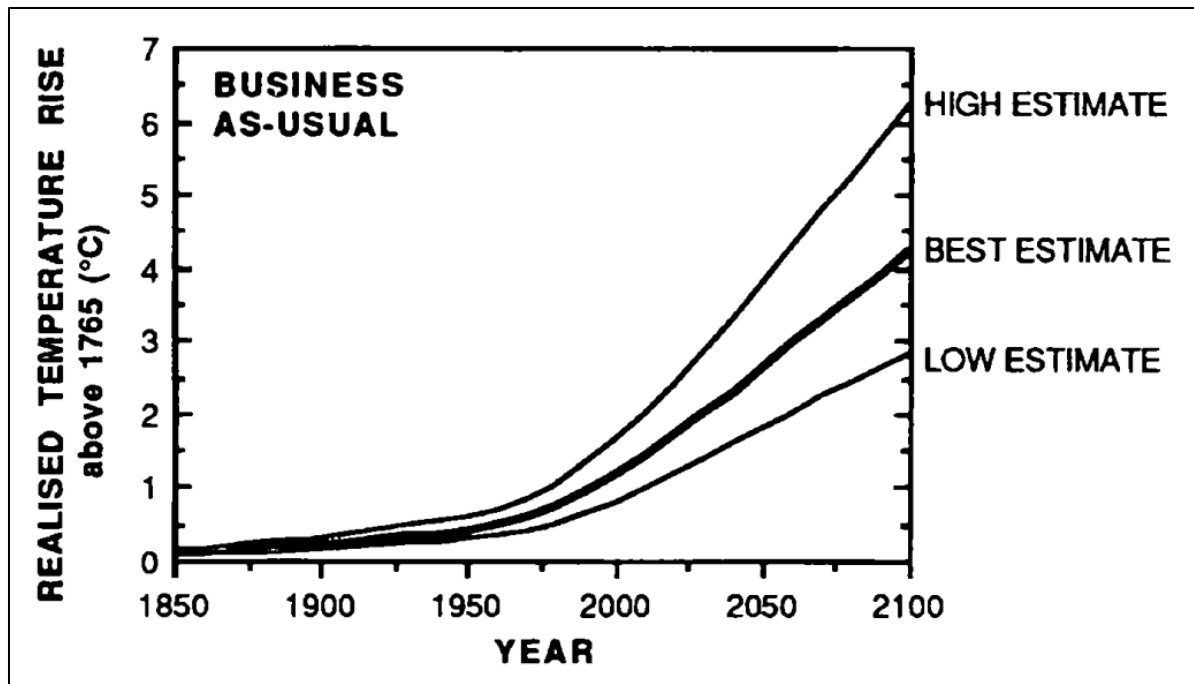


Picturing the Arctic of tomorrow

What the science says

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@FMassonnet

Turning abstract numbers into evidence-based plausible narratives: climate science's next grand challenge?



IPCC First assessment Report (1992)



Smoke in New York due to dramatic wildfires in Quebec

A first attempt to « storify » climate projections

La Première - Info

Déclic - Le Tournant

Un monde à +2° ça ressemble à quoi?

40 min | Publié le 19/04/23 | Disponible jusqu'au 18/04/2024

-39 min

Ecouter Tous les épisodes Ajouter à mon Auvio Partager

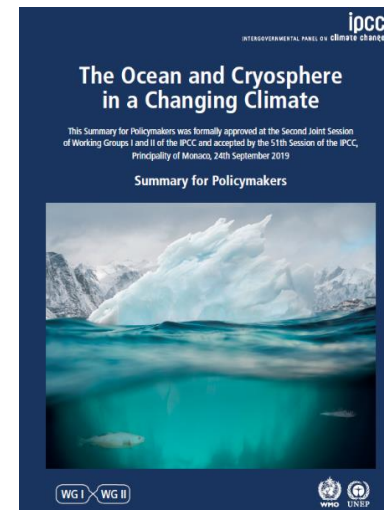
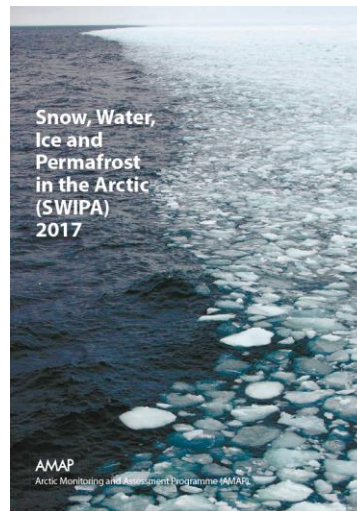
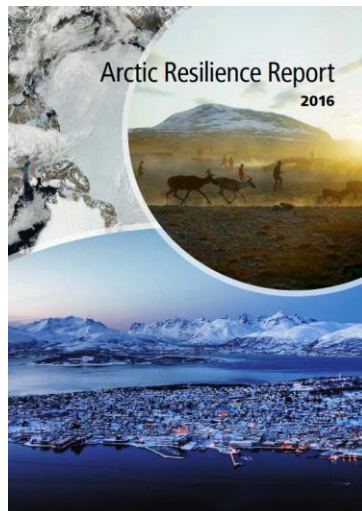
Le dernier rapport de synthèse du GIEC nous le démontre, nous sommes en route pour un réchauffement de 1,5° à l'horizon 2045. Et si nous ne redoublons pas d'effort, nous allons largement dépasser les 2° d'augmentation de la température moyenne globale, sur la planète. Mais que nous disent ces températures moyennes ? Et ça changerait quoi, un monde qui se réchauffe à +2° au lieu d'1,5° ? Dans cet épisode très concret et imagé on prend la mesure de tout ce que pourrait changer ce 0,5° en plus. Une différence majeure, presque un autre monde. Avec les climatologues François Massonnet (FNRS - UCLouvain) et Wim Thiery (VUB) ainsi que la spécialiste en migrations climatiques Alice Baillat (IDMC).



