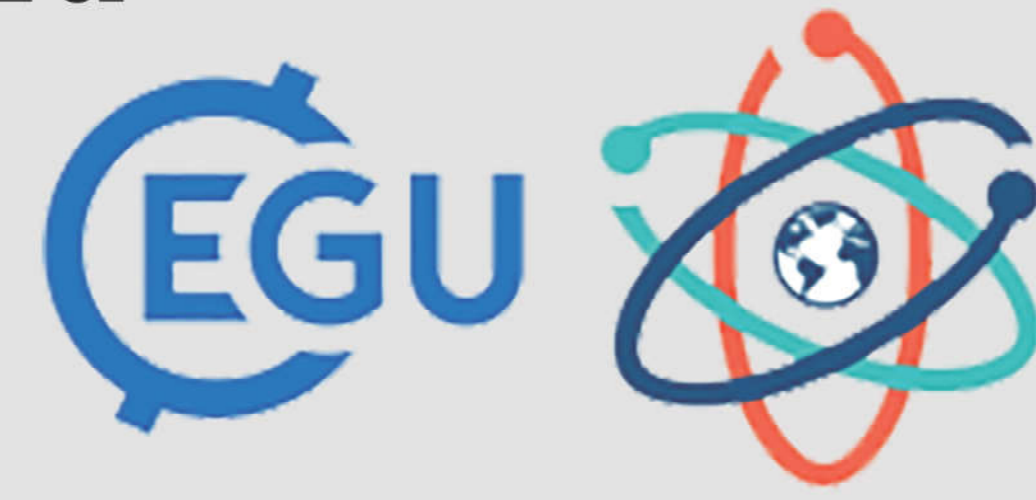


Late Miocene Goderdzi Volcanic Formation, Lesser Caucasus, Georgia: Evidences of the Presence of a Caldera

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Introduction

The Late Miocene Goderdzi formation in the Lesser Caucasus, is a part of the Late Cenozoic volcanic highland occupying more than 4500 km² in Georgia. The Goderdzi formation, among other places is well exposed in the Mtkvari River canyon in South Georgia, where during recent studies so-called caldera forming eruption (CFE) sequence was noticed. CFE sequence comprises several types of pyroclastic material and is typical for many large collapse calderas recording different stages of caldera forming events. We believe, this and some other features of the Goderdzi formation indicate to the existence of a caldera in the region.

Geology of the Region

- The study area is located in the vast volcanic province (Fig. 1) formed by Late Cenozoic volcanic activities as a response to the Arabia-Eurasia continental collision.
- In Georgia, three Late Cenozoic volcanic units form Samtskhe-Javakheti volcanic highland (>4500 km²): 1. Late Miocene - Early Pliocene andesitic-dacitic Goderdzi formation; 2. Late Pliocene to Early Pleistocene Javakheti plateau basalts and trachyandesites and dacites of Javakheti ridge 3. Middle-Late Pleistocene andesites and dacites of Abul-Samsari ridge.

