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SVALGEOBASE II: Tectono-thermal evolution of Svalbard, geological workshop, Svalbard 2024

Description of Field Excursions

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NY-ÅLESUND – BRØGGERHALVØYA (4 September 2024)

Objectives and geological background

On the 4 September, the SvalGeoBase II participants visited Ny-Ålesund to consider the effects of the Cenozoic Eurekan deformation on the Brøggerhalvøya (Fig. 1). The SvalGeoBase II workshop aimed to discuss the geological evolution of this arm of the West Spitsbergen Fold and Thrust Belt (WSFTB). The Eurekan structures have re-activated and/or overprinted earlier Ellesmerian, Caledonian, and Timanian structures. The West Spitsbergen Fold-and-Thrust Belt and the role of the offshore fault zones along the western continental margin of Spitsbergen have affected the Southwestern Basement Terrane of Svalbard and need further investigation (Fig. 2). In particular, the mapping, determination of the kinematics of the Eurekan structures and consequences of the resultant deformation are needed to recognize the effects of the Caledonian, Timanian, and/or possibly older orogenic events along the entire South West Basement Terrane.

The Eurekan deformation in Spitsbergen's central and southern parts is shown in Fig. 2 (after Piepjohn et al. 2016). Between Brøggerhalvøya and Sørkapp, the West Spitsbergen Fold-and-Thrust Belt can be divided into a basement-dominated domain 1 (brown) and a sediment-dominated domain 2 (green). Figure 2 shows that large parts of the West Spitsbergen Fold-and-Thrust Belt have affected the basement areas of Prins Karls Forland, Oscar II Land, Wedel Jarlsberg Land, and Sørkapp Land. The transport directions of the West Spitsbergen Fold-and-Thrust Belt are generally towards the ENE, with an exception at the northernmost end of the fold belt, where the transport directions turn into an NNE- to N-direction.

The kinematics and timing of the West Spitsbergen Fold-and-Thrust Belt is a matter of debate. Harland (1969), Birkenmajer (1972), Lowell (1972), Harland and Horsfield (1974), Kellogg (1975), and Steel et al. (1985) suggested that the fold belt was a transpressive strike-slip orogen developed at an intercontinental transform margin.

Later structural analyses led to the interpretation that convergent tectonics were predominantly responsible for most of the fold and thrust deformation (e.g. Craddock et al. 1985; Bergh

Fig. 1. Ny-Ålesund. From the left: Dr. Geoffrey Manby (NHM), Dr. Pierpaolo Guarnieri (GEUS), and Dr. Karsten Piepjohn (ex-BGR) discussing the geological structure of the Brøggerhalvøya Peninsula (photo: Szczepan Bal).

et al. 1988; Dallmann 1988, 1992; Maher 1988a,b; Maher and Craddock 1988; Nøttvedt et al.1988; Dallmann and Maher 1989; Maher et al. 1989; Bergh and Andresen 1990; Haremo et al. 1990; Welbon and Maher 1992). However, other authors (e.g. Lyberis and Manby 1993a,b; Manby and Lyberis 1996) consider the WSFTB to have been the result of Late Cretaceous – Palaeocene Svalbard-Greenland convergence following the opening of the Labrador Sea-Baffin Bay before the formation of the Central Tertiary Basin on Svalbard.

Tessensohn and Piepjohn (2000) and Piepjohn et al. (2016) proposed a succession of compressive and strike-slip events: the first tectonic phase of the Eurekan deformation on Svalbard was dominated by WSW–ENE compression with large-scale folding, detachment-faulting, and reverse faulting (Piepjohn et al. 2016). The Eurekan stage 1 was followed by major dextral strike-slip movements along NNW-SSE trending major faults (Hornsund Fracture Zone, Billefjorden Fault Zone, Lomfjorden Fault Zone; Fig. 2) of the Eurekan stage 2 (Piepjohn et al. 2016) and post-Eurekan extensional re-activation of the strike-slip faults. In contrast, Lamar et al. (1986); Manby and Lyberis (1992); and later Manby et al. (1994) using stress tensor (cf. also Lisle and Srivastava 2004) analyses across the Devonian Basin, including the Billefjorden Fault Zone, interpreted the deformation as the result of orthogonal compression. These authors also noted that the Mid-Carboniferous Monchiquite dykes at Krosspynten on the east coast of Andree Land are deformed, suggesting some possible WSFTB deformation.

