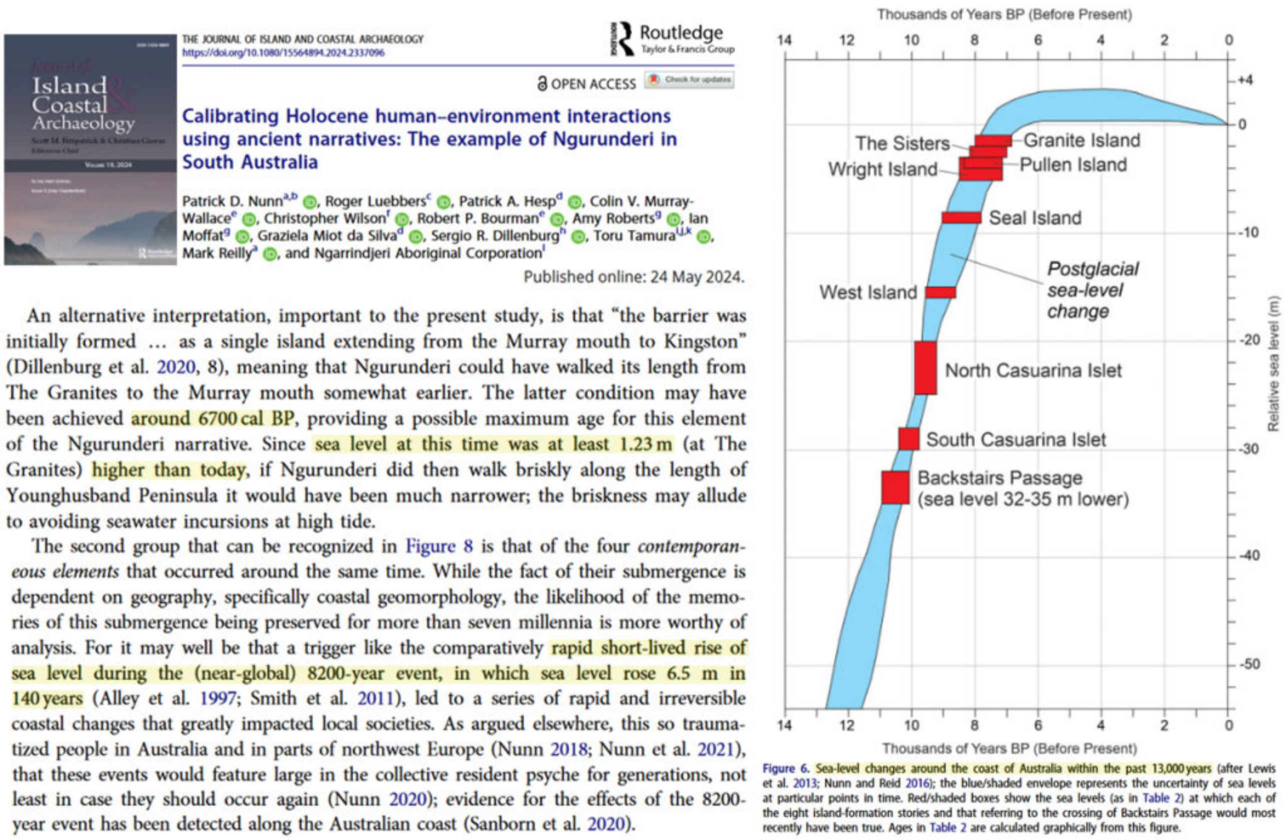
Neue Studie: Der Meeresspiegel stieg vor 8200 Jahren um 4,7 Zentimeter pro Jahr – 30 Mal schneller als heute

geschrieben von Chris Frey | 30. August 2024

Kenneth Richard

Die heutige Anstiegsrate des Meeresspiegels liegt nicht einmal annähernd außerhalb des Bereichs der natürlichen Variabilität.

Eine neue Studie erinnert uns daran, dass der Meeresspiegel vor 8200 Jahren in einem Zeitraum von nur 140 Jahren weltweit um 6,5 Meter gestiegen war. Das sind 470 Zentimeter pro Jahrhundert, 4,7 Zentimeter pro Jahr, und das in einer Zeit, in der der CO_2-Gehalt angeblich bei „sicheren" und stagnierenden 260 ppm lag.



