

EGU21-12707: The geology of Yelcho Station: a high new resolution geological map at northwestern Antarctic Peninsula

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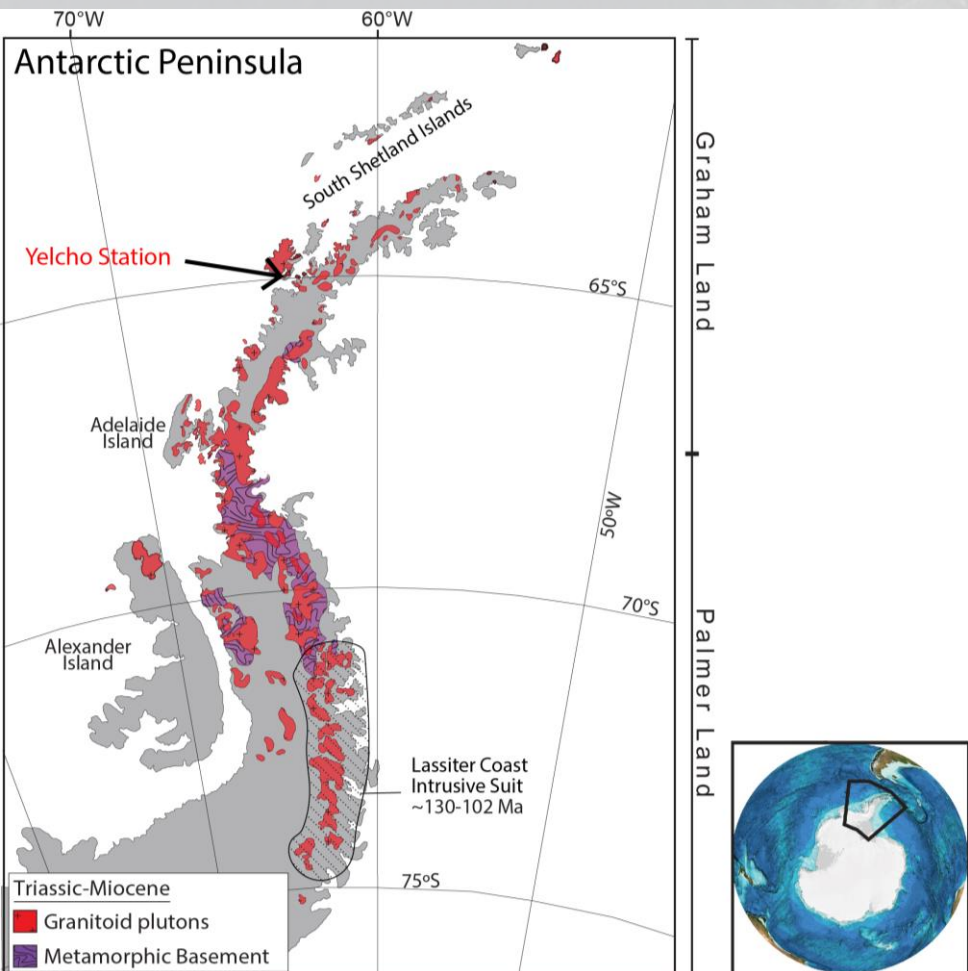


Figure 1: Geological map of the Antarctic Peninsula. It mainly shows the distribution of the Metamorphic Basement and the Granitoid Plutons. Modified from Bastias et. al. (2020).

Antarctic Peninsula map

- In the Antarctic Peninsula there's a subduction between the collision of oceanic crust with continental crust, developing an autochthonous sequence of different units in the crust in the remnant margin of Gondwana (Burton-Johnson et. al., 2015).
- The peak of volcanic activity was in the Cretaceous-Eocene on Adelaide Island, north of Doumer Island where Yelcho Station is located, which may reflect the collision of an expanding ridge with the subduction zone (Burton-Johnson et. al., 2015).

Geology of Yelcho Station

- On Doumer Island, Yelcho Station is composed mainly of plutonic igneous rocks such as monzogranites, granites and k-feldspar granite, with primary minerals from hornblende to biotite and on the north side of the base, tonalitic dikes are found (Bastias et. al., 2020).

