New paleomagnetic data for Ochotsk-Chukotka volcanic belt

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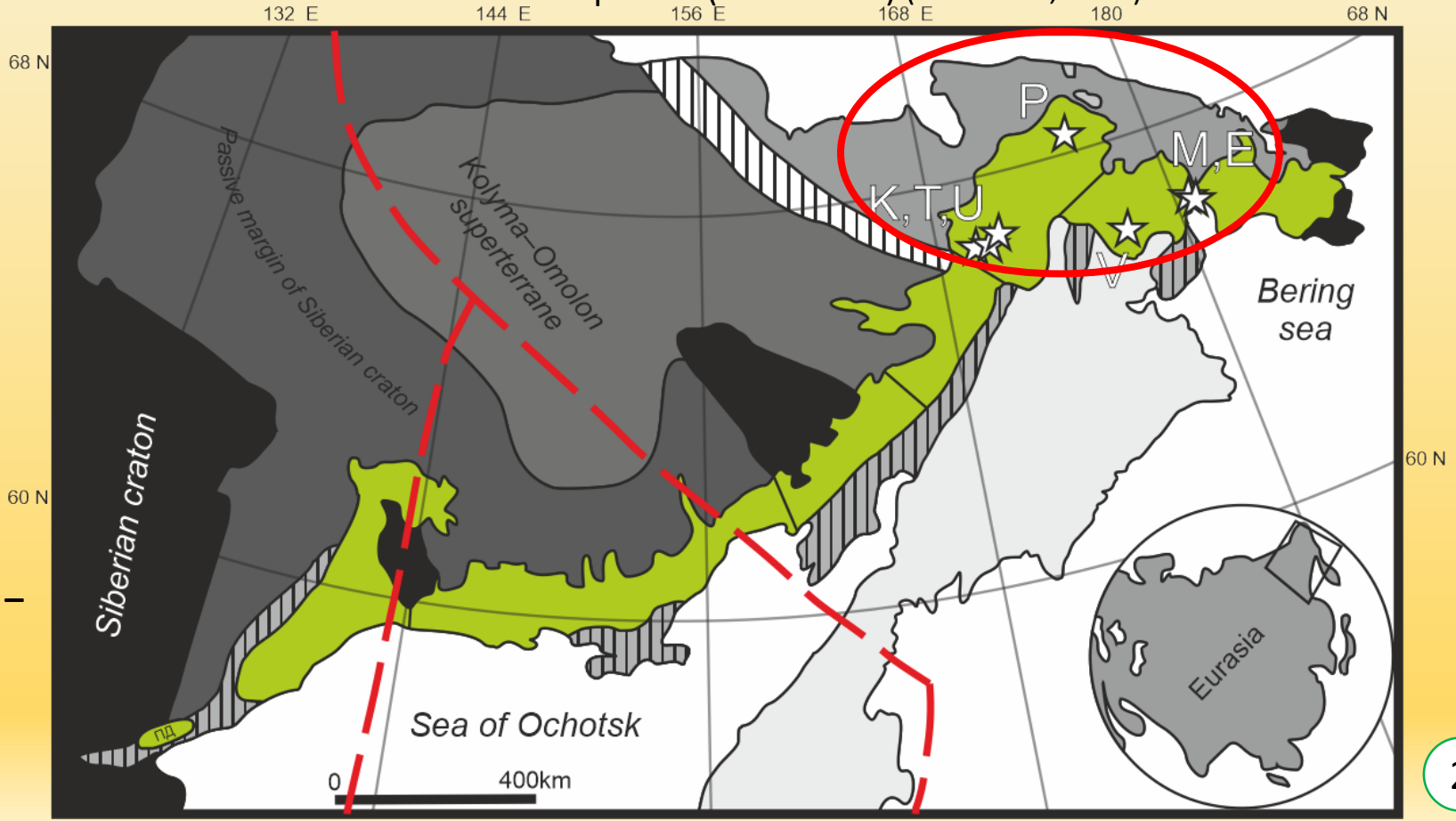
Object location

