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Paleocene clastic dyke at Janusfjellet, Spitsbergen

ABSTRACT: An about 200-m long sandstone dyke cutting through the shales of the Janusfjellet Formation (Jurassic-Lower Cretaceous) has been discovered at Janusfjellet Central Spitsbergen. The palynomorph assemblage and the character of sandstone from the dyke are indicative of the Firkanten Formation of Paleocene age.

Key words: Spitsbergen, geology

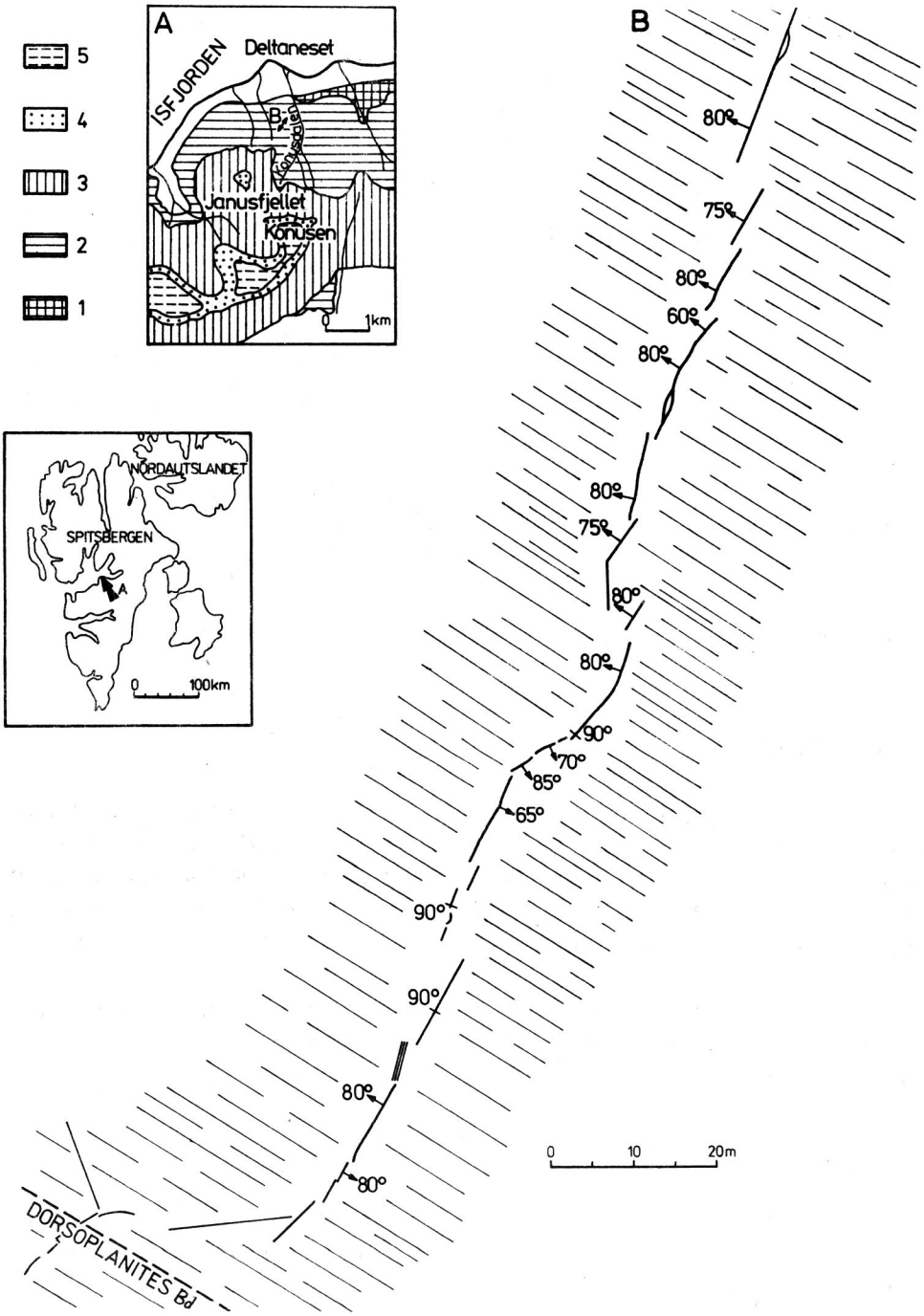
1. Introduction

The clastic dyke cutting through the Janusfjellet Formation (Jurassic-Cretaceous) has been discovered by C. Kulicki and A. Wierzbowski, members of a Polish Spitsbergen Expedition in 1979, in the Sassenfjorden area, Central Spitsbergen (Figs. 1 and 2). In addition to field observations, samples taken from the clastic dyke were studied petrographically in thin sections and palynologically.

Responsibility for the geological part of paper lies with Andrzej Wierzbowski, and for palynological part with Maria Ziembińska-Tworzydło.

2. Geological setting and description

The clastic dyke occurs on the north-eastern slopes of Janusfjellet (Figs. 1 and 2). It strikes generally NNE-SSW, cutting through the Upper Jurassic deposits of the Janusfjellet Formation, which dip gently (about 5°) southwestwards. The dyke cuts through shales and silty shales with calcareous bands and concretions of the Agardfjellet Member, the lower member of the Janusfjellet Formation (Figs. 3 and 4). wedging out near calcareous Dorsoplanites beds in the uppermost part of the member; it does not


5
4
3
2
1
A
ISFJORDEN
Deltaneset
Janusfjellet
Konusen
1km
B
80°
75°
80°
60°
80°
80°
75°
80°
80°
90°
70°
85°
65°
90°
90°
80°
80°
0 10 20m
DORSOPLANITES Bd
NORDAUTSLANDET
SPITSBERGEN
A
0 100km

continue in the succeeding deposits of the Rurikfjellet Member, exposed higher upslope. The total length of the dyke reaches about 200 meteres, and its thickness varies from a few up to 50 centimetres. The dyke is nearly vertical, or it dips steeply towards the southeast (in the lower part of the slope) and the northeast (in the upper part of the slope).

