

# AN EARLY PRECAMBRIAN SUPPOSED CONGLOMERATE IN THE FISKENÆSSET AREA, WEST GREENLAND

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During A/S Platinomino's prospecting programme 1970, an extensive gossan zone was discovered in the Fiskenæsset area, West Greenland. Blasting showed a rock composed of well rounded rock fragments (mainly gneiss and ultrabasic rocks) in a matrix consisting mainly of pyrrhotite and pyrite. The zone can be traced for more than 30 km with a width of only 1.5 m, and all observations so far indicate a conformable position within the surrounding rocks on a major scale. Local variations in width are believed to be due strong folding. An origin as an intrusive breccia cannot be rejected, but a sedimentary origin seems most probable to the author.

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Until 1970 the only geological mapping done in the Fiskenæsset area was a reconnaissance in the coastal areas by B. F. Windley in 1964, as part of the mapping programme of the Geological Survey of Greenland (GGU). The only more detailed GGU work was concentrated on the chromite-layered anorthosites, the chief component of the Fiskenæsset Complex (Ghisler & Windley, 1967). In 1970 GGU started detailed mapping of the area.

A/S Platinomino received an exploration concession covering the area in 1969, and geological mapping and prospecting by this company started in the summer of that year. During the summer of 1970 an extensive gossan zone was discovered north of the Fiskenæsset Complex in the bottom of Kångnaitsoq fjord west of Ũmat Mountain (fig. 1), and a subsequent blasting revealed a rock composed of well rounded rock fragments of different kinds embedded in a matrix consisting mainly of sulphides. In order to trace the extension of the zone, a blasting programme was started in the rust zones nearby. As a result of this, this rock was found at three further localities: at upper Ũmat (fig. 2), on the north side of Kångnaitsoq, and

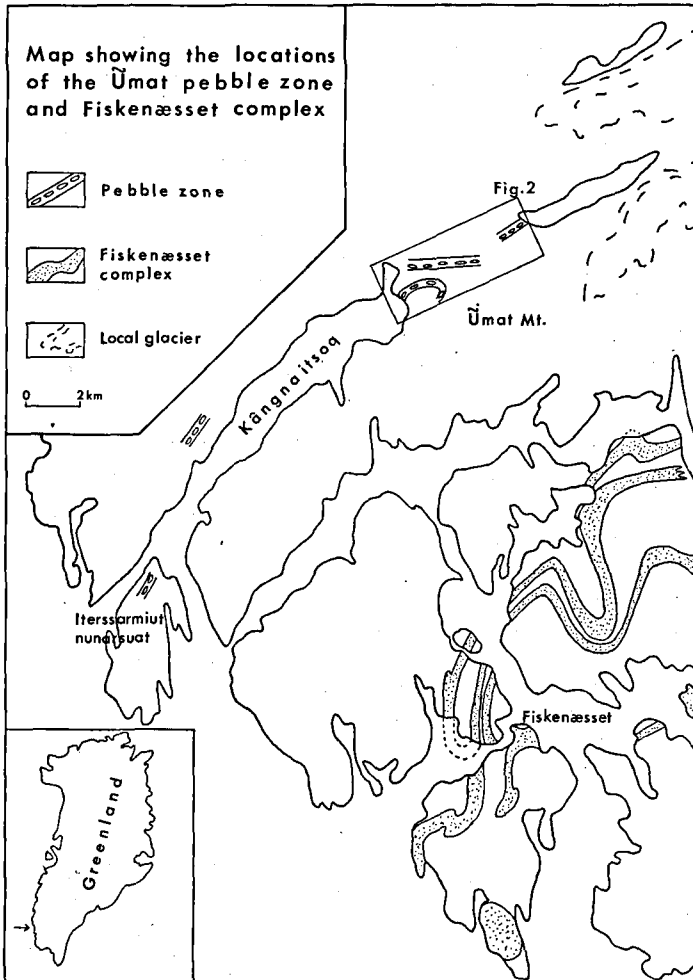


Fig. 1. Geological sketch-map of the Fiske-næsset Area giving the position of the Ūmat pebble zone shown in fig. 2.

on the island Iterssarmiut nunarsuat (fig. 1). The present note is based on field work done in 1970, mainly by the author as a participant in A/S Platinomino's exploration programme.

The most probable origin of the "Ūmat pebble zone" must be either a polymict conglomerate or an intrusive breccia. At the present stage of investigation neither of the two possibilities can be rejected. At the end of this article the origin is discussed in the light of the field data and preliminary microscopic investigations. In order to emphasize that the genetic problems are not solved yet, the term "pebble zone" will be used in the following because of the well rounded appearance of the rock fragments.

