New ways to 'see' under melting Antarctic ice shelves for more accurate climate modelling

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A breakthrough by Australian climate modeling researchers has led to a deeper understanding of the micro-scale processes that melt Antarctic ice shelves from below.

The research, published in *PNAS*, will help to provide a more accurate picture of future global sea levels.

Geophysical fluid dynamics researcher and co-author of the study, Dr. Bishakhdatta Gayen from the University of Melbourne, said that the research shows large-scale movement of water currents under an Antarctic ice shelf is not always a key driver of ice shelf melting.

"Using supercomputing modeling we can now see that a process known as double-diffusive convection is occurring, due to the unique ocean conditions beneath ice shelves, where cold, fresh water sits above warmer, saltier ocean."

"This is actually a very important piece of the puzzle for climate models, because at the end of the day, it helps us to understand the basic forces that drive sea level rise," Dr. Gayen said.

Lead author of the paper, Dr. Madi Rosevear from the University of Tasmania, said that the team's discovery overturns some major assumptions scientists had about the ocean processes that drive ice shelf melting.

The research team used Australia's National Computational Infrastructure (NCI) facility's supercomputing power to create models that show how the 'double-diffuse convection' phenomenon actually occurs under the Antarctic ice shelves.

Glaciologist Dr. Ben Galton-Fenzi from the Australian Antarctic Division and research co-author said scientists have been to the Moon and explored the depths of the Mariana Trench, but nobody has ever visited the world beneath Antarctica's ice shelves.

"Supercomputer simulations let us study these remote environments virtually, helping us gain a better understanding of the large-scale physical forces that shape the Earth over time," Dr. Galton-Fenzi said.

More information: Madelaine Gamble Rosevear et al. The role of double-diffusive convection in basal melting of Antarctic ice shelves, *Proceedings of the National Academy of Sciences* (2021). DOI: 10.1073/pnas.2007541118

Provided by University of Melbourne

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