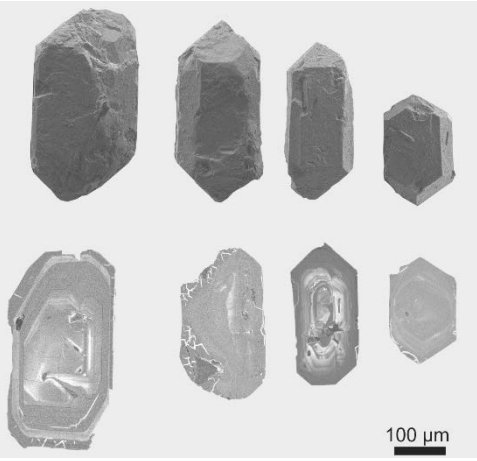
Late- to post-Variscan magmatism in the Lusatian Block occurred during two short episodes: Evidence from zircon dating



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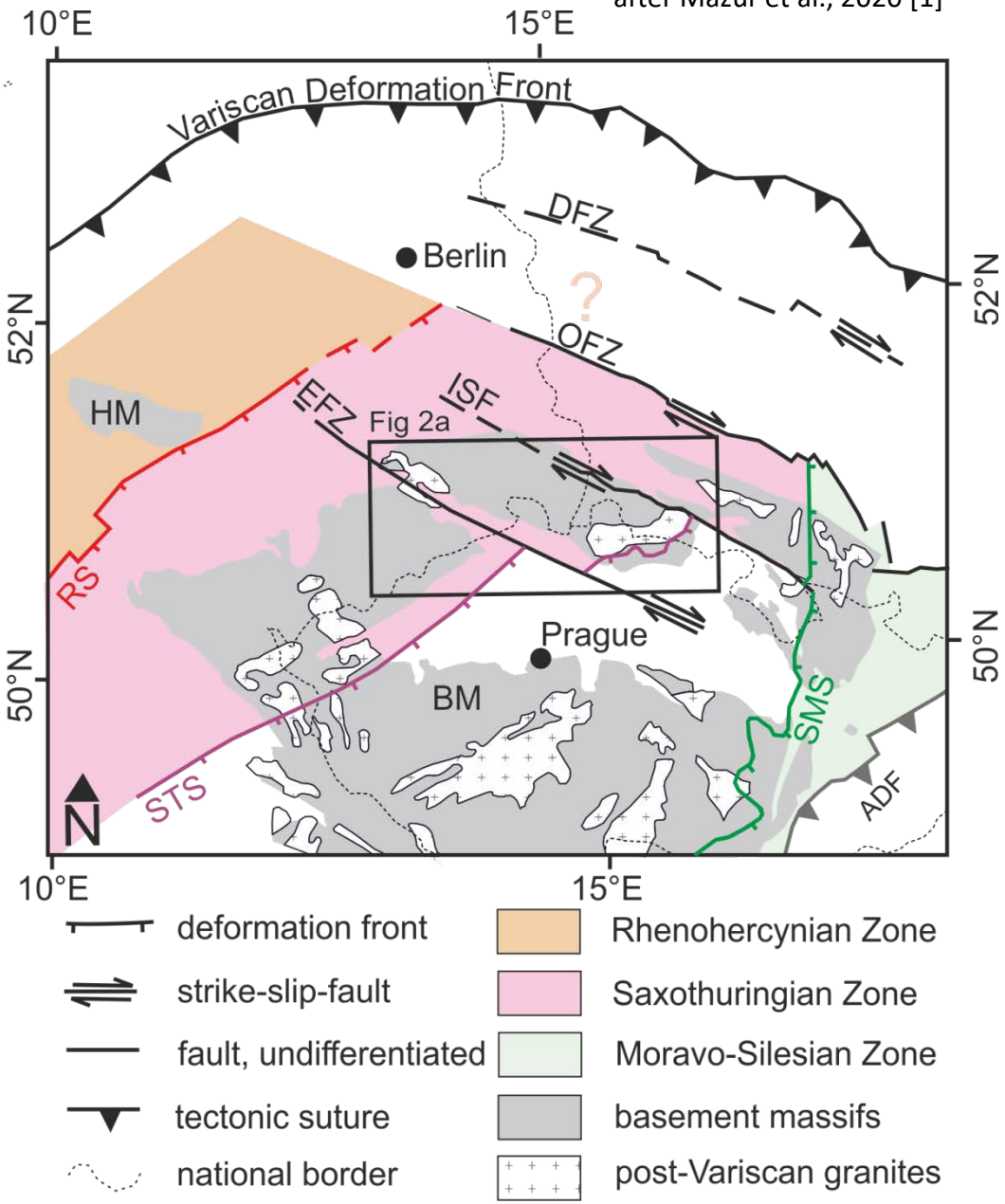
1 Introduction

- A set of NW trending strike-slip faults interrupts the continuity of the suture zones of the Variscan orogen at its NE border [1].
- Several late- to post-Variscan events of dextral and subordinate sinistral strike-slip faulting have been proposed (e.g. [2],[3],[4]).
- The timing of these events remains unclear.
- **Here, we present new CA-ID-TIMS zircon U-Pb data of late- to post-Variscan granitoids that are bound to the Intra-Sudetic Fault Zone (ISF) and the Elbe Fault Zone (EFZ.)**

