

1.85 Ga volcanic arc in southeastern Sweden

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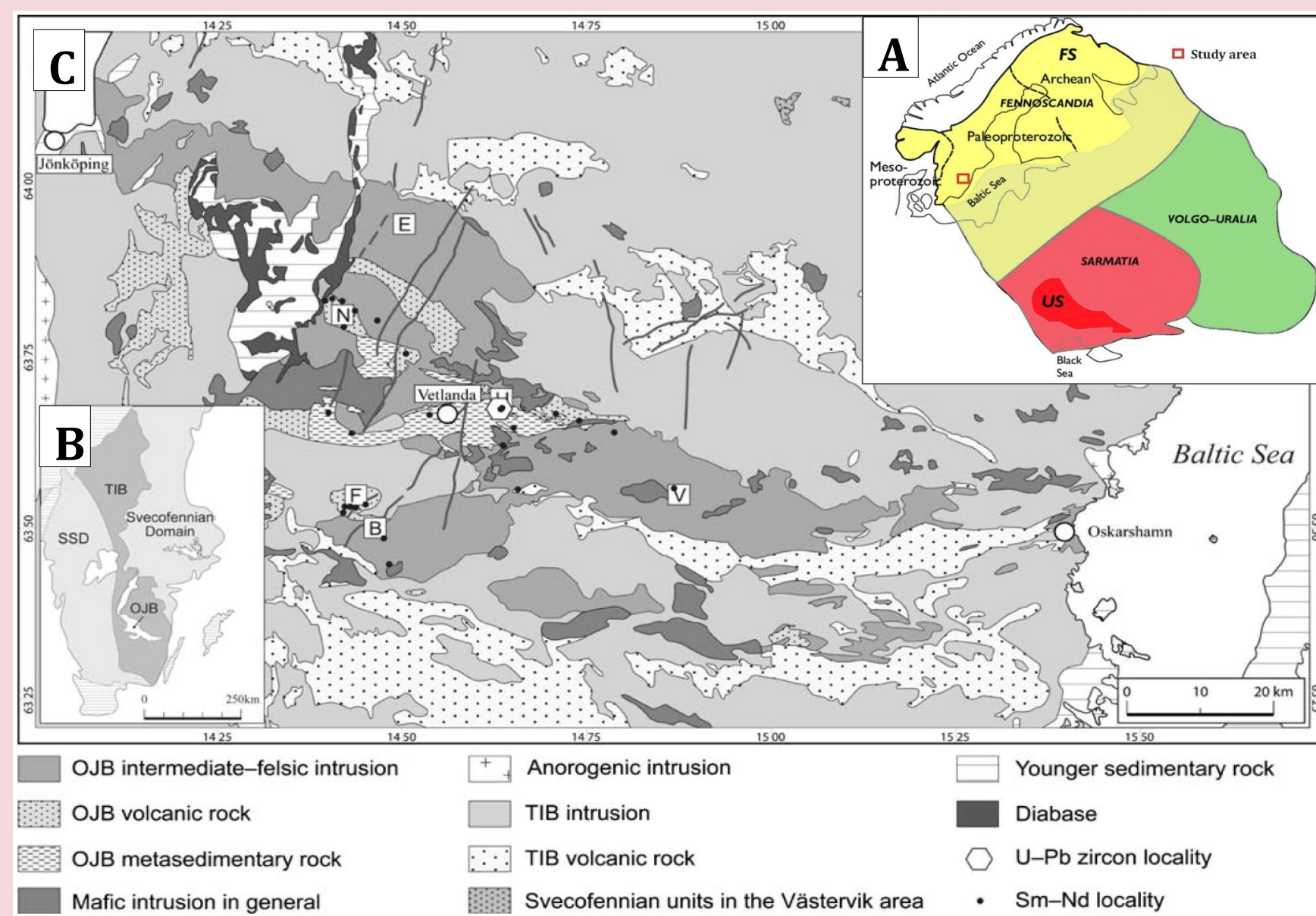
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1. Introduction

- Oskarshamn-Jönköping Belt (OJB) is a geographically well-defined belt in SE Sweden located in the vicinity of the southwestern margin of the Svecofennian Domain.
- The OJB is a collage composed of volcanic arc rocks, felsic intrusions and clastic sedimentary rocks, which were considered to be Svecofennian (Röshoff, 1975).
- The U-Pb age determinations have shown that the felsic plutonic rocks intruded between 1835 and 1823 Ma, while a granodioritic conglomerate clast has an age of 1829 Ma (Mansfeld et al., 2005).
- Before this investigation was done, the age of the Fröderyd volcanic Group, as well as other volcanic rocks within this belt, was poorly constrained between 1850 Ma and 1807 Ma.