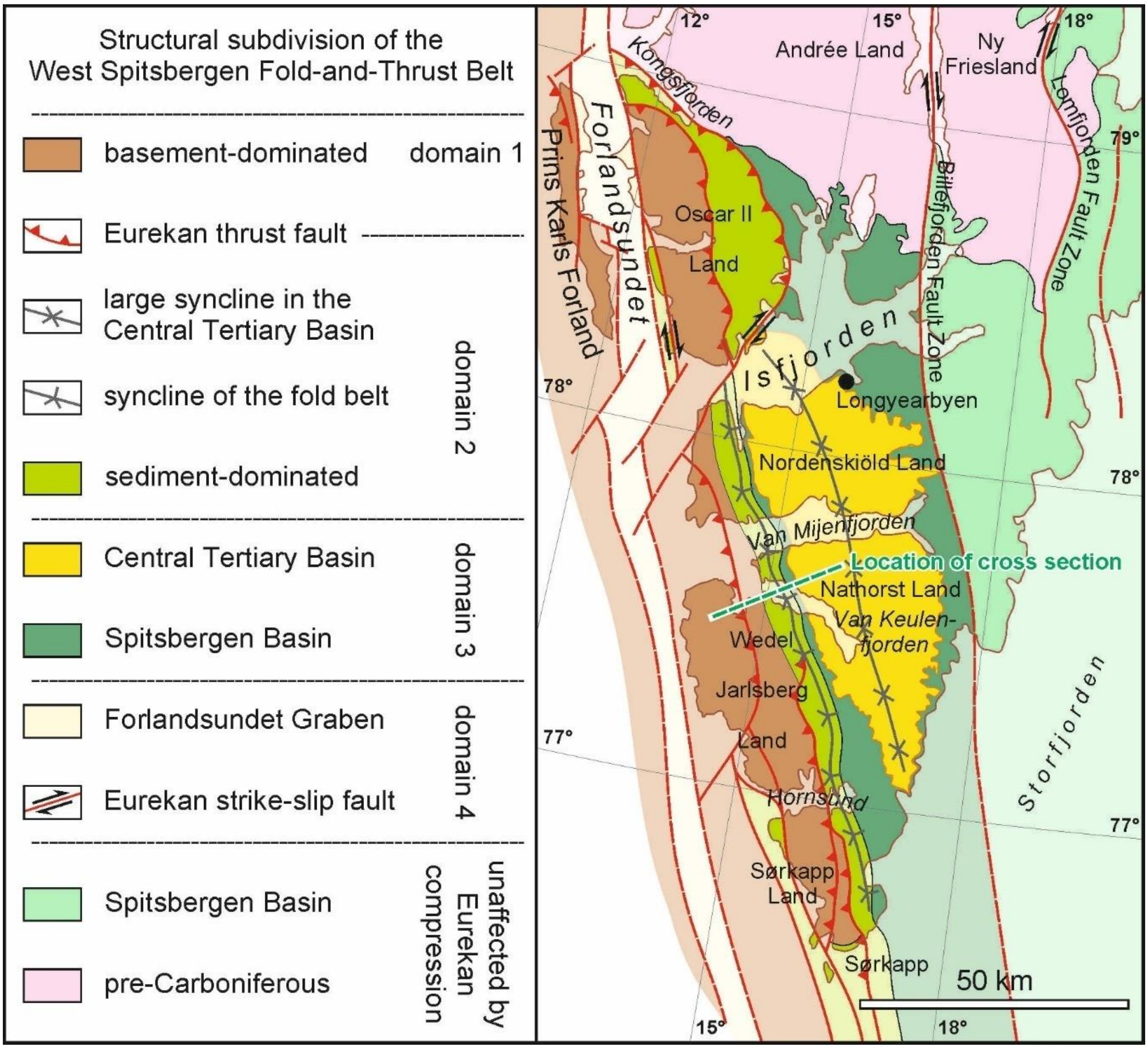

Fig. 2. Tectonic map of Spitsbergen showing the distribution of the Paleogene Eurekan deformation along the West Spitsbergen Fold-and-Thrust Belt – interpretation after Piepjohn et al. (2016).

Pressing scientific issues

- Better constrained field work that considers off-shore geophysical and further use of stress tensor analyses;
- Some reprocessing of the offshore geophysical data to greater depths across the Barents Shelf;
- A focus on obtaining isotopic ages of fault zones.

SPARRENESET – NEOPROTEROZOIC SUCCESSION (5 September 2024)

Objectives and geological background

One of Earth's most complete Neoproterozoic sequences is exposed in northeastern Svalbard. This unique region provides an exceptional opportunity to study climate fluctuations, including proposed global glaciation events and their impact on the evolution of life during this period. The Late Proterozoic was also marked by a major reconfiguration of lithospheric plates associated with the breakup of the Rodinia supercontinent. On the morning of 5 September, a field

Fig. 3. Landing on the Sparreneset Peninsula (Murchisonfjorden). Outcrop 1 (detailed description in the text). On the right side of the photo, red siltstones overlain by stromatolites – Backlundtoppen Formation(?)/Elbobreen Formation(?) (drone image taken with a Mavic 3 Pro by Anna Sartell and Rafael Kenji Horota; VR Svalbard, Svalbox).

trip was conducted to examine the geology and structures of the uppermost rock formations within the kilometre-thick Neoproterozoic sedimentary succession of western Nordaustlandet, northeast of Sparreneset (Fig. 3).

In the absence of radiometric dates, the local age models of the Neoproterozoic Murchisonfjorden sections are based primarily on lithostratigraphic and chemo-stratigraphic correlations (Hoffman et al. 2012; Halverson et al. 2018a,b), also correlated with other well-dated sections, located outside Svalbard, e.g. in Canada (Halverson et al. 2022). The stratigraphy of western Nordaustlandet is dominated by unmetamorphosed sedimentary rocks of the Tonian Murchisonfjorden Supergroup and the Cryogenian to Lower Palaeozoic Hinlopenstretet Supergroup (Fig. 4; e.g. Harland 1997; Halverson et al. 2022; Millikin et al. 2022). The Murchisonfjorden Supergroup primarily consists of clastic siltstones, sandstones, and quartzites, with some redbeds, which are exposed in the inner and eastern parts of Murchisonfjorden (Veteranen Group). The upper unit consists of limestones, dolomites, and stromatolites of the Akademikerbreen Group (Roaldtoppen Group). These rocks are overlain by limestones, dolomites, and diamictites of the Cryogenian Elbobreen Formation of the Polarisbreen Group (Gothiahalvøya Group), followed by post-glacial siltstones of the Ediacaran Dracoisen Formation and quartzitic sandstones and dolomites of the Lower Paleozoic Sparreneset Formation. The workshop participants visited outcrops representing the upper part of the Tonian Akademikerbreen Group, as well as exposures of the Cryogenian Polarisbreen Group.

In Outcrop 1, limestones of the Backlundtoppen Formation are exposed east of the landing site (Figs. 3 and 4). In the cliffs west of the landing site, a 10 to 20 m thick unit of red siltstones is exposed overlain by stromatholites. In the Neoproterozoic succession, similar red-beds are mainly exposed in the underlying clastic Tonian rock units, e.g., Raudstuped Formation, but there are also thin units of siltstones present in the uppermost Backlundtoppen Formation (Kinnvika Member) and in the upper Russøya Member of the Elbobreen Formation (Fig. 1b SPAR). The geological situation suggests that the red siltstones in Outcrop 1 are part of the Kinnvika Member between the limestones of the Backlundtoppen Formation below and the Elbobreen Formation above.