## Geology

The dominant rock types in the area are gneisses, which according to Ghisler & Windley (1967) have undergone at least two periods of regional metamorphism, first under granulite facies conditions and later a retrogression under amphibolite facies. During metamorphism the area was folded at least two times, affecting the Fiskenæsset Complex as well as the pebble zone. As a result of the repeated folding the pebble zone and surrounding rocks show a complicated fold interference pattern. At lower Ũmat the pebble zone forms a synform which is supposed to be connected with the south-west extension of the showing at upper Ũmat by an antiform. A helicopter reconnaissance has shown this horizon to continue to the north-east with a steep dip and a constant strike. It is not possible yet to connect Ũmat with the showings on the north side of Kângnaitsoq or on Iterssarmiut nunarsuat. On the north side of Kângnaitsoq a typical double fold structure was observed.

The pebble zone is situated in an amphibolite horizon which, seen on a major scale, is conformable to the surrounding gneisses. These rocks, which have not been studied in any detail, are leucocratic, partly migmatitic rocks with a very weak foliation. The width of the amphibolite is 50–60 m, remaining remarkably constant along the strike; small variations are regarded as a result of the strong folding. The pebble zone, which is situated near or along the contact to the gneiss (fig. 2), shows a varying thickness. The pre-tectonic width is assumed to be approximately 1.5 m, but considerable variations due to deformation are observed, showing thickening to over 10 m and thinning or complete absence at other places. The contact relations between the amphibolite and the pebble zone are often seen to be discordant on a minor scale, but this is probably due to deformation. The narrow amphibolite layer between the gneiss and the pebble zone is internally isoclinally folded both at upper and lower Ũmat, whereas similar structures within the main amphibolite on the other side of the pebble zone have not been observed. The narrow amphibolite is a medium-grained, dark, well foliated rock just at the contact to the pebble zone, and gradually becomes more and more migmatized towards the gneiss. The main amphibolite is dark near the pebble zone, but further away it becomes more leucocratic, the last few metres before the gneiss being migmatized. In the main amphibolite at upper and lower Ũmat a 0.3 m wide rust zone running parallel to the pebble zone is found.

The pebble zone contains well rounded pebbles in a matrix consisting mainly of sulphides. The pebble size varies from a few millimetres to 30 cm. The shapes of the pebbles are mostly elliptical, and a weak tendency to parallelism is observed. No systematic variation in composition, amount

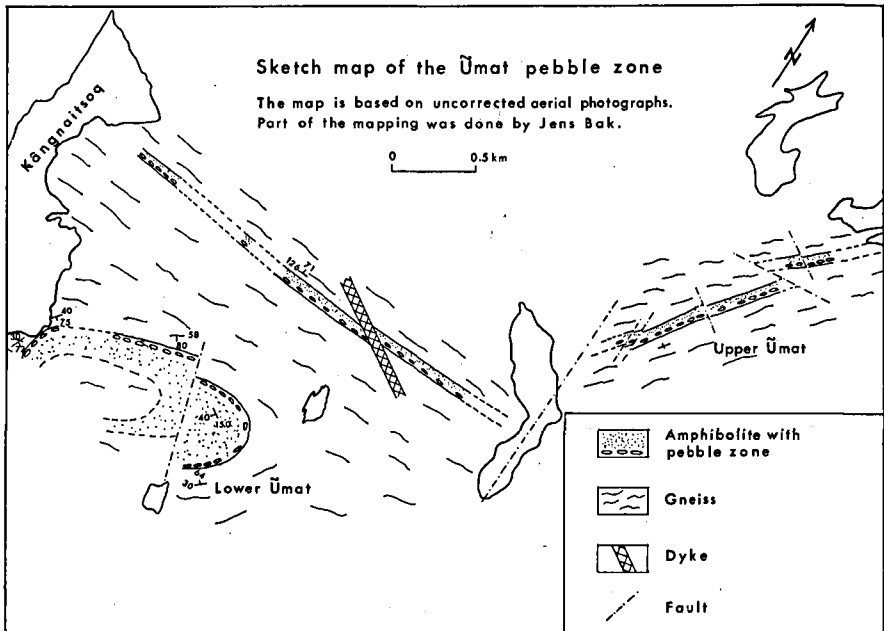


Fig. 2. The Ũmat pebble zone in the Fiskenæsset Area.

or size of pebbles *across* the strike has been observed, but there seems to be a marked decrease in amount of pebbles *along* the strike from upper Ũmat to Iterssarmiut nunarsuat. At upper Ũmat pebbles are found in nearly every sample; at lower Ũmat there are far fewer pebbles over 1 cm in size. At the showing on the north side of Kângnaitsoq only a few pebbles were found, and at Iterssarmiut nunarsuat only one was found. The total amount of sulphides (mainly pyrrhotite and pyrite) shows the same variation along the strike. Upper and lower Ũmat contain approx. 25 % sulphides, the locality on the north side of Kângnaitsoq has 5–10 %, and there is less than 5 % sulphides on Iterssarmiut nunarsuat. It is interesting to note, however, that the relative proportion between pyrrhotite and pyrite seems to change regularly along the strike. At upper and lower Ũmat there is a dominance of pyrrhotite compared with pyrite, but further west the importance of pyrrhotite decreases compared to pyrite. Molybdenite is very scarce at Ũmat, but on Iterssarmiut nunarsuat considerable amounts are found. The pyrrhotite-pyrite variation could be explained by differences in metamorphic grade, but the differences in the amount of molybdenite are probably primary. A mere inspection of samples taken systematically across the pebble zone at lower Ũmat indicates a tendency to higher values of chalcopyrite towards the bottom of the synform near the gneiss contact.