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Calibrating Holocene human–environment interactions using ancient narratives: The example of Ngurunderi in South Australia

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An alternative interpretation, important to the present study, is that "the barrier was initially formed … as a single island extending from the Murray mouth to Kingston" (Dillenburg et al. 2020, 8), meaning that Ngurunderi could have walked its length from The Granites to the Murray mouth somewhat earlier. The latter condition may have been achieved around 6700 cal BP, providing a possible maximum age for this element of the Ngurunderi narrative. Since sea level at this time was at least 1.23 m (at The Granites) higher than today, if Ngurunderi did then walk briskly along the length of Younghusband Peninsula it would have been much narrower; the briskness may allude to avoiding seawater incursions at high tide.

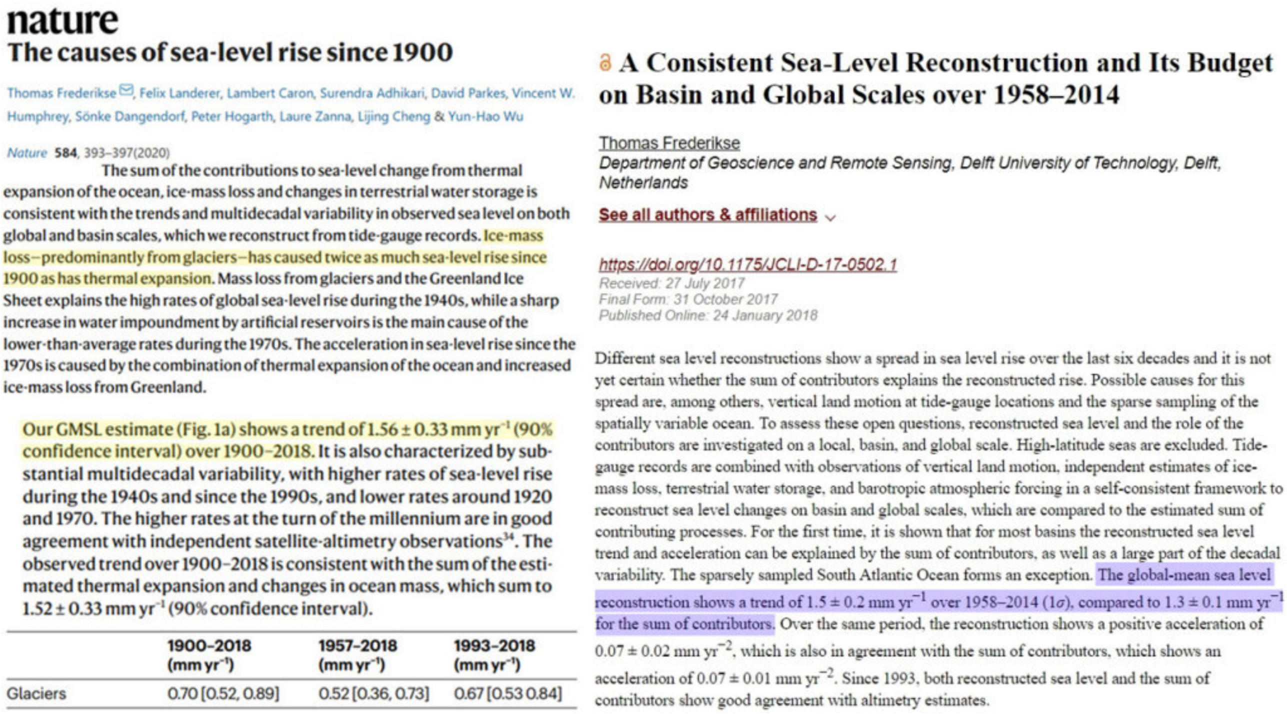
The second group that can be recognized in Figure 8 is that of the four *contemporaneous elements* that occurred around the same time. While the fact of their submergence is dependent on geography, specifically coastal geomorphology, the likelihood of the memories of this submergence being preserved for more than seven millennia is more worthy of analysis. For it may well be that a trigger like the comparatively rapid short-lived rise of sea level during the (near-global) 8200-year event, in which sea level rose 6.5 m in 140 years (Alley et al. 1997; Smith et al. 2011), led to a series of rapid and irreversible coastal changes that greatly impacted local societies. As argued elsewhere, this so traumatized people in Australia and in parts of northwest Europe (Nunn 2018; Nunn et al. 2021), that these events would feature large in the collective resident psyche for generations, not least in case they should occur again (Nunn 2020); evidence for the effects of the 8200-year event has been detected along the Australian coast (Sanborn et al. 2020).

Figure 6. Sea-level changes around the coast of Australia within the past 13,000 years (after Lewis et al. 2013; Nunn and Reid 2016); the blue/shaded envelope represents the uncertainty of sea levels at particular points in time. Red/shaded boxes show the sea levels (as in Table 2) at which each of the eight island-formation stories and that referring to the crossing of Backstairs Passage would most recently have been true. Ages in Table 2 are calculated graphically from this figure.

