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A stratigraphic framework for naming and robust correlation of abrupt climatic changes during the last glacial period based on three synchronized Greenland ice core records

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Due to their outstanding resolution and well-constrained chronologies, Greenland ice core records have long been used as a master record of past climatic changes during the last interglacial-glacial cycle in the North Atlantic region. As part of the INTIMATE (INtegration of Ice-core, MArine and TErrestrial records) project, protocols have been proposed to ensure consistent and robust correlation between different records of past climate. A key element of these protocols has been the formal definition of numbered Greenland Stadials (GS) and Greenland Interstadials (GI) within the past glacial period as the Greenland expressions of the characteristic Dansgaard-Oeschger events that represent cold and warm phases of the North Atlantic region, respectively. Using a recent synchronization of the NGRIP, GRIP, and GISP2 ice cores that allows the parallel analysis of all three records on a common time scale, we here present an extension of the GS/GI stratigraphic template to the entire glacial period. This is based on a combination of isotope ratios (δ^{18}O, reflecting mainly local temperature) and calcium concentrations (reflecting mainly atmospheric dust loading). In addition to the well-known sequence of Dansgaard-Oeschger events that were first defined and numbered in the ice core records more than two decades ago, a number of short-lived climatic oscillations have been identified in the three synchronized records. Some of these events have been observed in other studies, but we here propose a consistent scheme for discriminating and naming all the significant climatic events of the last glacial period that are represented in the Greenland ice cores. This is a key step aimed at promoting unambiguous comparison and correlation between different proxy records, as well as a more secure basis for investigating the dynamics and fundamental causes of these climatic perturbations.

The work presented is under review for publication in Quaternary Science Reviews. Author team: S.O. Rasmussen, M. Bigler, S.P.E. Blockley, T. Blunier, S.L. Buchardt, H.B. Clausen†, I. Cvijanovic, D. Dahl-Jensen, S.J. Johnsen†, H. Fischer, V. Gkinis, M. Guillevic, W.Z. Hoek, J.J. Lowe, J. Pedro, T. Popp, I.K. Seierstad, J.P. Steffensen, A.M. Svensson, P. Vallelonga, B.M. Vinther, M.J.C. Walker, J.J. Wheatley, and M. Winstrup (†: deceased).