KEY CHEMICAL CHARACTERISTICS OF CRYOCONITE SEDIMENTS FROM BEZENGI GLACIER AND LOCAL MOUNTAIN SOILS IN THE CAUCASUS MOUNTAINS, RUSSIA

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Cryoconites are dark colored supraglacial sediments enriched with carbon-containing dust and organic matter which are usually found in glacial environments.

Cryoconites may affect soil formation in periglacial zone due to transfer of material by aeolian processes and water streams. Thus, our main aim was through study of key chemical and some physical properties estimate role of cryoconites in soil formation in the periglacial zone of the Bezengi Glacier.

Fig. 1. Periglacial zone nearby the Bezengi Glacier

Influence?

Fig. 2. The Bezengi Glacier with dust cover and terminal moraine

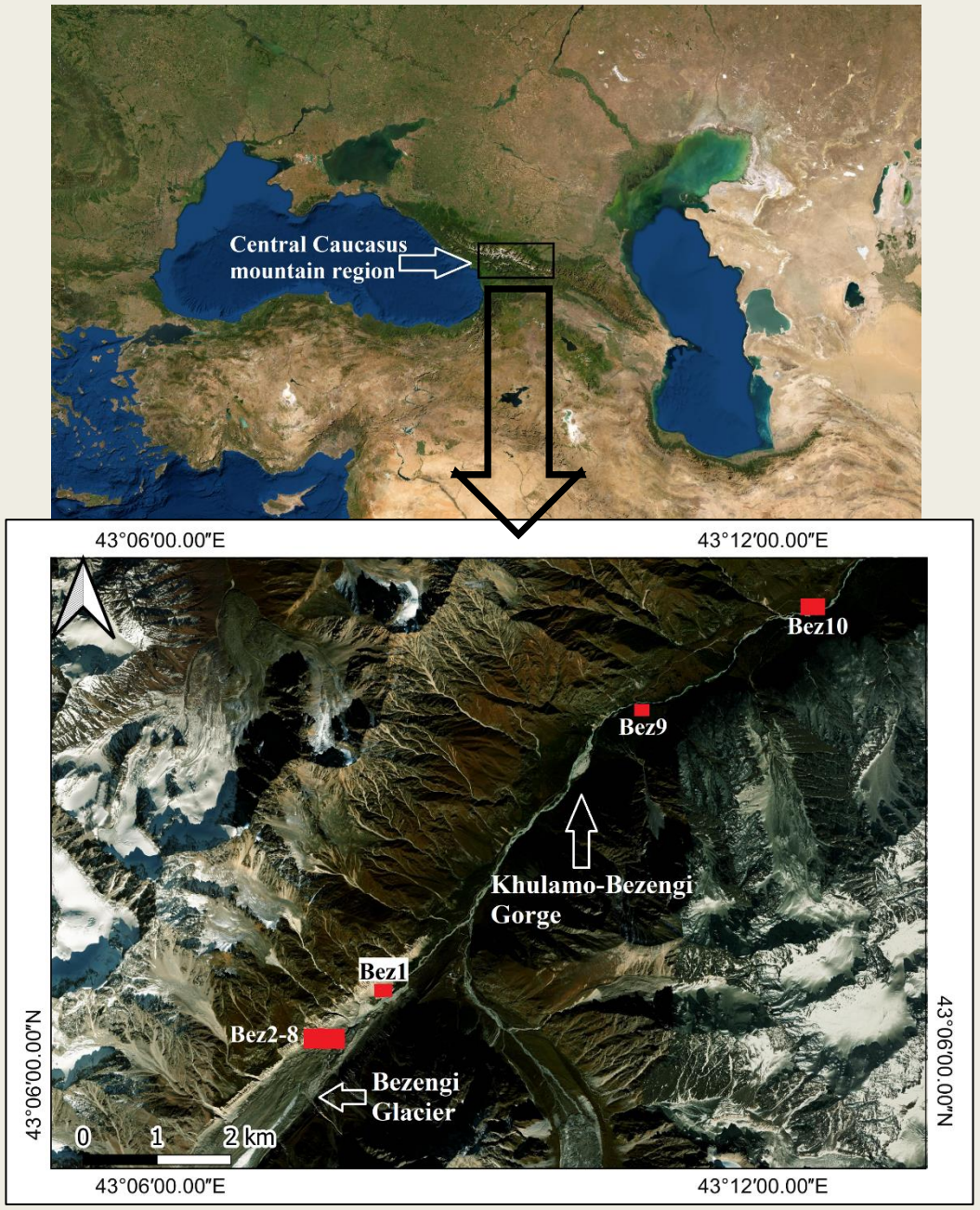

Fig. 3. Location of the study area

Fig. 4. Cryoconites at the Bezengi Glacier

Influence?

