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Implications of the Paris Climate Agreement for future sea-level rise from Antarctica

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The agreement reached at the 21st Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCC) is aimed at limiting the post-preindustrial rise in global mean temperature to less than 2 ºC at the end of this century, and to promote further efforts to limit the warming to 1.5 ºC. Here, we use a numerical ice sheet-shelf model, with physics tested and calibrated against modern and past ice-sheet behavior and coupled to highly resolved atmospheric and ocean components, to test the Antarctic Ice Sheet's response to a range of future climate scenarios representing COP21 aspirations versus a fossil-fuel intensive RCP8.5 emissions scenario. Assuming COP21 temperature targets are achievable and those temperatures will not be exceeded beyond 2100, we find that a global mean temperature rise less than 2 ºC substantially reduces both the short term (decadal-century) and long-term risk of catastrophic sea level rise from Antarctica. In contrast, we find that the current, Intended Nationally Determined Contributions (INDCs), allowing global mean temperature to approach ∼3 ºC by the end of this century, results in a substantial increase in Antarctica's contribution to sea-level rise, relative to 1.5 or 2 ºC. The results suggest that the current INCDs might not be sufficient to save the West Antarctic Ice Sheet and some East Antarctic outlets from substantial retreat.