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Sensitivity of the Antarctic ice sheets to the warming of MIS11c

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The Marine Isotope Substage 11c (MIS11c) interglacial (425 – 395 thousand years before present) is a useful analogue to climate conditions that can be expected in the near future, and can provide insights on the natural response of the Antarctic ice sheets to a moderate, yet long lasting warming period. However, its response to the warming of MIS11c and consequent contribution to global sea level rise still remains unclear. We explore the dynamics of the Antarctic ice sheets during this period using a numerical ice-sheet model forced by MIS11c climate conditions derived from climate model outputs scaled by three ice core and one sedimentary proxy records of ice volume. We identify a tipping point beyond which oceanic warming becomes the dominant forcing of ice-sheet retreat, and where collapse of the West Antarctic Ice Sheet is attained when a threshold of 0.4 °C oceanic warming relative to Pre-Industrial levels is sustained for at least 4 thousand years. Conversely, its eastern counterpart remains relatively stable, as it is mostly grounded above sea level. Our results suggest a total sea level contribution from the East and West Antarctic ice sheets of 4.0 – 8.2 m during MIS11c. In the case of a West Antarctic Ice Sheet collapse, which is the most probable scenario according to far-field sea-level reconstructions, this range is reduced to 6.7 – 8.2 m, and mostly reflects uncertainties regarding the initial configuration of the East Antarctic Ice Sheet.