2. Geological context



Formation of the Svecofennian Domain as amalgamated microcontinents, volcanic and island arcs finished in the Palaeoproterozoic (by the 1.85 Ga).

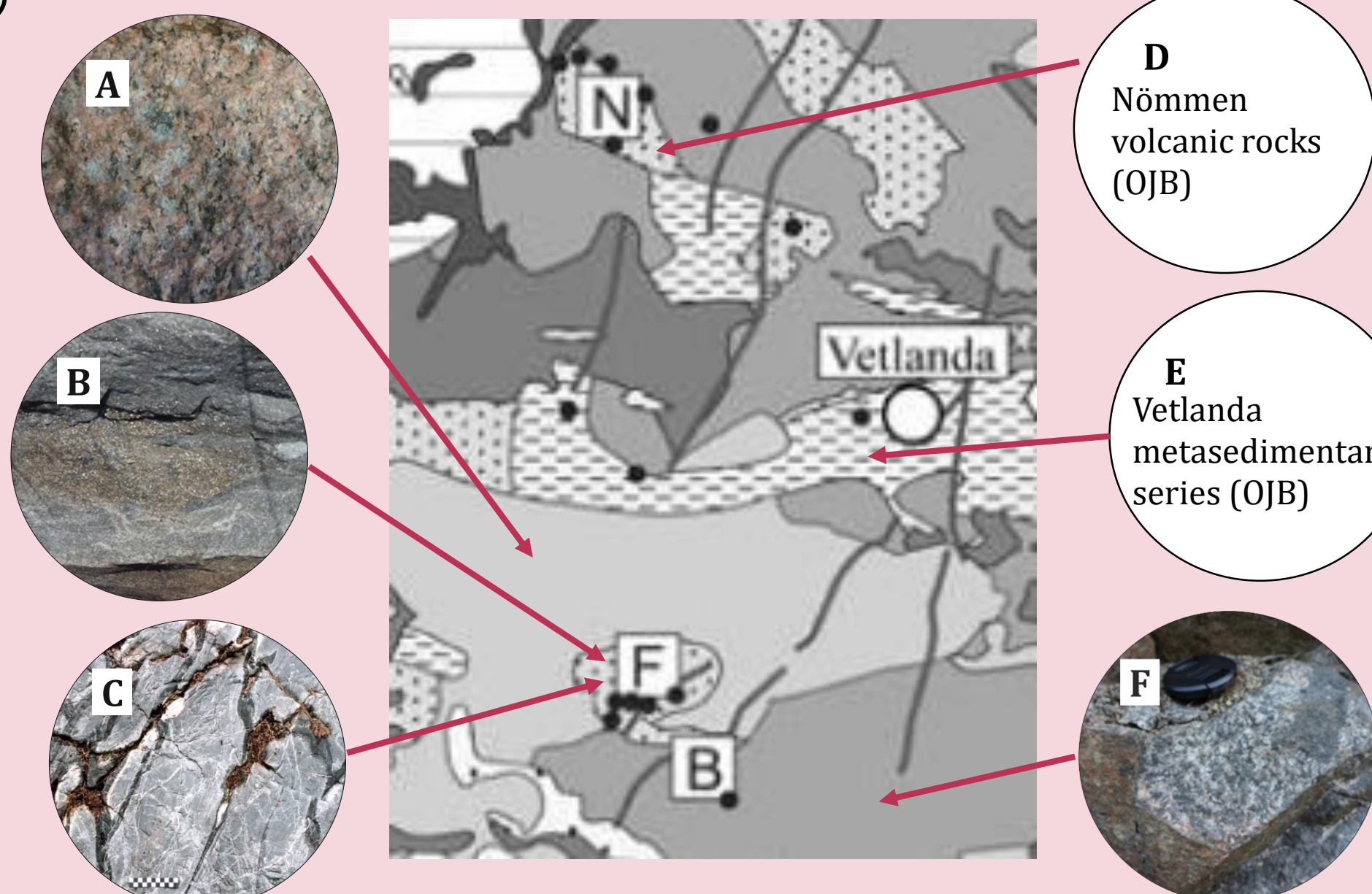
The southwestern margin of the Svecofennian Domain was intruded by the TIB 0 granitoids at ca. 1.85 Ga, while the next generation of the TIB 1 granitoids intruded along the Svecofennian margin at 1.81-1.76 Ga.