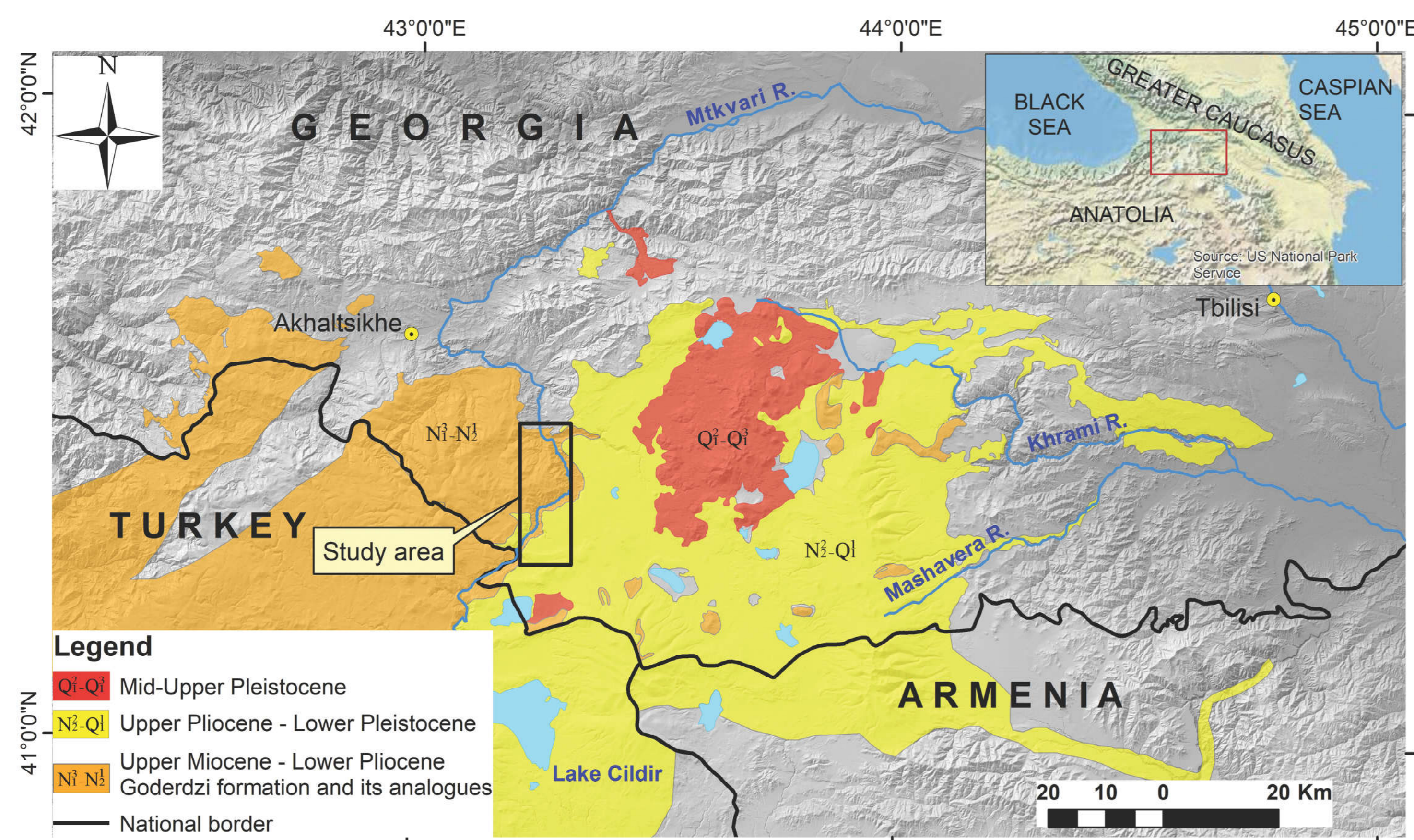


Fig. 1. Part of Late Cenozoic volcanic formations in Georgia, Turkey and Armenia

The Goderdzi Formation

- The Goderdzi formation is andesitic-dacitic, thick (~1000 m) volcanic formation. Its lower part is mostly composed of pyroclastic material, such as ignimbrites, lithic breccias and volcanic ash (Fig. 5), whereas the upper part consists of lava flows.
- The Goderdzi formation rocks are widespread in South Georgia, they are also present in NE Turkey and Armenia.
- Ignimbrites from the lower part of the Goderdzi formation (Fig. 2) have been dated recently using U-Pb method with a LA-ICP-MS and their average age is 7.5 Ma, corresponding to the Late Miocene epoch.

Evidences of the Presence of a Caldera

- Stratigraphy (Fig. 6) of the lower part of the Goderdzi formation resembles so-called caldera-forming eruption sequence, described at many calderas.
- Presumably all explosive volcanoes erupting more than 5 km³ material produce a caldera. Even if only lower ignimbrites (Fig. 2, 3 and 4) were just 10 m thick and covered 724 km² in Georgia, their volume would be 7.24 km³. In reality, the Goderdzi formation spreads further south to Turkey and ignimbrite thicknesses sometimes reach 60-80 m.

