A comparison of Holocene sediment- and paleo-magnetic characteristics from the margins of Iceland and East Greenland

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Abstract — We present environmental and paleo-magnetic data from sixteen cores from either side of the Denmark Strait; six are from East Greenland and the remainder from the SW, NW, and N Iceland shelf. The bedrock geology in both regions mainly consists of Tertiary and Quaternary basalts. The cores were sampled by u-channels and processed in a cryogenic magnetometer at 1-cm intervals; in addition we measured whole core and discrete sample mass magnetic susceptibility. For eight cores we also have quantitative weight% measurements of magnetite, hematite, and quartz. We restrict our analyses to the last 10,000 $^{14}$C yrs BP and present the spatial variability of the median, standard deviation, and coefficient of variation on magnetic parameters that reflect changes in concentration, grain-size, and mineralogy, based on a sediment volume basis. Our results show a consistent difference in terms of median values and coefficient of variation between East Greenland versus Icelandic sediments in terms of several magnetic properties. In particular the sediments from Iceland have lower mass magnetic and anhysteretic susceptibilities, and lower and more variable median destructive fields. In part this is attributable to higher values of carbonate and volcanic glass in Icelandic sediments. Magnetic grain-size is usually coarser in Iceland sediments, especially in sites from Vestfjörður. Paleomagnetic measurements revealed that the maximum angular deviations (MAD) are small for East Greenland sediments (<5°) and higher and more variable for the Iceland sediments, but still generally <10°. Normalized intensity and inclination are more uniform across the area, with a median inclination value of 73° at all sites compared to an expected geocentric dipole value of 77°.

INTRODUCTION

Scientific investigation in and on both sides of the Denmark Strait between Iceland and Greenland has intensified during the last decade. This region has, in many studies, been portrayed as one of the key regions for studies of past and present environments, including research in the marine, terrestrial, lacustrine, and glacial environments. The environments on either side of the Denmark Strait are very dissimilar - with the East Greenland margin being polar in character with extensive glacier and sea-ice, whereas the Iceland margin is influenced by the relatively warm Irminger Current (Stefánsson, 1962), was totally deglaciated by ca. 13 ka BP, and any influence from extensive land ice had disappeared by 9 ka BP (Norðdahl, 1990; Geirsdóttir et al., 1997). Tertiary and Quaternary flood basalts dominate the bedrock geology of both areas (Larsen, 1983) thus imposing a broad mineralogical control on magnetic sediment properties.