<https://auvio.rtbf.be/media/declic-le-tournant-declic-le-tournant-un-monde-a-20-ca-resssemble-a-quoi-3025852>

Outline

- Objective: moving from abstract, statistical indices of Arctic changes to actual, palpable storylines with concrete implications
- A case study: consequences of amplified Arctic temperatures



+ scientific literature

Amplified Arctic air temperature changes

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Article | [Open Access](#) | [Published: 11 August 2022](#)

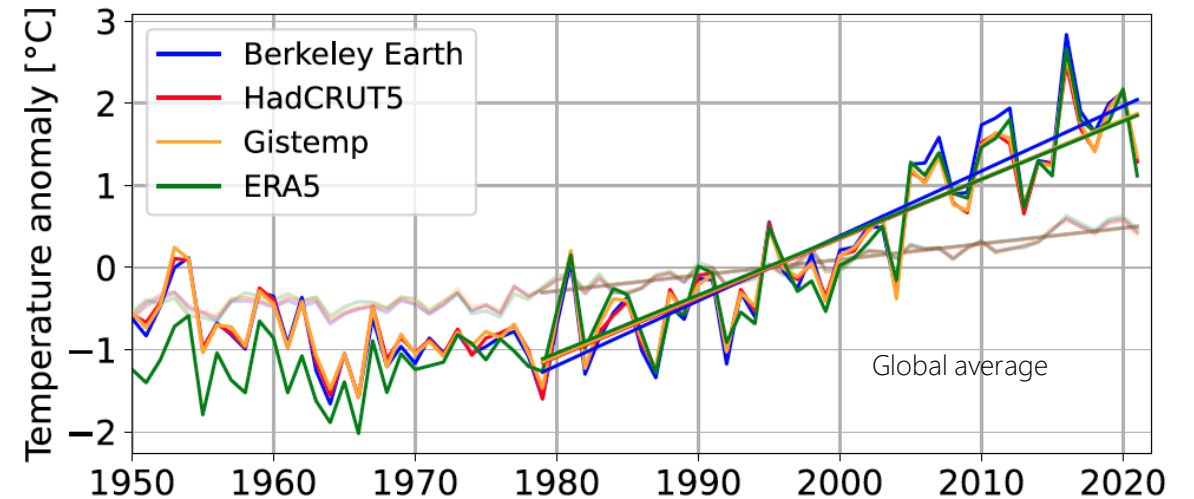
The Arctic has warmed nearly four times faster than the globe since 1979

[Mika Rantanen](#) [✉](#), [Alexey Yu. Karpechko](#), [Antti Lipponen](#), [Kalle Nordling](#), [Otto Hyvärinen](#), [Kimmo Ruosteenoja](#), [Timo Vihma](#) & [Ari Laaksonen](#)

[Communications Earth & Environment](#) 3, Article number: 168 (2022) | [Cite this article](#)

77k Accesses | 167 Citations | 6907 Altmetric | [Metrics](#)

Change in annual mean surface air temperature relative to 1981-2010



The limited meaning of averages

Bill Gates runs into a bar.

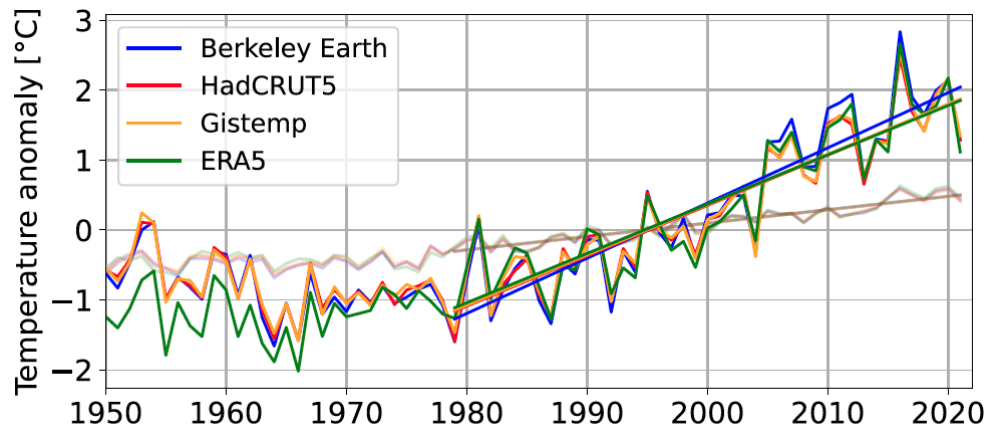
Suddenly, everyone becomes a billionaire.