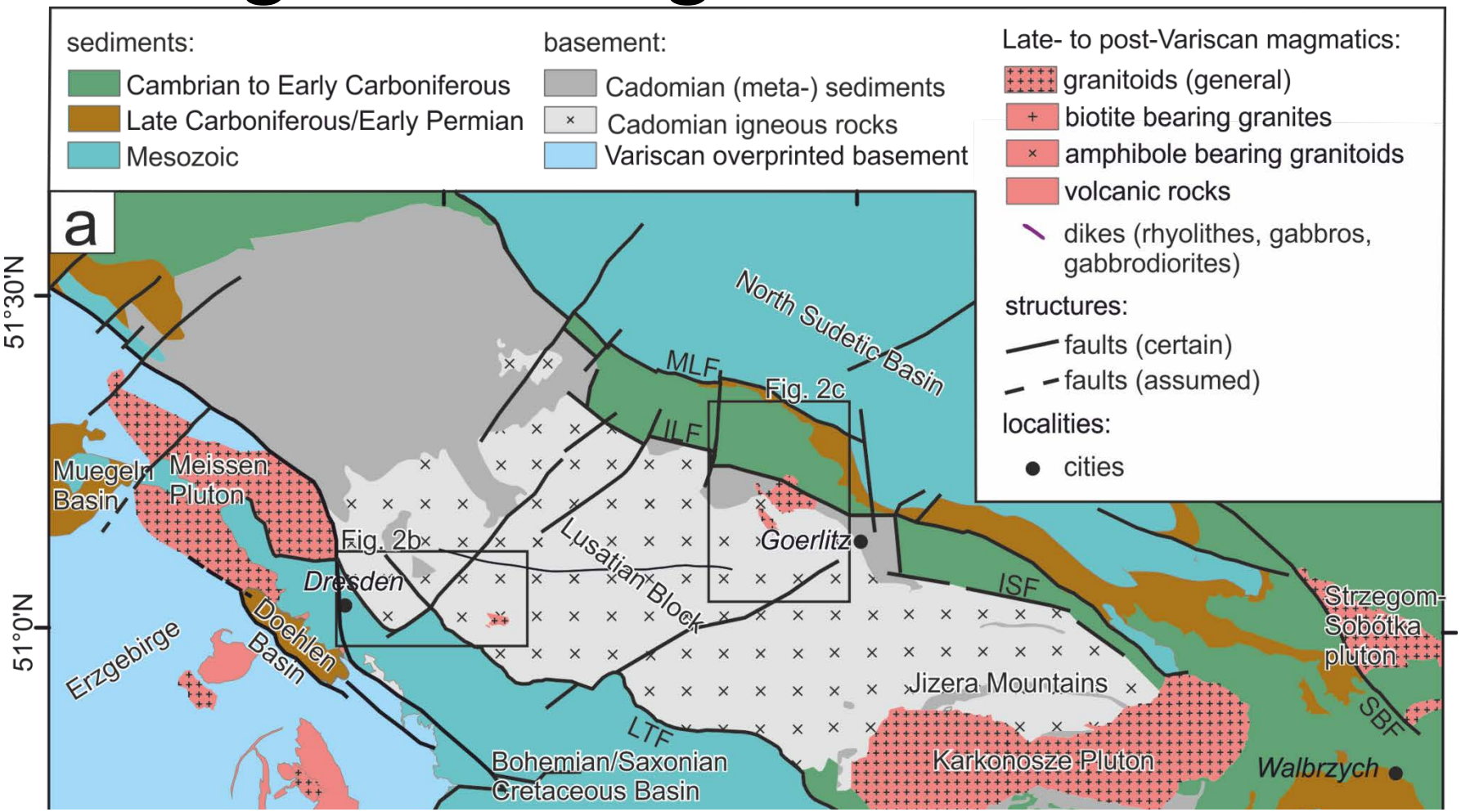
after Mazur et al., 2020 [1]



EFZ: Elbe Fault Zone, ISF: Intra-Sudetic Fault Zone, OFZ: Odra Fault Zone, DFZ: Dolsk Fault Zone, STS: Saxothuringian Suture Zone, RS: Rheno-Hercynian Suture Zone, SMS: Moravo-Silesian Suture Zone, ADF: Alpine Deformation Front

Geological Setting

after Kozdrój et al., 2001 [5]

