

**Geological research during 25-th Ukrainian Antarctic Expedition,
February – April 2020: Kiev Peninsula of the Graham Coast**

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SUMMARY

From February to April 2020 the authors carried out geological survey on the Graham Coast of the West Antarctica. The survey was a part of the seasonal researches of 25-th Ukrainian Antarctic Expedition supported by National Antarctic Scientific Center. Studied area was the mainland of the Kiev Peninsula from the Girard Bay to the Collins Bay and nearby islands. It was found out that outcrops of varied intrusive rocks are widely distributed in the inner part of the Kiev Peninsula of the Graham Coast. They are represented by plutonic and hypabyssal facies. Granitoids prevail among other petrographic representative of the intrusive rocks. Granites and granodiorites intrude in the Jurassic volcanites and Early-Cretaceous gabbroids in the Waddington Bay to Bussey Glacier area. Studied granitoids can belong to the different intrusive complexes. To find out their relative ages it is necessary to complete additional routes on the west slopes of the Mount Mill and Guys Cliff. The parts of the large gabbroic intrusion are exposed in the inner part of the Girard Bay and are intruded by granitoids. Their geological position, age and petrography also need more researches. Erratic boulders additionally confirm the abundance of the granitoids in the inner part of the Kiev Peninsula. Among them red coarse granite deserve special attention as in relation to finding their bedrock and also to the reconstructions of the ancient glaciation namely its extent, thickness and travel routes.



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Introduction

The Institute of Geology of the Taras Shevchenko National University of Kyiv and the Institute of Geophysics of the National Academy of Sciences once again took part in *the Ukrainian Research Program in Antarctica*. The seasonal researches of 25-th Ukrainian Antarctic Expedition (UAE) were supported by National Antarctic Scientific Center. The main purpose of geological and geophysical researches is to study the geological structure of Western Antarctica, its main structural elements and their relationship with the ecology and mineral resource potential of the region. During the Antarctic summer of 2020, the main activity of the geological party was focused on the studying of the mainland of the Graham Coast adjacent to the Ukrainian Antarctic Station (UAS).

Studied area and methods

Studied area on the Graham Coast was the mainland of the Kiev Peninsula from the Girard Bay to the Collins Bay and nearby islands (Fig. 1). Current geological survey was a continuation of the researches started in 2017 and 2019 (Mytrokhyn and Bakhmutov, 2019).