On average.

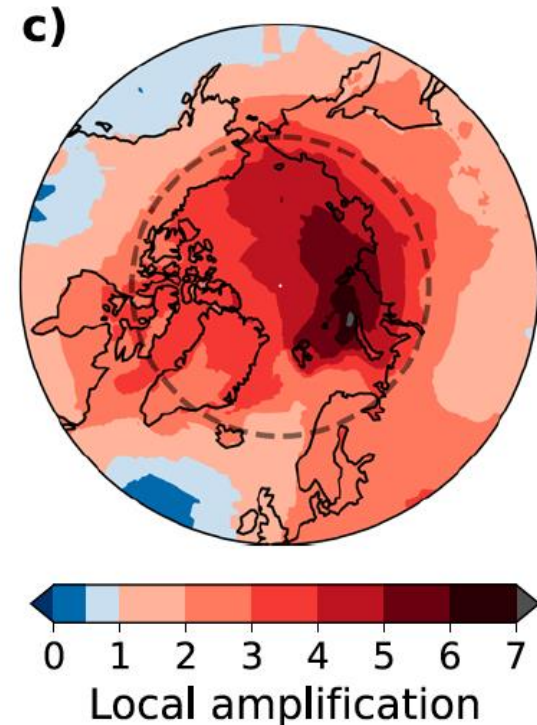


Amplified Arctic air temperature changes

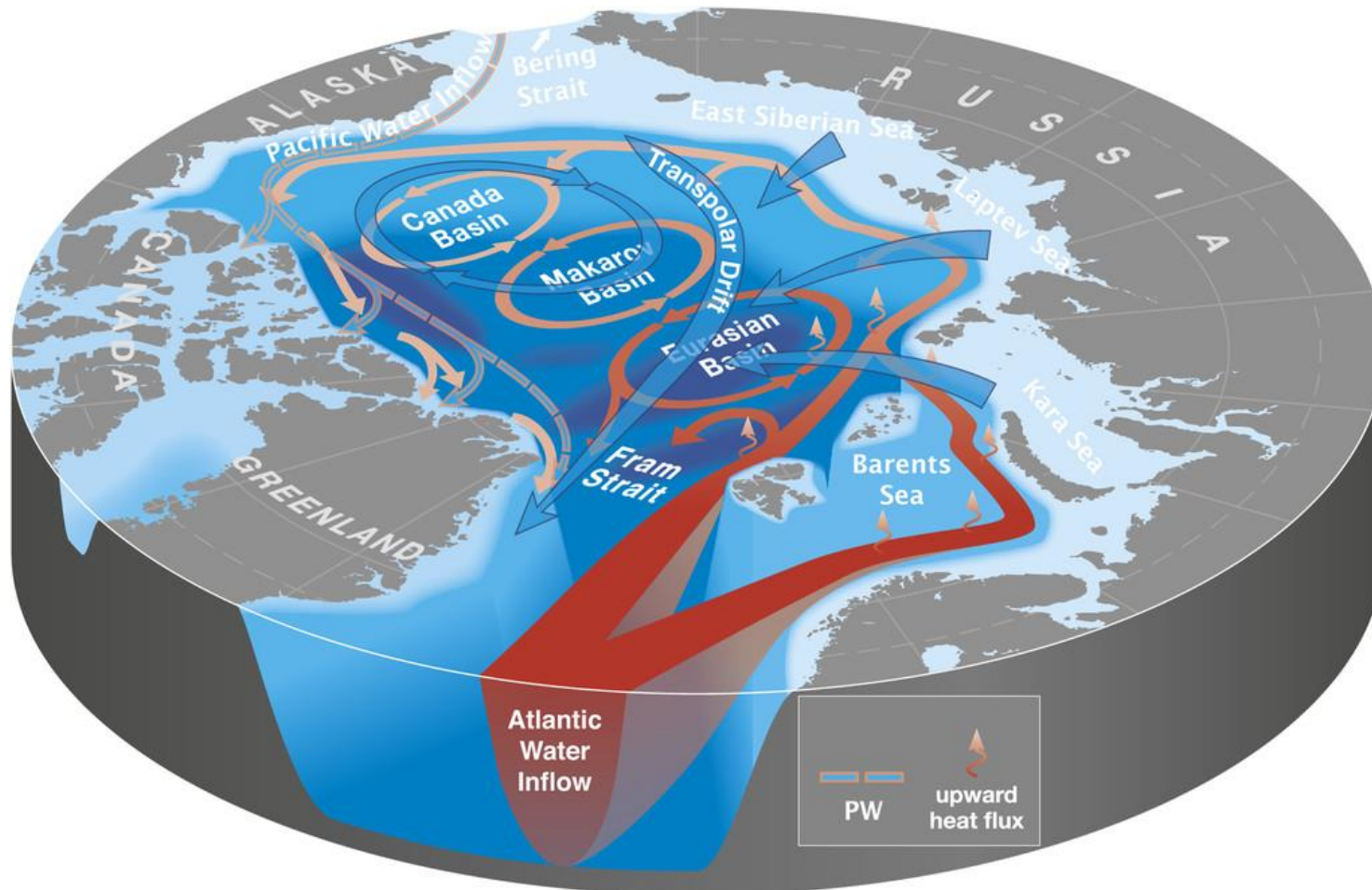
Change in annual mean surface air temperature relative to 1981-2010