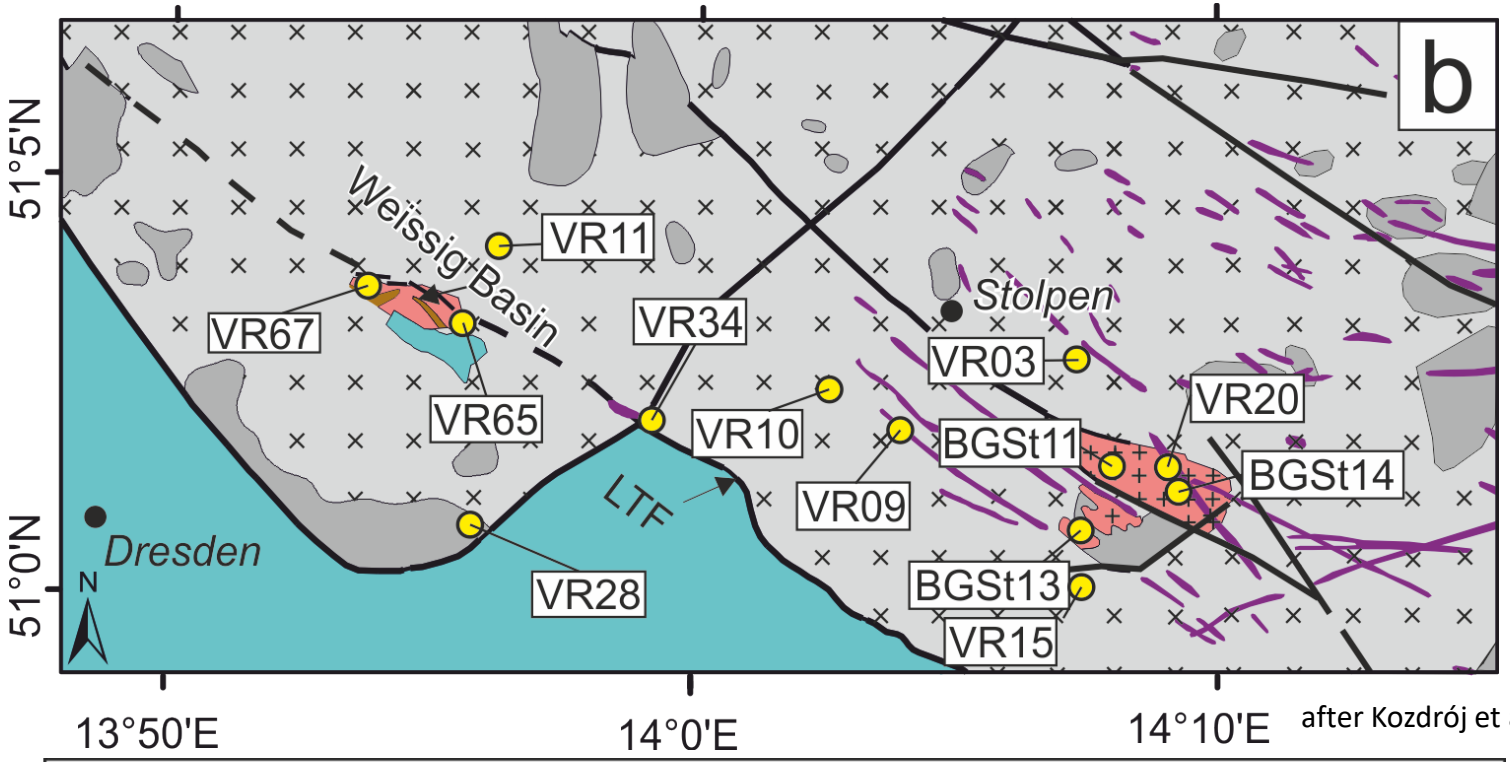


- The Lusatian Block is part of the Saxothuringian Zone of the Variscides, but was only slightly affected by the Variscan metamorphic overprint.
- The Lusatian Block is bound towards NE by the Intra-Sudetic Fault Zone (ISF) which splits into the Main Lusatian Fault (MLF) and the Intra-Lusatian Fault (ILF)
- Towards SW it is bound by the Lusatian Thrust Fault (LTF), which is an element of the Elbe Fault Zone (EFZ)

Samples

From the SW boundary of the Lusatian Block:

- 3 samples of biotite granite of the Stolpen pluton (BGSt)
- 8 samples of volcanic dikes and one porphyric tuff and one porphyric lava of the Weissig Basin (VR)



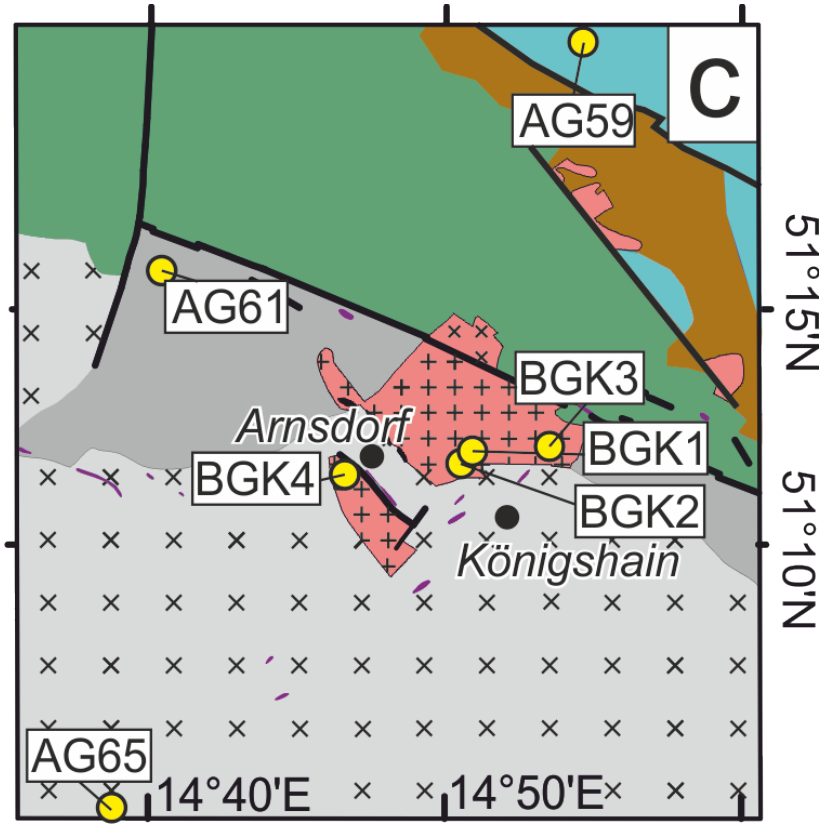
after Kozdrój et al., 2001 [5]