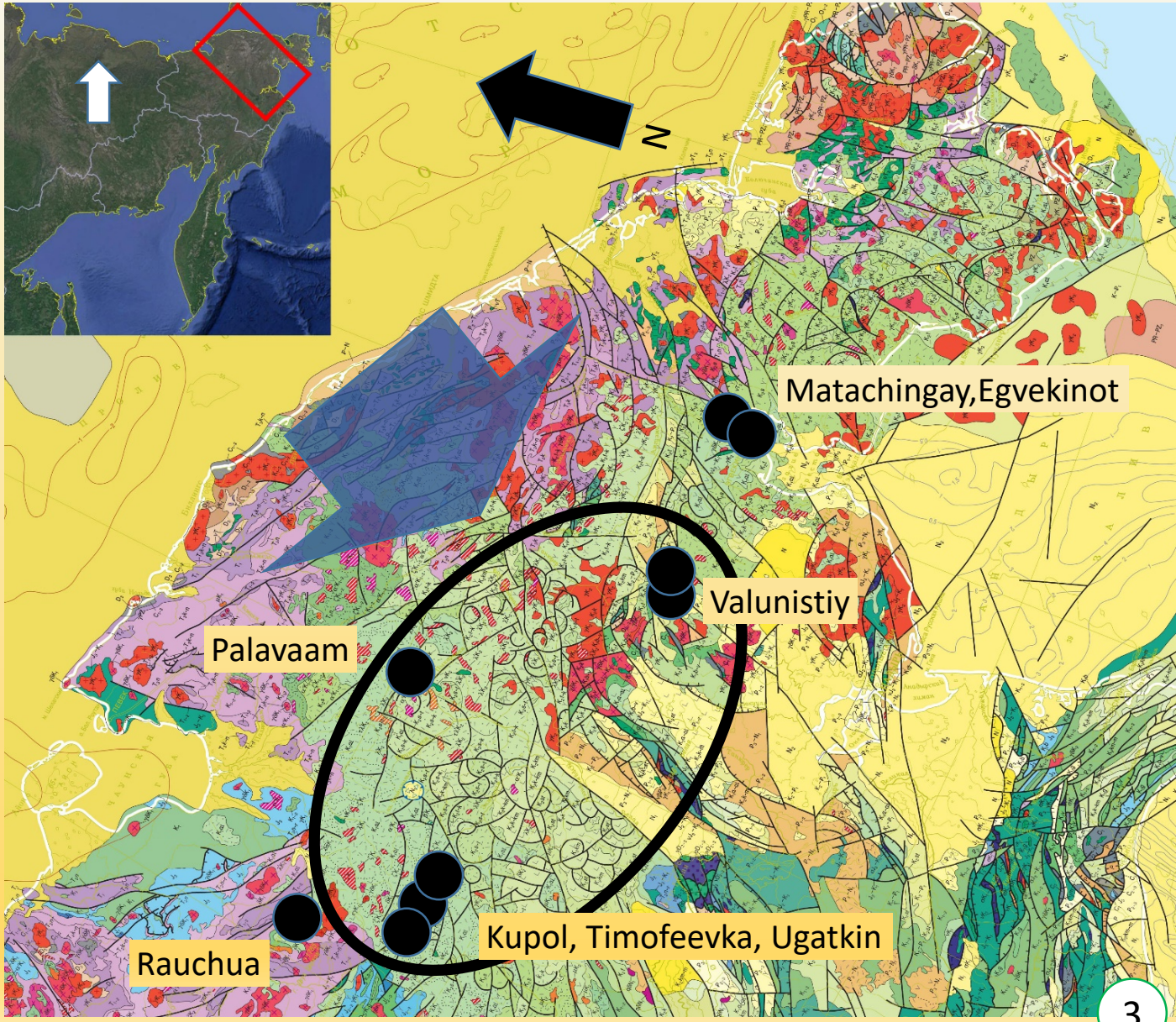
- **The aim**: obtaining new paleomagnetic data for cretaceous volcanics of Ohotsk-Chukotka volcanic belt and obtaining restrictions on the tectonic evolution of North-East of Russia.
- OChVB (light green on map) is one of the biggest volcanic belt with length more then 3000 km. It is a result of subduction along an Andean type convergent continental margin.
- Rocks represents different genesis and amount of silica: lavas, tuffs, ignimbrites and etc. But silica rocks prevail.
- Age of formation of OChVB from Albian to Campanian (106-74 Ma) (Tihomirov, 2018)



Light green – OChVB

Object location

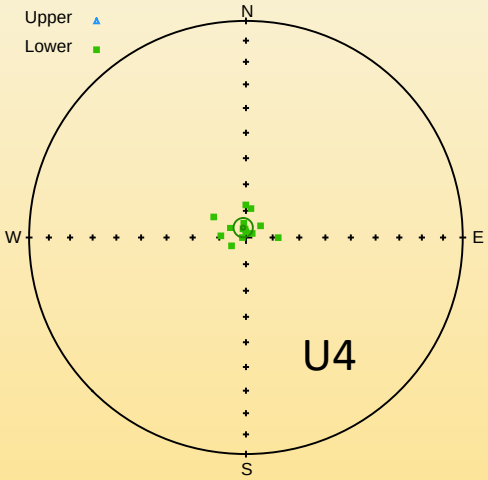
- We sampled 9 sections from Central-Chukotka and East-Chukotka areas
- The nearest isotopic dates (Ar-Ar and U-Pb) for our sections has **average age 85 Ma** (Tihomirov et al, 2006, 2012; Sahno et al., 2010), but most of this dates not close enough to our sections. But it is enough for our aims, because in this time observe stability of poles of neighbor N. America and Eurasia plates.