Spatial distribution of the amplification factor (relative to the global average)

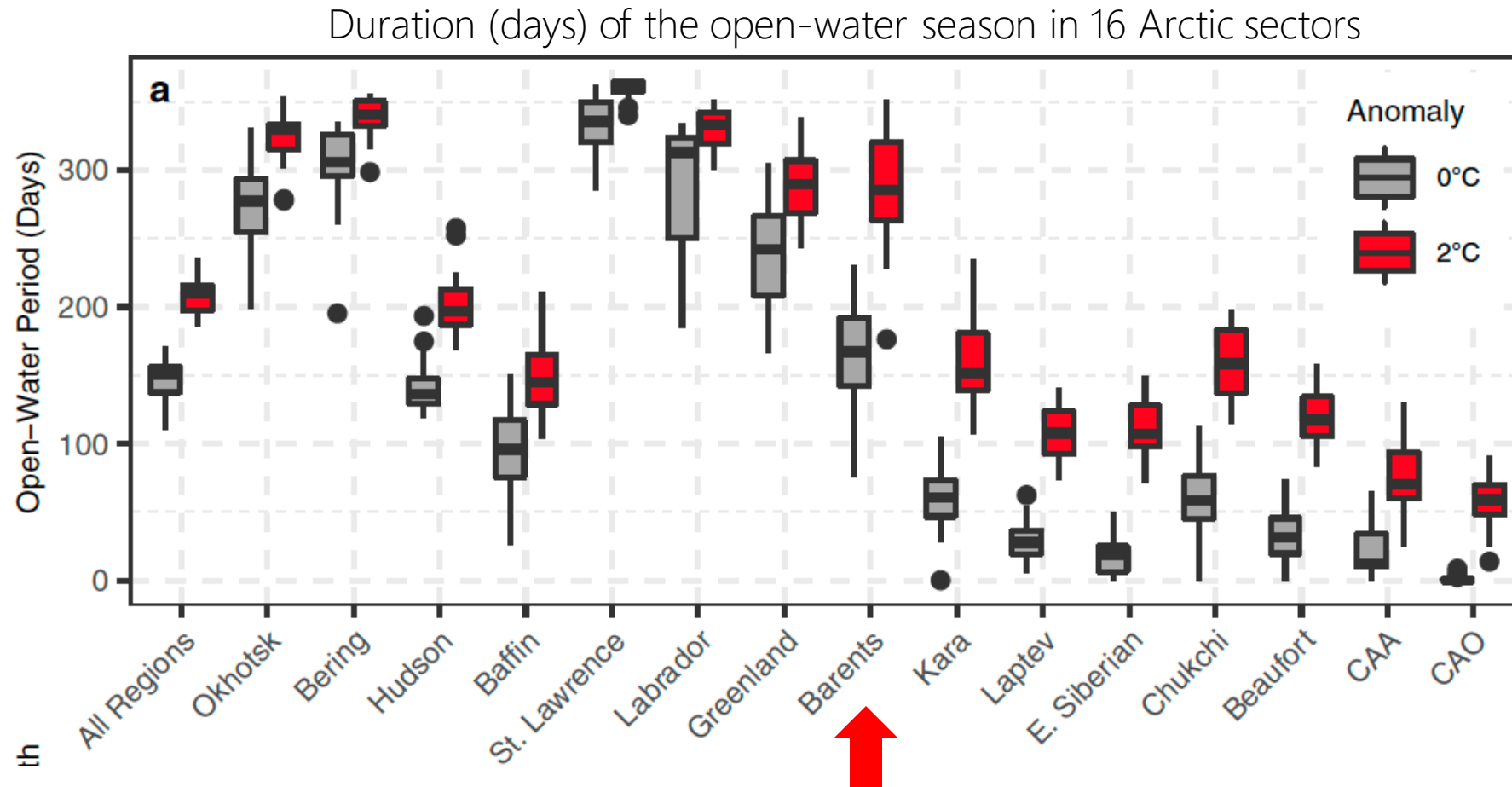


« Atlantification » of the Arctic: when climate change challenges geography

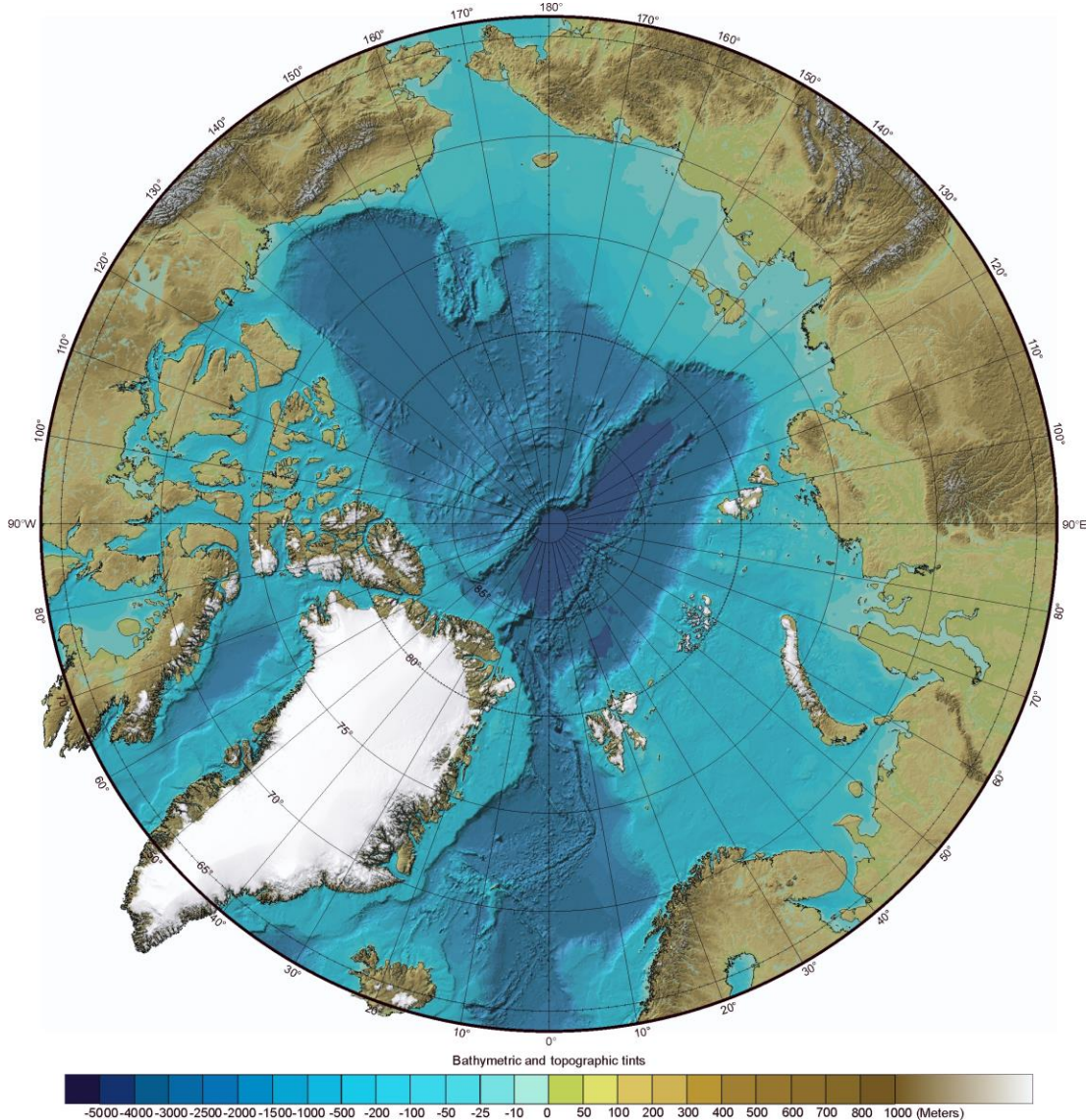


Rising temperatures, combined with increased poleward oceanic heat transport and sea ice disappearance, imply that, climatically speaking, **the Barents Sea is progressively becoming an outpost of the Atlantic Ocean and no longer a definite Arctic entity**

Soon 10 months without sea ice in the Barents Sea?