Samples

after Kozdrój et al., 2001 [5]

From the NE boundary of the Lusatian Block:

- 4 samples of biotite granites of the Koenigshain pluton (BGK)
- 3 samples of subsurface amphibole bearing granitoids near the Koenigshain pluton



sediments:
- Cambrian to Early Carboniferous
- Late Carboniferous/Early Permian
- Mesozoic

basement:
- Cadomian (meta-) sediments
- Cadomian igneous rocks
- Variscan overprinted basement

Late- to post-Variscan magmatics:
- granitoids (general)
- biotite bearing granites
- amphibole bearing granitoids
- volcanic rocks
- dikes (rhyolithes, gabbros, gabbrodiorites)

structures:
- faults (assumed)

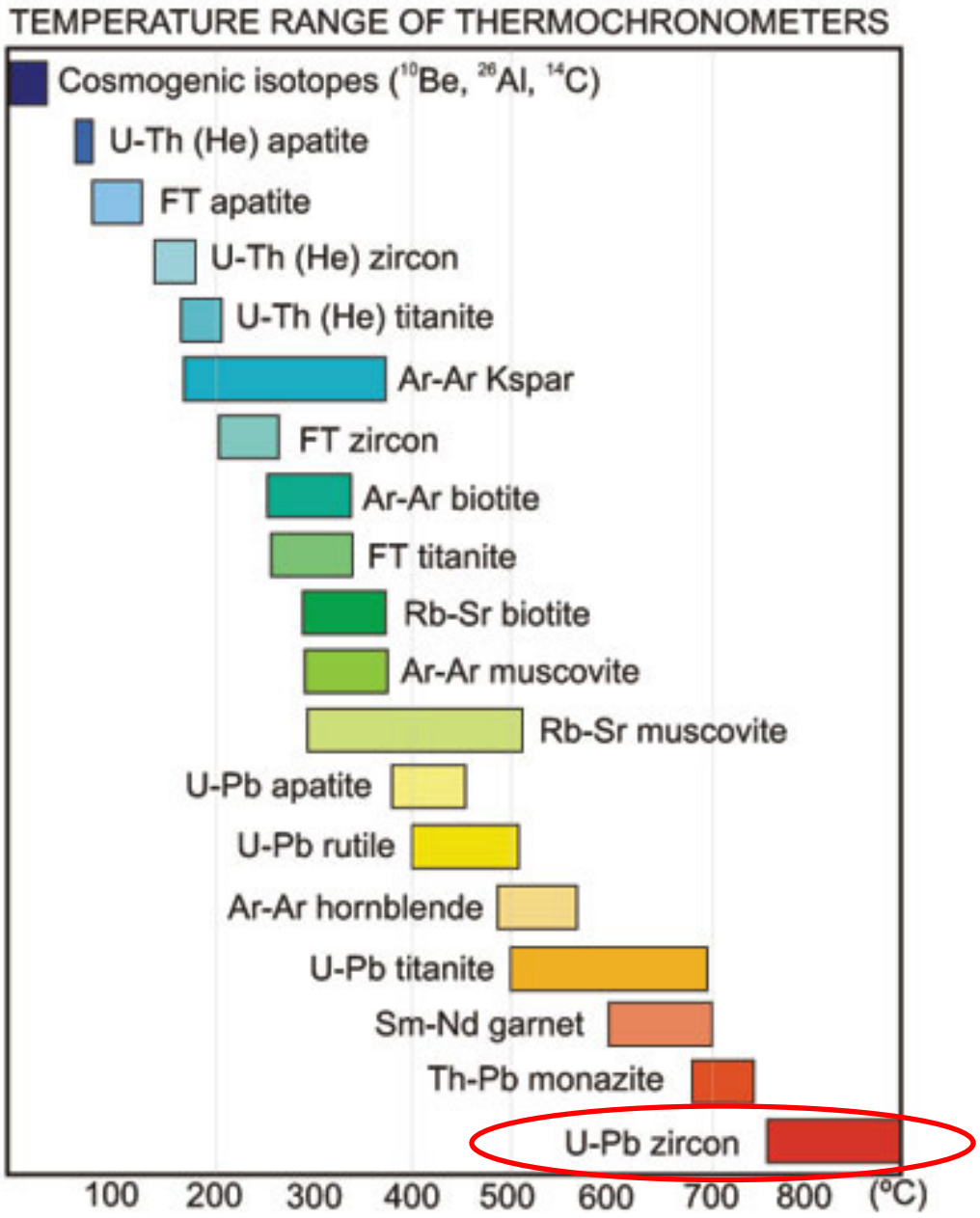
localities:
- samples
- cities

Methodology

- Intrusion ages can be best achieved by U-Pb zircon because of:

➢ high closure temperature

➢ rather high resistance against hydrothermal overprint

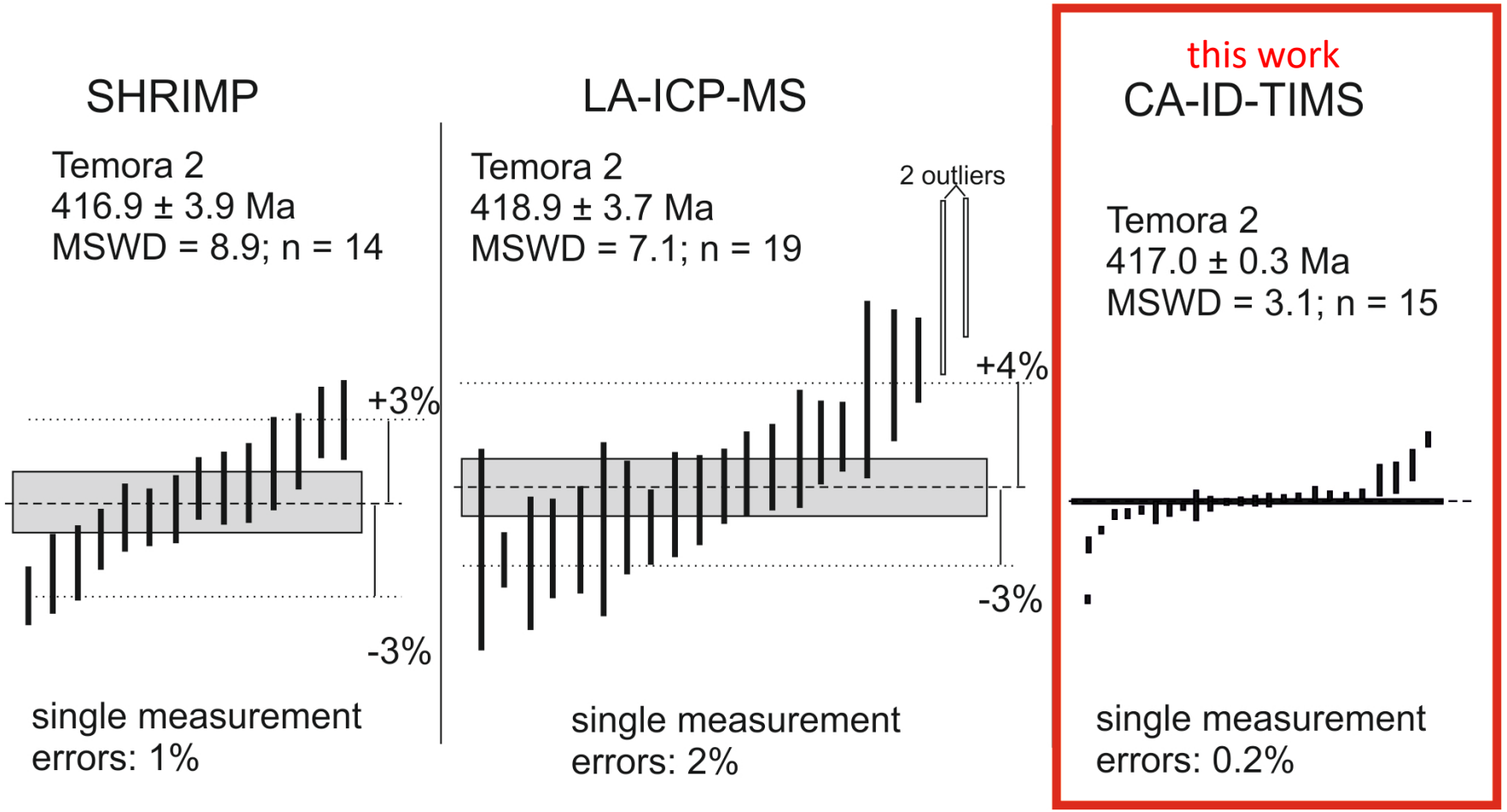


from Gehrels et al., homepage of Stanford University

Methodology

CA-ID-TIMS: Comparison of different zircon U-Pb dating methods

Tichomirowa et al., 2017 [6]



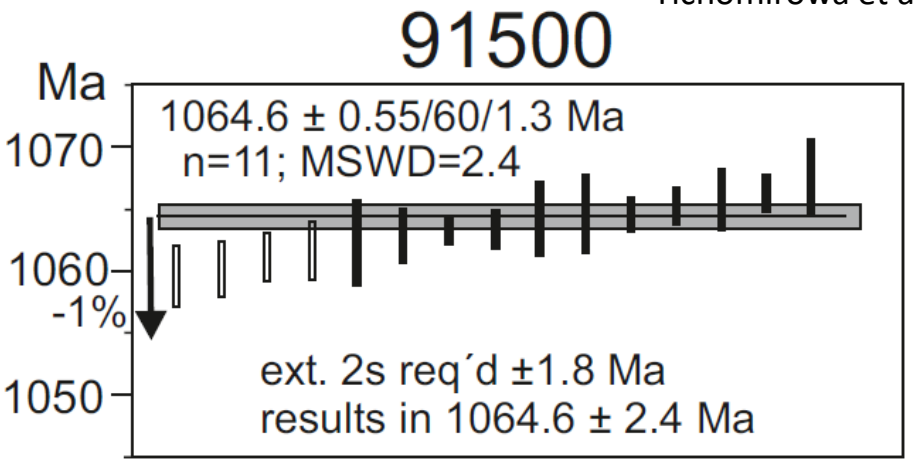
The use of well calibrated tracers and sophisticated lab protocols result in very low analytical errors for single grain age data → EARTHTIME (http://www.earthtimetestsite.com/)