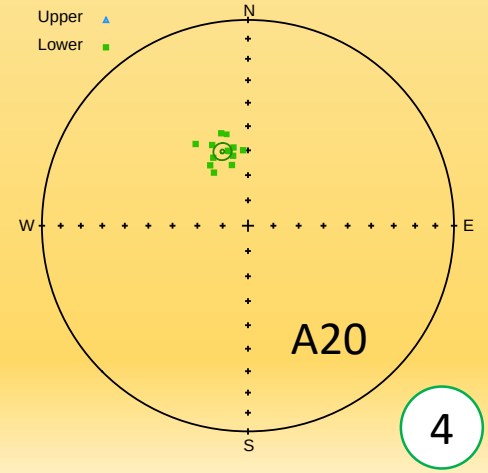
(https://www.vsegei.ru)

Paleomagnetic record

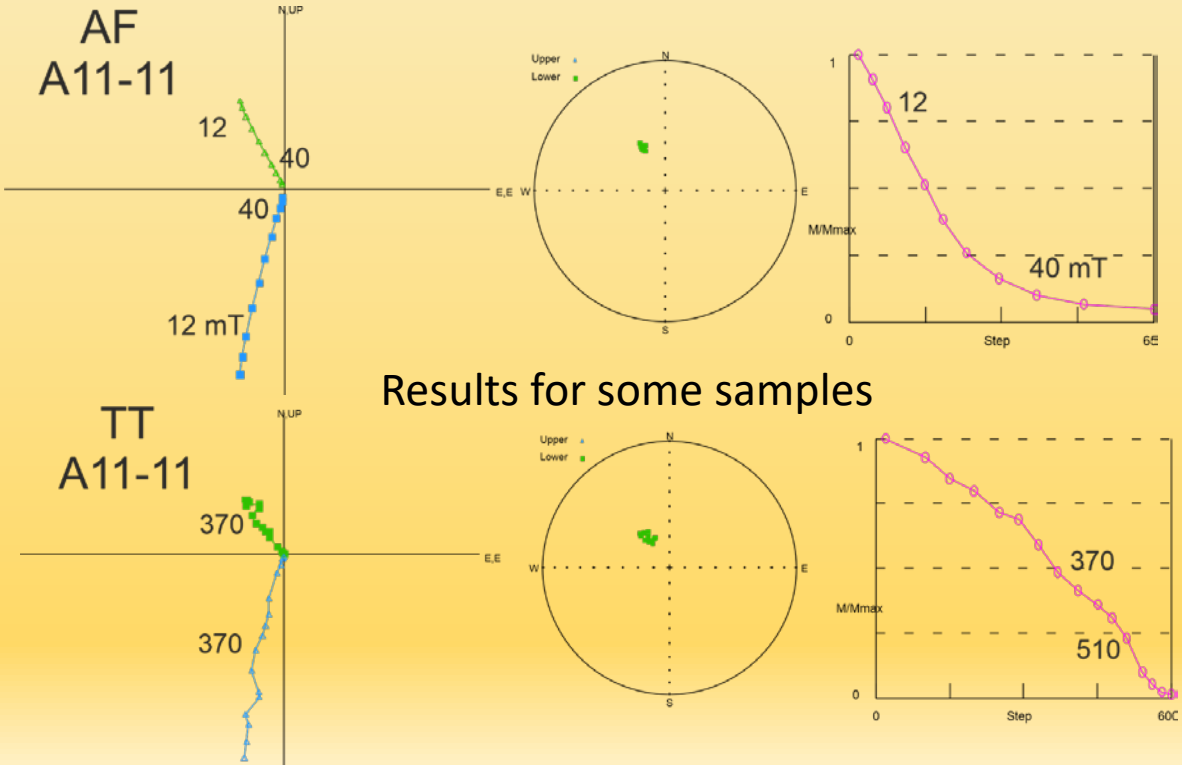
- On preliminary collections we compare results of alternating field and thermal demagnetization and results is equal. So then we used only AF.
- The best quality is observed in central parts of OChVB in sections: Kupol, Timofeevka, Ugatkin, Palavaam and Valunistiy.
- Although, in this sections prevail lavas. Tuffs and sediments have not reliable results.
- So for calculating paleomagnetic pole we used only this sections.