The clastic dyke consists of grey-greenish, very poorly sorted sandstone with some admixture of gravel (mostly quartz, quartzite and chert), clasts of shals (from the Janusfjellet Fm.), and plant debris. The grain size is variable, of the fine to medium sand grade. The sandstone consists of quartz and feldspar (microcline and orthoclase dominate over plagioclase) and muscovite. The cement is usually dominated by a complex of clay minerals with ferruginous materials, and the rock is generally friable; however, in some parts, the quartz graines are recrystallized and the quartz overgrowths produce a highly compact rock.

No greater displacements of the Jurassic rocks can be observed along the dyke. Locally observed are only the horizontal displacements up to 1,5 m, well visible when the dyke is cutting the calcareous concretions. Small slickensides indicating horizontal as well as vertical displacements are observed within the sandstone forming the clastic dyke.

3. Age and conclusions

Two samples taken from sandstones of the clastic dyke have been studied palynologically, producing few corroded palynomorphs. These are exclusively represented by forms with a thick cellular wall:

Verrucosisporites septentrionalis Manum
Toroisporis (Toroisporis) longitirus Krutzsch
Pityosporites sp.
Inaperturopollenites sp.
Trudopollis rotundus Manum
Tricolporopollenites cingulum fusus (R. Potonie) Th. et Pf.
Basopollis sp.

All these forms are known to occur in Spitsbergen in the Firkanten Formation (and its equivalents, cf. Major and Nagy 1972). The bulk of them have been reported by Manum (1962) from the coalbearing layers of the "lower light series" (= Firkanten Fm.) at Longyearbyen and Barentsburg.

Fig. 1. Clastic dyke at Janusfjellet and its geological setting A. Geological map of the investigated area (after Major and Nagy 1972) showing the location of the clastic dyke; the location map below shows the position of the area within Svalbard 1—De Geerdalen Fm. (Upper Triassic-Lower Jurassic), 2—Janusfjellet Fm. (Jurassic-Lower Crateceous), 3—Helvetiafjellet Fm. — Carolinafjellet Fm. (Cretaceous), 4—Firkanten Fm. (Paleocene), 5—Basilika Fm, — Sarkofagen Fm. (Paleocene-Eocene)

The presence of all these palynomorphs, including Basopollis sp. (not reported by Manum 1962), have been stated also by one of the present authors (M.Z–T) in a sample taken from the lower part of the Firkanten Formation at Barantsburg.