## Petrography

Microscopic examination of a few thin sections and a study of hand specimens makes it possible to divide the pebbles into 3 groups: ultrabasic pebbles, gneiss pebbles and quartz pebbles. There are only very few quartz pebbles. The ultrabasic pebbles seem to form the main group. The pebbles range in size from 0.5 cm to 10 cm. Under the microscope they can be subdivided into pyroxenites and peridotites. The pyroxenites, which dominate, contain ortho- and clinopyroxene, probably hypersthene and augite, a little plagioclase, biotite, apatite and opaque minerals. The peridotites contain serpentinised olivine, hypersthene and very little plagioclase. In both the pyroxenites and peridotites small amounts of green hornblende are found now and then. The gneiss pebbles seem to attain the largest size, which is especially well demonstrated at upper Ūmat. They are composed of antiperthitic plagioclase and hypersthene in a saccharoidal texture with subordinate amounts of quartz and biotite. The plagioclase is an andesine with 35 % anorthite. On Iterssarmiut nunarsuat the pebble zone is dominated by a medium- to coarse-grained rock composed of plagioclase, quartz and very small amounts of well rounded zircon. At upper Ūmat a peculiar rock is developed in the northernmost part of the pebble zone. This is a 5–10 cm wide layer consisting nearly entirely of an orthoclase with a very strong rhombohedral cleavage (adular habit).

## Summary and conclusions

1. The pebble zone has a present extension of more than 30 km, and all present field data indicate that it is conformable on a major scale with the amphibolite and the surrounding gneisses.
  2. The width of the pebble zone is mostly 1.5 m, but local thinning and thickening is observed. These variations are believed as due to the strong folding.
  3. All pebbles found so far are well rounded with an elliptical shape, and a weak tendency to parallel arrangement.
  4. The size of the pebbles varies from a few millimetres to 30 cm, and there is a marked decrease in size and amount from east to west.
  5. Ultrabasic pebbles are dominating.
  6. No contact influence on the wall rock was found, neither in form of contact metamorphism nor as impregnation with sulphides.
  7. The pyrrhotite:pyrite ratio decreases from east to west, while the molybdenite content shows highest values in the westernmost locality.
- The pebble zone must be pre-tectonic, and the change in the pyrrhotite:

pyrite ratio along the strike indicates that it probably also is pre-metamorphic.

It is reasonable to assume that a discussion of origin of the pebble zone can be restricted to two alternatives: an intrusive breccia formation or a sedimentary formation. 1. and 2. strongly favour a sedimentary origin. It is difficult to imagine an intrusive breccia following the structures in the surrounding rocks for more than 30 km. Well rounded pebbles are most often found in sedimentary deposits, but some obviously igneous rocks display very similar features: e.g. some of the kimberlites in South Africa, an intrusive "conglomerate" at Qingussâq in the Umanak district (T.C.R. Pulvertaft, pers. comm.), and some of the Sudbury breccias (pebble dykes) (Fairbairn & Robson, 1942). The distribution along the strike could be accounted for whichever hypothesis is adopted. The predominance of ultrabasic pebbles is perhaps more easily explained by an intrusive origin. The lack of contact metamorphism could easily be due to later metamorphism, but if an intrusive breccia origin is adopted, one might expect to find impregnation of sulphides in the wall rocks (Brynner, 1961).

It is not possible to exclude an intrusive origin, but on the field data available at the present stage, the author finds a sedimentary origin most probable.

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## Dansk sammendrag

Under A/S Platinomino's prospekteringsprogram i sommeren 1970 fandtes en gossan zone i bunden af Kângnaitsoq nord for Fiskensættet, Vestgrønland. Efter sprængning sås en bjergart bestående af velafrundede bjergartsfragmenter liggende i en matrix, der hovedsagelig består af magnetkis og pyrit. Ved sprængning i de omkringliggende rustzoner fandtes den samme bjergart på øvre Ūmat, på nordsiden af Kângnaitsoq og på øen Iterssarmiut nunarsuat. Zonen, der sjældent er over 1,5 m mægtig, kan følges over godt 30 km, men på grund af talrige forkastninger mangler den en del steder undervejs. Genetisk kan den tolkes enten som en intrusiv breccie eller som en sedimentær bjergart. På baggrund af de forhåndenværende oplysninger mener forfatteren, at en sedimentær oprindelse er mest sandsynlig.

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