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Palaeomagnetism in the High Arctic. Palaeomagnetic Investigations of Svalbard Archipelago Conducted by the Institute of Geophysics, Polish Academy of Sciences from 1999 to 2018

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A b s t r a c t

In the years 1999-2016 Laboratory of Palaeomagnetism of the Institute of Geophysics, Polish Academy of Sciences coordinated numerous palaeomagnetic field investigations in different parts of Svalbard Archipelago. More than 950 independently oriented palaeomagnetic samples were collected from 156 sites representing all three Svalbard Caledonian Terranes (Harland and Wright 1979) as well as post-Caledonian, pre-Eurekan cover of Spitsbergen and Edgeøya. Palaeomagnetic samples were collected during following expeditions: (a) XXII PAS Polar Wintering Expedition to Hornsund (1999-2000; Wedel Jarlsberg Land and Torell Land), (b) IGF PAS palaeomagnetic field investigations of Torell Land (2002), (c) IGF PAS palaeomagnetic field investigations of Wedel Jarlsberg Land, Torell Land, and Sørkapp (2004), (d) Joined expedition of IGF PAS/University of Greenwich (UK) along western and northern coasts of Spitsbergen (2006; Kongsfjorden, Ny Friesland), (e) Palaeomagnetic field investigations of Caledonian Terranes of Svalbard organized in the course of PALMAG NCN project (2012-2013; Oscar II Land, Kongsfjorden, Ny Friesland, Nordaustlandet), (f) "Trias North"project joined expedition of UNIS and Statoil to Edgeøya (2016).

The main conclusions regarding palaeogeographic and geotectonic evolution of the NW Barents Shelf based on interdisciplinary palaeomagnetic – petrological – structural – geochronological investigations (1999-2018) are as follows:

- Palaeomagnetic investigation of the Lower Paleozoic metacarbonates from Hornsund combined with ^{40}Ar-^{39}Ar age determinations of Billelfjorden Fault Zone mylonites confirm that Svalbard constituted part of Baltica already from Late Silurian (Michalski *et al.* 2012);
- Multidisciplinary palaeomagnetic – structural – geochemical – petrological investigations prove intensive Caledonian remagnetisation of Spitsbergen basement and point to important role of listric faults related to opening of North Atlantic system in modifying geometry of the central – western part of Spitsbergen (Michalski *et al.* 2014, 2017; Michalski 2018, Burzyński *et al.* 2017);

- Multidisplinary palaeomagnetic – structural – petrological studies of Neoproterozoic – Lower Paleozoic Murchisonfiord succession suggest that part of Nordaustlandet could constitute foreland of the Caledonian orogenic front were unique pre-Caledonian (primary?) palaeomagnetic record could survive. Preliminary palaeomagnetic results from Murchisonfiord suggest that through at least part of the Neoproterozoic Eastern Svalbard was located min. 10º to the North of the Barents Shelf on the latitudes coeval with NE sector of Laurentia and could constitute separate microplate (in revision);
- Palaeomagnetic investigations of the Lower Triassic sediments of the Torell Land (S Spitsbergen) revealed complicated pattern of the Natural Remanent Magnetization and intensive remagnetization of investigated rocks. At least part of the measured palaeomagnetic vectors can represent a secondary pre-folding magnetic overprint that originated in post-Jurassic Late Mesozoic – Cenozoic time before Eurekan deformations (Dudzisz *et al.* 2018).

Keywords: Svalbard, Caledonian Terranes, Eurekan orogeny, West Spitsbergen Thrust, Fault Belt.

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