The 1.83-1.82 Ga OJB is an enigmatic terrane completely surrounded by the 1.81-1.79 Ga TIB 1 rocks in the north and 1.79-1.76 Ga TIB 1 rocks in the south.

3. Field relationship

Fig. 2. Map of a central part of the OJB showing field relations between rocks of the Transscandinavian Igneous Belt (TIB) and the Oskarshamn-Jönköping Belt (OJB).

- A:** 1786 Ma TIB 1 granites surrounding Fröderyd volcanic area
- B:** Rhyolite layers in the Fröderyd area
- C:** Well-preserved pillow structures within the Fröderyd area (OJB volcanics)
- D:** Nömmen amygdaloidal lavas (OJB volcanics)
- E:** Coarse-grained clastic metasedimentary sequences of the Vetlanda series
- F:** 1.83 Ga granite to tonalite, Bäckaby intrusion (OJB plutonics)



4. Petrology and geochemistry

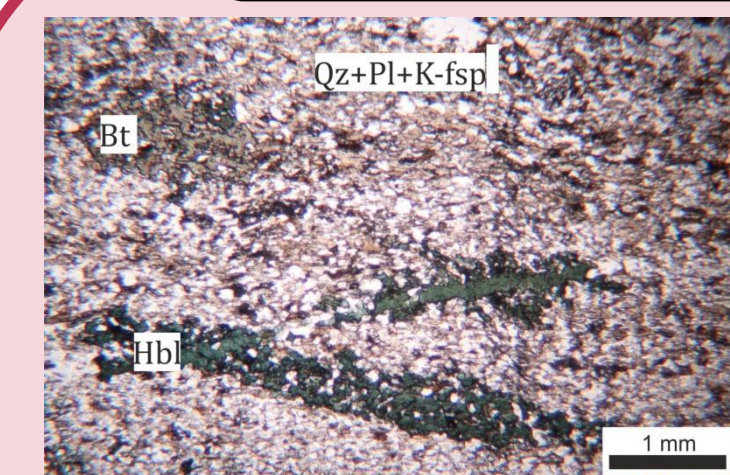


Fig. 4. Plane-polarized light photomicrograph from the Fröderyd rhyolite. Banded phenocrysts of Bt and Hbl in a fine-grained matrix of Qtz, Bt, Pl and K-fsp. "Eaten" appearance is a result of degassing of volatiles from the magma.

Fröderyd area:

Mafic volcanic rocks bear MORB and BABB signatures (Fig. 5A). They are interlayered with rhyolites (~20 % of Fröderyd volcanics).

However:

- 20 % of felsic volcanics is too much for a mid-ocean ridge and back-arc environments.
- Mafic and felsic rocks have REE patterns similar to the rocks of a volcanic arc rift (5 B-C).

