

Minulost Grónska bez ledu staví klimatické dogma na hlavu

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Co nechtějí klimatičtí hysterici slyšet: Uprostřed Grónska, kde je nyní tříkilometrová vrstva ledu, se kdysi dařilo rostlinám a hojně se množil hmyz – a na úrovni CO₂, kterou by dnešní klima považovalo za téměř příkladné. standardy fanatiků.

Objev publikovaný ve studii „Fosilie rostlin, hmyzu a hub pod středem grónského ledového příkrovu jsou důkazem doby bez ledu“ zní jako provokace pro klimatickou zeitgeist: Vědci dokázali, že centrální Grónsko je v In. v nedávné geologické minulosti – asi před 250 000 až 1,1 miliony let – byla zcela bez ledu. Je ironií, že v době, kdy se hladiny CO₂ v atmosféře pohybovaly mezi 275 a 290 ppm – hodnoty, o kterých si dnes klimatičtí fanatici mohou nechat jen zdát.

Při vrtání na projektu GISP2 výzkumníci narazili na ohromující nálezy: zbytky máku, mechové kapradiny, dřevěné tkáně a části hmyzu. Skutečná vegetace tundry, kde je dnes věčný led.

Biermanovi vědci vypočítali, že červencové teploty se tehdy pohybovaly mezi +3 a +7 °C – což je dramatický rozdíl oproti –7 °C naměřeným dnes.

Plant, insect, and fungi fossils under the center of Greenland's ice sheet are evidence of ice-free timesPaul R. Bierman¹, Halley M. Mastro², Dorothy M. Peteet^{3,4}, Lee B. Corbett⁵, Eric J. Steig⁶, Chris T. Halsted⁷, Marc M. Caffee⁸, Alan J. Hidy⁹, Greg Balco⁵, Ole Bennike¹⁰, and Barry Rock¹¹

The persistence and size of the Greenland Ice Sheet (GrIS) through the Pleistocene is uncertain. This is important because reconstructing changes in the GrIS determines its contribution to sea level rise during prior warm climate periods and informs future projections. To understand better the history of Greenland's ice, we analyzed glacial till collected in 1993 from below 3 km of ice at Summit, Greenland. The till contains plant fragments, wood, insect parts, fungi, and cosmogenic nuclides showing that the bed of the GrIS at Summit is a long-lived, stable land surface preserving a record of deposition, exposure, and interglacial ecosystems. Knowing that central Greenland was tundra-covered during the Pleistocene informs the understanding of Arctic biosphere response to deglaciation.

In 1993, the Greenland Ice Sheet Project 2 (GISP2) recovered the only basal material from central Greenland: 40 cm of erratic boulders, 8 cm of till, and 105 cm of rock (Fig. 1B) 6–8. Analysis of sediment in the lowest basal ice revealed substantial organic carbon and nitrogen and meteoric ¹⁰Be—consistent with limited erosion, long subaerial exposure, and the presence of soil (9). A depth profile of cosmogenic nuclides from the GISP2 subglacial rock core indicated that central Greenland deglaciated at least once in the last 1.1 My (6). Here, we re-examine the till to learn about past conditions at Summit. The presence of poppy, spike-moss, fungal sclerotia, woody tissue, and insect parts in the GISP2 till shows that tundra vegetation once covered central Greenland, mandating that the island was largely ice-free. The fossil assemblage suggests that ice was replaced by a cold, dry, open environment where snow lingered into summer. We make this interpretation

because we found *S. rupestris*, which forms creeping mats on sandy gravel or rocky places (11) and is today found only in southern Greenland (12). *S. rupestris* forms spores, such as those identified in the till, during late July (13). *Papaver sect. Scapiflora* is a dominant member of the most depauperate vegetation assemblage that borders the Arctic Ocean. In the High Arctic, they grow in areas with long-lasting snow cover (14). *Papaver* blooms in June–July and is pollinated by bees in early summer but by flies later (15).