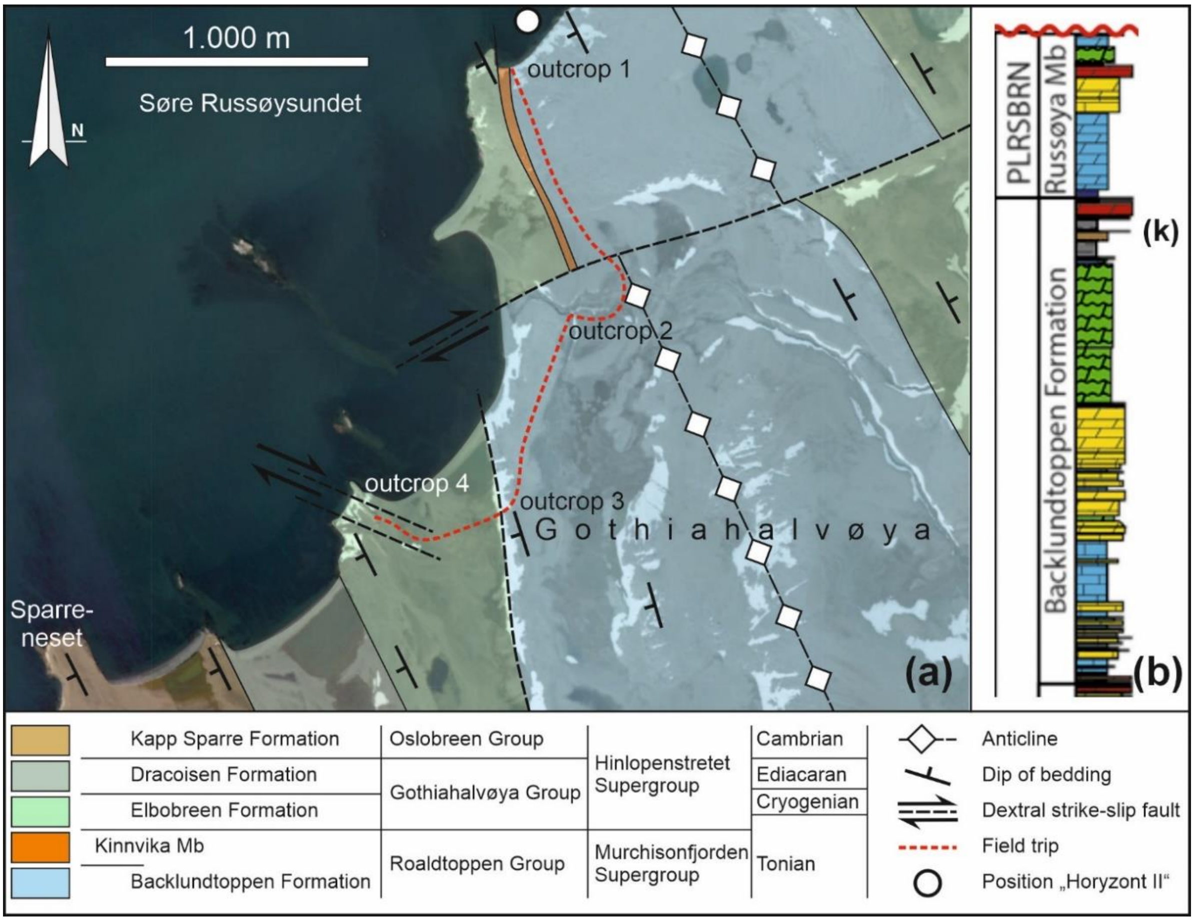

Fig. 4: (a) Geological map of the area NE of Sparreneset; (b) Stratigraphy of the Tonian to Cambrian succession east of Sparreneset (Halverson et al. 2022); (k) Kinnvika Member of the uppermost Backlundtoppen Formation (the figure containing the structural interpretation and stratigraphic scheme was modified by Dr. Karsten Piepjohn).

Outcrop 2 was located south of a WSW-ENE striking dextral strike-slip fault in black limestones of the Backlundtoppen Formation. In Outcrop 3 further southwest, stromatholites of the Backlundtoppen Formation contacts with diamictites of the Elbobreen Formation (Petrovbreen Member).The final outcrop (Outcrop 4) consists of thick, unbedded diamictites from the Wilsonbreen Formation (Figs. 4 and 5; on the map in Fig. 4, they represent the upper part of the Elbobreen Formation).

Structurally, the Murchisonfjorden area exhibits many characteristics of thin-skinned fold and thrust belts. The prominent NNW-SSE-oriented anticlinal folds display steep to overturned western forelimbs, often with evidence of thrust fault displacements. Subsidiary folds vary from upright to inclined structures, some associated with small-scale east-directed back thrusts. Conjugate shear faults related to brittle failure are noted on all scales.

The structure of the visited area is characterized by a large-scale, NNW-SSE striking anticline (Fig. 4). The area west of the anticline represents the gently to steeply WSW-dipping limb of the anticline consisting of sedimentary units of the Backlundtoppen, Elbobreen, Dracoisen, and Sparreneset formations (Fig. 4a). In outcrop scale, the deformation of the west limb of the anticline is characterized by the formation of metres- to tens-of-metres-scale subordinary, mostly ENE-vergent, folds and, in some cases, the formation of a steeply ENE-dipping fracture cleavage, which is mainly exposed in clastic rock units but mostly absent in limestones and dolomites.

Fig. 5. Outcrop 4 – matrix-dominated Wilsonbreen Formation diamictite at Sparreneset, SW Murchisonfjorden, with a large K-feldspar granite clast (photo: Krzysztof Michalski).

The large anticline and related folding, thrusting and cleavage-formation are part of a large, at least 60 km wide fold belt between the Veteranen Fault in Ny-Friesland (Spitsbergen) in the west and the Lady Franklinfjorden Fault (Nordaustlandet) in the east (e.g. Piepjohn et al. 2022). The large-scale folding has affected the entire Tonian, Cryogenian, Ediacaran, and Lower Paleozoic sedimentary succession across the Hinlopenstretet and therefore can be related to the Caledonian Orogeny.

The Murchisonfjorden area lie out of the main Caledonian tectonic-metamorphic zone. The original sedimentary structures are well preserved since the rocks here did not reach the anchi-metamorphic grade. The relatively low temperatures to which these rocks were subjected during the Caledonian orogeny potentially may have preserved the unique primary pre-Caledonian paleomagnetic record (Maloof et al. 2006; Michalski et al. 2023; Bal et al. 2025).

Pressing scientific issues

- Radiometric age determinations in the NE Svalbard Neoproterozoic sections, including detrital zircons analyses, are needed for provenance studies and maximum likelihood depositional ages (MLDA) determinations;
- Detailed paleomagnetic analyses in locations not subjected to Caledonian metamorphism to aid in distinguishing between primary Proterozoic and Lower Palaeozoic signals and secondary overprints related to Caledonian thermal alterations and Cretaceous magmatism;
- Testing Neoproterozoic True Polar Wander models – detailed paleomagnetic studies of Tonian Akademikerbreen Group, NE Svalbard.