The lithologies of rocks forming the clastic dyke and those occurring in the Firkanten Formation are very similar; in both cases there occur mostly felspathic quartzose sandstones, but locally also conglomerates or admixture of quartz and chert pebbles are found (cf. Major and Nagy 1972).

The palynological and lithological evidence given above shows that the sandstones from the clastic dyke belong to the Firkanten Formation. This formation is generally attributed to the Lower Paleocene (see Major and Nagy 1972, Livsic 1974, and earlier papers cited therein). It is also remarkable that in the palynomorph assemblage obtained from the clastic dyke, there occur some forms (especially Basopollis sp.) which may be be treated as indicative of the Lower Paleogene (Goczan et al. 1967).

The general shape of the clastic dyke, its dimensions, including its original depth attaining possibly several hundered meteres (as counted from the base of Firkanten Formation, preserved actually at the top of Janusfjellet, cf. Fig. 1), and a horizontal displacement of bordering rocks, show that the clastic dyke has developed along a tectonic fissure opened possible due to an earthquake during the sedimentation of the Lower Paleocene Firkanten Formation. The sand and gravel of this formation together with some admixture of the older rocks have settled in the fissure rather rapidly forming almost structureless sandstone. The clastic dyke must therefore be treated as a result of tectonic disturbance of the Sassenfjorden area in Early Paleocene time.

The paper results from field work carried out by the paleontological group of the Polish Spitsbergen Expedition in 1979, organized and sponsored by the Institute of Geophysics, Polish Academy of Sciences. The authors with to thank Professor G. Biernat, Dr. A. Baliński, Dr. C. Kulicki and Dr. K. Małkowski, Institute of Paleobiology, Polish Academy of Sciences, who were the members of the paleontological group, for their help in the course of field work.

4. Summary

The sandstone clastic dyke cutting through almost horizontally lying Upper Jurassic deposits of the Janusfjellet Formation was discovered at Janusfjellet, Sassenfjorden area, Spitsbergen (Figs. 1–4). The total length of the dyke reaches about 200 m, and its thickness varies from a few up to 50 centimetres. The sandstone forming the dyke consists of quartz, feldspar and muscovite; some admixture of gravel, and plant debris are observed. The samples from sandstone have been studied palynologically producing small assemblage