The very dry exposed vegetation assemblage with abundant *S. rupestris* megaspores, fragile *Cenococcum* fungal sclerotia, and lack of other taxa including bryophytes suggests minimal fossil transport and a mean July temperature in central Greenland somewhere between 1 and 10 °C (16) reflecting the wide distribution of *Papaver sect. Scapiflora* today in Greenland (17). The botanically determined temperature range is consistent with the 3 to 7 °C range derived using lapse rates (SI Appendix). The abundance of macrofossils in the till explains the organic carbon and nitrogen found in sediment from GISP2 basal ice. High concentrations of meteoric ¹⁰Be (9) on basal ice sediment reflect stability and exposure of the soil developed on the till in which the plants grew.

The timing of the most recent exposure of Summit remains uncertain although rock core ²⁶Al/¹⁰Be data indicate that it occurred within the last 1.1 My (6). Argon measurements in the overlying clear ice suggest that it persisted for at least the past 250 ky (18).

Paleotemperature estimate

We have two ways of estimating the temperature at GISP2 when the ice was gone, the first based on physical principals and contemporary empirical measurements, and the second based on inferences related to the ecology of plant fossils found in the till.

Understanding the temperature at the GISP2 site when the ice was gone requires considering both the elevation of the site when it was deglaciated and the environmental lapse rate in the summer when the plants grew. The GISP2 site on the present ice surface is at an elevation of 3216 m asl, and the ice core length is 3053 meters to the bed. Thus, the current bed elevation is about 160 m asl. The contemporary environmental lapse rate (determined empirically by ref 14) is lowest in July when the plants would have been growing (0.46 °C per 100 m).

Using the July mean temperature for Summit (-7 °C) and the 0.46 °C per 100 m lapse rate suggests that if there were no isostatic rebound, the surface temperature during an interglacial comparable to the present would be about 7 °C. However, this is an upper bound as some rebound must have occurred while the ice was thinning and then absent. A recent calculation suggests that if rebound went to completion, a process that would take many thousands to a few tens of thousands of years without ice, then the elevation at GISP2 would be at most 900 m (15). In this case, the July mean surface temperature would have been about 3 °C.

Thus, if we accept modern interglacial July environmental lapse rate (0.46/100 m) we can bracket the expected July mean temperature (peak of growing season) with ice gone between 7 °C (no rebound) and 3 °C (full rebound) – fully consistent with the estimate based on the plant assemblage. However, our simple calculation ignores feedbacks such as albedo changes from substantial reduction in ice extent as well as changes in humidity and cloud cover that likely changed the environmental lapse rate. Such considerations are outside the scope of this simple, first-order analysis but suggest that our estimate of paleo-temperature when the plants grew at GISP2 are probably minima.

Studie zdroje obrazu

Zvláště zajímavé: Koncentrace CO₂ v tomto období bez ledu téměř přesně odpovídá hodnotám „malé doby ledové“ mezi lety 1700 a 1900. Tehdy stejně jako dnes bylo Grónsko pokryto obrovskými ledovými masami. Zjištění, které vážně otřásá jednoduchou rovnicí „více CO₂ rovná se méně ledu“. Studie vyvolává zásadní otázku. Například: Pokud Grónsko dokázalo být bez ledu při nízkých úrovních CO₂, jaké faktory skutečně určují námrazu nebo tání? Odpověď může být složitější, než by si někteří klimatičtí hysterici přáli.



(A) Map of coring sites.

To, co zde vidíme, není malá záležitost: je to vědecký důkaz, že vztah mezi koncentracemi CO₂ a zaledněním Grónska je mnohem méně jasný, než se dříve myslelo. Nepříjemná pravda pro všechny, kteří chtějí zredukovat složité klimatické vztahy (které jsem také zmínil ve své knize „CO₂ není náš nepřítel“) na jednoduché vzorce CO₂.

Zdá se, že příroda se nedrží moderních klimatických dogmat všech hysterek. Možná bychom se měli častěji dívat do minulosti, než uděláme ukvapené závěry o budoucnosti. Snaha omezit klimatické změny na jediný faktor – totiž CO₂ – prostě nestačí.

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