Directions into some sites

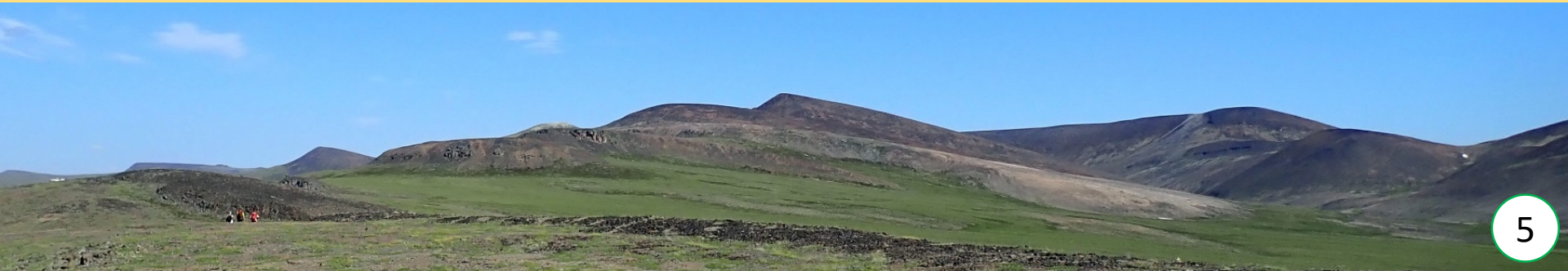


Results for some samples



Is it necessary to do tilt correction?

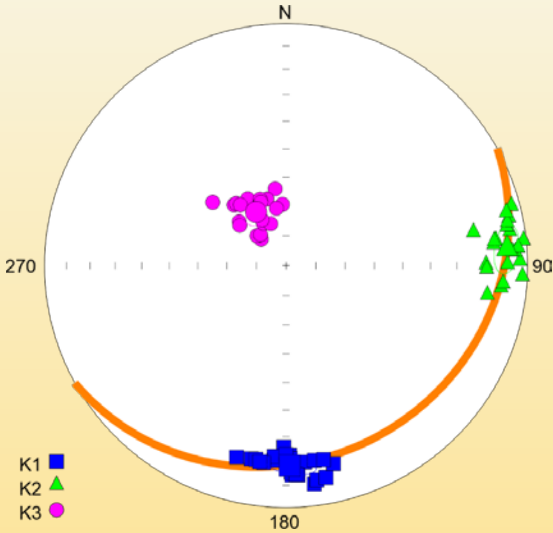
- Many researchers consider that there are **no significant deformations** in the OChVB (Tihomirov, 2018; Miller et al., 2018 and others).
- But we observe monocline attitude in our sampled rocks.
- Is it **tectonic or paleotopography**?
- Simple measurements of attitude in outcrop is **impossible** because most of rocks **have not visible fabric**.



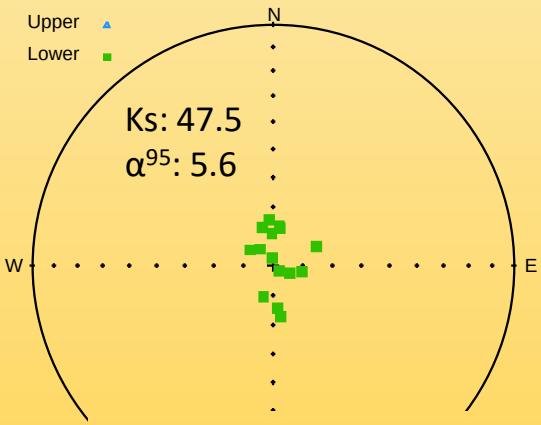
Tilt correction

- We tried to get attitude from satellite and AMS.
- Attitude from AMS calculated as perpendicular to min axe of AMS.
- Attitude from satellite calculates from 3 points of altitude for one well distinguished flow.
- We compare results in geographic and stratigraphic coordinates and maximum of accuracy has **geographic coordinates**
- So most likely it is **paleotopography?**

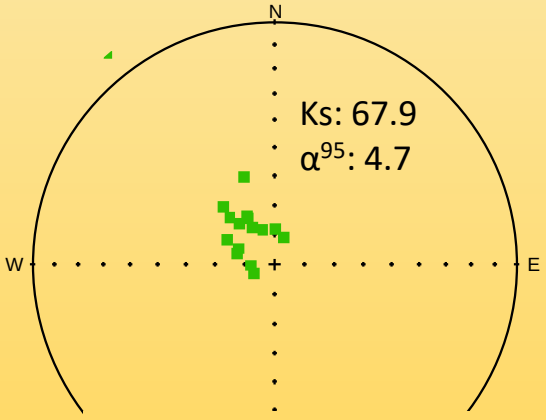
Example of AMS for one flow. Attitude - 151∠21