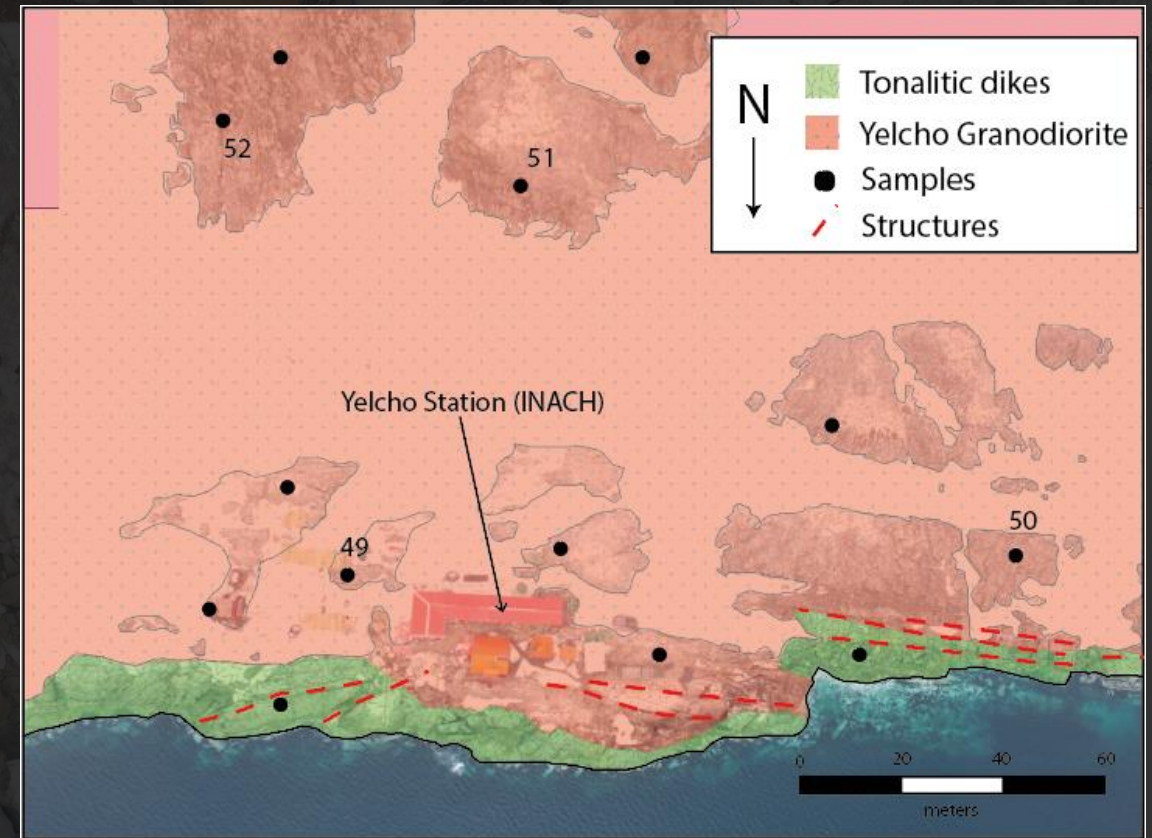


Figure 2: Geological map of the Yelcho Station showing the distribution of the intrusive rocks and the samples obtained in the fieldwork of 2015-2016.