SVALBARD NORDKAPP–METAMORPHIC BASEMENT (5/6 September 2024)

Objectives and geological background

Just before midnight on the 5 September, R/V Horyzont II arrived in Beverlysundet and was anchored in the innermost part of the sound east of Laponiafjellet (Figs. 6 and 7). The geology in this area is dominated by igneous rocks of the lower crustal level of Nordaustlandet (e.g. Flood et al. 1969; Gee et al. 1999; Johansson et al. 1999, 2001, 2004; Dallmann et al. 2002; Tebenkov et al. 2002; Elvevold and Dallmann 2014). Large areas of northern Laponiahalvøya and the islands in the north (Chermsideøya, Sjuøyane) consist of massive, coarse-grained granite bodies of the Kontaktberget Granite west and the Laponiahalvøya Granite east of Birdvågen (Fig. 6). The relation between both granite bodies is still a matter of debate: the question is if the Kontaktberget and Laponiahalvøya granites represent two different granites with an intrusional boundary and different ages or if they are just two varieties of the same granite with a transition zone between both varieties.

South of Beverlysundet and on Chermsideøya and Castrénøyane, dark-coloured metasedimentary rock units are included in the Laponiahalvøya Granite (Fig. 6) which are migmatized but partly show remnants of the structural inventory of the original metasediments which predate the intrusion of the Laponiahalvøya Granite. Concerning the geological maps, these rocks can be related to the Duvefjorden Migmatite Complex, widespread in the eastern parts of Nordaustlandet. A narrow occurrence of these migmatitic rocks was also exposed in the area visited by the SvalGeoBase II participants at Laponiafjellet.

A third granite is exposed in central Chermsideøya. There, granites of the Rijpfjorden Granitoid Suite have intruded the Laponiahalvøya Granite and the Duvefjorden Migmatite Complex (Fig. 6). The Rijpfjorden Granitoid Suite represents the youngest magmatic event on Nordaustlandet and was formed during the final stage of the Caledonian Orogeny (Gee et al. 1999; Johansson et al. 1999, 2004).

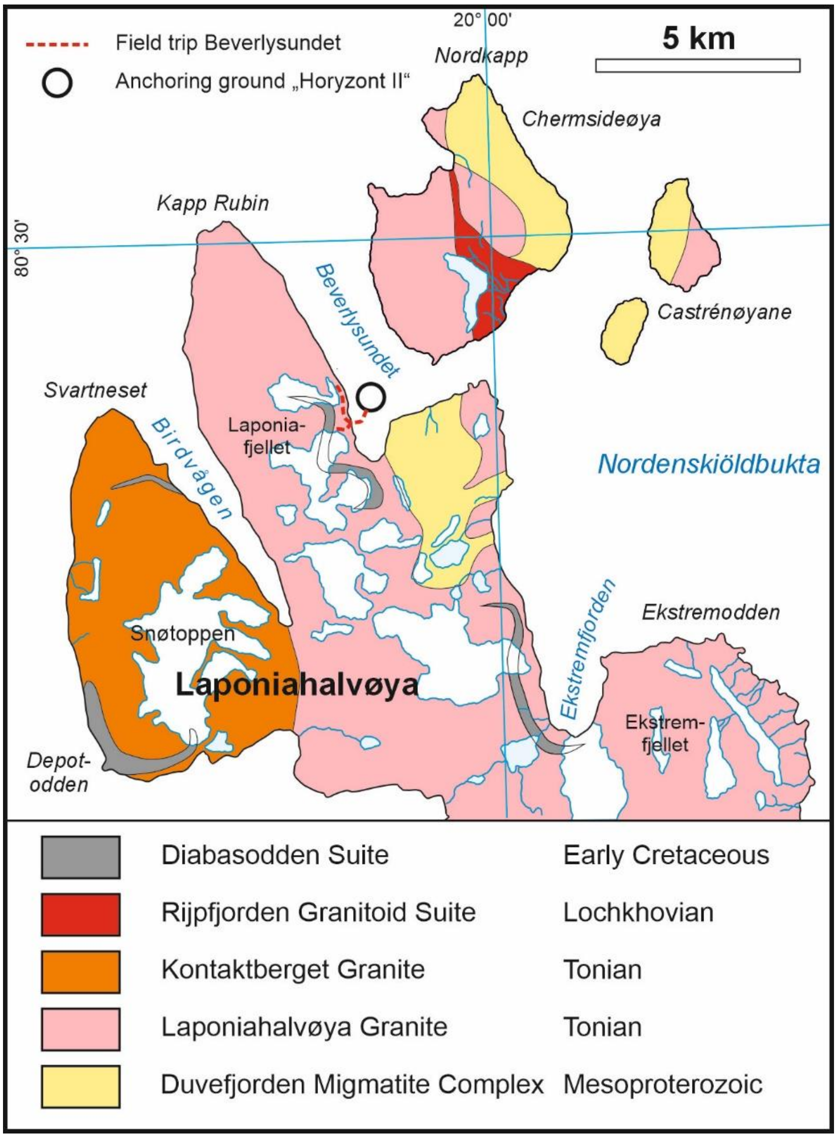

Fig. 6. Geological map of northern Laponiahalvøya, Beverlysundet, and Chermsideøya, modified from Elvevold and Dallmann (2014) (the map was modified by Dr. Karsten Piepjohn).

Fig. 7. Midnight, 5/6 September 2024. Nordkapp, Svalbard – vicinity of Beverlysundet. Aboard the R/V Horyzont II, Prof. Piotr Głowacki dreams of future polar expeditions (photo: Krzysztof Michalski).

The youngest rocks in the area are represented by up to 100 m thick Lower Cretaceous dolerite sills of the Diabasodden Suite at Depotodden, Birdvågen, Laponiafjellet, and Ekstremfjorden (Fig. 6). Except for the dolerite body west of Birdvågen, which dips gently to the S, the other dolerites represent horizontally intruded sills.

Due to the difficult accessibility of the north coast of Nordaustlandet, there are still several important questions regarding pre-Devonian geology, structural history, and the plate-tectonic evolution of the Caledonian and possibly older orogenies. A major question is related to the ages of the different igneous and metamorphic rocks on Nordaustlandet and whether the Grenvillian Orogeny has affected the Nordaustlandet Terrane or only the Caledonian Orogeny.