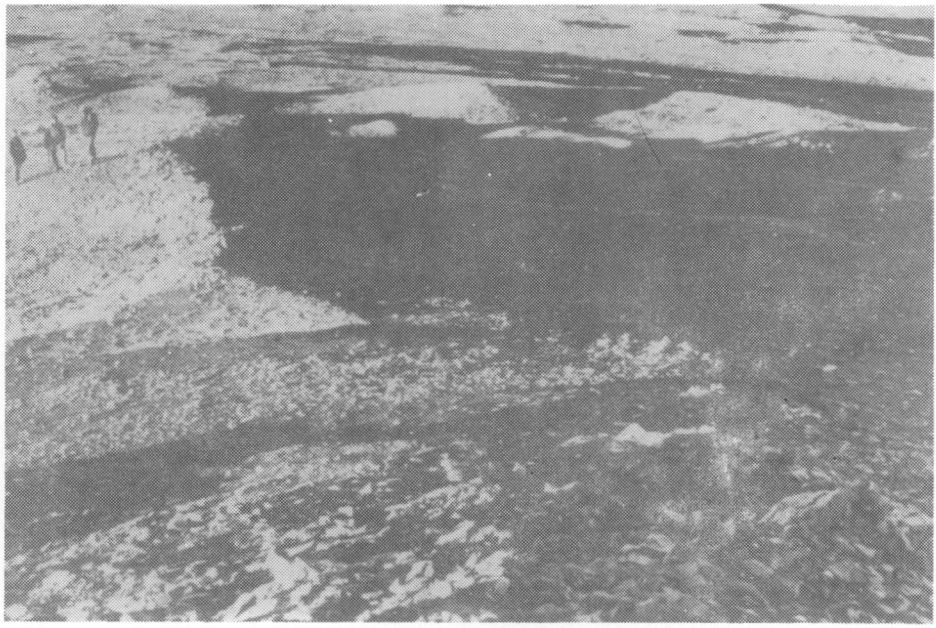


Fig. 2. General view of the clastic dyke on the north-eastern slope of Janusfjellet; the dyke is weathered out of the shales (Agardhfjellet, Mb.), and forms a low wall which is marked on the photograph by shadow-boundary

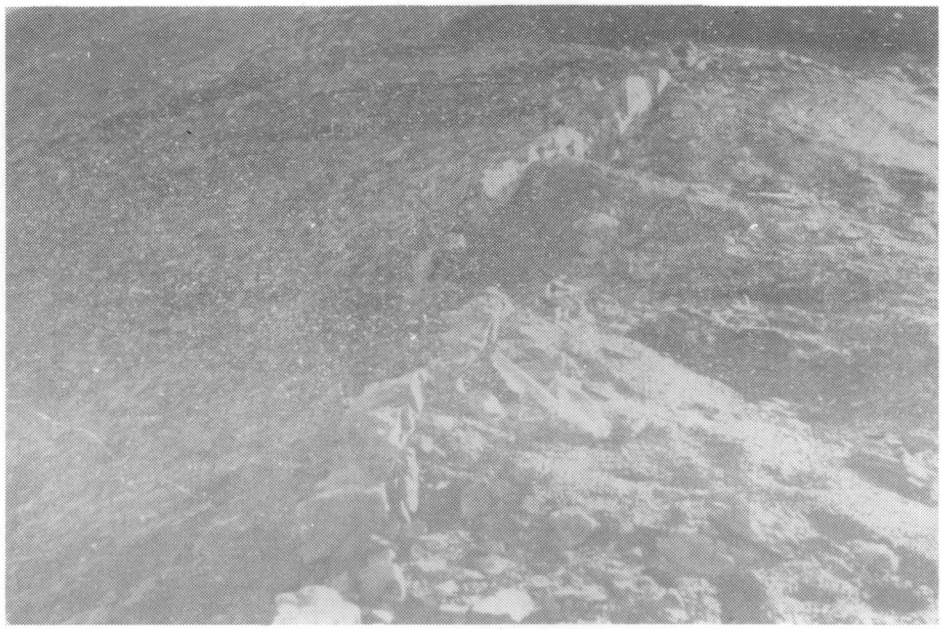


Fig. 3. Clastic dyke in shales (detail corresponding to a middle part of Fig. 2)

