustatic sea level rise. Large melting areas and rapid thinning at its margins have raised concerns about its stability. However, it is conceivable that these observations represent the transient adjustment of the fastest reacting parts of the ice sheet, masking slower processes that dominate the long term fate of the GrIS and its contribution to sea level rise.

We simulate the GrIS during the Eemian interglacial, a period 126,000 years before present (126 ka) with Arctic temperatures comparable to projections for the end of this century. The northeastern part of the GrIS is unstable and retreats significantly, despite moderate melt rates. Unlike the south and west, strong melting in the northeast is not compensated by high accumulation, or fast ice flow. This result is found to be robust in a large ensemble of experiments. As a result, recent findings of limited melting in southern Greenland during the Eemian do not preclude a considerable sea level contribution from the GrIS at that time. The analogy with the present warming suggests that in coming decades, positive feedbacks could increase the rate of mass loss of the northeastern GrIS, exceeding the currently observed melting in the south.