Tichomirowa et al., 2019 [7]

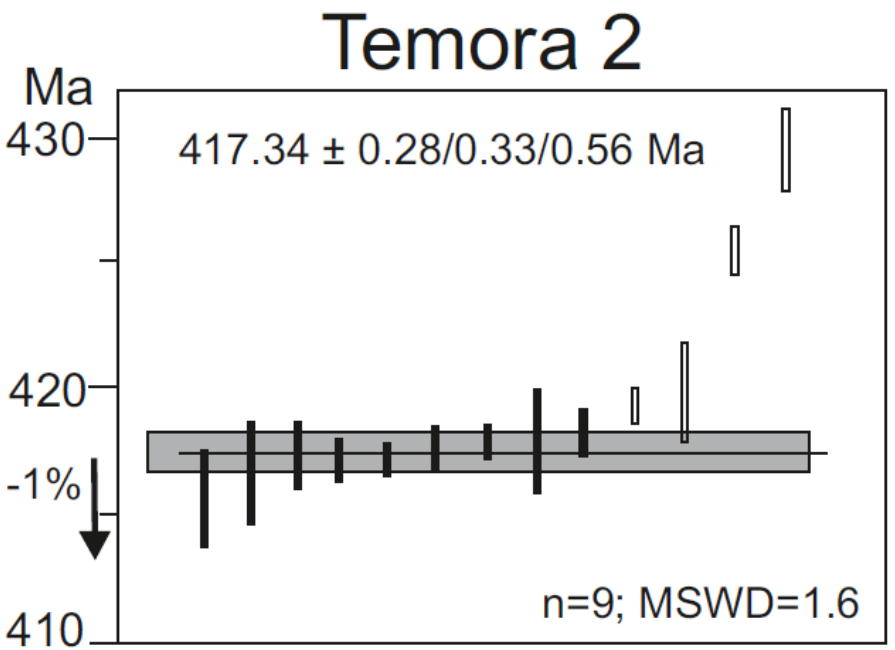
Methodology

CA-ID-TIMS: accuracy of Dating at TU Freiberg

91500:
1062.4 ± 0.4 Ma
(Wiedenbeck et al., 1995)[8]



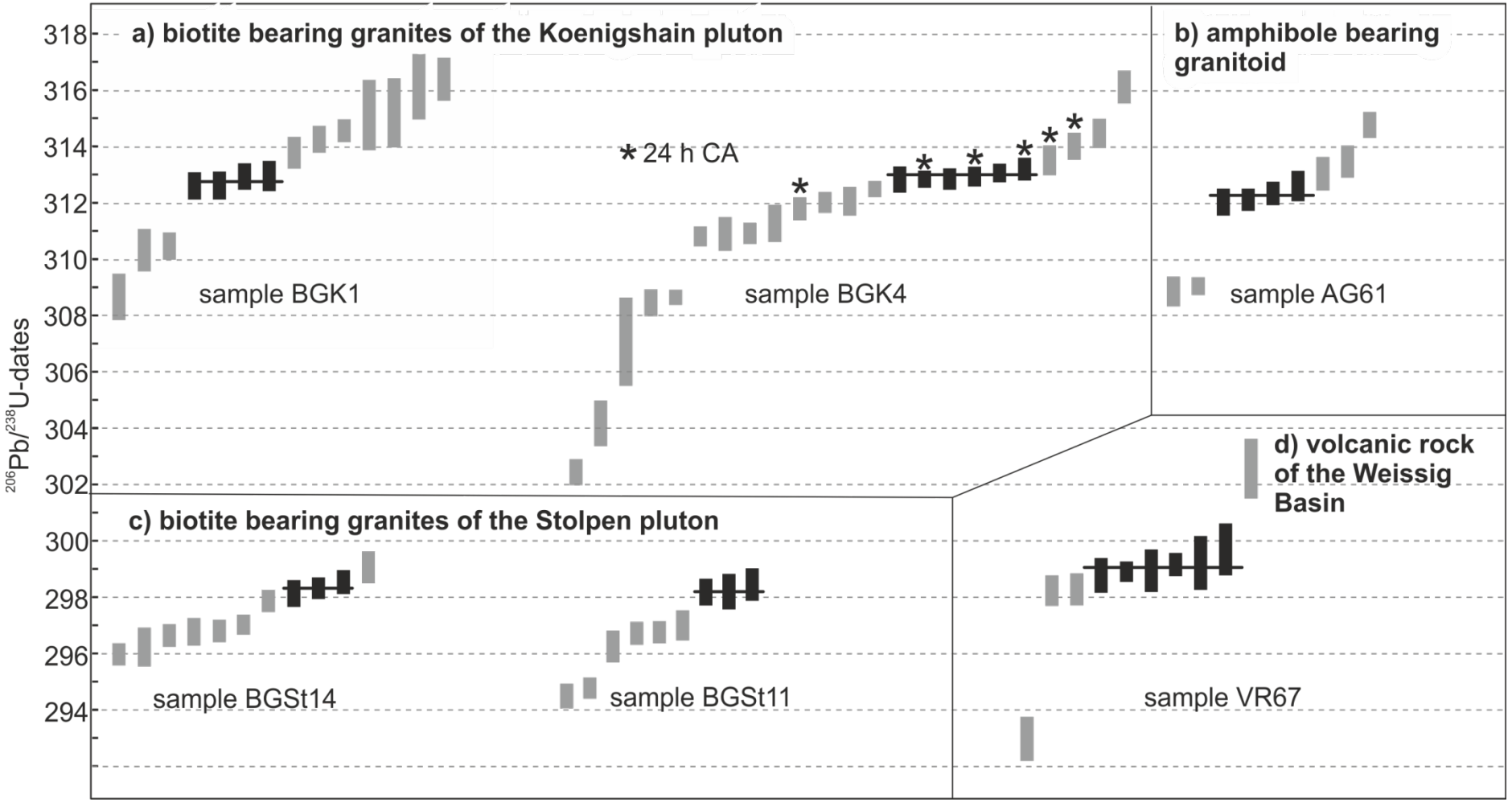
Temora:
416.8 ± 0.33 Ma
(Black et al., 2004)[9]