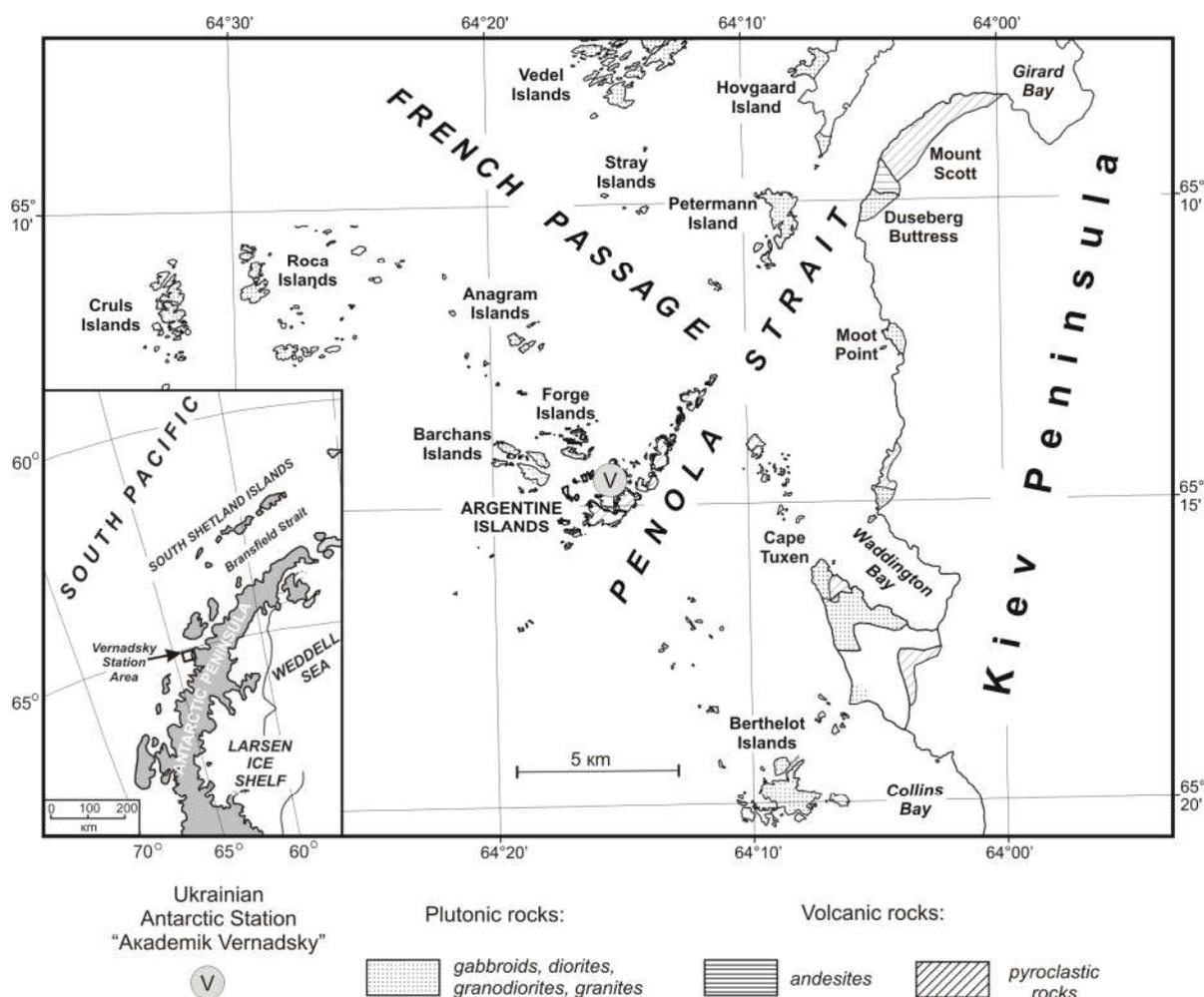


Figure 1 Geology of Ukrainian Antarctic Station region. The geological map of the British Antarctic Territory (1981) was modified and supplemented by the author data

The bulk of the field works were carried out from February 9 to April 18, 2020. The authors completed reconnaissance geological survey into the interior part of the Kiev Peninsula from the



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Rasmussen Hut to the west spurs of the Mount Peary. Field camps on the Rasmussen Hut, the Guys Cliff and the Bussey Glacier were the starting points for the geological routes. The main means of transportation were the skis. Climbing equipment was used to climb the mount Mill. Coasts of the Waddington Bay, the Girard Bay and the Collins Bay were studied at the landing sites reachable with the “Zodiac” motorboats. Satellite photos as well as photos obtained by the drone were used on all stages of the study. Inspection of numerous erratic boulders and moraines provided additional information on the petrography of the subglacier basement of the Kiev Peninsula.

Results

Geological survey in the Waddington Bay and on the Mount Mill shown that outcrops of the Jurassic volcanites described in (Curtis, 1964) are limited to a small coastal area on the Rasmussen Hut. Further east, the foothills, slopes and top of the Mount Mill are composed of granitoids (fig. 2). But from the side of the Waddington Bay extended outcrops of the gabbroids underlie Mount Mill at the sea level. Obviously these are continuation of the Early-Cretaceous gabbroid intrusion that was described in (Mytrokhyn et al., 2017).