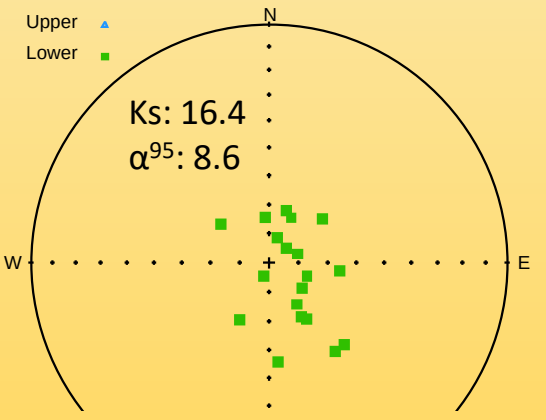
Mean directions from all Timofeevka sites



Stratigraphic coordinates
From **satellite**



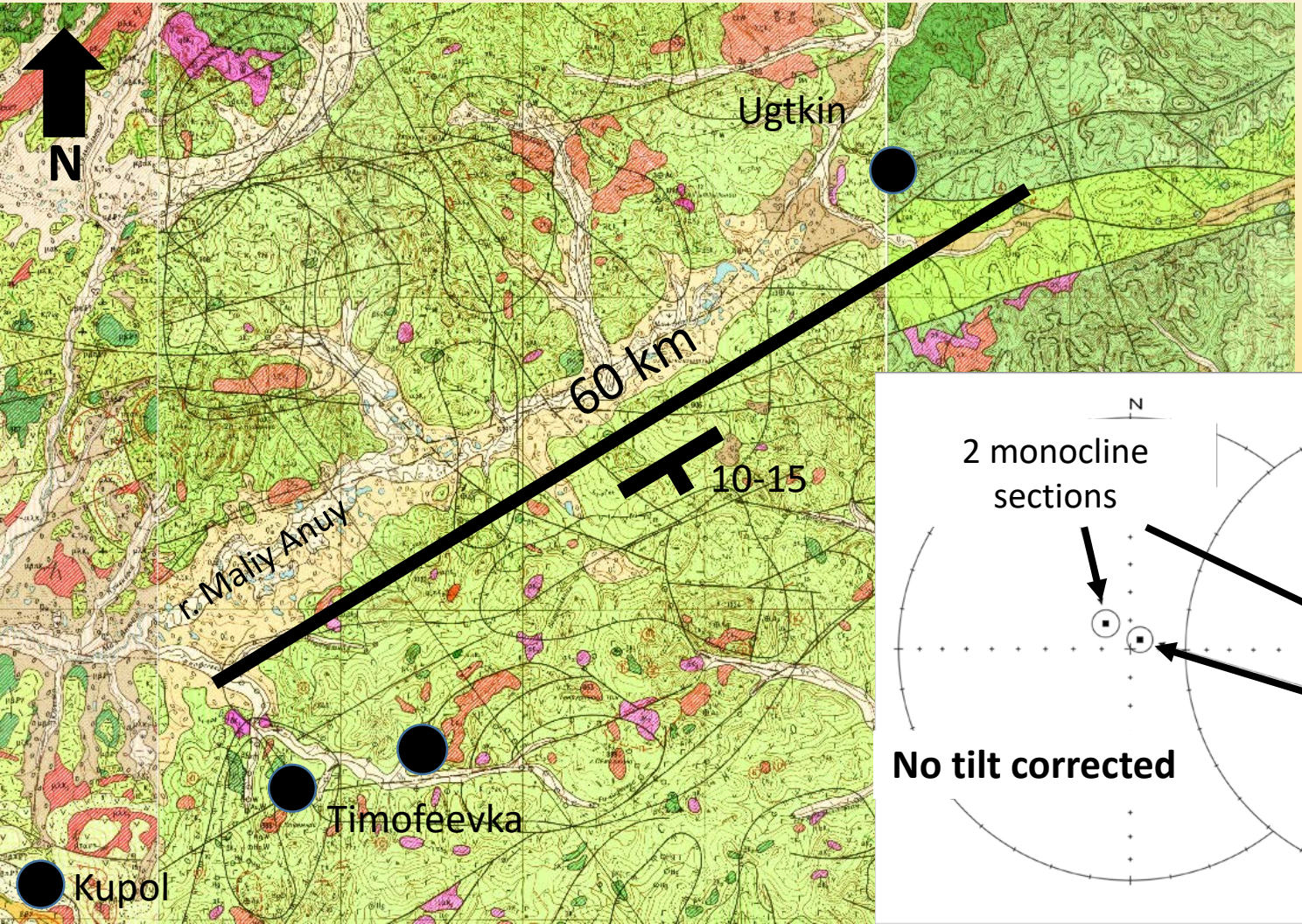
Geographic coordinates
No correction



Stratigraphic coordinates
from **AMS**

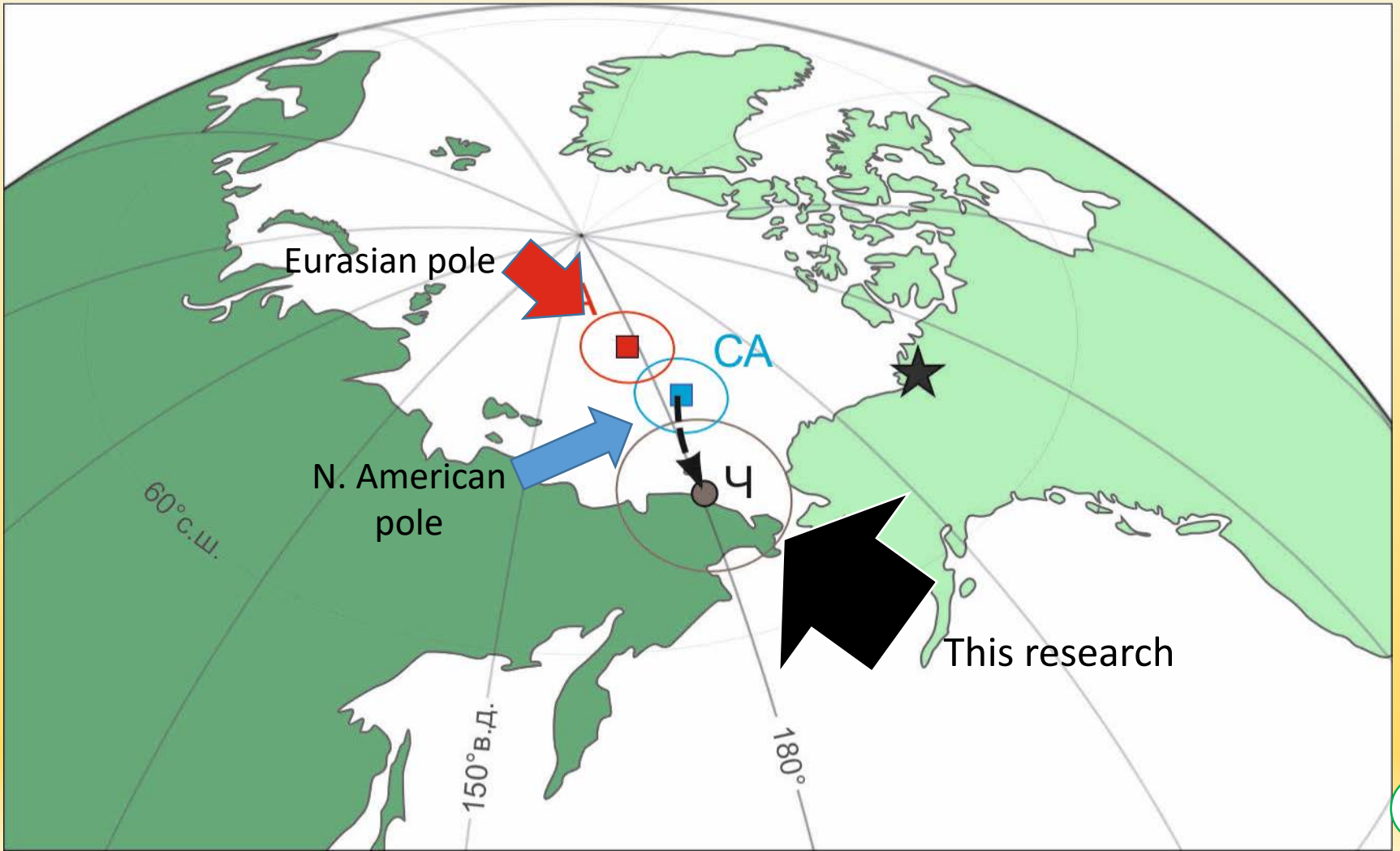
Tilt correction

- But 2 our sections were placed in Ugatkin monocline with length more then 60 km, where generally observed south-east dip 10-15°. It is hard to explain as paleotopography.
- So this 2 sections should be tilt corrected.
- We compare mean directions from this 2 tilt corrected sections with another (no tilt corrected) sections and receive **positive regional fold test**.