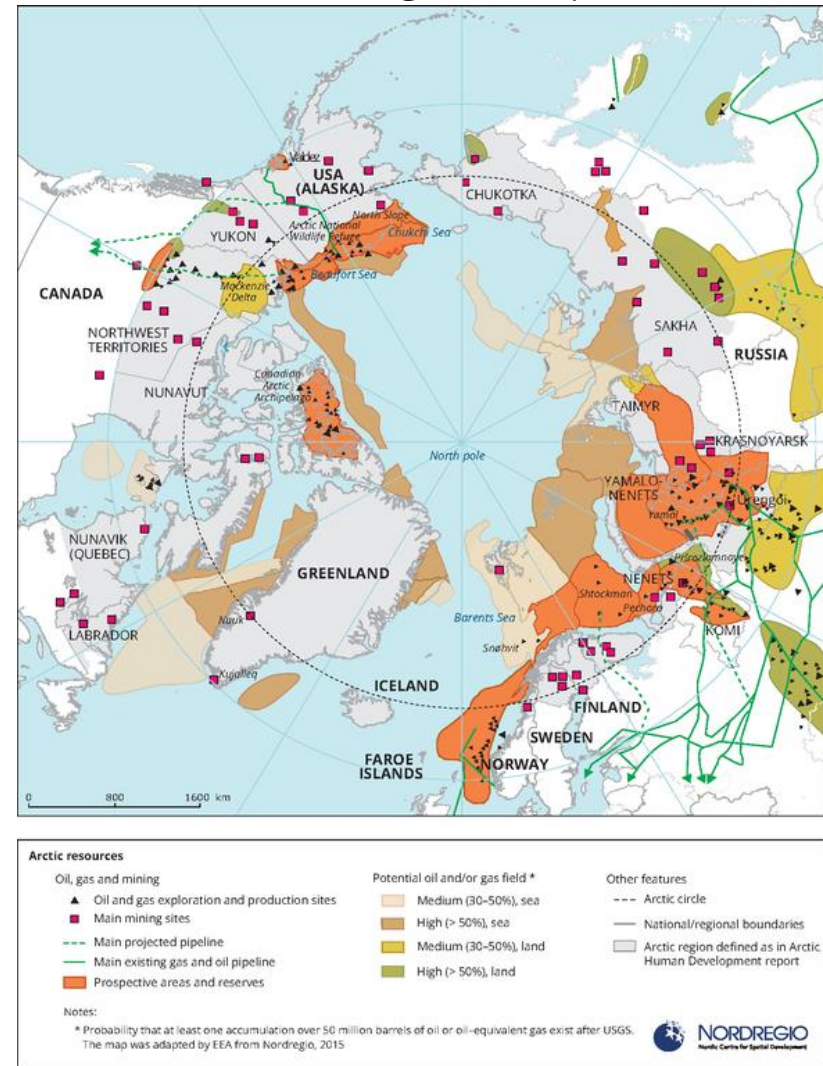


Bathymetry of the Arctic Ocean



<https://www.ngdc.noaa.gov/mgg/bathymetry/arctic/currentmap.html>

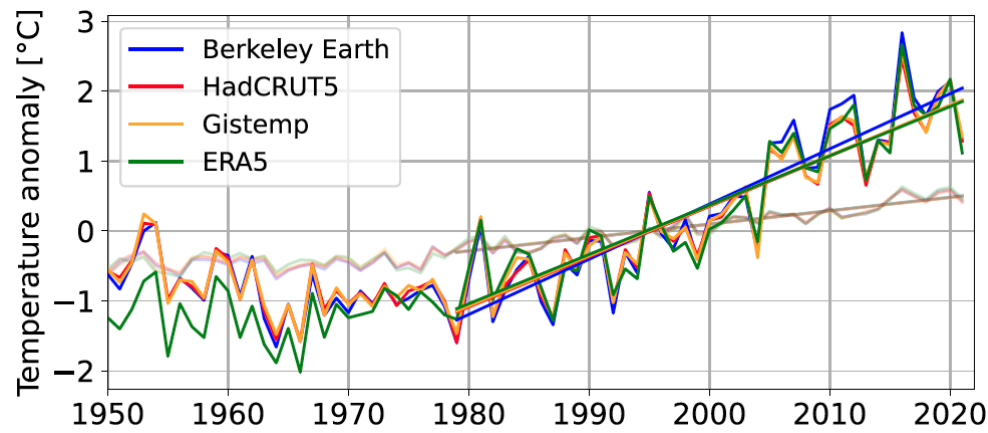
Gas, oil and mining resources in the Arctic (existing and potential)



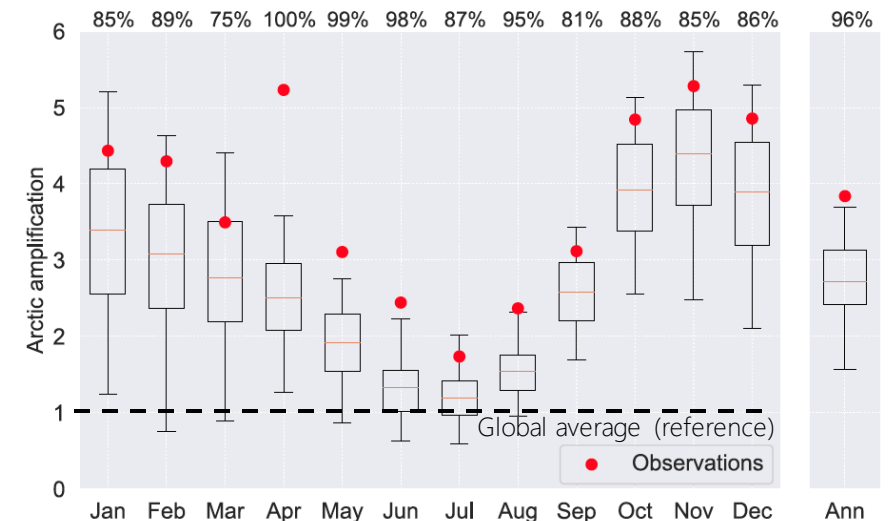
<https://www.eea.europa.eu/data-and-maps/figures/arctic-resources>