Figure 2 Geological survey of the Waddington Bay – Bussey Glacier area on the Google Earth image

On the Rasmussen Hut area Early-Cretaceous granites show intrusive relationships with the older volcanites. Climbing to the top of the Guys Cliff (545 m), located at a distance of about 3 km east of the coast, revealed several small outcrops of the andesitic volcanites only on its apical part. Hypsometrically lower, they are settled by the younger granites containing xenoliths of the andesites. Granodiorites lie even lower and up to the foot of the Guys Cliff. The farthest from the coast was the observation point in the area called the Rusty Rocks. It is also largely composed of intrusive rocks namely the microgranites. Peculiar red coarse-grained granites occur as erratic boulders and sea pebbles on the islands in the Waddington Bay for example on the Rasmussen Island. Due to the extremely favorable ice conditions, it was possible to survey the most inaccessible parts of the Waddington Bay. In one of the many small inlets, the authors discovered a small island that is not marked on any of the available hydrographic maps (fig. 3). The new piece of land was named Salhanskiy Islet in honor of Olexandr Salhanskiy the winterer of 25-UAE. The landing showed that the Salhanskiy Islet is composed of loose gravel-pebble and boulder deposits, which lie on the original granite bed. The origin of the Islet was due to the accumulation of the debris in shallow water



formed on the site of neighboring retreating glacier. Local granitoids and gabbroids predominate among the debris. But some erratic boulders of the red coarse granites and ancient polymictic conglomerate were also found.

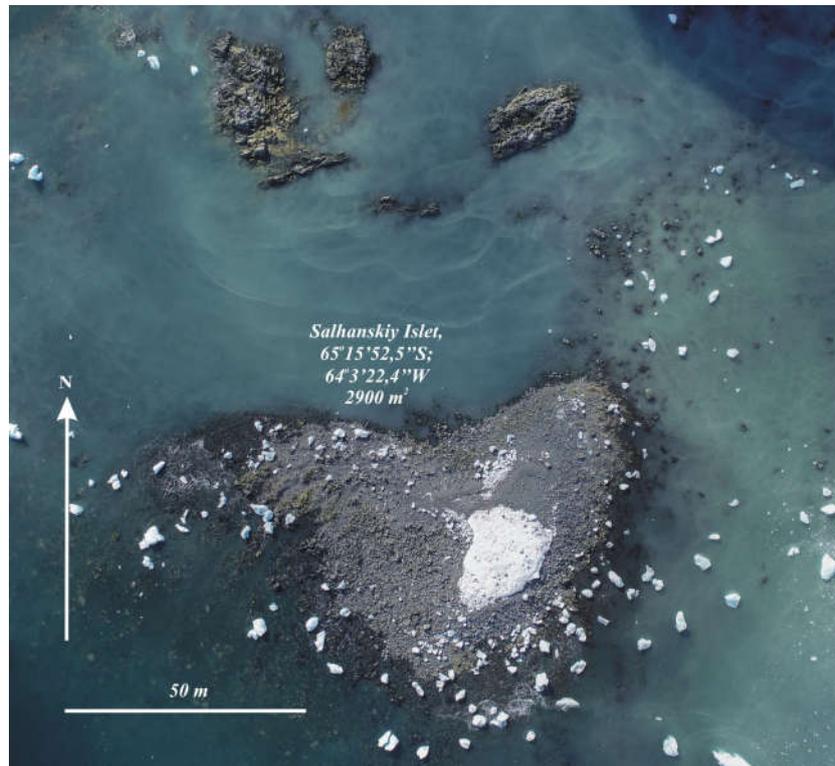


Figure 3 Salhanskiy Islet is a new piece of land formed in the Waddington Bay in front of the Bussey Glacier. It was founded by the authors on February 13, 2020. The drone imagery was taken by Yuriy Shepeta