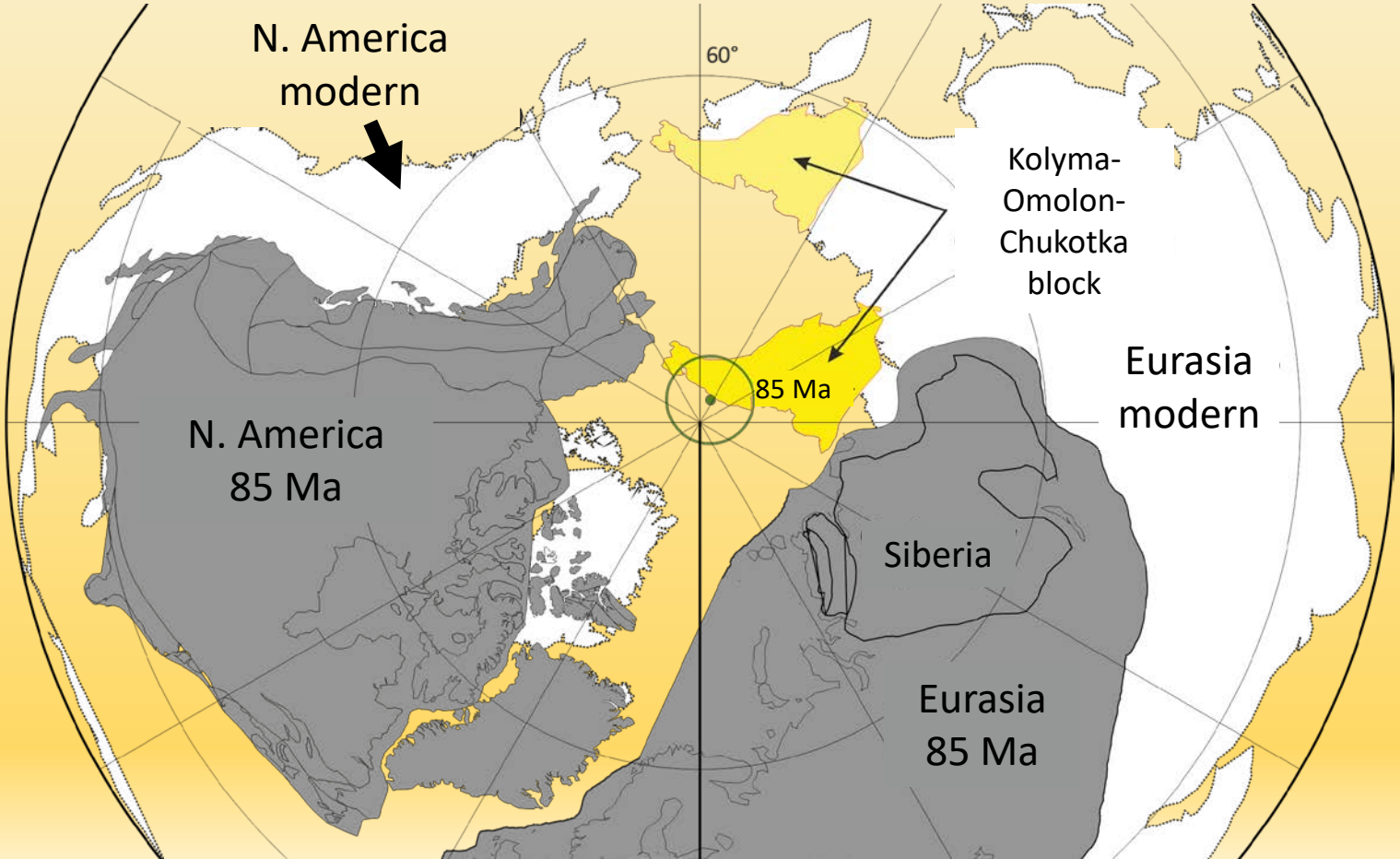
Paleomagnetic pole 85 Ma for OChVB

- Our pole is **equal** to previous works (Stone et al., 2009; Otofuji et al., 2015)
- But it is **different** from expected if OChVB is formed on N. America or Eurasia plates.
- So we can observe the **relative displacement** rocks of OChVB after their formation ~85 Ma