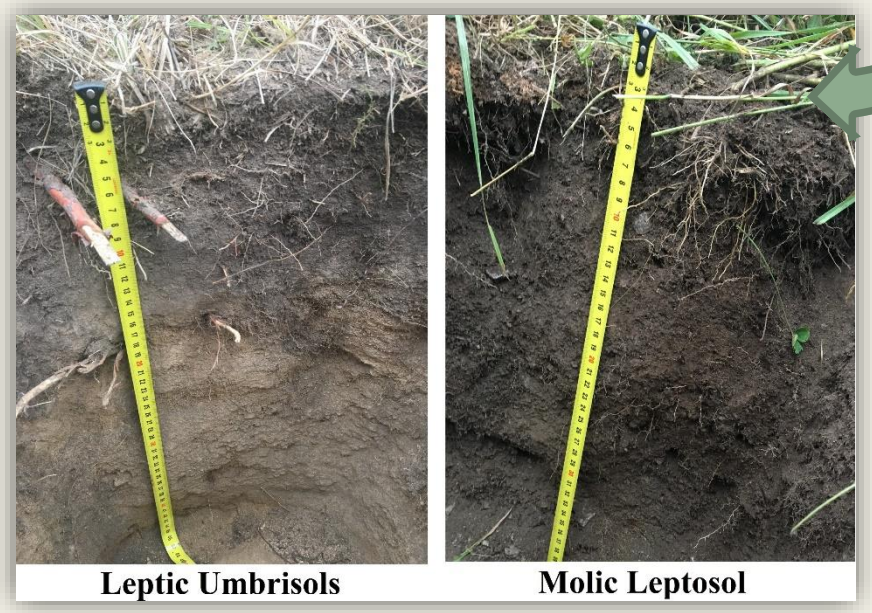

Fig. 5. Soil profiles of studied soils

- In the Khulamo-Bezengi Gorge local soils, generally, were more acidic than supraglacial sediments, their values are close to 6 while values of cryoconites are closer to 7.