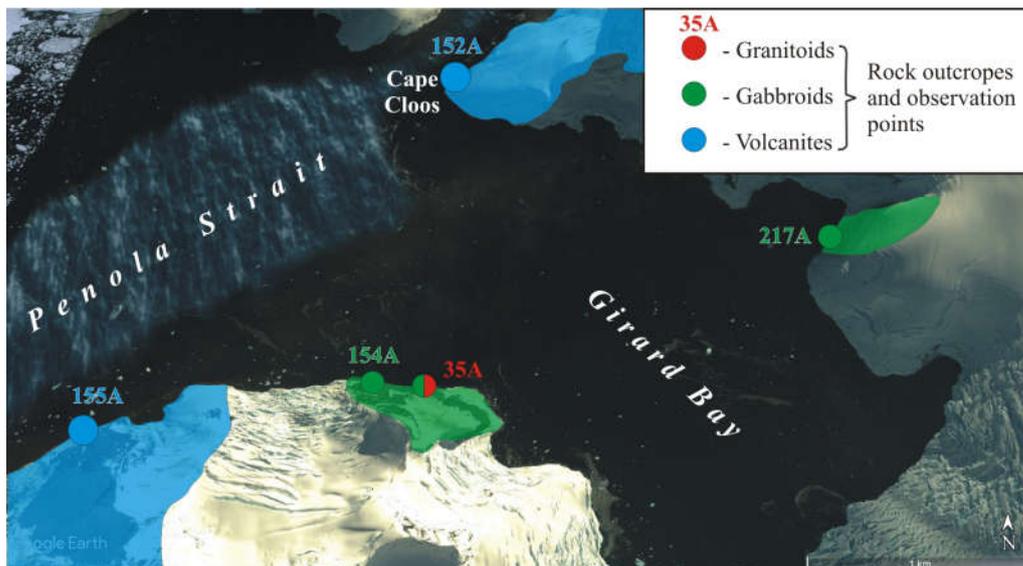


Figure 4 Geological survey of the Girard Bay area on the Google Earth image



New outcrops of the gabbroids were found in the inner part of the Girard Bay. So, as in the case of Waddington Bay, previously known outcrops of the volcanites are limited to the coast adjacent to the entrance of the Girard Bay (fig.4).

In the Collins Bay, the authors were able to survey a small area of the mainland lying to the east from the Berthelot Islands. It was found that on this area the bed of the Trooz Glacier is composed of granitoids. Erratic boulders of the red coarse granites were found on the both summits of the Berthelot Island i.e. at an altitude 165 m above sea level. At the moment this is the highest location of such erratic boulders on the Wilhelm Archipelago.

Conclusion

1. Outcrops of varied intrusive rocks are widely distributed in the inner part of the Kiev Peninsula of the Graham Coast. They are represented by plutonic and hypabyssal facies. Granitoids prevail among other petrographic representative of the intrusive rocks.
2. Granites and granodiorites intrude in the Jurassic volcanites and Early-Cretaceous gabbroids in the Waddington Bay to Bussey Glacier area. Studied granitoids can belong to the different intrusive complexes. To find out their relative ages it is necessary to complete additional routes on the west slopes of the Mount Mill and Guys Cliff.
3. The parts of the large gabbroic intrusion are exposed in the inner part of the Girard Bay and are intruded by granitoids. Their geological position, age and petrography also need more researches.
4. Erratic boulders additionally confirm the abundance of the granitoids in the inner part of the Kiev Peninsula. Among them red coarse granite deserve special attention as in relation to finding their bedrock and also to the reconstructions of the ancient glaciation namely its extent, thickness and travel routes.

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References

- Curtis, R. [1966]. The petrology of the Graham Coast, Graham Land. London: *British Antarctic Survey*, 50, 51.
- Geological map of the British Antarctic Territory 1:500000. [1981]. Southern Graham Land, Series BAS 500G, Sheet 3, Edition I: British Antarctic Survey.
- Mytrokhyn, O., Bakhmutov, V. [2019]. Geological research during 24-th Ukrainian Antarctic Expedition, January – April 2019: Graham Coast of Antarctic Peninsula and adjacent islands. *XIII International Scientific Conference “Monitoring of Geological Processes and Ecological Condition of the Environment”*, 12-15 November 2019, 4.
- Mytrokhyn, O.V., Bakhmutov, V.G., Aleksieienko, A.G., Gavryliv, L.I, Mytrokhina, T.V. [2017]. Geological position and age of Tuxene-Rasmussen layered gabbroid intrusion (West Antarctica). *Ukrainian Antarctic Journal*, 16, 21-28.