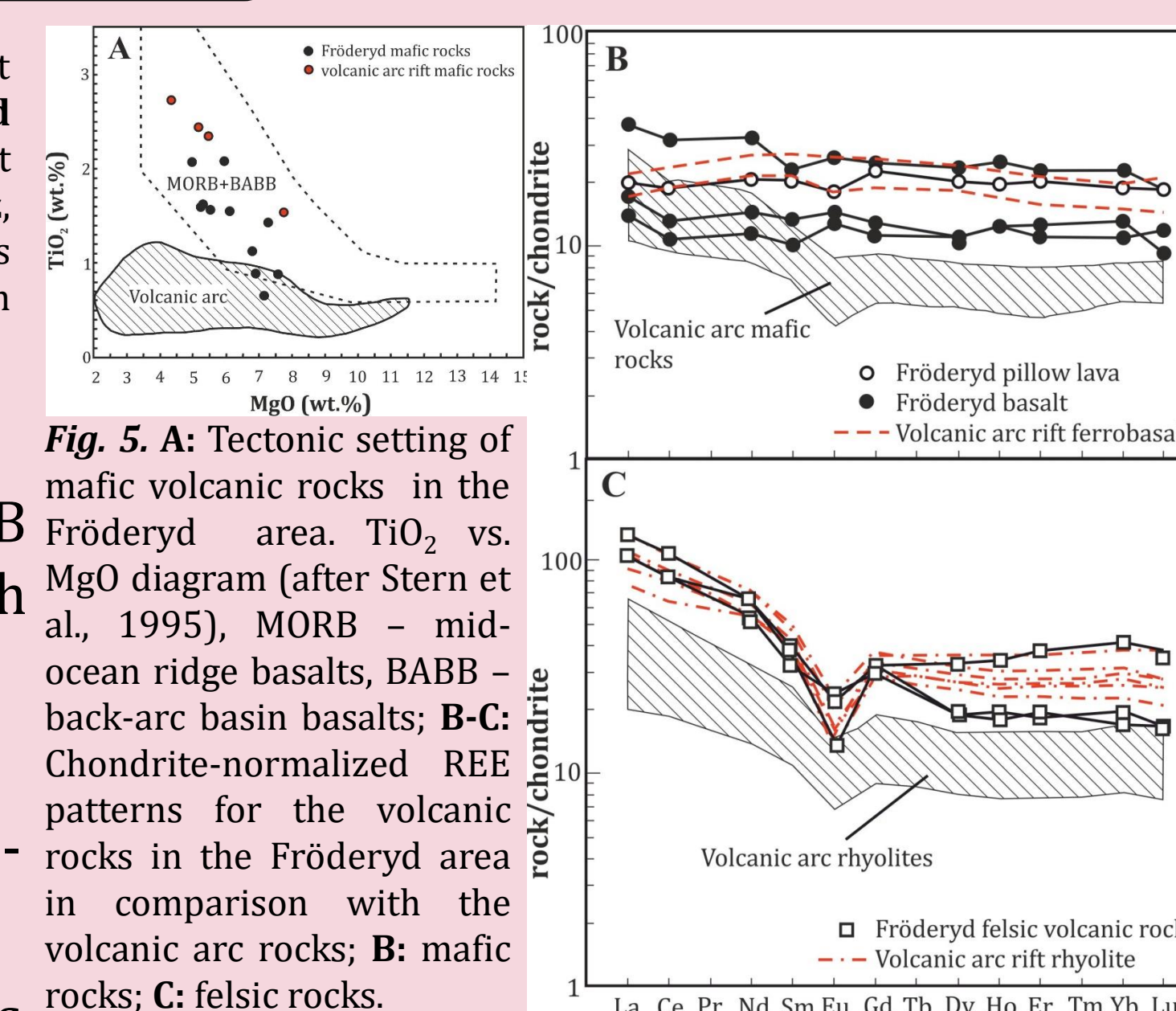
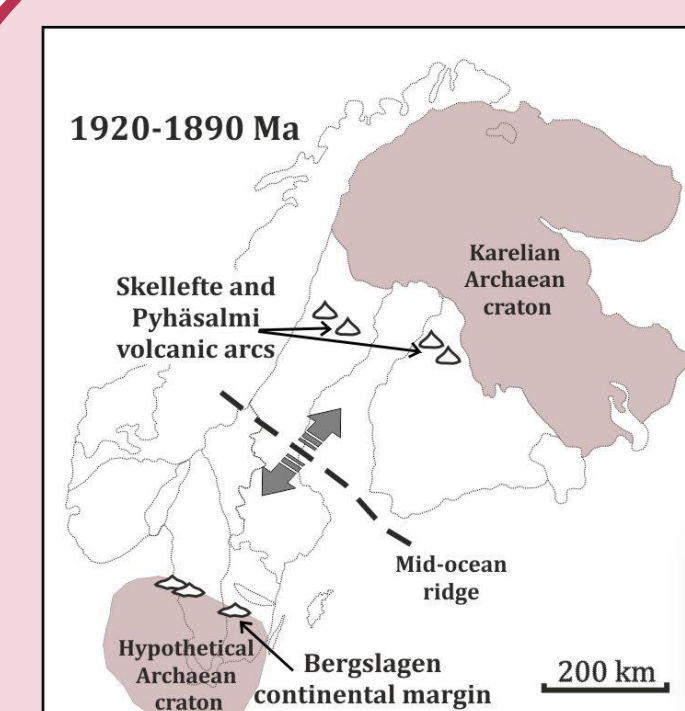
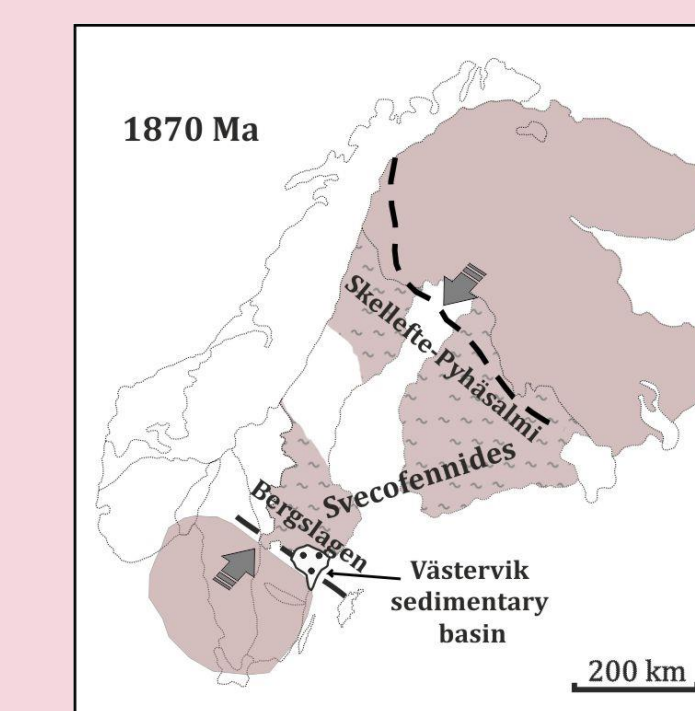