Petrography

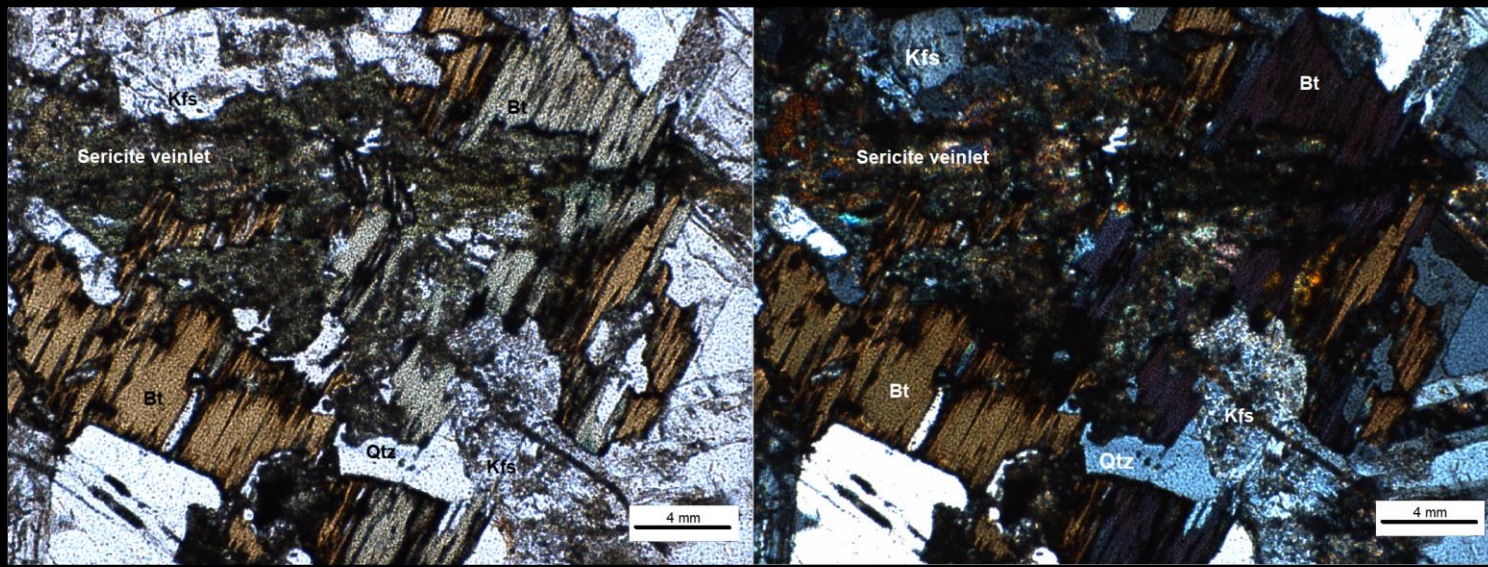


Figure 3: Sample 15JB-49. Parallel and crossed Nichols. Representative microphotography of the sample, classified as a hornblende monzogranite, with phaneritic texture and a main sericite vein cuts the width of the sample and other secondary ones that comes from de main. Highly altered to sericite in plagioclases, k-feldspars and pyroxenes, and in biotite and hornblende minerals are highly altered to chlorite.