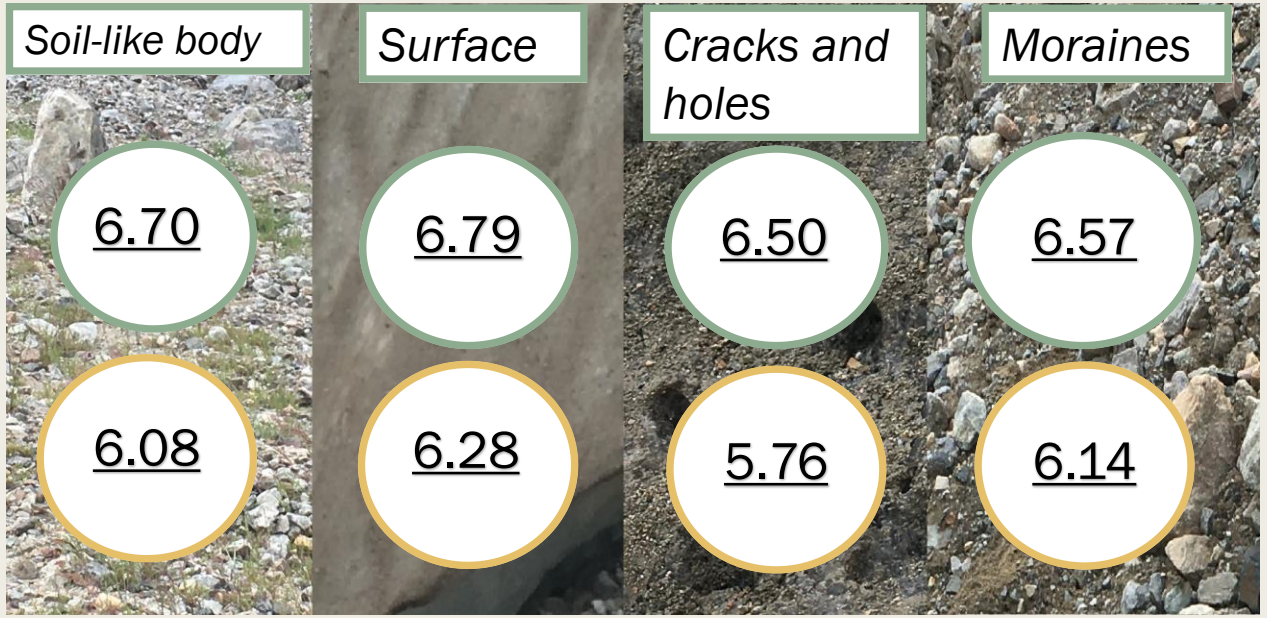

Fig. 6. Mean pH of studied cryoconites and other glacial materials (H_2O and $CaCl_2$)

- Significant difference between pH H_2O and $CaCl_2$ was observed within soils which indicates the presence of silt and fine fraction or humus as well as diverse mineralogical composition, which increase an absorptive capacity for hydrogen ions in acidic soils, thereby acidifying the soil solution

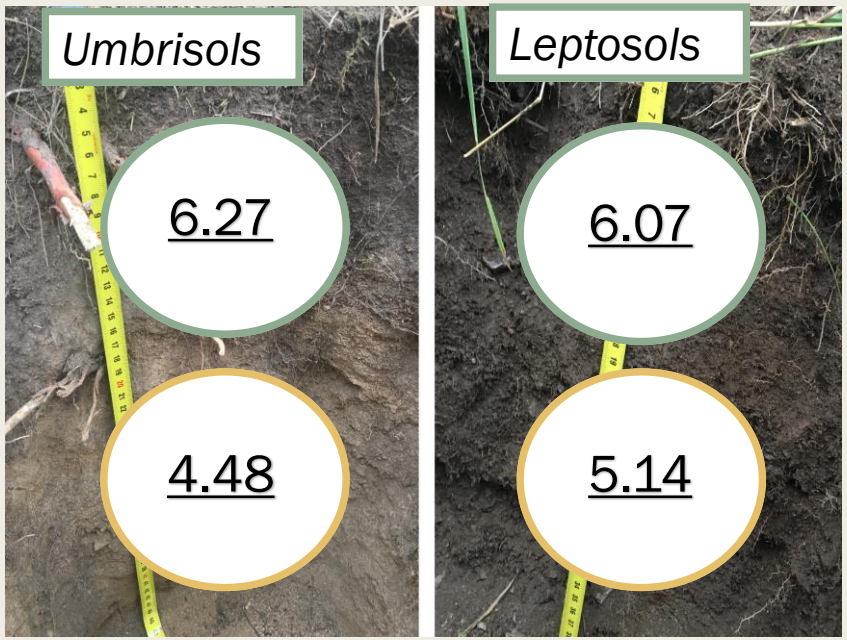

Fig. 7. Mean pH of studied soils (H_2O and $CaCl_2$)

- Significant relationship (according to one-way ANOVA test) was found between values of total organic carbon (TOC) and basal respiration due to fact that organic carbon act as a source for development of microbial communities.
- High microbial activity was observed in studied soils due to input of easily accessible organic carbon from the glacier surface which may accelerate development of soils.