standards are dated as unknowns regularly, the results are compared to published ages
→ accuracy of ca**. ± 0.1%** is reached at TU Freiberg

Results

CA-ID-TIMS data

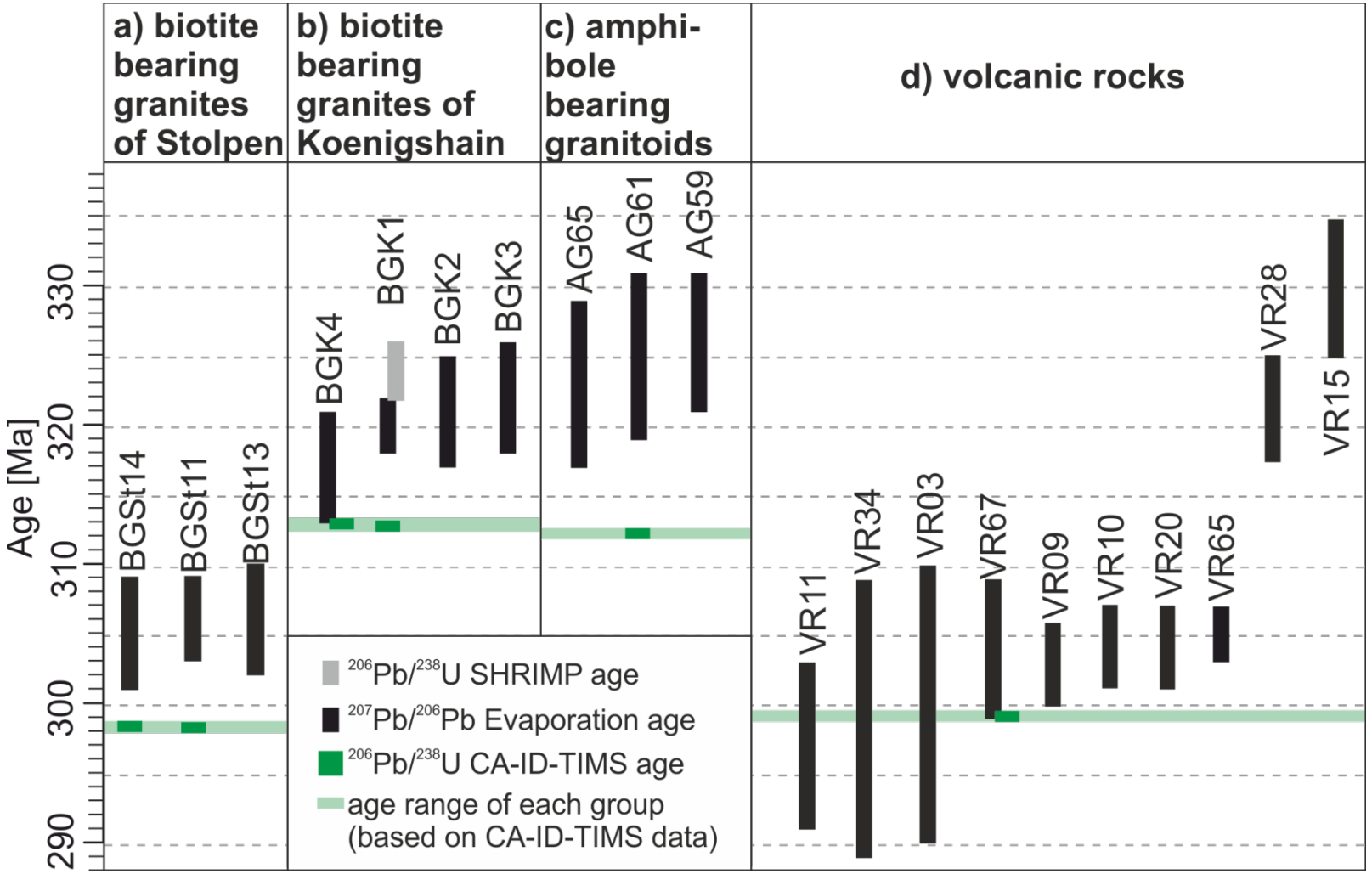


new zircon U-Pb CA-ID-TIMS ages display two clear age groups:

- 312-313 Ma at the NE boundary of the Lusatian Block
- 298-299 Ma at the SW boundary of the Lusatian Block

Results

Zircon Pb-Pb Evaporation, U-Pb SHRIMP and U-Pb CA-ID-TIMS data

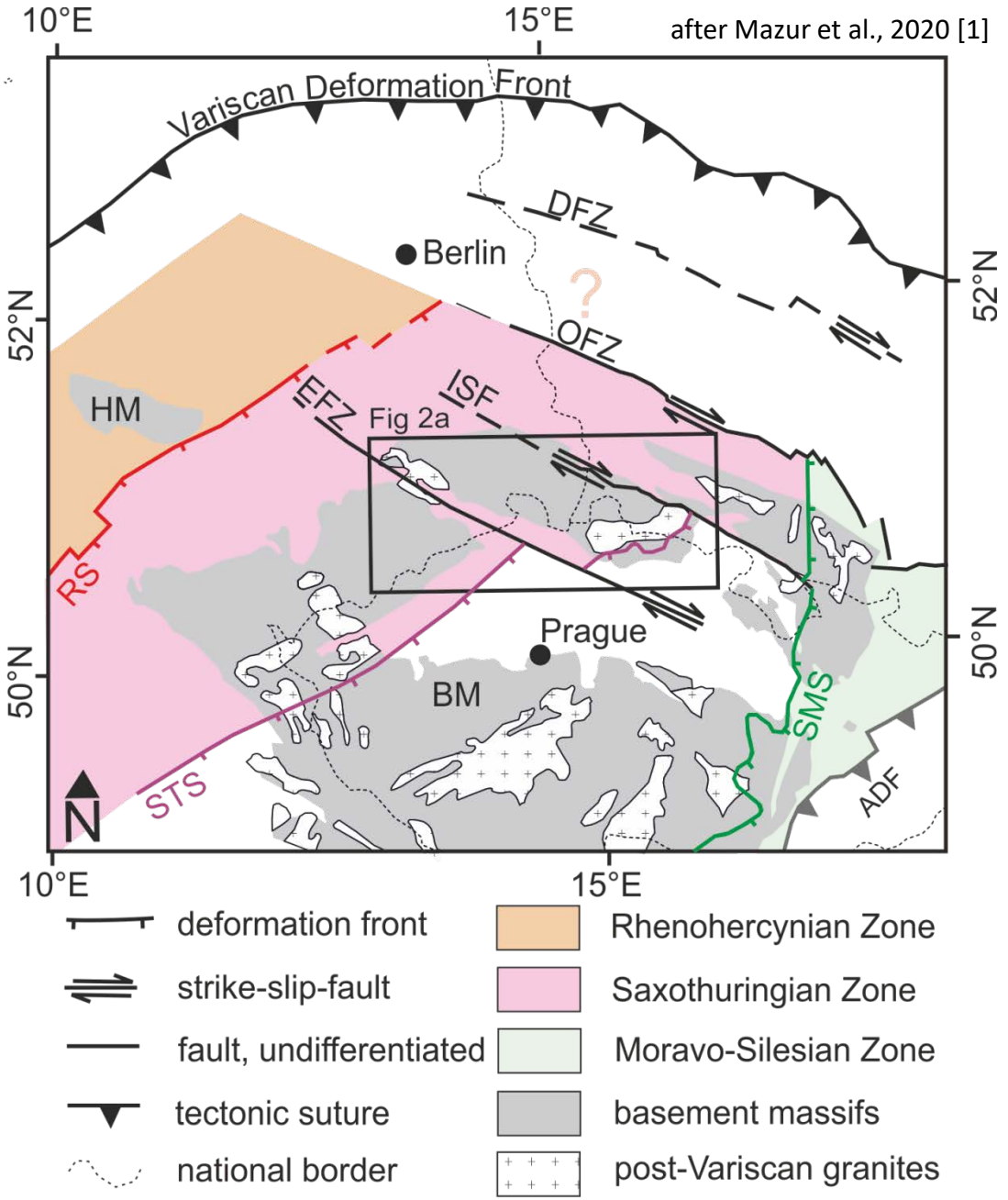


Further samples were dated with the less elaborate Pb-Pb zircon evaporation and with the zircon U-Pb SHRIMP method.

- These data confirm the subdivision of ages into two groups.

Discussion and Conclusions

- fault-bound granitoid rocks at the ISF intruded at 312-313 Ma
- fault-bound granitic and rhyolithic rocks at the EFZ intruded at 298-299 Ma
- time of intrusion is presumably contemporaneous with faulting activity
- 2 distinct events of strike-slip faulting at NW trending faults of the NE Variscan orogen occurred at 312-313 Ma and at 298-299 Ma



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