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The Atlantic Overturning Circulation: At its Weakest in a Millennium?

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The Atlantic Meridional Overturning Circulation (AMOC) is a major mechanism for northward heat transport on our planet and the prime reason why the Northern Hemisphere is warmer than the Southern Hemisphere (Feulner et al. 2013). The AMOC is a sensitive non-linear system dependent on subtle thermohaline density differences in ocean water, and major AMOC transitions have been implicated e.g. in millennial climate events during the last glacial (Rahmstorf 2002).

There is evidence that the AMOC is slowing down in response to modern global warming, as predicted by climate models (Caesar et al. 2018). We will review and compile proxy evidence for AMOC changes during the past 1-2 millennia, including e.g. Sherwood et al. 2011, Thibodeau et al. 2018, Thornalley et al. 2018, Rahmstorf et al. 2015, Zanna et al. 2019. We conclude that there now is substantial and consistent evidence from multiple independent sources for a modern AMOC slowdown that is unprecedented in at least a millennium.

References

Caesar, L., S. Rahmstorf, A. Robinson, G. Feulner, and V. Saba. 2018. Nature, 556: 191-96.

Feulner, G, S Rahmstorf, A Levermann, and S Volkwardt. 2013. Journal of Climate, 26: 7136-50.

Rahmstorf, S. 2002. Nature, 419: 207-14.

Rahmstorf, S., Jason E. Box, Georg Feulner, Michael E. Mann, Alexander Robinson, Scott Rutherford, and Erik J. Schaffernicht. 2015. Nature Climate Change, 5: 475-80.

Sherwood, O. A., M. F. Lehmann, C. J. Schubert, D. B. Scott, and M. D. McCarthy. 2011. Proc Natl Acad Sci U S A, 108: 1011-5.

Thibodeau, Benoit, Christelle Not, Jiang Hu, Andreas Schmittner, David Noone, Clay Tabor, Jiaxu Zhang, and Zhengyu Liu. 2018. Geophysical Research Letters, 45: 12,376-12,85.

Thornalley, D. J. R., D. W. Oppo, P. Ortega, J. I. Robson, C. M. Brierley, R. Davis, I. R. Hall, P. Moffa-Sanchez, N. L. Rose, P. T. Spooner, I. Yashayaev, and L. D. Keigwin. 2018. Nature, 556: 227-30.

Zanna, L., S. Khatiwala, J. M. Gregory, J. Ison, and P. Heimbach. 2019. Proc Natl Acad Sci U S A, 116: 1126-31.