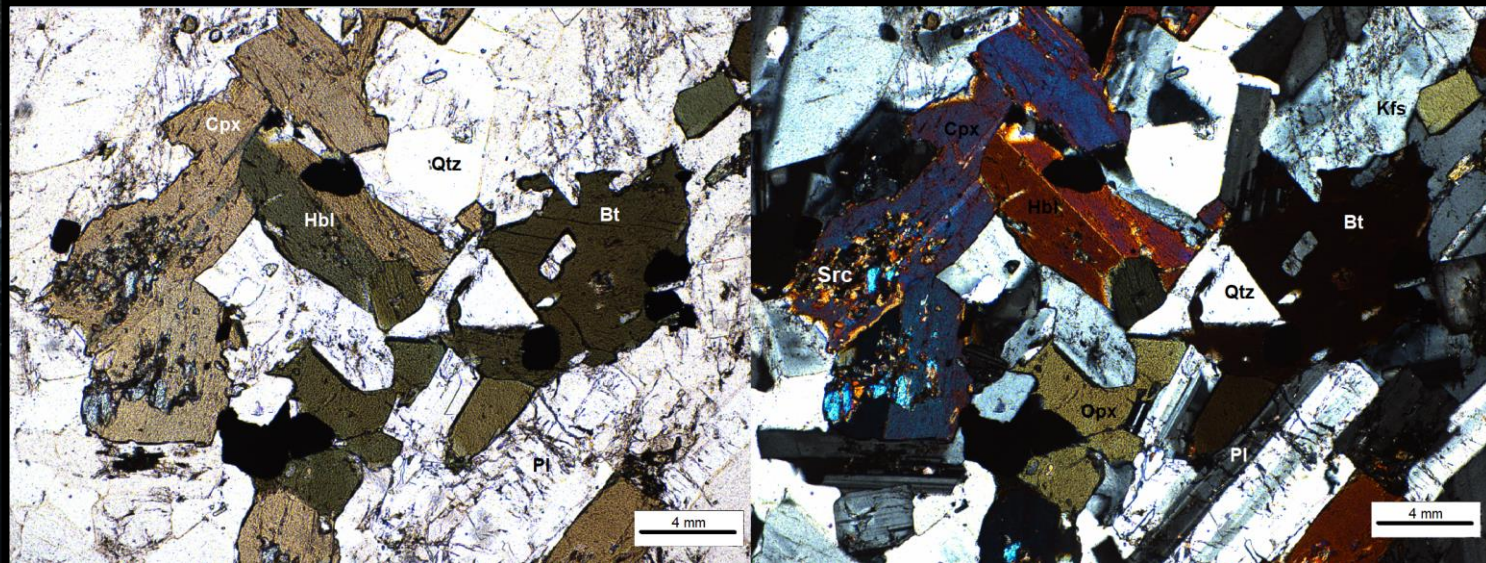


Figure 4: Sample 15JB-50. Parallel and crossed Nichols. Representative microphotography of the sample, classified as a hornblende granite, it has phaneritic texture and there is an abundance of sericitic alteration in plagioclase, k-feldspars and pyroxenes and chloritic alteration in biotites, hornblendes and pyroxenes.