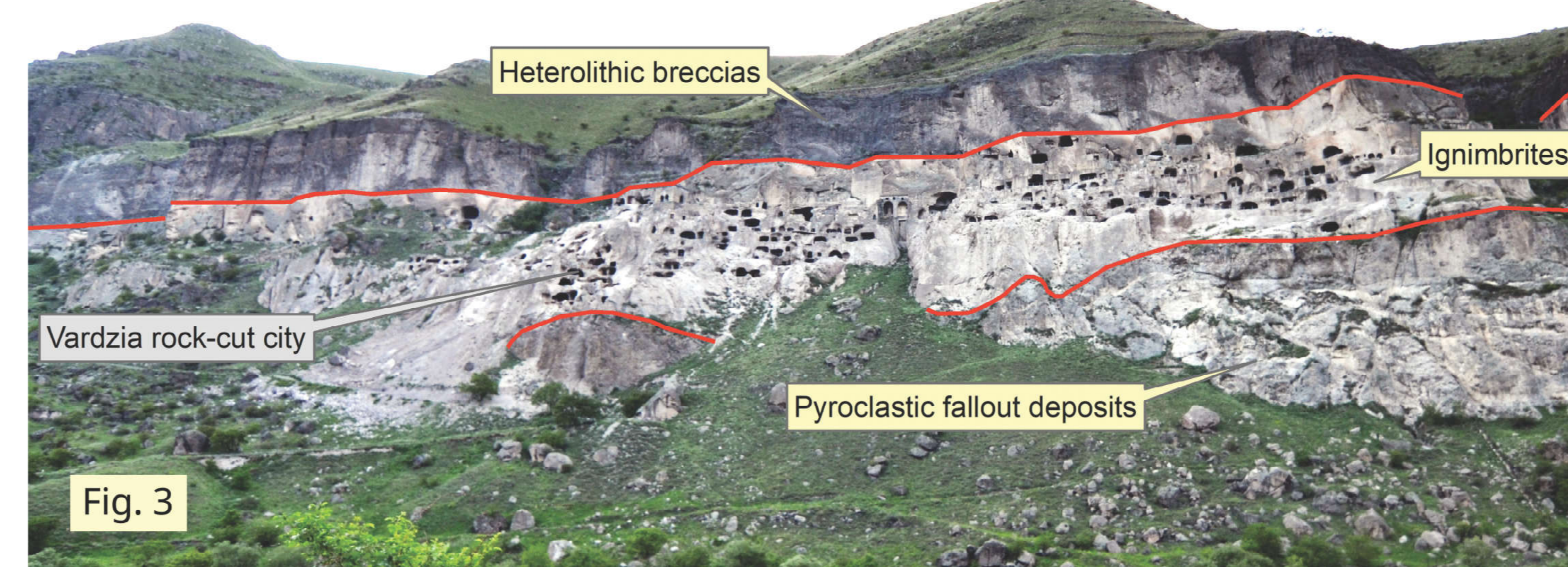


Fig. 3



Fig. 4



Fig. 5

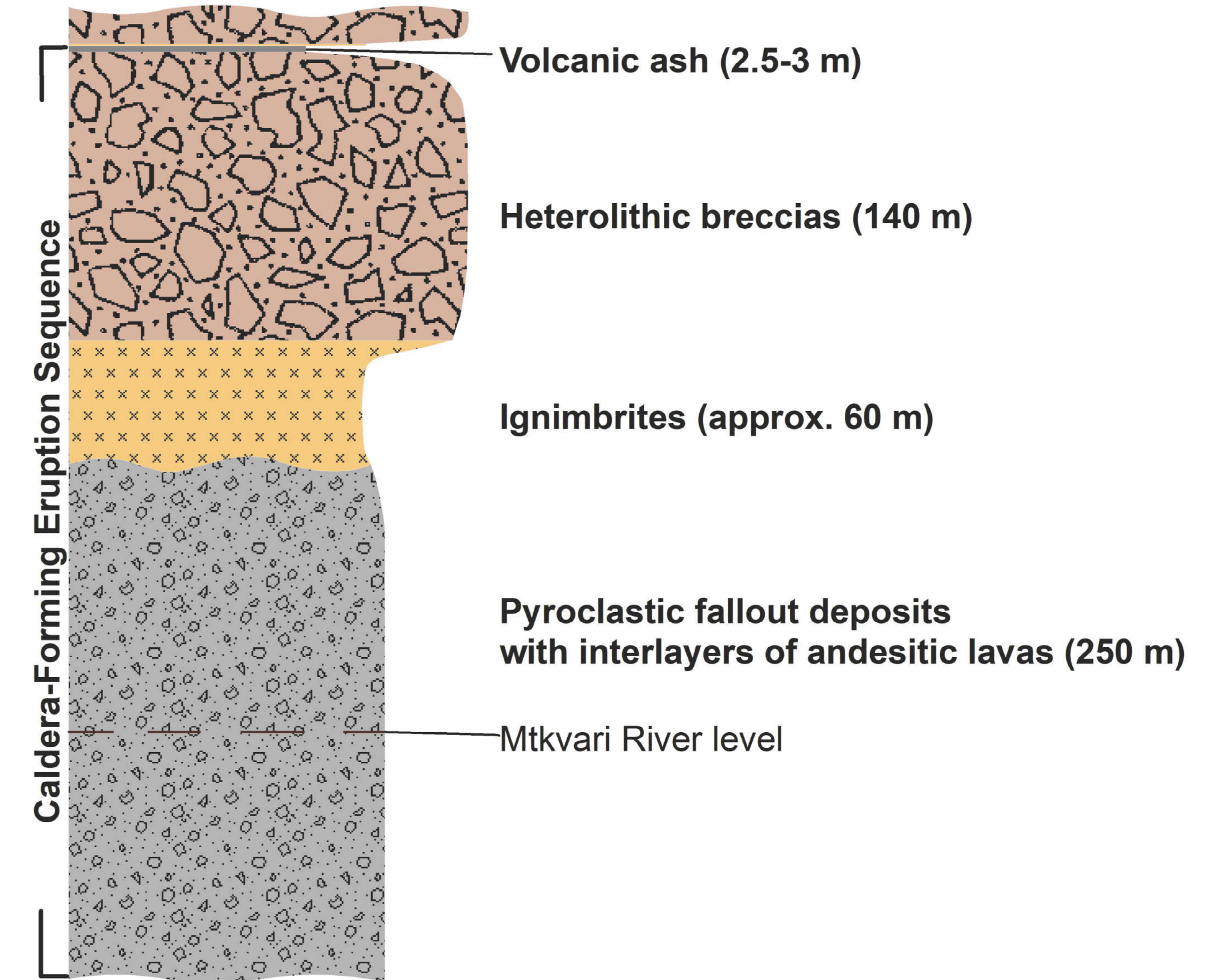


Fig. 6. A stratigraphic column showing caldera-forming eruption (CFE) sequence in the lower part of the Goderdzi formation

Conclusions

Due to intense deformation, erosion and concealment, caldera structure is not clearly visible, thus its location is yet unknown. Despite this, we can make following conclusions: 1. Thick ignimbrites are exposed in remote places of the region, which indicates to strong eruption (VEI still unestablished); 2. Stratigraphy of the Goderdzi formation is very similar to the caldera-forming eruption (CFE) sequence, where different stages of caldera forming event are recorded by different types of pyroclastic rocks; 3. Within the study area, ignimbrites are weakly welded, also hydrothermally altered rocks are barely present. Therefore, these units are assumed to be extracaldera formations.

Preliminary results, presented here, shall be extended by future studies in Georgia and Turkey. Correlations of volcanic rocks, topographic survey and geological mapping will possibly help to identify the Late Miocene caldera.

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