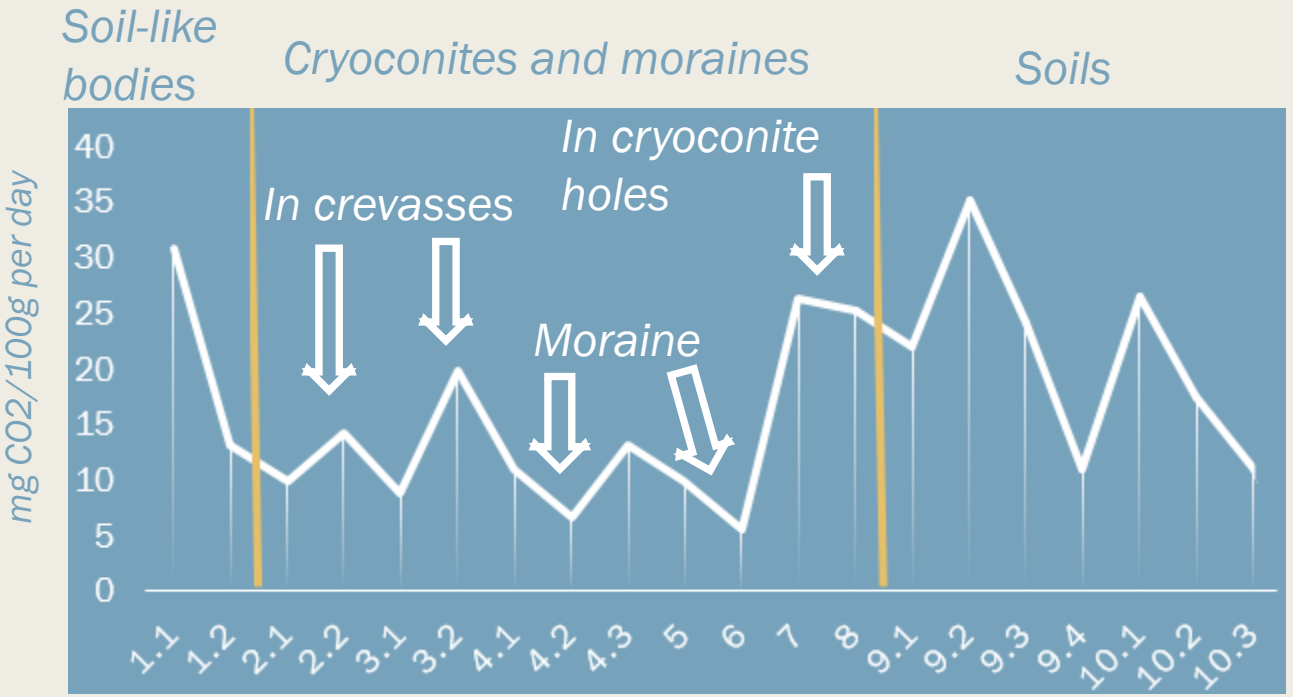

Fig. 8. Basal respiration values of studied materials

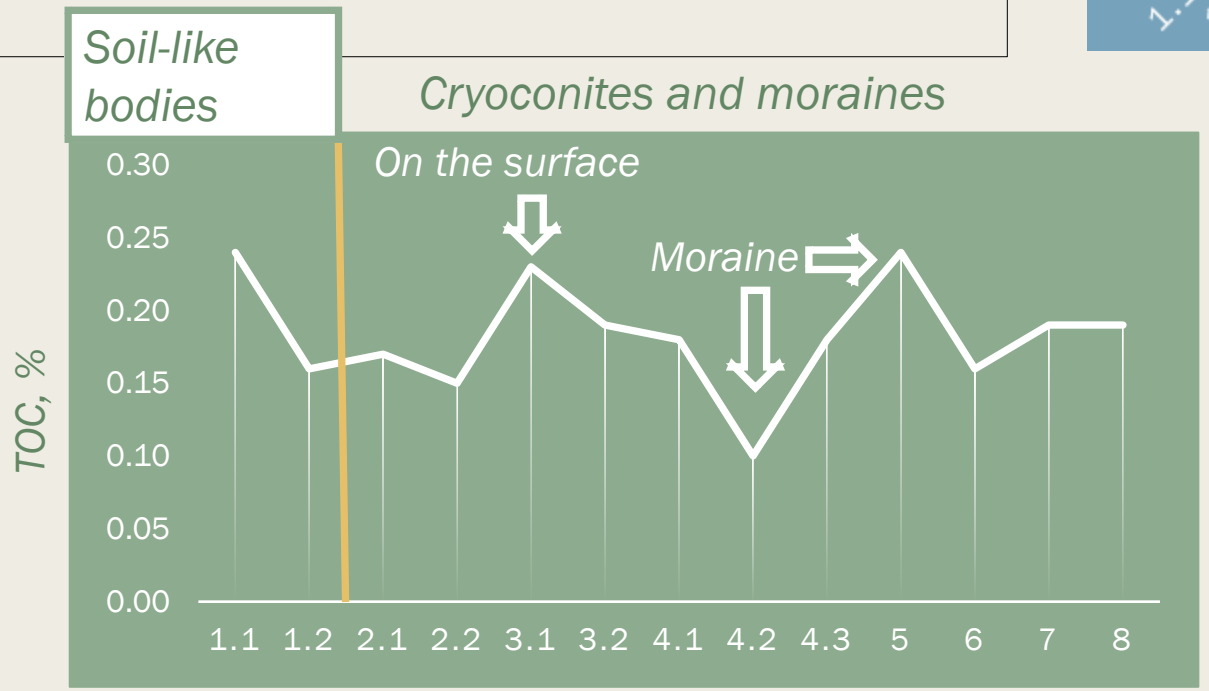

Fig. 9. TOC content in cryoconites and other sediments

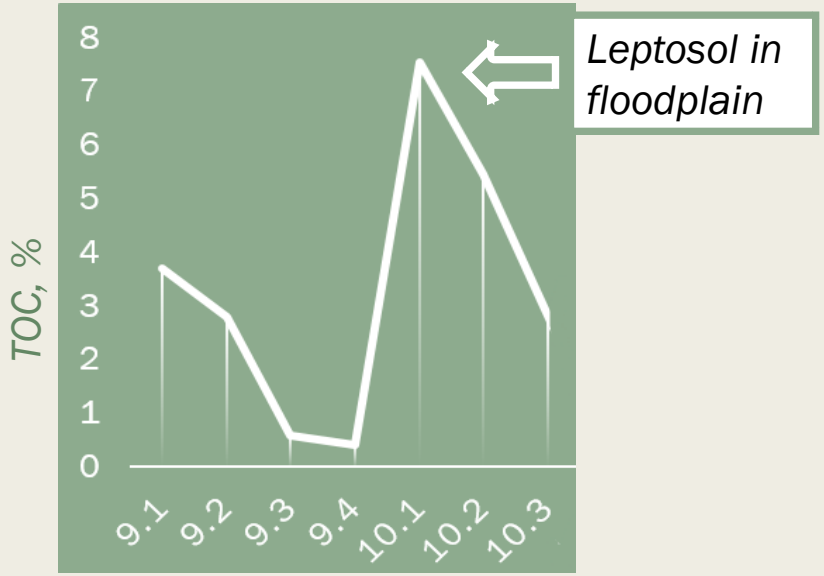

Fig. 10. TOC content in studied soils

- Among all studied cryoconites and almost all samples of mountain soils sand (grain size 1-0.05 mm) was dominated.
- Caucasus mountain range blocks eolian transfer of small (clay and silt) particles while valley walls act as a source for large (sand) particles.