Amplified Arctic air temperature changes

Change in annual mean surface air temperature relative to 1981-2010



Breakdown by season



September



October



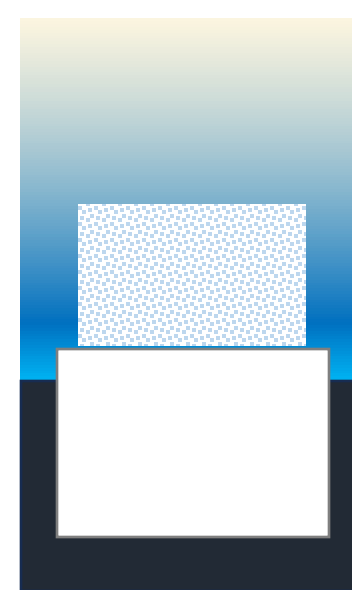
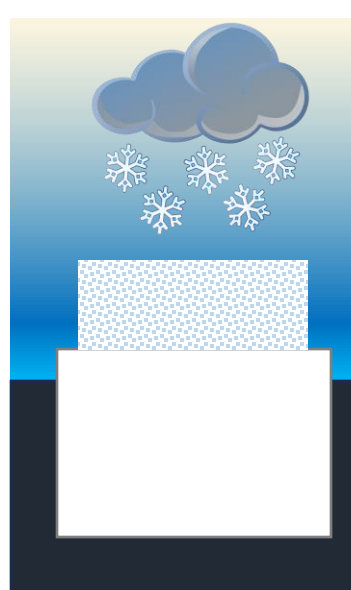
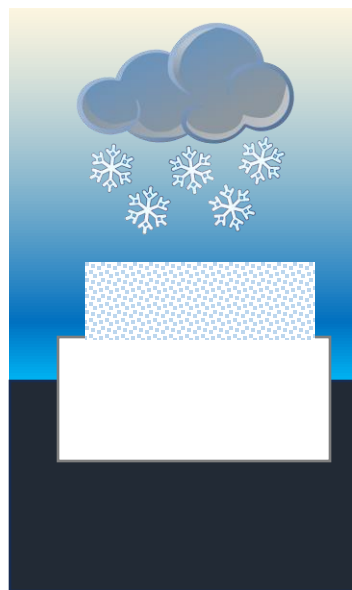
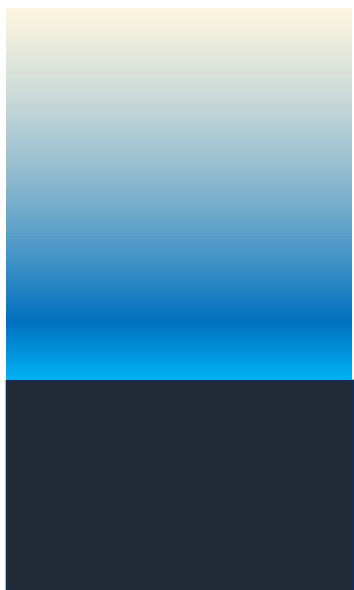
November



