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Ice core evidence for a recent increase in snow accumulation in coastal Dronning Maud Land, Antarctica

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Ice cores provide temporal records of snow accumulation, a crucial component of Antarctic mass balance. Coastal areas are particularly under-represented in such records, despite their relatively high and sensitive accumulation rates. Here we present records from a 120 m ice core drilled on Derwael Ice Rise, coastal Dronning Maud Land (DML), East Antarctica in 2012. We date the ice core bottom back to 1745 $\pm$ 2 AD. δ^{18}O and δD stratigraphy is supplemented by discontinuous major ion profiles, and verified independently by electrical conductivity measurements (ECM) to detect volcanic horizons. The resulting annual layer history is combined with the core density profile to calculate accumulation history, corrected for the influence of ice deformation. The mean long-term accumulation is 0.425 $\pm$ 0.035 m water equivalent (w.e.) a^{-1} (average corrected value). Reconstructed annual accumulation rates show an increase from 1955 onward to a mean value of 0.61 $\pm$ 0.02 m w.e. a^{-1} between 1955 and 2012. This trend is compared to other reported accumulation data in Antarctica, generally showing a high spatial variability. Applying the Community Earth System Model demonstrated that sea ice and atmosphere patterns largely explain the accumulation variability. This is the first and longest record from a coastal ice core in East Antarctica showing a steady increase during the 20^{th} and 21^{st} centuries, thereby confirming modelling predictions.