Fig. 5. A: Tectonic setting of mafic volcanic rocks in the Fröderyd area. TiO₂ vs. MgO diagram (after Stern et al., 1995). MORB - mid-ocean ridge basalts, BABB - back-arc basin basalts; B-C: Chondrite-normalized REE patterns for the volcanic rocks in the Fröderyd area in comparison with the volcanic arc rocks; B: mafic rocks; C: felsic rocks.

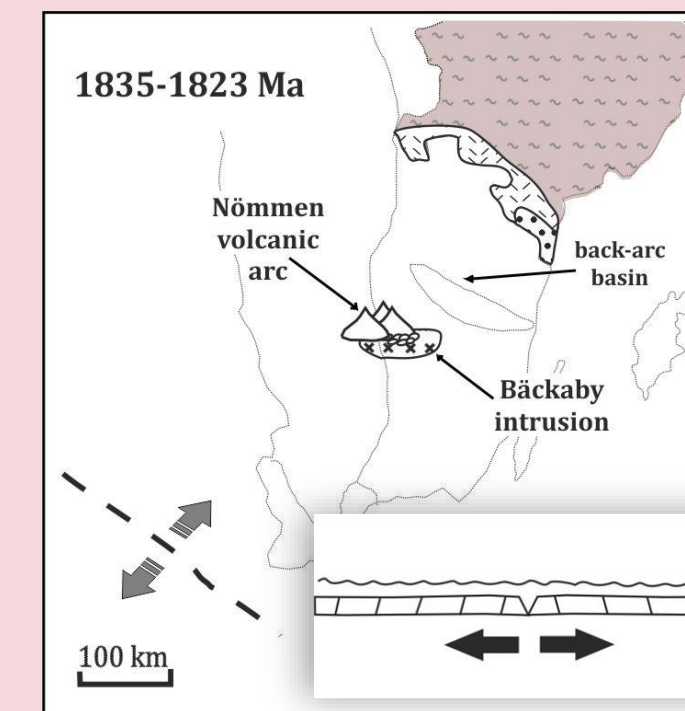
6. Tectonic scenario