December

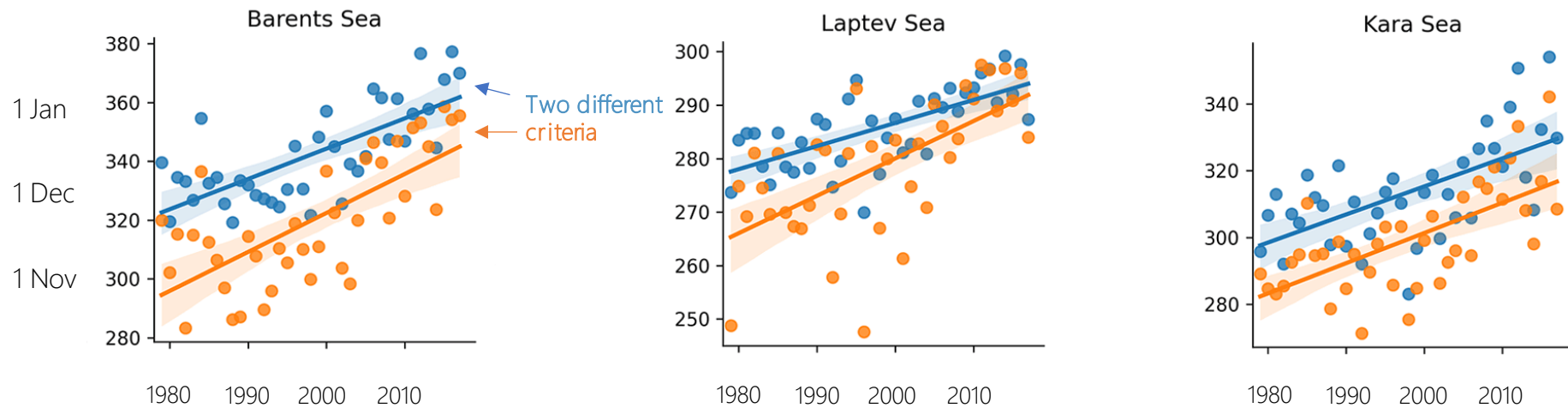


April



The date of sea ice freeze-up has shifted by ~1 day every year

Day of year (counted from January 1) at which sea ice is formed



September



October



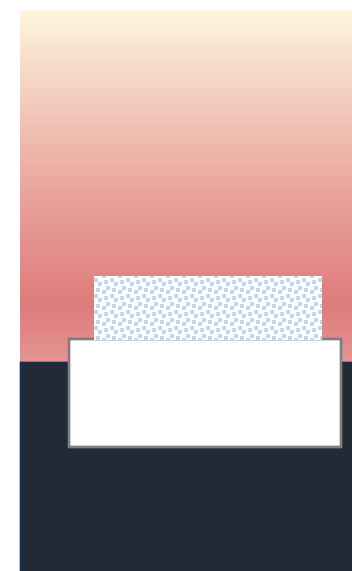
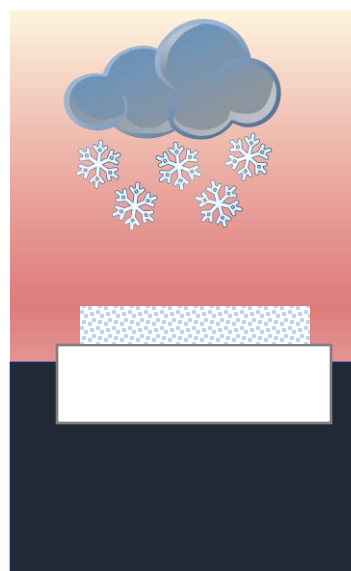
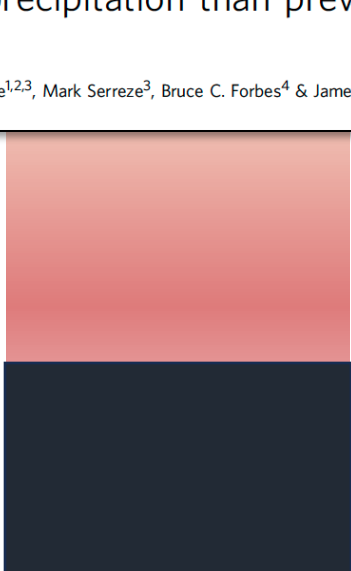
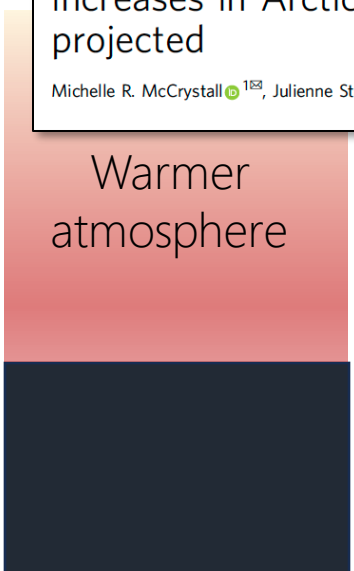
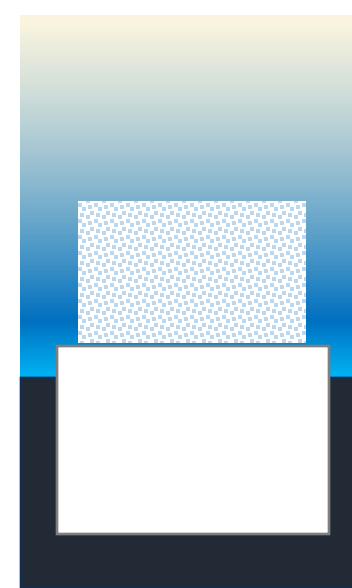
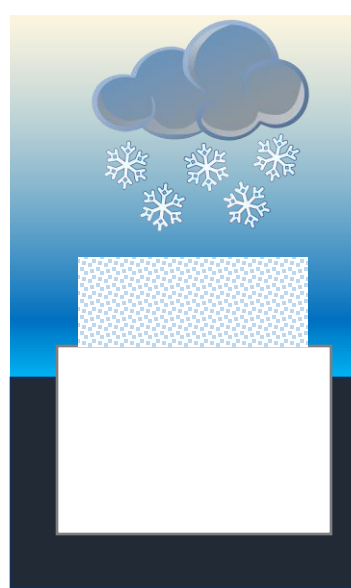
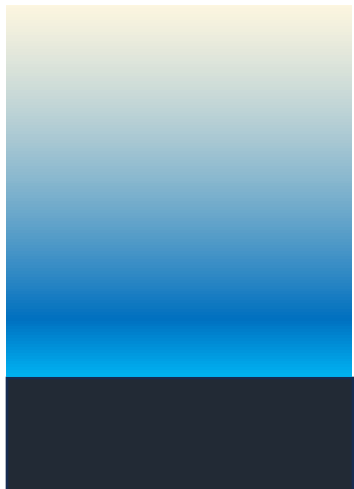
November



December



April



ARTICLE

Check for updates

<https://doi.org/10.1038/s41467-021-27031-y>

OPEN

New climate models reveal faster and larger increases in Arctic precipitation than previously projected

Michelle R. McCrystall¹, Julienne Stroeve^{1,2,3}, Mark Serreze³, Bruce C. Forbes⁴ & James A. Screen⁵

Warmer atmosphere



GEOPHYSICAL RESEARCH LETTERS, VOL. 39, L17505, doi:10.1029/2012GL052794, 2012

Projected decline in spring snow depth on Arctic sea ice caused by progressively later autumn open ocean freeze-up this century

P. J. Hezel,¹ X. Zhang,¹ C. M. Bitz,¹ B. P. Kelly,² and F. Massonnet³

Received 19 June 2012; revised 24 July 2012; accepted 5 August 2012; published 15 September 2012.

« The area with snow depths above 20 cm —a threshold needed for ringed seals to build snow caves — declines by 70% [by 2100 with the business-as-usual emission scenario] »

An excessive focus on traditional metrics of changes (average temperature, sea ice) potentially detracts us from what the Arctic will look like in reality.

More attention must be paid to (1) the geographic and seasonal manifestation of these changes, and (2) the physical interactions between physical variables.