The widespread migmatites of the Duvefjorden Migmatite Group on Nordaustlandet were interpreted as being the result of the late Mesoproterozoic and early Neoproterozoic Grenvillian Orogeny (Harland 1997; Elvevold and Dallmann 2014) or the Palaeozoic Caledonian Orogeny (e.g. Tebenkov et al. 2002; McClelland et al. 2018). The same applies to the Kontaktberget and Laponiahalvøya granites: a late Grenvillian age (960–940 Ma) was suggested by, e.g. Gee et al. (1995, 1999), Johansson et al. (1999, 2004, 2005), and Tebenkov et al. (2002) whereas McClelland et al. (2018) interpreted a Caledonian (Silurian) age of the granites.

Further fieldwork and sampling are needed in the future concerning the age of the granites, migmatites, and deformation(s) in Nordaustlandet. As long there are no reliable and more detailed data, an interpretation and reconstruction of the Neoproterozoic and Palaeozoic plate tectonic evolution in this part of the Arctic and the relations of the basement terranes of Svalbard to the east coast of Greenland and the north coast of Greenland and Ellesmere Island (Laurentia) are not possible.

Pressing scientific issues

- High precision U-Pb dating of various generations of granitoids;
- Metamorphic evolution of migmatites;
- Better understanding of the paleogeographic position of the Nordaustlandet Terrane.

BOCKFJORDEN – CENOZOIC VOLCANISM/DEVONIAN BASIN (6 September 2024)

Objectives and geological background

On 6 September, the SvalGeoBase II participants visited the Sverrefjellet volcano in southern Bockfjorden. The eruptions that formed the present-day 500 m high volcano are 100,000–250,000 years old and sit on the Hekla Hoek bedrock west of the main Graben fault (Fig. 8). Interbedding of pahoehoe lavas, pillow lavas and coarse cinders at all levels within the edifice suggests that Sverrefjellet grew concurrently with the rise of the glaciers that surround it (Gjelsvik 1963; Skjelkvåle et al. 1989). The present volcanic edifice has been eroded; large erratic boulders on its summit show that it was completely buried during the last ice age, and

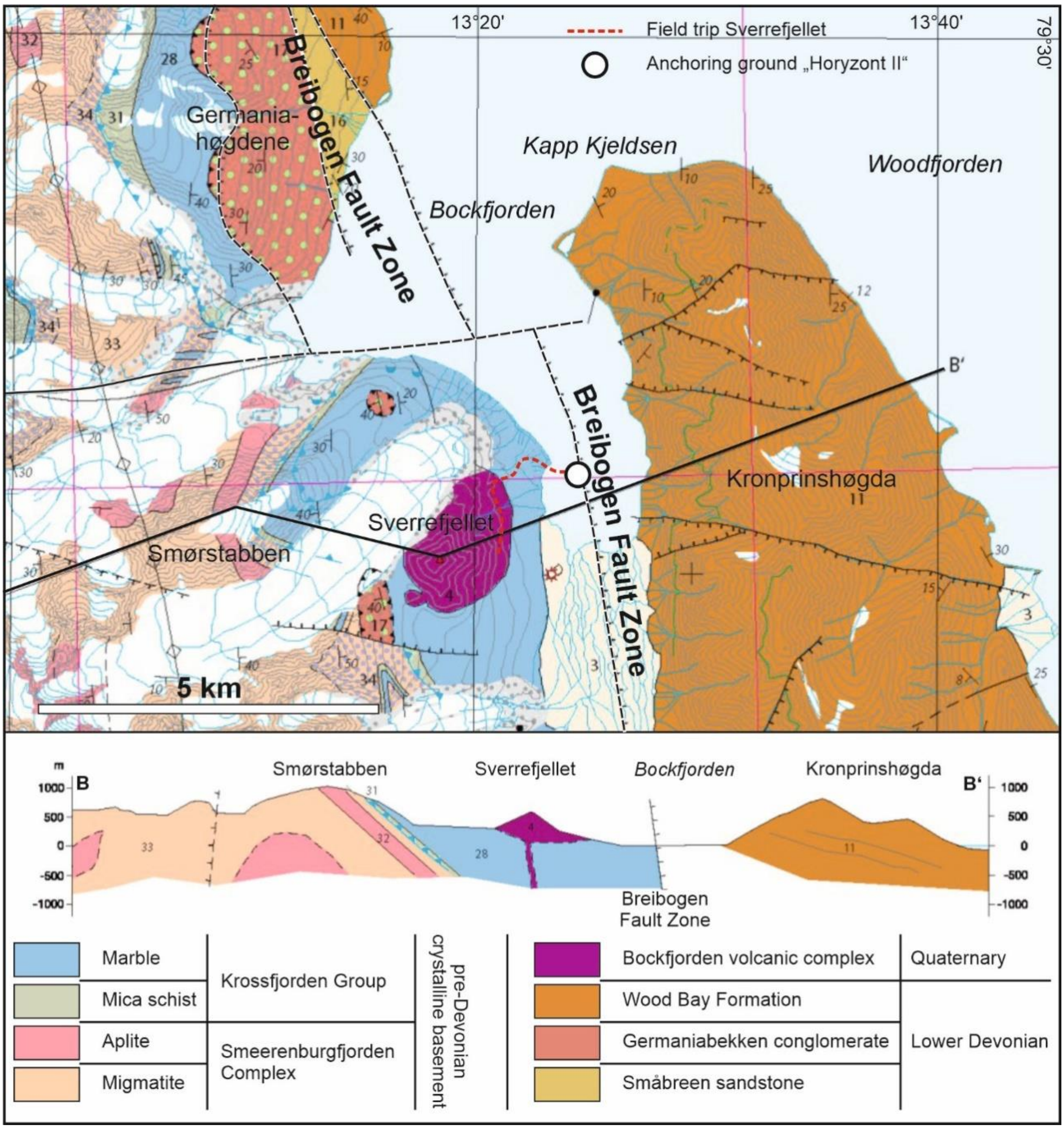

Fig. 8. Geological map of the area around Bockfjorden, after Piepjohn and Thiedig (1994) and Dallmann et al. (2005) (the map was modified by Dr. Karsten Piepjohn).