Petrography

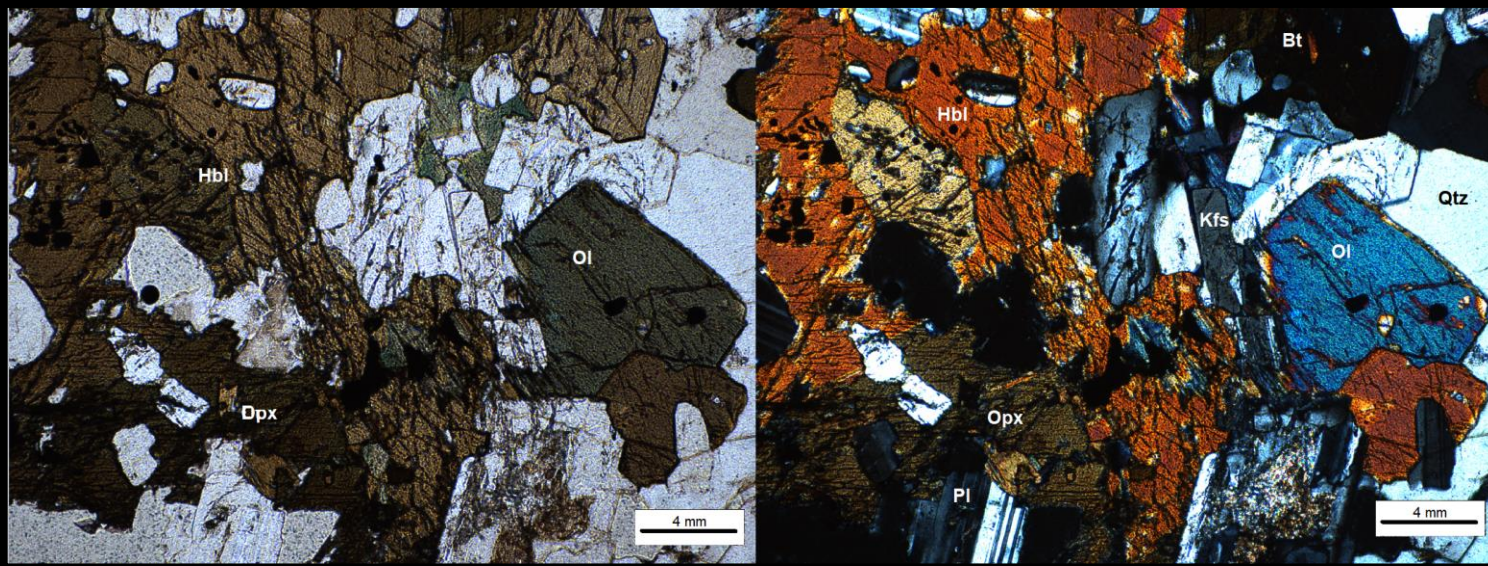


Figure 5: Sample 15JB-51. Parallel and crossed Nichols. Representative microphotography of the sample, classified as a biotite granite, with phaneritic texture. Increases the amount of biotite compared to hornblende. Decreases sericitic alteration concentrating only on plagioclase and k-feldspars, while chloritic alteration remains.

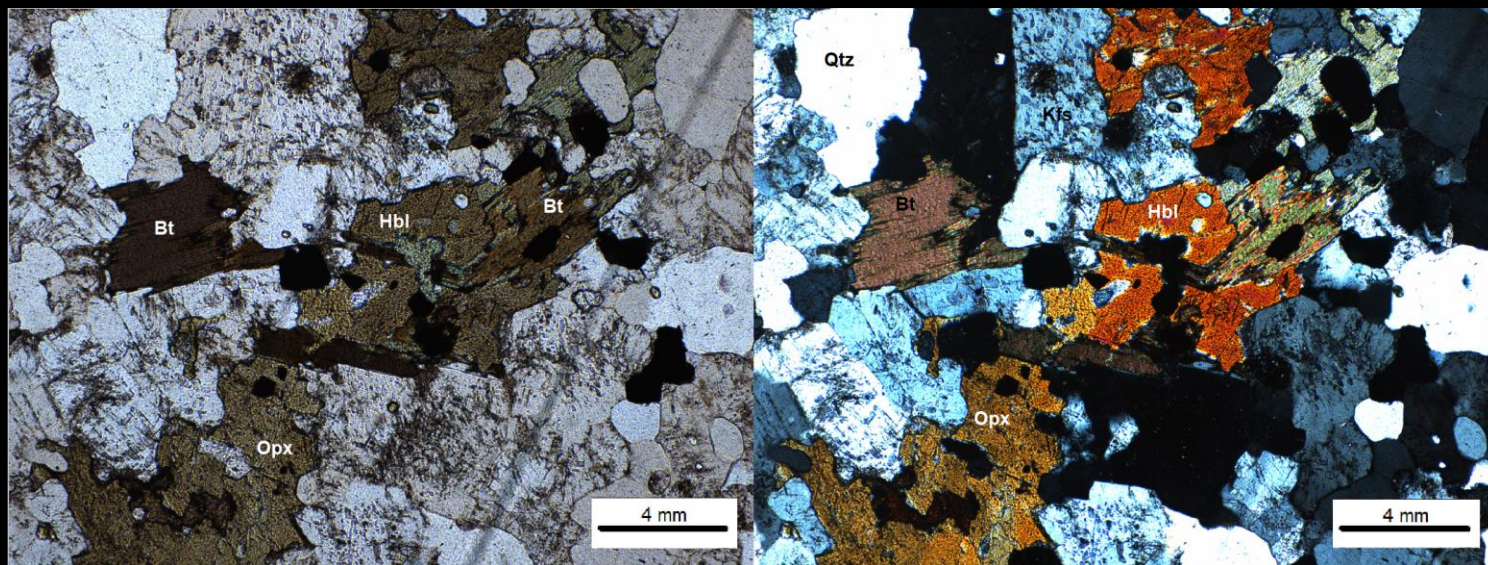


Figure 6: Sample 15JB-52. Parallel and crossed Nichols. Representative microphotography of the sample, classified as a biotite K-feldspar granite. It has phaneritic and granular texture, most of the crystal are euhedral-subhedral and equidimensional. Compared with the other samples, in this one the amount of plagioclase decreases, and the amount of potassium feldspar increases.