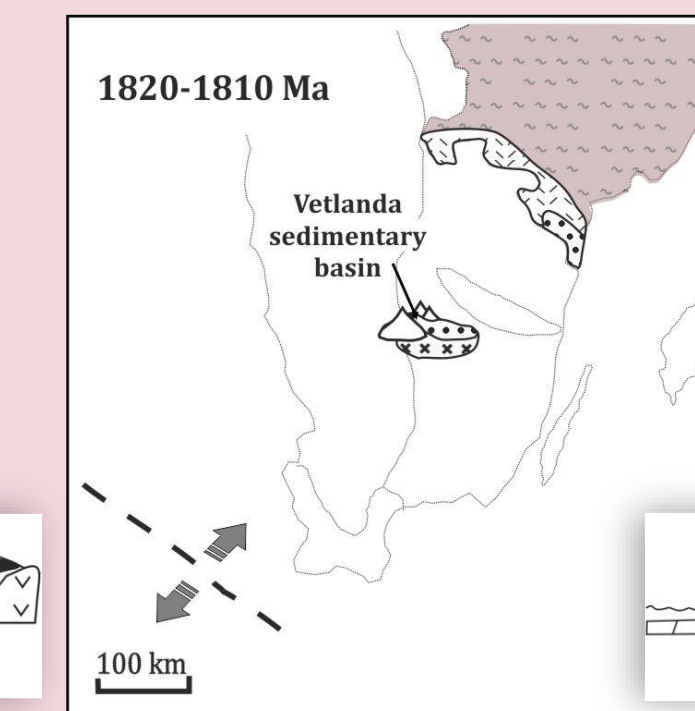
Formation of Skellefte, Pyhäsalmi and Bergslagen volcanic arcs along the Archaean continent



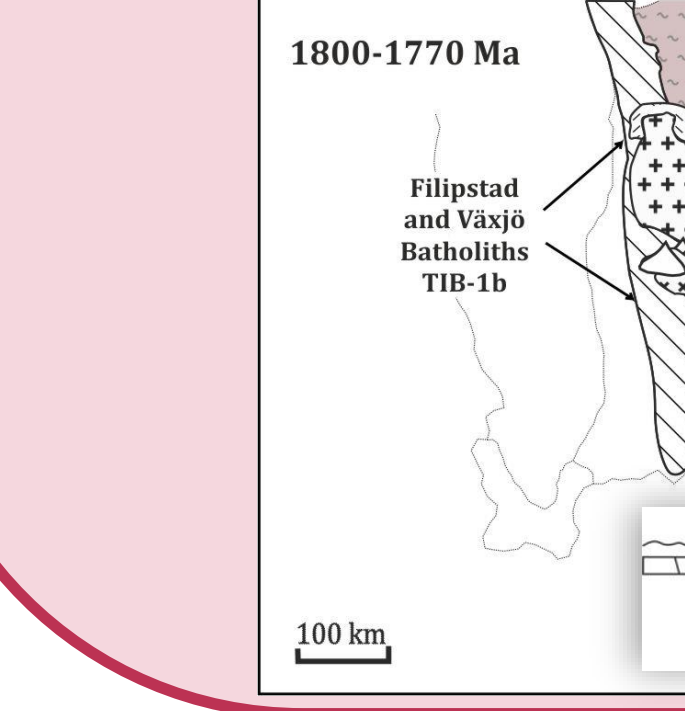
Amalgamation of the Svecofennian terranes, and their accretion on top of the Archaean continent



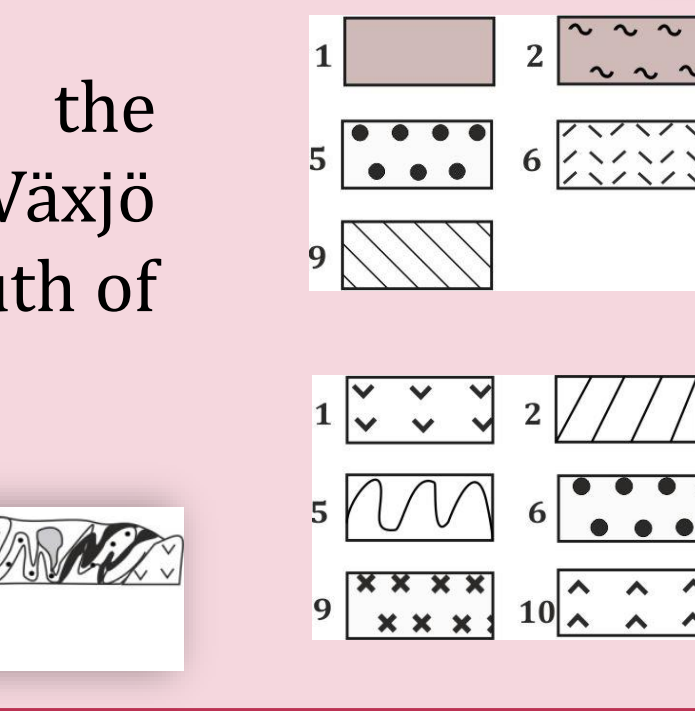
Emplacement of the Bäckaby tonalite into the volcanic arc sequences



