Initial report on a 220-year record of accumulation rate and melting history of the SE-Dome II ice core from southeastern Greenland

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Arctic warming has accelerated surface melting even in the highland areas of the Greenland ice sheet. Understanding the relationship between climate and surface melting is essential for improving the estimates of ice-sheet mass loss due to warming. We here analyzed an ice core (hereafter SE-Dome II ice core) from the southeastern dome of Greenland, where the accumulation rate is high [1] and bears a large discrepancy among the climate models regarding snow accumulation estimates [2]. From stratigraphical observations, dielectric profile, H_2O_2, and tritium concentrations, we established the half-year accurate time scale for 1799–2020 and then compared ice core results with the ERA5 reanalysis data (1950–2020). The annual ice layer thickness has increased over 220 years and has synchronized with temperature changes in the Arctic. In contrast, the annual accumulation rate from the SE-Dome II ice core with an average of 1.04 ±0.20 m w.e. yr^{-1} shows no significant trend in the 220 years. A significant positive correlation is found between the annual ice layer thickness and time-integrated summer temperature anomaly of the ERA5 air temperature. The annual accumulation rate estimated from the SE-Dome II ice core is consistent with the ERA5 precipitation rate. Our results suggest that the annual accumulation rate in the southeastern dome is constant regardless of temperature warming and the SE-Dome II ice core has an advantage for reconstructing the past environment from the pre-industrial to the present with the half-year accurate time scale.
[1] Iizuka et al., 2021: *Bull. Glaciol. Res.,*39, 1–12. [2] Fettweis et al., 2020: *The Cryosphere*, 14, 3935–3958.

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