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Reconstruction of geomagnetic paleosecular variation on the continental margin of northwestern Barents Sea

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Abstract

In the last decades, geomagnetic paleosecular variation (PSV) for the past millennia have been reconstructed from paleomagnetic and archeomagnetic data, in order to understand the variability of the geomagnetic field. PSV data from the Artic region could be of critical importance for geomagnetic field models. In particular, sedimentary sequences with suitable lithological character and good paleomagnetic properties may provide valuable empirical inputs for the reconstruction of the geomagnetic field variability over geological times.

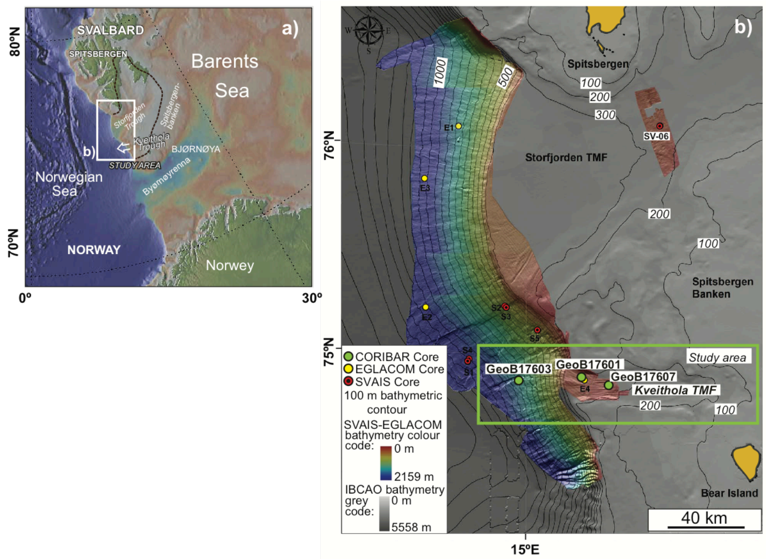

Figure 1 Location of the CORIBAR cores (this work) and SVAIS and EGLACOM cores [Sagnotti et al., 2011; 2016]. (a) Location map of the study area in the NW Barents Sea. (b) Detail of the square study area indicated in map and location of the CORIBAR-SVAIS-EGLACOM sediment cores.

In this work, we present the analysis of high-resolution paleomagnetic and rock magnetic analyses carried out on 3 sedimentary cores collected in glaciomarine silty-clay sequences from the continental shelf and slope across Kveithola trough-mouth fan, on the continental margin of northwestern Barents Sea (Fig. 1).

This study has been conducted in the framework of the PNRA project CORIBAR-IT, whose general aim is to define the timing and the paleo-environmental changes linked to the last deglaciation, by investigating the glacigenic sediments in a palaeo-ice stream depositional system in the western Barents Sea.

The cores have been divided in sections of about 1m of length and then cut in two half parts

(archive and working). Subsequently, each section has been subsampled with u-channel plastic holders for continuous paleomagnetic and rock magnetic measurements.
Rock magnetic and palaeomagnetic measurements were carried out at the palaeomagnetic laboratory of the Istituto Nazionale di Geofisica e Vulcanologia, in Rome, in a magnetically shielded room. For each u-channel, we measured the low-field magnetic susceptibility (k), natural remanent magnetization (NRM) and anhysteretic remanent magnetization (ARM) at 1 cm spacing.
The rock magnetic analyses indicate that all three cores show limited and consistent variation in rock magnetic properties, with stratigraphic trends of individual magnetic parameters for each core generally ranging within the same order of magnitude. Magnetic minerals are distinctly less abundant in the core collected from the shelf than in the core collected from the continental slope and magnetite is most probably the main magnetic mineral carrying the remanence.
The stepwise demagnetization data have been visualized and analyzed using DAIE software (Sagnotti 2013). The studied sediments are characterized by good palaeomagnetic properties, and carry a well-defined characteristic remanent component (Fig. 2)

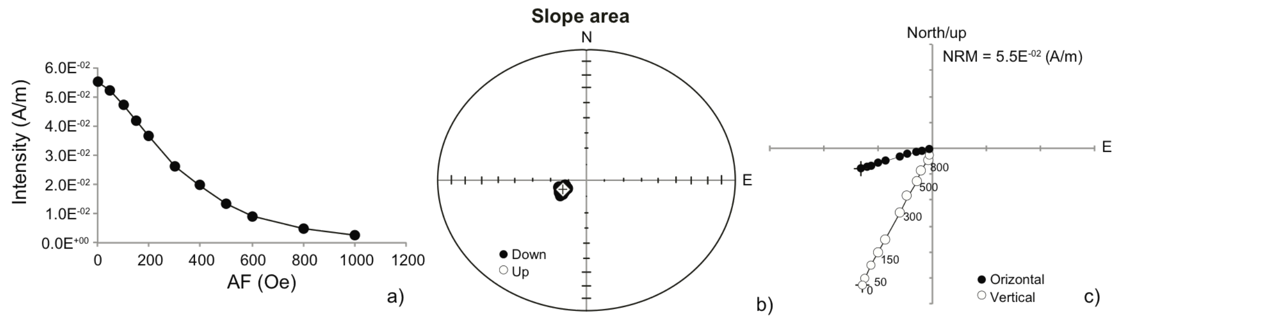

Figure 2 *Representative NRM demagnetization graphs for selected specimens subjected to AF demagnetization. The demagnetization data have been visualized and analyzed using the DAIE program (Sagnotti, 2013). From left to right: a) variations of the NRM intensity as a function of the demagnetization steps; b) Stereographic (equal area) projection of unit vectors defined at each demagnetization steps; c) Orthogonal projection diagrams of vector measured at each demagnetization step with projection on the North-South vertical plane.*

The stratigraphic trends of rock magnetic and paleomagnetic parameters allow a high-resolution correlation between the cores, along the E-W section, thorough the Kveithola TMF, taking into account also the sedimentological features.
Paleomagnetic and rock magnetic results contribute also to define and refine the reconstruction of paleosecular variation of geomagnetic field, including relative paleointensity, in the North-western Barents Sea area. Paleomagnetic records for the three cores have been matched with the PSV and RPI variation expected at cores location according to the global model Scha.dif.14k (Pavón-Carrasco et al., 2014).
The new paleomagnetic and rock magnetic data allowed to refine the reconstruction of geomagnetic field variation at 75°–76° northern latitudes. These data provide an original chronological framework for the sedimentological and the palaeoenvironmental evolution along an E-W transect from the continental shelf to slope in the NW Barents Sea during the main climatic pulses of glaciers fusion and retreat.

References

Pavon-Carrasco F. J., Osete, M.L., Torta, J.M., De Santis, A., 2014. A geomagnetic field model for the Holocene based on archeomagnetic and lava flow data, Earth and planetary science, 338, 98-109, http://dx.doi.org/10.1016/j.epsl.2013.11.046

Sagnotti, L., 2013. Demagnetization Analysis in Excel (DAIE)—an open sourceworkbook in Excel for viewing and analyzing demagnetization data from paleomagnetic discrete samples and u-channels, Annals Geophysics, 56, D0114, doi:10.4401/ag-6282.