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Evidence for Elemental Dust Proxies abrupt changes across Dansgaard-Oeschger events inferred by UV-LA-ICPMS on NGRIP ice cores

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Elemental concentrations of selected ions in ice cores are classically utilized as proxies for dust, preserving seasonal to millennial scale variability induced by changes in source or atmospheric transport. We analysed several chemical species including Na, Mg, Al, Ca and Fe across the warm-to-cold and cold-to-warm transitions of three different Dansgaard-Oeschger events (20, 21.2 and 22) from the deepest part of the NGRIP ice core, at a resolution of $\sim$200 μm (0.2 mm), which, nominally, represents 2-3 weeks' time at this depth and is achievable only by cryo-cell laser-ablation. Calibrated elemental concentrations show an order of magnitude decrease for most elements across Stadial/Interstadial transitions and vice versa. Furthermore, the complete switch between the two phases appears to happen within one to a few years only, especially in the case of the warming transitions. These oscillations are accompanied by a relative change in elemental ratios (Fe/Al, Mg/Al and Ca/Al) at the onset of the Stadial phase and vice versa, compatible with a change in location of the dust sources within East Asia. We suggest that a southward shift of the polar front at the onset of the Stadial phase may have triggered a change in the atmospheric transport mechanisms over East Asia as a result of the westerly jets jumping north and south of the Tibetan Plateau and changing abruptly and sustainably in strength between Stadial and Interstadial phases.