- Transfer of particles with organic carbon and other substances occurs not only from glacier to foothill but also backwards with fine earth transfer.

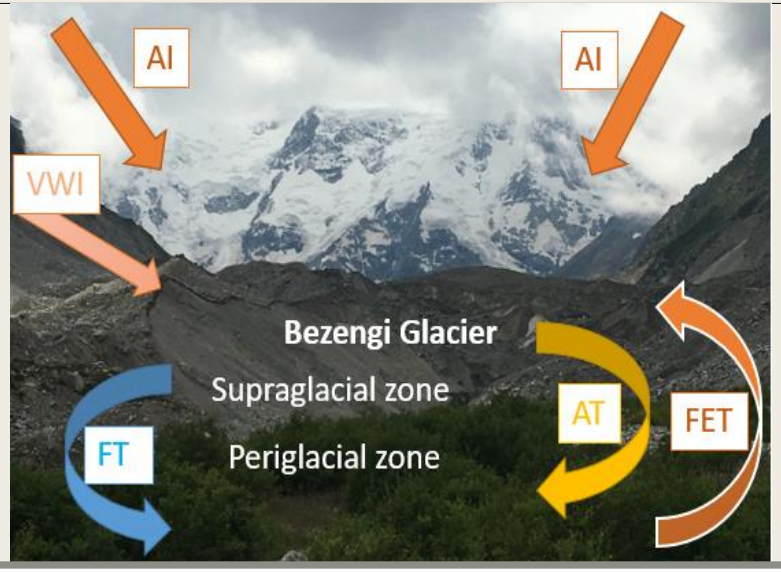

Fig. 12. Flows of matter between supraglacial and periglacial zones of the Bezengi Glacier (AI – allochthonous input; VWI – input from the valley walls; FT – fluvioglacial transfer; AT – aeolian transfer; FET – transfer of fine earth fraction)

