

Fragen zum Klimawandel - (AC)³-WissenschaftlerInnen antworten.



Fact Sheet „Warum erwärmt sich die Arktis stärker als der Rest der Erde?“

- Literatur -

- 1 IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press., <https://www.ipcc.ch/report/ar6/wg1/>
- 2 Serreze, M. C. and R.G. Barry, 2011: Processes and impacts of Arctic amplification: A research synthesis, Global and Planetary Change, 77(1), 85-96, <https://doi.org/10.1016/j.gloplacha.2011.03.004>
- Thoman, R. L., J. Richter-Menge, and M. L. Druckenmiller, Eds., 2020: Arctic Report Card 2020, <https://doi.org/10.25923/mn5p-t549>, <https://arctic.noaa.gov/Report-Card>
- Stuecker, M. F., Bitz, C. M., Armour, K. C., Proistosescu, C., Kang, S. M., Xie, S.-P., et al., 2018: Polar amplification dominated by local forcing and feedbacks, Nature Climate Change, 8, 1076–1081, <https://doi.org/10.1038/s41558-018-0339-y>
- Hahn L. C., Armour K. C., Zelinka M. D., Bitz C. M., and A. Donohoe, 2021: Contributions to Polar amplification in CMIP5 and CMIP6 models, Frontiers in Earth Science, 9, <https://www.frontiersin.org/article/10.3389/feart.2021.710036>
- Smith, D. M., Screen, J. A., Deser, C., Cohen, J., Fyfe, J. C., García-Serrano, J., et al., 2019: The Polar Amplification Model Intercomparison Project (PAMIP) Contribution to CMIP6: Investigating the causes and consequences of Polar amplification, Geoscientific Model Development, 12, 1139-1164, <https://doi.org/10.5194/gmd-12-1139-2019>
- 3 Goosse, H., Kay, J.E., Armour, K.C. et al., 2018: Quantifying climate feedbacks in polar regions, Nature Communications, 9, 1919, <https://doi.org/10.1038/s41467-018-0417>
- Wendisch, M., M. Brückner, J.P. Burrows, S. Crewell, K. Dethloff, K. Ebelt, C. Lüpkes, A. Macke, J. Notholt, J. Quaas, A. Rinke, and I. Tegen, 2017: Understanding causes and effects of rapid warming in the Arctic, EOS, Transactions, American Geophysical Union, 98, <https://doi.org/10.1029/2017EO064803>
- Block, K., and T. Mauritsen, 2013: Forcing and feedback in the MPI-ESM-LR coupled model under abruptly quadrupled CO₂, Journal of Advances in Modeling Earth Systems, 5, 676–691, <https://doi.org/10.1002/jame.20041>

Block, K., F.A. Schneider, J. Mülmenstädt, M. Salzmann, and J. Quaas, 2020: Climate models disagree on the sign of total radiative feedback in the Arctic, Tellus A: Dynamic Meteorology and Oceanography, 72, 1-14, <https://doi.org/10.1080/16000870.2019.1696139>

4 <https://ourworldindata.org/co2-emissions>

5 Jain, P.C., 1993: Greenhouse effect and climate change: scientific basis and overview, Renewable Energy, 3 (4–5), 403-420, [https://doi.org/10.1016/0960-1481\(93\)90108-S](https://doi.org/10.1016/0960-1481(93)90108-S)

Le Treut, H., R. Somerville, U. Cubasch, Y. Ding, C. Mauritzen, A. Mokssit, T. Peterson and M. Prather, 2007: Historical Overview of Climate Change. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
https://archive.ipcc.ch/publications_and_data/ar4/wg1/en/faq-1-3.html

6 Hall, A., 2004: The role of surface albedo feedback in climate, Journal of Climate, 17 (7), 1550-1568, [https://doi.org/10.1175/1520-0442\(2004\)017%3C1550:TROSAF%3E2.0.CO;2](https://doi.org/10.1175/1520-0442(2004)017%3C1550:TROSAF%3E2.0.CO;2)