Fig. 9. Bockfjorden – Andrée Land Devonian Basin east of the Breibogen Fault Zone (archive drone photo: Rafael Kenji Horota; VR Svalbard, Svalbox).

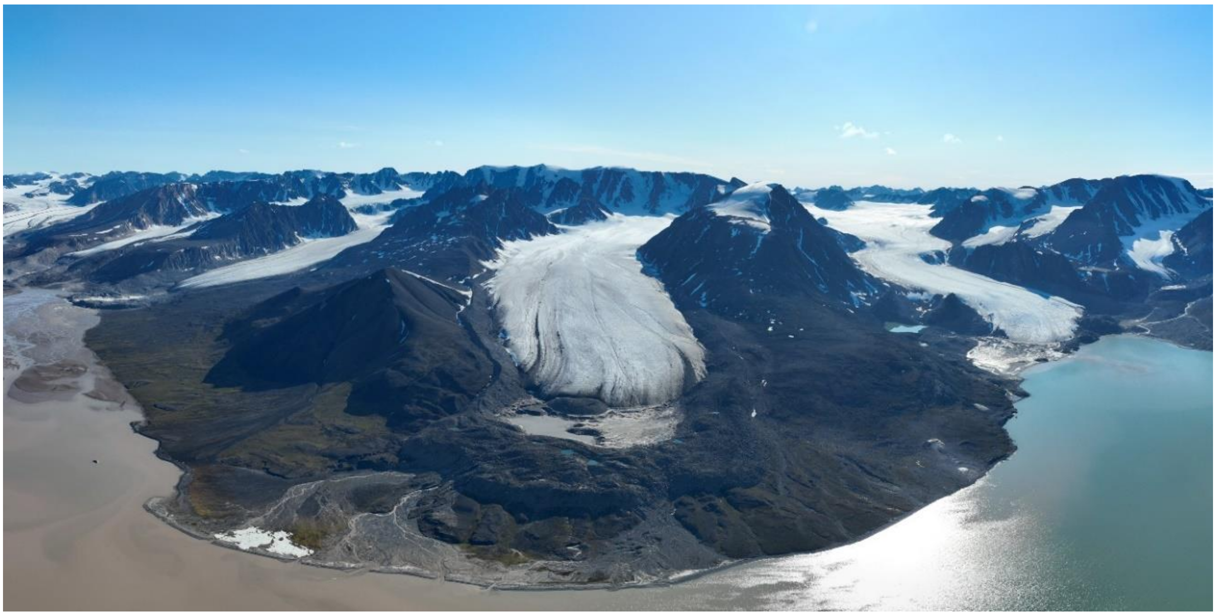

Fig. 10. Bockfjorden – Sverrefjellet volcano (left side of the photo) partially covered from the west by the Adolfbreen glacier. In the background, metamorphosed massifs of the Caledonian basement of Haakon VII Land (archive drone photo: Rafael Kenji Horota; VR Svalbard, Svalbox).

Adolfbreen partly buries its northern flank (Fig. 10). The remaining hill probably represents less than half of the original stratovolcano. Several studies (e.g. Jackson et al. 1984; references therein) have linked Tertiary to Quaternary basaltic volcanism on NW Spitsbergen to the development of the Yermak Plateau. Major deep faults, including the graben-bounding structures along Bockfjorden, probably localize the volcanism (Amundsen et al. 1987; Griffin et al. 2012).

The basement rocks west of the Breibogen Fault Zone are exposed in the main NNW-SSE trending Bockfjorden Anticline (Gee and Moody-Stuart 1966; Gjelsvik 1979). The core of the anticline hosts granitic rocks and migmatites of the Silurian Smeerenburgfjorden Complex (e.g.

Petterson et al. 2009) overlain by mica schists and marbles of the Mesoproterozoic Krossfjorden Group (Fig. 8). Migmatization, metamorphism, and deformation of the basement rocks are related to the Caledonian Orogeny. Tertiary basalt flows in sequences up to 150 m thick.

East of the Breibogen Fault Zone, kilometres-thick clastic deposits of the Old Red Sandstone are exposed. These are part of the 60 km wide and 170 km long, NNW-SSE trending Andrée Land Basin (e.g. Dallmann and Piepjohn 2020), which consists of at least 3 km thick red siltstones and sandstones of the Pragian/Emsian Wood Bay Formation (Friend and Moody-Stuart 1972; Figs. 8 and 9). The stratigraphic position of the isolated blocks of the Germaniabekken conglomerate and Småbreen sandstone at Germaniahøgdene within the Breibogen Fault Zone remains unclear. They may be related to the Lochkovian Red Bay Group of the Raudfjorden Trough west of the basement of the Bockfjorden Anticline. After the deposition of the Old Red Sandstone in Spitsbergen, both the Devonian sedimentary rocks and the pre-Devonian basement rocks were affected by the west-directed Svalbardian tectonic event (e.g. Piepjohn 2000; Dallmann and Piepjohn 2020) which can be correlated with the Ellesmerian Orogeny in northern Greenland and in the Canadian Arctic (McCann 2000; Piepjohn et al. 2015; Dallmann and Piepjohn 2020).

The 80 km, almost linear, Breibogen Fault shows a km-scale down-to-the-east offset at Bockfjorden. The base of the Andrée Land Basin between the Breibogen Fault in the west and the Billefjorden Fault Zone in the east is unknown. However, the activation of the Breibogen Fault is possibly a reason for the volcanic activity in the Pleistocene and the ongoing geothermal activity indicated by thermal springs north and south of Sverrefjellet.

Pressing scientific issues

- Regional geodynamic significance of Miocene and Quaternary volcanism in NW Spitsbergen;
- Deciphering relationship of magmatism and thermal hot springs with structural framework;

Fig. 11. Prof. Martin Whitehouse (Museum of Natural History, Sweden; blue jacket) and Prof. Simon Wilde (Curtin University, Australia; yellow jacket) at a xenoliths site in the Sverrefjellet massif (a frame from the film SvalGeoBase II, directed by Sławek Matczak).

- Analysis of the mantle xenoliths (Fig. 11) and other volcanics across northern Svalbard using modern geochemical methods;
- The stratigraphy and thickness of the Devonian Old Red Sandstone (Andrée Land Basin);
- Recognition of the Caledonian Basement underneath the Andrée Land Basin;
- Analysis of the offshore seismic profiles for extension of faults and Devonian Basin;
- Zircon U/Pb analyses of Devonian Basin Fill for provenance.