Quelle: Nunn et al., 2024

Um diese Veränderungsrate in die richtige Perspektive zu rücken: der globale Meeresspiegel stieg von 1900 bis 2018 mit einer Rate von 1,56

Millimetern pro Jahr, einschließlich einer Rate von 1,5 mm pro Jahr während des jüngeren Zeitraums von 1958-2014 (Frederikse et al., 2020, Frederikse et al., 2018). Das sind knapp 16 Zentimeter pro Jahrhundert oder sechzehn Hundertstel eines Zentimeters (0,16 cm) pro Jahr.



nature

The causes of sea-level rise since 1900

Thomas Frederikse, Felix Landerer, Lambert Caron, Surendra Adhikari, David Parkes, Vincent W. Humphrey, Sönke Dangendorf, Peter Hogarth, Laure Zanna, Lijing Cheng & Yun-Hao Wu

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The sum of the contributions to sea-level change from thermal expansion of the ocean, ice-mass loss and changes in terrestrial water storage is consistent with the trends and multidecadal variability in observed sea level on both global and basin scales, which we reconstruct from tide-gauge records. Ice-mass loss—predominantly from glaciers—has caused twice as much sea-level rise since 1900 as has thermal expansion. Mass loss from glaciers and the Greenland Ice Sheet explains the high rates of global sea-level rise during the 1940s, while a sharp increase in water impoundment by artificial reservoirs is the main cause of the lower-than-average rates during the 1970s. The acceleration in sea-level rise since the 1970s is caused by the combination of thermal expansion of the ocean and increased ice-mass loss from Greenland.

Our GMSL estimate (Fig. 1a) shows a trend of 1.56 ± 0.33 mm yr^{-1} (90% confidence interval) over 1900–2018. It is also characterized by substantial multidecadal variability, with higher rates of sea-level rise during the 1940s and since the 1990s, and lower rates around 1920 and 1970. The higher rates at the turn of the millennium are in good agreement with independent satellite-altimetry observations[34]. The observed trend over 1900–2018 is consistent with the sum of the estimated thermal expansion and changes in ocean mass, which sum to 1.52 ± 0.33 mm yr^{-1} (90% confidence interval).

	1900–2018 (mm yr^{-1})	1957–2018 (mm yr^{-1})	1993–2018 (mm yr^{-1})
Glaciers	0.70 [0.52, 0.89]	0.52 [0.36, 0.73]	0.67 [0.53 0.84]

A Consistent Sea-Level Reconstruction and Its Budget on Basin and Global Scales over 1958–2014

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Different sea level reconstructions show a spread in sea level rise over the last six decades and it is not yet certain whether the sum of contributors explains the reconstructed rise. Possible causes for this spread are, among others, vertical land motion at tide-gauge locations and the sparse sampling of the spatially variable ocean. To assess these open questions, reconstructed sea level and the role of the contributors are investigated on a local, basin, and global scale. High-latitude seas are excluded. Tide-gauge records are combined with observations of vertical land motion, independent estimates of ice-mass loss, terrestrial water storage, and barotropic atmospheric forcing in a self-consistent framework to reconstruct sea level changes on basin and global scales, which are compared to the estimated sum of contributing processes. For the first time, it is shown that for most basins the reconstructed sea level trend and acceleration can be explained by the sum of contributors, as well as a large part of the decadal variability. The sparsely sampled South Atlantic Ocean forms an exception. The global-mean sea level reconstruction shows a trend of 1.5 ± 0.2 mm yr^{-1} over 1958–2014 (1σ), compared to 1.3 ± 0.1 mm yr^{-1} for the sum of contributors. Over the same period, the reconstruction shows a positive acceleration of 0.07 ± 0.02 mm yr^{-2}, which is also in agreement with the sum of contributors, which shows an acceleration of 0.07 ± 0.01 mm yr^{-2}. Since 1993, both reconstructed sea level and the sum of contributors show good agreement with altimetry estimates.