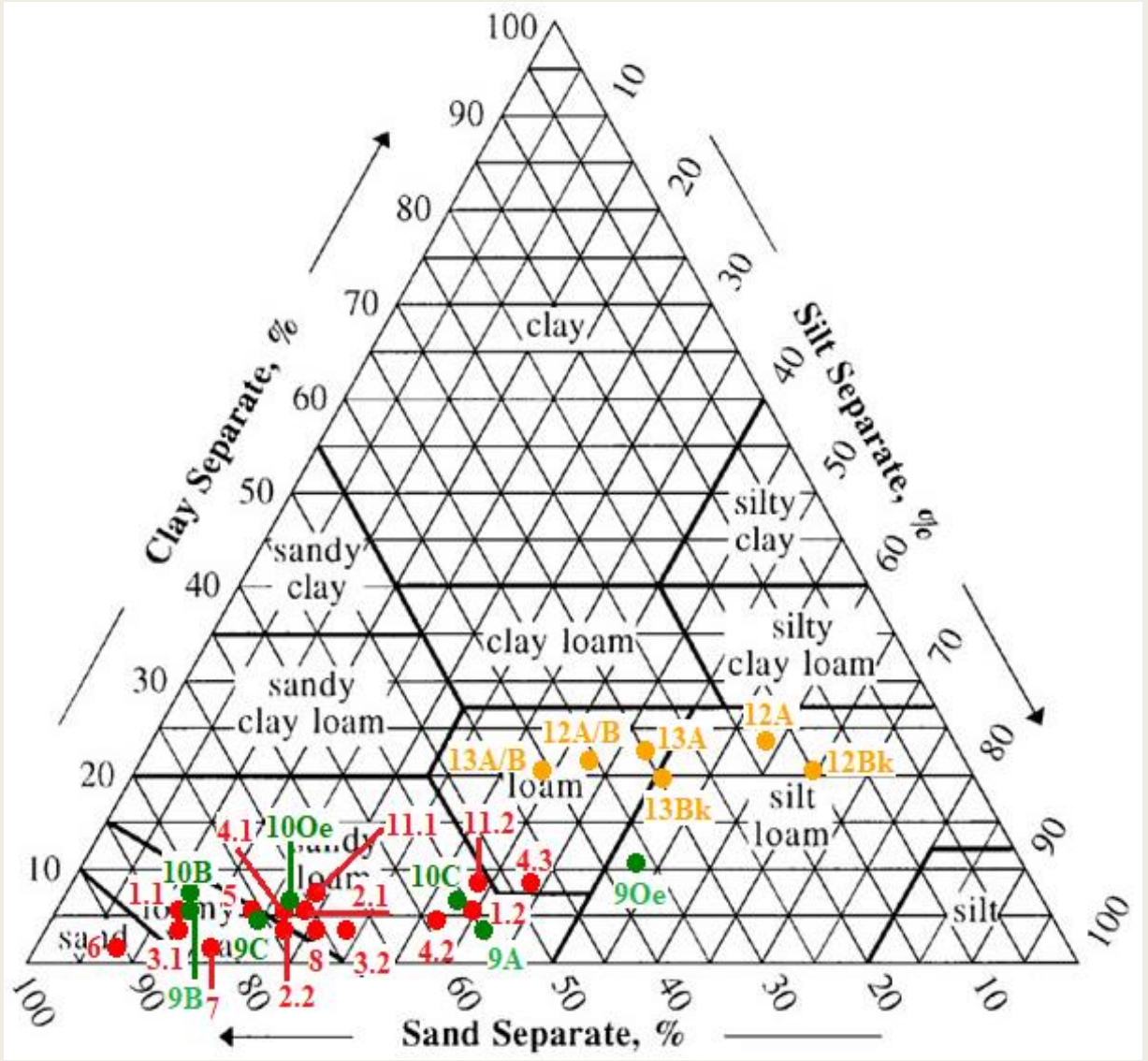

Fig. 11. Particle-size distribution of materials from the Bezengi Glacier (red), Khulamo-Bezengi Gorge Entisols (green) and studied Chernozems (yellow) at the texture triangle

Thank you for attention!