# Die Höhe des westantarktischen Eisschildes im frühen Holozän ist einst innerhalb von 200 Jahren um 480 Meter gesunken.

geschrieben von Chris Frey | 7. März 2024

**Kenneth Richard**

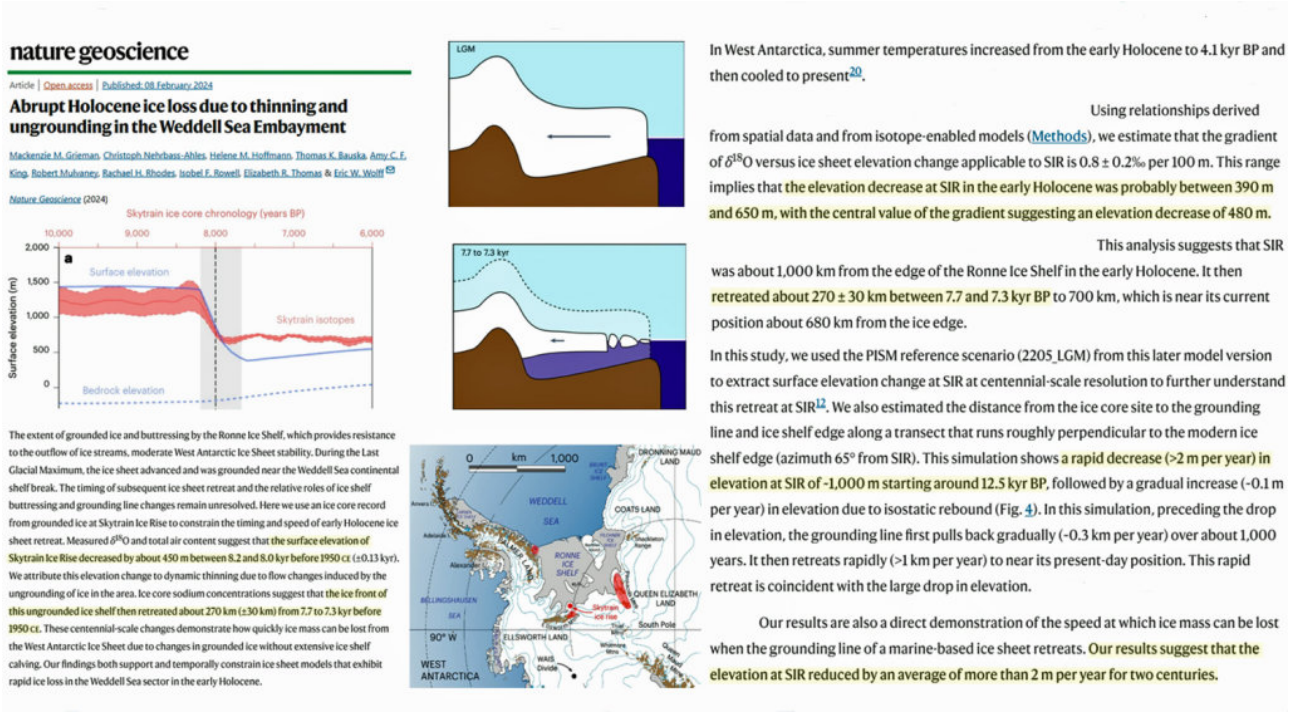
Die Rückzugsraten des westantarktischen Eisschilds (WAIS) waren während des frühen Holozäns, als die ), massiv und übertrafen alle Rückzugsraten der Neuzeit, obwohl $CO_2$-Konzentrationen damals niedrig und stabil waren (~265 ppm).

Neue, in Nature Geoscience veröffentlichte Forschungsergebnisse (Grieman et al., 2024) zeigen, dass die Höhe des Eisschildes der Westantarktis innerhalb von nur 200 Jahren von vor etwa 8.000 bis 8.200 Jahren um ~480 m abnahm, was einem Rückgang von mehr als 2 Metern pro Jahr entspricht.

Die Wissenschaftler dokumentieren auch einen Rückgang der Eisfläche von 270 Kilometern am Untersuchungsort innerhalb von nur 400 Jahren, von vor ~7.300-7.700 Jahren. Das ist eine Rückzugsrate von etwa 675 Metern pro Jahr.

