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Tephra-based time-markers from the Last Glacial Period recorded in the North Atlantic: an emerging tool for an east-west synchronization of paleoclimate records

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Geochemically distinct volcanic ash (tephra) deposits have the potential to act as a key geochronological tool to independently synchronize independent paleoclimate archives. Recent advances in the detection of invisible (crypto) tephra have led to the ongoing development of regional tephra frameworks. These frameworks provide an overview of the spatial coverage of existing geochemically distinct tephra horizons attributed to dated eruptions. Hence, these developing frameworks produce an essential tool for precise correlation of different and/or disparate climate archives within a certain region. Here, using cryptotephra analysis, we investigate the potential occurrence of two well-known tephra horizons from the Last Glacial Period (i.e. FMAZ II-1 (26.7 ka b2k) and NAAZ II (II-RHY-1) (55.3 ka b2k)), in five different marine sediment cores from the Denmark Strait, as well as the Nordic, Irminger and Labrador Seas. We have successfully identified FMAZ II-1 in both the Nordic and Irminger Seas. Even more so, this study presents the first identification of an isochronous FMAZ II-1 horizon detected in the Irminger Sea. This clearly demonstrates an increased potential for tephrochronology within this region. In addition, NAAZ II (II-RHY-1) was also recorded in the Denmark Strait, the Irminger Sea and the Labrador Sea. Using those identified tephra time-markers allows us to discuss the synchronization of paleoclimate records retrieved from the in this study and previously investigated marine sediment cores. We focus on both time periods when the tephra time-markers were deposited (i.e. Greenland Stadial-3 (FMAZ II-1) and Greenland Interstadial-15 (NAAZ II (II-RHY-1)) with the aim to provide synchronized records of ocean temperature and salinity changes. Therefore, we use Mg/Ca ratios of benthic foraminifera and stable isotopes ($d^{18}O$ & $d^{13}C$) of benthic and planktonic foraminifera. By coupling the paleoclimatic information with the identified tephra time-markers, we provide a robust overview of the climatic conditions in the North Atlantic Ocean during these two time periods.