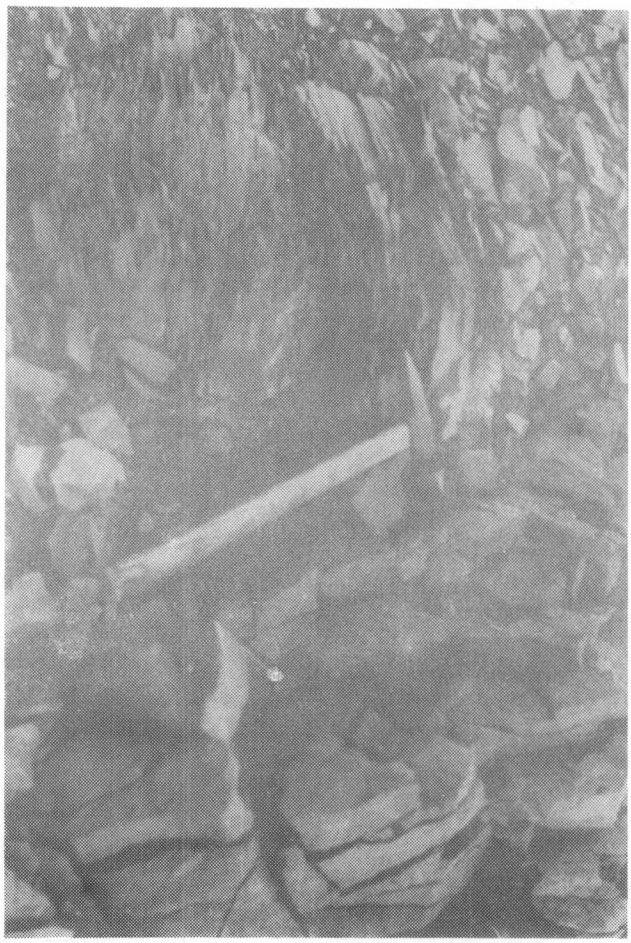


Fig. 4. Clastic dyke (to the right) cutting a calcareous concretion of the Agardhfjellet Mb.

of palynomorphs. These are exclusively known to occur in Spitsbergen in the Lower Paleocene Firkanten Formation; moreover the lithologies of the rocks forming the clastic dyke and those occurring in the Firkanten Formation are very similar. The clastic dyke has developed along a tectonic fissure produced possibly by an earthquake during sedimentation of the Lower Paleocene Firkanten Formation.

5. Резюме

Во время работ в районе Янусфьеллет (Сассенфьорден, Шпицберген) была обнаружена кластическая жила, пересекающая почти плоско залегающие слои верхней юры формации Янусфьеллет (фиг. 1—4). Длина жилы составляет около 200 м, а ее мощность колеблется от нескольких до 50 см. Кластическая жила заполнена кварцевыми песчаниками с примесью полевого шпата и мусковита, с отдельными зернами во фракции гравия и с растительным детритом. Палинологический анализ песчаников выявил наличие небольшого комплекса спороморф, который можно считать типичным для различаемой на Шпицбергене нижнепалеоценовой формации Фиркантен. Литологические черты отложений, заполняющих изучаемую кластическую жилу, а также осадков известных в формации Фиркантен, отличаются большим сходством. Жила образовалась вдоль тектонической трещины, которая является вероятно результатом сейсмического толчка, наступившего в нижнем палеоцене, во время осадконакопления формации Фиркантен.

6. Streszczenie

W czasie prac w rejonie Janusfjellet wykryta została żyła klastyczna przecinająca prawie płasko leżące warstwy górnojurajskie formacji Janusfjellet (fig. 1–4). Długość żyły wynosi około 200 m., a jej grubość waha się od kilku do 50 cm. Żyła klastyczna wypełniona jest piaskowcami kwarcowymi z domieszką skaleni i muskowitu, z pojedynczymi ziarnami frakcji żwirowej, oraz z detrytusem roślinnym. Analizy palynologiczne piaskowców wykazały obecność niewielkiego zespołu sporomorf który może być uznany jako typowy dla wyróżnianej na Spistbergenie formacji Firkanten, wieku dolnopaleoceńskiego. Także charakter litologiczny osadów wypełniających omawianą żyłę klastyczną, oraz osadów znanych z formacji Firkanten, są bardzo podobne. Żyła klastyczna rozwinęła się na szczelinie tektonicznej, powstałej zapewne jako efekt wstrząsu sejsmicznego, w dolnym paleocenie, w czasie sedymentacji formacji Firkanten.

7. References

1. Goczan F., Groot J. J., Krutzsch W., Pacltova B. 1967 — "Stemma Normapolles Pflug 1953 b" (Angiospermae) — Paleont. Abh., Abt B, 2: 431–539.
2. Livsic Ju. Ja. 1974 — Paleogene deposits and the platform structure of Svalbard — Norsk Polarinst. Skr., 159: 1–50.
3. Major H., Nagy J. 1972 — Geology of the Adventdalen map area — Norsk Polarinst. Skr., 138: 1–58.
4. Manum S. B. 1962 — Studies in the Tretiary flora of Spitsbergen, with notes on Tertiary floras of Ellesmere Island, Greenland, and Iceland. A palynological investigation — Norsk Polarinst. Skr., 125: 7–27.