RAUDFJORDEN – THE CONVERGENT BOUNDARY (7 September 2024)

Objectives and geological background

The primary objective of the landing in Raudfjorden on the morning of 7 September 2024 was to reach the eclogite exposure in the western part of the fjord, north of the Rabotdalen valley (Fig. 12).

The group landed south of Alicehamna on the Svalisstranda coast, which is composed of rocks from the Princesses Alicefjellet Formation, a widespread quartz conglomerate within the Early Devonian Red Bay Group.

East of this formation lies a thin unit of garnet-mica schist with mylonitic textures (Montblanc unit), followed by garnet biotite-amphibolite gneiss of the Richardalen Complex (Fig. 13).

On the southern slope of Princesses Alicefjellet, north of Rabotdalen, an eclogite lens occurs within the biotite-amphibolite gneisses (Fig. 13). The protolith of this body was likely a mafic dyke that intruded into the gneisses before the Caledonian Orogeny, undergoing metamorphism under high-pressure/low-temperature conditions, similar to those found in subduction zone complexes.

The group reached the eclogite exposure after an hour’s walk from the coast.

The interpretation of the tectonic position, age, and geochemical analysis of the metamorphic complexes and post-Caledonian sedimental cover visited in Radfjorden can be found in the

Fig. 12. On the morning of 7 September Raudfjorden greeted us with a wintery landscape. The photo presents an eastward view of the snow-covered exposures of the Montblanc Unit and the Richardalen Complex, with Raudfjorden stretching in the background (drone image taken with a Mavic 3 Pro by Anna Sartell and Rafael Kenji Horota; VR Svalbard, SvalBox).

Fig. 13. Lenses of eclogite, surrounded by garnet-rich orthogneiss, represent mafic dykes that were metamorphosed under high-pressure conditions. South-eastern slope of Prinsesse Alicefjellet (archive photo 2023: Krzysztof Michalski).

following scientific articles: Gee (1966), Dallmeyer et al. (1990), Gromet and Gee (1998), Dallmann et al. (2002), Labrousse et al. (2008), Elvevold et al. (2014), Beranek et al. (2020), Dallmann and Piepjohn (2020), Koglin et al. (2022), Mazur et al. (2022), Dallmann (2015).

Pressing scientific issues

- Direct isotopic dating of eclogite facies assemblage using e.g. Lu-Hf and U-Pb garnet techniques;
- Modern P-T models for eclogites and their host rocks;
- Metamorphic evolution of the Montblanc unit;
- The paleogeographic position of the Richarddalen Complex during high-pressure (HP) metamorphism.

BLOMESLETTA – THE HIGH ARCTIC LARGE IGNEOUS PROVINCE (8 September 2024)

Objectives and geological background

The landmasses around Ekmanfjorden (Figs. 14–16), northern Isfjorden, are characterized by Devonian to Triassic sedimentary successions intruded by the Early Cretaceous Diabasodden Suite. An introduction to this magmatism on Svalbard was given in the abstract "Diabasodden and its Suite – the High Arctic Large Igneous Province on Svalbard (HALIP) and its type locality" (this volume). Ekmanfjorden is located ca. 45 km north-west from the type locality Diabasodden. Blomesletta, one of the most accessible places to observe these dolerites in Ekmanfjorden, is a low-lying coastal plain at the southeastern end of the fjord. Here, the magma intrudes the Permian carbonates and cherts, as can be seen at the exposed contact along the coast (marked with a red star in Fig. 14, see also the photograph of the contact in Fig. 15).

Nejbert et al. (2011) sampled the central part of this thick undulating sill and obtained a K-Ar date of 93.9 ± 3.3 Ma. Further HALIPs in this locality and others were visited during two extensive field campaigns in 2020 (led by A. Sartell) and 2021 (led by O. Galland). The geometry of the intrusions found in the Ekmanfjorden area is discussed in detail in Galland et