Keine der modernen WAIS-Rückgangsraten ist auch nur annähernd mit denjenigen vergleichbar, die während des frühen bis mittleren Holozäns auf natürliche Weise erreicht worden waren.

Jüngste Forschungsergebnisse (Zhang et al., 2023) weisen darauf hin, dass die mittleren jährlichen Temperaturen der Westantarktis von 1999 bis 2018 um mehr als -1,8 °C (-0,93 °C pro Jahrzehnt) gesunken sind, was einen Rückgang des WAIS in Verbindung mit einem Erwärmungstrend an der Oberfläche ausschließen würde.



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**Abrupt Holocene ice loss due to thinning and ungrounding in the Weddell Sea Embayment**

Mackenzie M. Grieman, Christoph Nehrbass-Ahles, Helene M. Hoffmann, Thomas K. Bauska, Amy C. F. King, Robert Mulvaney, Rachael H. Rhodes, Isobel F. Rowell, Elizabeth R. Thomas & Eric W. Wolff

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The extent of grounded ice and buttressing by the Ronne Ice Shelf, which provides resistance to the outflow of ice streams, moderate West Antarctic Ice Sheet stability. During the Last Glacial Maximum, the ice sheet advanced and was grounded near the Weddell Sea continental shelf break. The timing of subsequent ice sheet retreat and the relative roles of ice shelf buttressing and grounding line changes remain unresolved. Here we use an ice core record from grounded ice at Skytrain Ice Rise to constrain the timing and speed of early Holocene ice sheet retreat. Measured $\delta^{18}O$ and total air content suggest that the surface elevation of Skytrain Ice Rise decreased by about 450 m between 8.2 and 8.0 kyr before 1950 CE (±0.13 kyr). We attribute this elevation change to dynamic thinning due to flow changes induced by the ungrounding of ice in the area. Ice core sodium concentrations suggest that the ice front of this ungrounded ice shelf then retreated about 270 km (±30 km) from 7.7 to 7.3 kyr before 1950 CE. These centennial-scale changes demonstrate how quickly ice mass can be lost from the West Antarctic Ice Sheet due to changes in grounded ice without extensive ice shelf calving. Our findings both support and temporally constrain ice sheet models that exhibit rapid ice loss in the Weddell Sea sector in the early Holocene.



In West Antarctica, summer temperatures increased from the early Holocene to 4.1 kyr BP and then cooled to present[20].

Using relationships derived from spatial data and from isotope-enabled models (Methods), we estimate that the gradient of $\delta^{18}O$ versus ice sheet elevation change applicable to SIR is 0.8 ± 0.2‰ per 100 m. This range implies that the elevation decrease at SIR in the early Holocene was probably between 390 m and 650 m, with the central value of the gradient suggesting an elevation decrease of 480 m.

This analysis suggests that SIR was about 1,000 km from the edge of the Ronne Ice Shelf in the early Holocene. It then retreated about 270 ± 30 km between 7.7 and 7.3 kyr BP to 700 km, which is near its current position about 680 km from the ice edge.

In this study, we used the PISM reference scenario (2205_LGM) from this later model version to extract surface elevation change at SIR at centennial-scale resolution to further understand this retreat at SIR[12]. We also estimated the distance from the ice core site to the grounding line and ice shelf edge along a transect that runs roughly perpendicular to the modern ice shelf edge (azimuth 65° from SIR). This simulation shows a rapid decrease (>2 m per year) in elevation at SIR of ~1,000 m starting around 12.5 kyr BP, followed by a gradual increase (~0.1 m per year) in elevation due to isostatic rebound (Fig. 4). In this simulation, preceding the drop in elevation, the grounding line first pulls back gradually (~0.3 km per year) over about 1,000 years. It then retreats rapidly (>1 km per year) to near its present-day position. This rapid retreat is coincident with the large drop in elevation.

Our results are also a direct demonstration of the speed at which ice mass can be lost when the grounding line of a marine-based ice sheet retreats. Our results suggest that the elevation at SIR reduced by an average of more than 2 m per year for two centuries.

Bildquelle: Grieman et al., 2024

Link: https://notrickszone.com/2024/02/26/the-elevation-of-the-early-holocenes-w-antarctic-ice-sheet-once-plunged-480-meters-in-200-years/

Übersetzt von Christian Freuer für das EIKE