Quelle: Frederikse et al., 2020 und Frederikse et al., 2018

Es wird angenommen, dass die Nettoschmelze des grönländischen Eisschilds (GIS) den größten Beitrag zum Anstieg des Meeresspiegels in den letzten Jahrzehnten geleistet hat. Um die GIS-Änderung jedoch in einen Kontext zu stellen, betrug der gesamte Beitrag der Eisschildschmelze zum Meeresspiegelanstieg zwischen 1992 und 2020 nur 1,2 Zentimeter (Simonsen et al., 2021):

Geophysical Research Letters

Greenland Ice Sheet Mass Balance (1992–2020) From Calibrated Radar Altimetry

Sebastian B. Simonsen[1], Valentina R. Barletta[1], William T. Colgan[2], and Louise Sandberg Sørensen[1]

Abstract We present the first 1992–2020 record of Greenland Ice Sheet (GrIS) mass balance derived from multisatellite Ku-band altimetry. We employ an empirical approach as an alternative detailed to radar-propagation modeling, and instead convert elevation changes observed by radar altimetry into mass changes using spatiotemporal calibration fields. This calibration field is derived from a machine learning approach that optimizes the prediction of a previously published mass balance field as a function of ice sheet variables. Our mass balance record shows a GrIS contribution of 12.1 ± 2.3 mm sea-level equivalent since 1992, with more than 80% of this contribution occurring after 2003. Our record also suggests that the 2017 hydrological year is the first year in the 21st century which, within uncertainties, the GrIS was in balance. Overall, the 28-year radar-derived mass balance record we present highlights the potential of the method to provide operational mass balance estimates derived from multisatellite Ku-band altimetry.

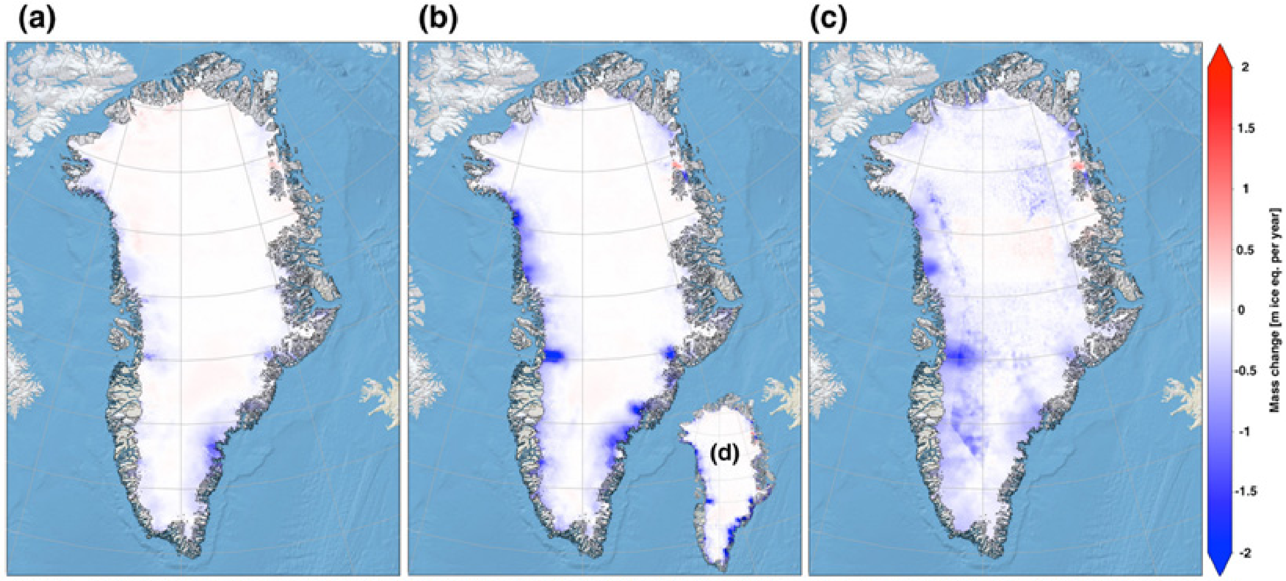

Figure 3. Satellite radar-altimetry mass balance. (a) the early period 1992–1999, with only limited mass loss at the outlet glaciers. (b) The 2000s, whereas the insert (d) showing the spatial distribution of the ICESat-VMB (2003–2009). Compared to the 1990s the accelerating mass loss of the GrIS is clearly visible. (c) The later period 2010–2020, which show a continuation in the mass loss, with the outlet glaciers in the Baffin-area showing the speed-up in the mass loss.

Quelle: Simonsen et al., 2021

Die natürliche Schwankungsbreite des Meeresspiegelanstiegs auf der Erde, die zeitweise bis zu 4,7 cm pro Jahr betragen hatte, war somit 30-mal größer als die „anthropogene“ Rate der Neuzeit (1900-2018), die 0,156 cm pro Jahr beträgt.

Link: https://notrickszone.com/2024/08/26/study-sea-levels-rose-4-7-centimeters-per-year-8200-years-ago-30-times-faster-than-modern-rates/

Übersetzt von Christian Freuer für das EIKE