Sea level rise of 3.3 metres from West Antarctic Ice Sheet collapse

The West Antarctic Ice Sheet (WAIS) is vulnerable to even moderate climate change and could collapse rapidly, pushing up sea levels around the world. A new study concludes that the global sea level rise (SLR) from the collapse of the WAIS will not be as high as predicted by previous studies, but still substantial at around 3.3 metres on average.

Previous studies have suggested that if the WAIS was to completely collapse, there would be an SLR of 5 to 6 metres, distributed equally across all regions of the world. However, these studies did not assess how much of the WAIS is unstable and therefore which parts of it are more susceptible to collapse. In addition, most of these studies did not consider how SLR might vary across the world’s oceans.

Instead of assuming a complete disintegration of the whole WAIS, the researchers used models, based on glaciological theory, to simulate how it would respond if floating ice shelves which fringe the WAIS broke free. Although they cannot predict when it will collapse, they reassessed the potential volume of ice that could melt and the possible global and regional sea levels rises that would occur.

Ice sheets and glaciers on land naturally flow downwards under the enormous weight of accumulated ice. Those that reach the sea become ice shelves that float on the water. These floating ice shelves exert a backward pressure on the remaining ice sheets which block their downward flow. If warmer ocean temperatures and/or air temperatures disintegrate the ice shelves rapidly, causing them to break free, the ice sheets will be able to move considerably faster.

Much of the WAIS sits on a layer of rock that is below sea level (the marine portion). There are also extensive areas of the WAIS on land. However, slopes on the land, together with the marine portion, cause instability. If the adjacent ice shelves disappear through the effects of a warming climate, parts of the WAIS would accelerate towards the ocean.

The researchers’ results suggest that the global sea-level changes would not be equal across the world. The redistribution of the melting ice in the oceans would cause a complex regional pattern of SLR. The highest levels are most likely occur in the Indian Ocean and in a band around 40 degrees North, affecting the Pacific and Atlantic coasts of the United States. This threatens cities including New York, Washington D.C. and San Francisco.

On top of the changes predicted by this study could be the effects of melting in other regions including Greenland and mountain glaciers, also susceptible to a warming climate.


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