Kashiwase, H., Ohshima, K.I., Nihashi, S. et al., 2017: Evidence for ice-ocean albedo feedback in the Arctic Ocean shifting to a seasonal ice zone, Scientific Report, 7, 8170, <https://doi.org/10.1038/s41598-017-08467-z>

Dai, A., Luo, D., Song, M., and J. Liu, 2019: Arctic amplification is caused by sea-Ice loss under increasing CO₂, Nature Communications, 10, 121, <https://doi.org/10.1038/s41467-018-07954-9>

Donohoe, A, E Blanchard-Wrigglesworth, A Schweiger, and P Rasch, 2020: The effect of atmospheric transmissivity on model and observational estimates of the sea ice albedo feedback, Journal of Climate, <https://doi.org/10.1175/jcli-d-19-0674.1>

7 <https://wiki.bildungsserver.de/klimawandel/index.php/Albedo>

8 <https://www.meereisportal.de/> und <http://nsidc.org/arcticseaicenews/>

9 Pithan, F., and T. Mauritsen, 2014: Arctic amplification dominated by temperature feedbacks in contemporary climate models, Nature Geoscience, 7, 181–184, <https://doi.org/10.1038/ngeo2071>

10 Boeke, R. C., Taylor, P. C., and S.A. Sejas, 2021: On the nature of the Arctic's positive lapse-rate feedback, Geophysical Research Letters, 48, e2020GL091109, <https://doi.org/10.1029/2020GL091109>

Feldl, N., Po-Chedley, S., Singh, H. K. A., Hay, S., and P.J. Kushner, 2020: Sea ice and atmospheric circulation shape the high-latitude lapse rate feedback, npj Climate and Atmospheric Science, 3 (41), <https://doi.org/10.1038/s41612-020-00146-7>

Lauer, M., K. Block, M. Salzmann, and J. Quaas, 2020: CO₂-forced changes of Arctic temperature lapse-rates in CMIP5 models, Meteorologische Zeitschrift, 29 (1), 79-93, <https://doi.org/10.1127/metz/2020/0975>

Graversen, R. G., Langen, P. L., and T. Mauritsen, 2014: Polar amplification in CCSM4: Contributions from the lapse rate and surface albedo feedbacks, *Journal of Climate*, 27, 4433–4450, <https://doi.org/10.1175/JCLI-D-13-00551.1>

11 Zhang, Y., D. J. Seidel, J.-C. Gola, C. Deser, and R. A. Tomas, 2011: Climatological characteristics of Arctic and Antarctic surface-based inversions, *Journal of Climate*, 24, 5167–5186, <https://doi.org/10.1175/2011JCLI4004.1>

Zhang, L., Ding, M., Dou, T., Huang, Y., Lv, J., and C. Xiao, 2021: The shallowing surface temperature inversions in the Arctic, *Journal of Climate*, 34(10), 4159–4168, <https://doi.org/10.1175/JCLI-D-20-0621.1>

Nygård, T., T. Valkonen, and T. Vihma, 2014: Characteristics of Arctic low-tropospheric humidity inversions based on radio soundings, *Atmospheric Chemistry and Physics*, 14, 1959–1971, <https://doi.org/10.5194/acp-14-1959-2014>

Bintanja, R., R. Graversen, and W. Hazeleger, 2011: Arctic winter warming amplified by the thermal inversion and consequent low infrared cooling to space, *Nature Geoscience*, 4, 758–761, <https://doi.org/10.1038/ngeo1285>

Gefördert durch die Deutsche Forschungsgemeinschaft.



UNIVERSITÄT
LEIPZIG



Universität
Bremen



Universität
zu Köln



ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR-
UND MEERESFORSCHUNG



TROPOS
Leibniz Institute for
Tropospheric Research