New projections of future sea-level rise based on expert judgement

Plain language summary

Melting ice sheets in Greenland and the Antarctic, and subsequent sea level rise (SLR) this will cause, are widely recognised as posing a significant threat to coastal communities and ecosystems. Strategies and measures to mitigate and plan for the potential impacts are reliant on scientific projections of future SLR, conventionally provided using numerical modelling. However, limitations in the ability of predictive capability of numerical models of ice sheets mean that the potential contribution of Greenland and Antarctica remains the largest uncertainty in projecting sea level rise beyond 2050.

For this paper, 22 ice sheet experts were each asked to estimate plausible ranges for future sea level rise due to the projected melting of each of the Greenland, West Antarctic and East Antarctic ice sheets under low and high future global temperature rise scenarios. The authors then used a technique called structured expert judgment (SEJ) – used previously for other hard-to-model problems – to combine these estimates into a set of projections that reflect current scientific understanding.

The authors find that projections of total global SLR include a small but meaningful (5%) probability of SLR exceeding two metres by the year 2100 under the high temperature scenario (roughly equivalent to "business as usual") which is well above the 'likely' upper limit presented in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). The findings suggest that coastal communities should therefore not rule out the possibility of 21st-century SLR in excess of two metres when developing adaptation strategies.

Beyond 2100, both projected SLR and the uncertainty around it increase rapidly. Under the high emissions scenario, it was found that the ice sheet contribution to sea level rise could exceed 7.5m by 2200. This is in part due to the influence of poorly understood but potentially critical processes, such as "marine ice cliff instability", which may act as significant tipping points in ice sheet response to temperature rise.

Full paper (open access): Bamber, J.L., Oppenheimer, M., Kopp, R.E., Aspinall, W.P. and Cooke, R.M. (2019) Ice sheet contributions to future sea-level rise from structured expert judgment. Proceedings of the National Academy of Sciences (DOI: 10.1073/pnas.1817205116)

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