Reconstruction

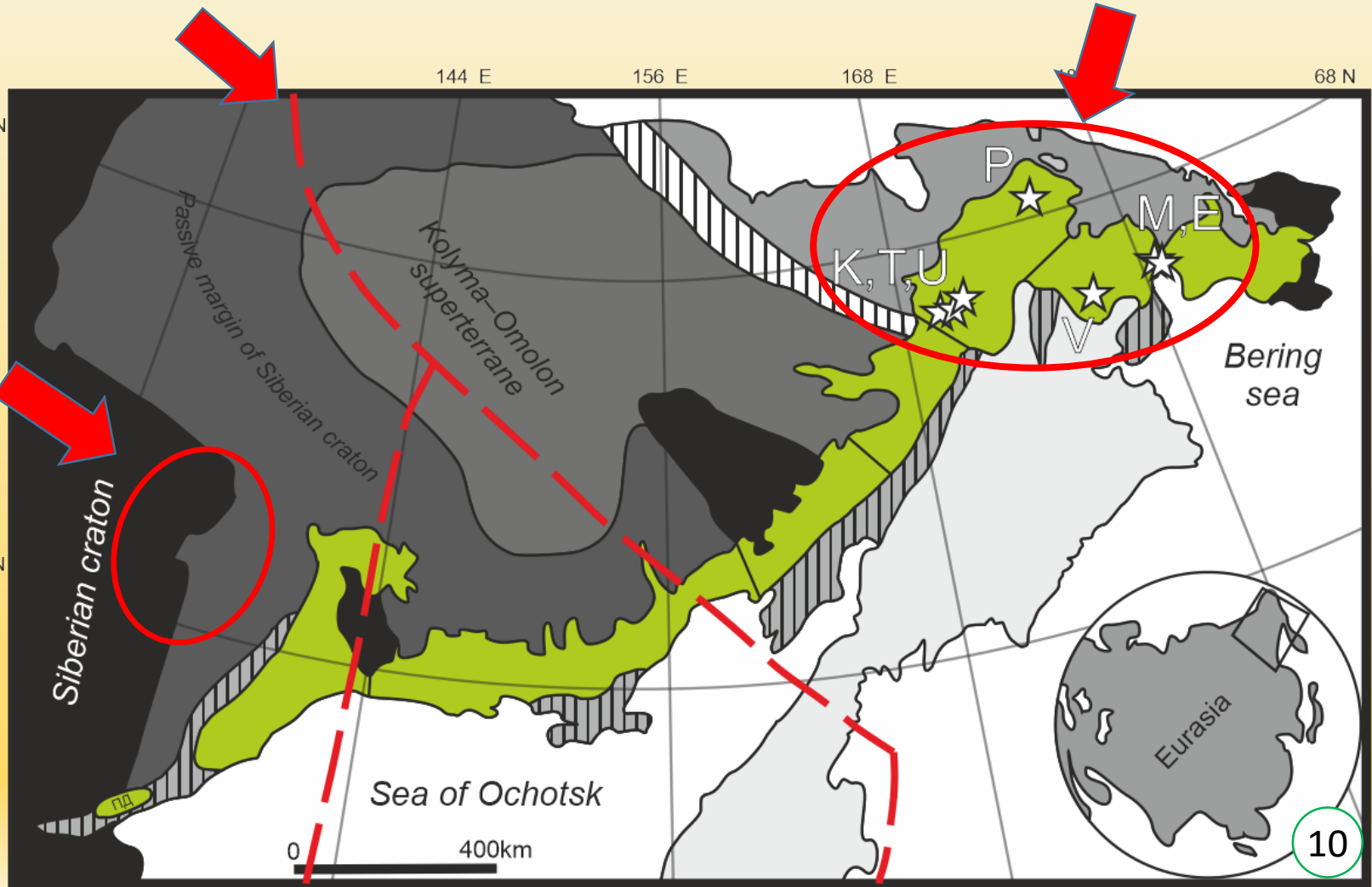
- We received a paleolatitude that differs from that expected by 6° form North America and 9° from Eurasia.
- This difference implies a average 600-1000 km southward movement of OChVB.
- But according to geological data [Parfenov et al, 2009; Sokolov, 2010 and others], **all tectonic motions ended before the formation of OChVB** and OChVB **overlap** all terraines in basement.
- Because of that and no deformed OChVB we implies that Chukotka and Kolyma-Omolon blocks after 85 Ma can be one tectonic unit.



Where we can find younger deformations?

1. Modern diffuse border of North American and Eurasian plates. In some articles discussed motions through Cenozoic time (Gaina et al., 2002; Imaeva et al., 2017; Parfenov et al., 1995)

2. Main deformation stage in south Verhoyansk in 90-70 Ma by AFT (Malishev et al., 2018)



Light green – OChVB

Conclusions

- At the time of the formation of the UChVB, there was a dissected paleotopography, which is confirmed by the attitude of rocks obtained different sources. In addition, there are signs of tectonic deformations.
- Our paleomagnetic pole of ~ 85 Ma is statistically not distinguishable from the previous works, and implies a motion of Kolyma-Omolon-Chukotka block southward.
- Geological data generaly can not explain this movement, but in some works implies younger movements in last stages of thrust formation in the Verkhoyansk fold-thrust system and / or the modern diffuse border of the North American and Eurasian plates.

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Thanks for your attention!