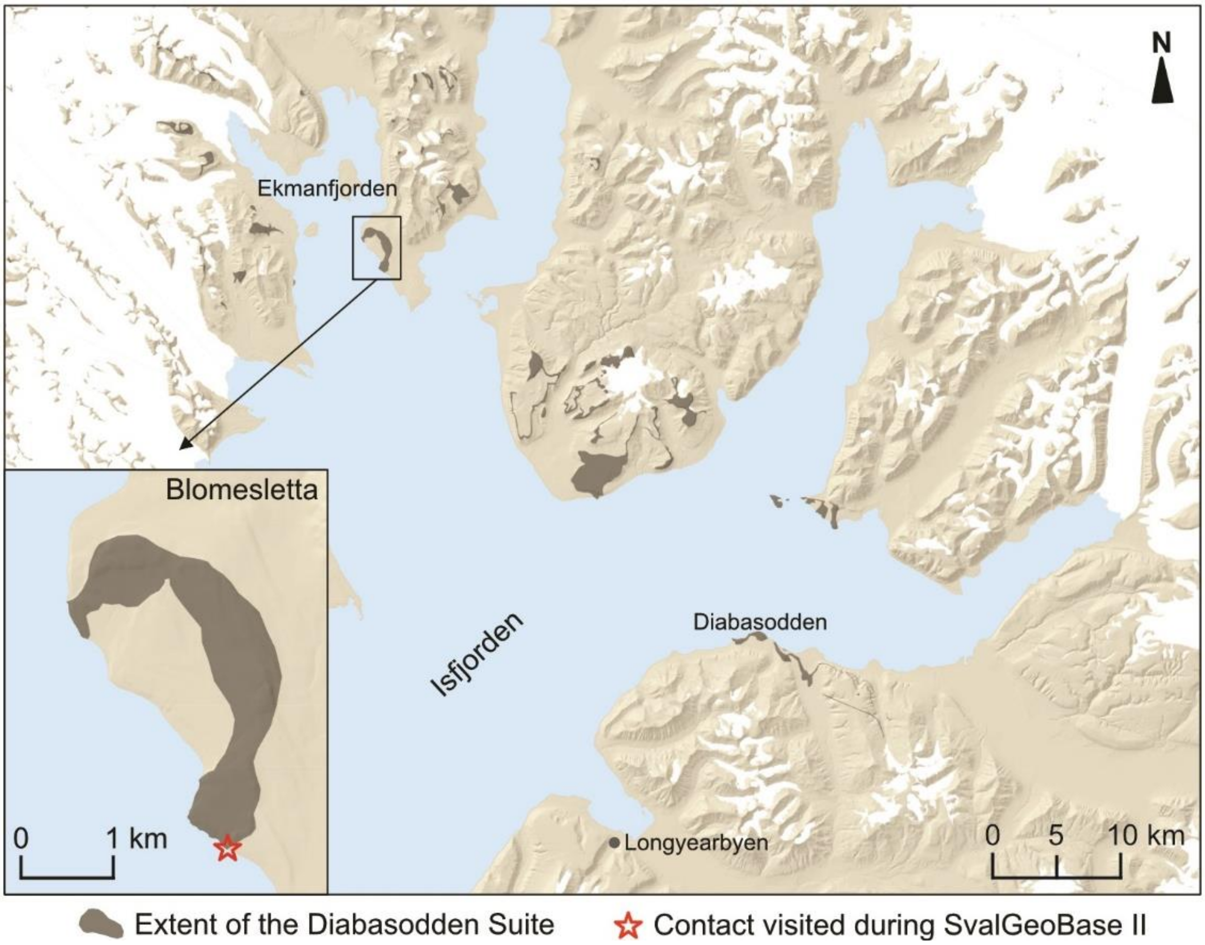

Fig. 14. Topographical map over central and northern Isfjorden, Svalbard, illustrating the extent of the High Arctic Large Igneous Province, regionally called the Diabasodden Suite, in dark grey. The inset map shows the intrusion visited at Blomesletta, Ekmanfjorden. Red star indicates the location of the contact between the dolerite and the Permian strata, visited during SvalGeoBase II. The glacier extents, land area and digital elevation are from the Norwegian Polar Institute (2014a,b), and the extent of the Diabasodden Suite is a modified version of the Geological map of Svalbard (Norwegian Polar Institute 2016), based on field observations made in 2020 and 2021.

al. (in revision). U-Pb geochronology of samples collected during these expeditions suggests that the magma was emplaced earlier than indicated by the K-Ar age (Sartell et al., in revision) and that the emplacement was coeval with the intrusion at Diabasodden, U-Pb dated by Corfu et al. (2013). The intrusions at Diabasodden and in Ekmanfjorden, including Blomesletta, were emplaced at ca. 125–123 Ma (Sartell et al., in revision; Corfu et al. 2013). Petrographically, Blomesletta dolerite has a similar composition to that described at Diabasodden, with plagioclase and clinopyroxene phenocrysts in a matrix of plagioclase, clinopyroxene and Fe-Ti oxides (Sartell 2021; see abstract "Diabasodden and its Suite – the High Arctic Large Igneous Province on Svalbard and its type locality" for more details on the petrography of the Diabasodden Suite).

Pressing scientific issues

- Further high-precision U-Pb dating of magma emplacement, along with comprehensive geochemical analyses (whole-rock, isotope, and mineral geochemistry), to investigate magma sources and the evolution of the HALIP on Svalbard in comparison to the circum-Arctic region;

- Research on magma-sediment interactions: examining contact metamorphism processes, the influence of magmatic intrusions on material migration within the sediments (including hydrocarbon migration), the release of volatile compounds into the atmosphere, and the subsequent climatic changes during the Cretaceous.

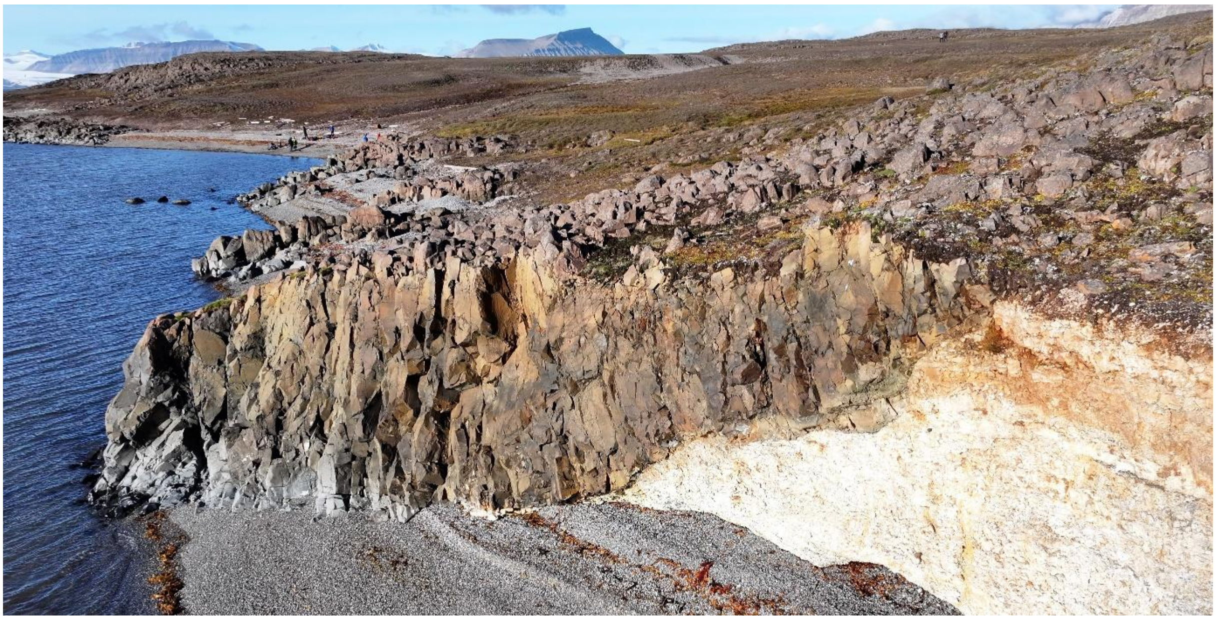

Fig. 15. Ekmanfjorden – Blomesletta. The contact between Permian sedimentary rocks of the Kapp Starostin Formation and a Cretaceous magmatic intrusion (drone image taken with a Mavic 3 Pro by Anna Sartell and Rafael Kenji Horota; VR Svalbard, Svalbox).

Fig. 16. R/V Horyzont II in Ekmanfjorden (drone image taken with a Mavic 3 Pro by Anna Sartell and Rafael Kenji Horota; VR Svalbard, Svalbox).

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