Preliminary model

Paleogene

Yelcho Granodiorite

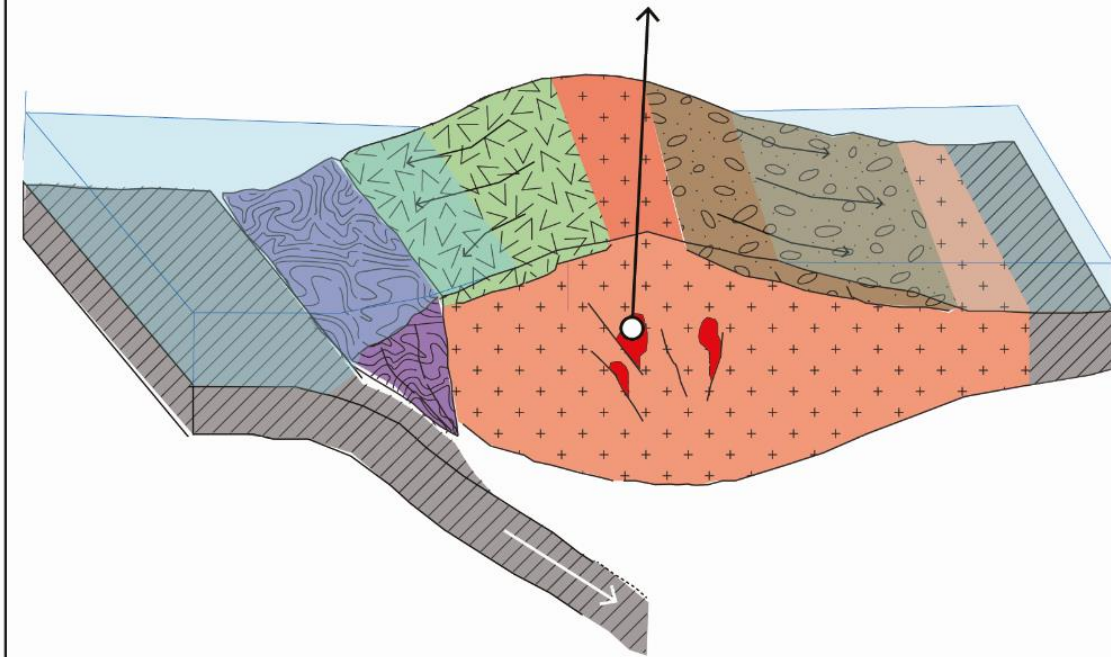


Figure 7: preliminary model of the subduction under the block where the intrusive Granodiorite Yelcho is found.

Preliminary model

- Preliminary model of a cross-section of the Yelcho Station geology, showing a subducting oceanic plate digging under the Yelcho granodiorite during a decrease in magmatic activity in the Paleogene

An aerial photograph of a rugged, rocky island. In the center, there is a research station with several buildings, including a large white building with a red roof and several smaller orange and white structures. The island is surrounded by dark blue water, and the terrain is covered in light-colored rocks and patches of snow or ice. A semi-transparent white circle is overlaid on the left side of the image, containing the text 'Future work' and a list of bullet points.

Future work

- Characterize the magmatism: define its age, geochemistry and isotopic tracing features, using LA-ICP-MS method in U–Pb isotopic composition of zircons.
- Create outreach material for the Yelcho Station's installations: geological maps and didactic material about the local geology.

References

- J. Bastias, R. Spikings, A. Ulianov, et al., The Gondwanan margin in West Antarctica: Insights from Late Triassic magmatism of the Antarctic Peninsula, *Gondwana Research*(2019)
- Burton-Johnson, A., & Riley, T. R. (2015). Autochthonous v. accreted terrane development of continental margins: a revised in situ tectonic history of the Antarctic Peninsula. *Journal of the Geological Society*, 172(6), 822-835.
- Jordan, T.A., Riley, T.R., Siddoway, C.S., 2020. Anatomy and evolution of a complex continental margin: Geologic history of West Antarctica. *Nature Reviews Earth and Environment* 1, 117 -133. doi.org/10.1038/s43017-019-0013-6.