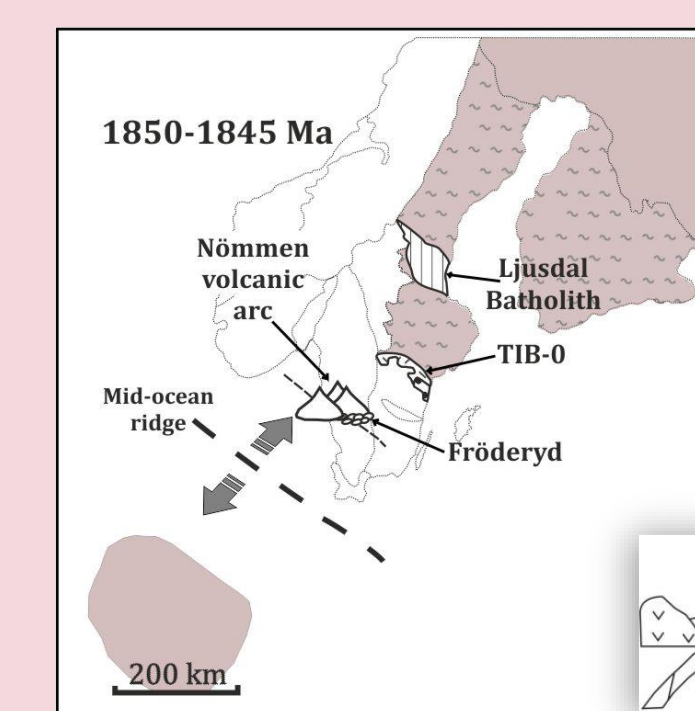
Erosion of the Bäckaby tonalite and deposition of Vetlanda sedimentary successions



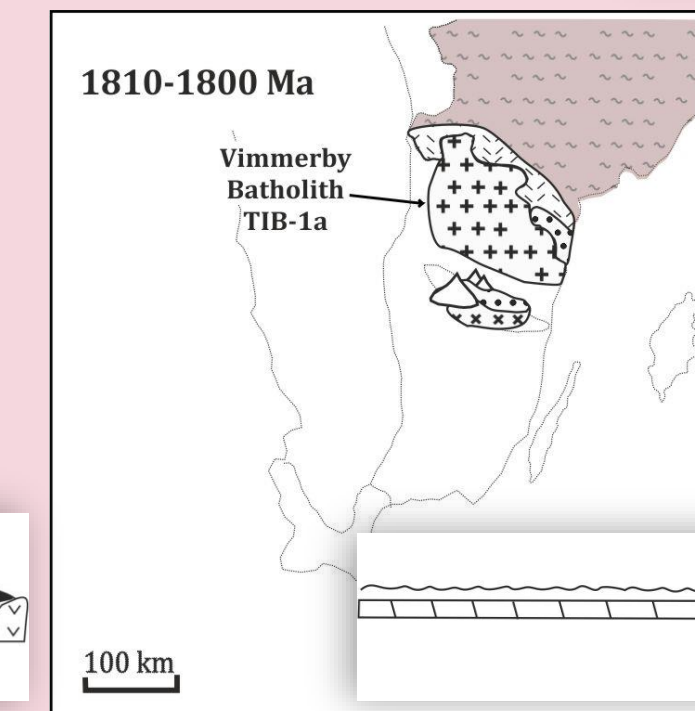
Emplacement of the 1.79-1.76 Ga Växjö batholith mostly south of the OJB



Formation of the Nömmen volcanic arc, its rifting and subsequent formation of Fröderyd pillow lavas and basalts



Formation of the Nömmen volcanic arc, its rifting and subsequent formation of Fröderyd pillow lavas and basalts



Emplacement of the 1.81-1.79 Ga Vimmerby batholith north of the OJB

7. References

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