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Reply to Comments by Ye. Kornienko Sheremet (2020)

S.M. Stovba, 2021

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On behalf of the authors of the paper by Stovba et al. [2020], I would like to thank Kornienko Sheremet [2020] for her comments on our recent article [Stovba et al., 2020], despite the fact that most of the comments look like peremptory accusations, and not like a real scientific discussion.

Kornienko Sheremet`s accusations relate to the absence in the results of our work of any new information about the tectonics and geological evolution of the Black Sea, ignoring the old and new results of the study of the Black Sea region by other researchers, as well as the fact that we describe our own well-known («old») views. In this regard, I can only note that Ye. Kornienko Sheremet was probably inattentive when reading our paper. I think that readers can see for themselves whether our work is novel and informative, or not.

The main place in the comments is given to the accusation of our team that we allegedly inaccurately referred to the papers by Sheremet et al. [2016a, b]. According to Ye. Kornienko Sheremet [2020] this leads to a distorted image of the results of these papers. Meanwhile, I want to emphasize that we compared our work results with those of Sheremet et al. [2016a,b], as well as with many others, to show their similarities or differences. We have no the intension of a detailed criticism of any work, including the papers by Sheremet et al. [2016a, b]. In addition, I insist that all references to Sheremet's works are relevant only to the content of these works. We also use the word «speculative» exactly in the sense that this word means in English.

Among many unfounded allegations by Kornienko Sheremet [2020] there are two that especially attract our attention. The first statement is that Stovba et al. [2020] did not pay «more attention to a previous work, including seismic interpretation recently published ...» The second statement is that the interpretation of seismic data by Sheremet et al. [2016b] «does not contradict with the one, recently published for the entire Black Sea [Nikishin et al., 2015a—c] and two models fit since the Miocene». Let us show that both of these statements are wrong.

Fig. 1—3 will help everybody to compare interpretations of Sheremet et al. [2016b], Stovba et al. [2020] and Nikishin et al. [2015c].

The left part of Fig. 1 demonstrates the seismic section of Sheremet et al. [2016b] in their Fig. 4, *a*. The right side of Fig. 1 shows the southern continuation of the same seismic section, which was not interpreted and published by Sheremet et al. [2016b]. Taking into account the sub-horizontal layering of sedimentary cover in its upper part we have continued the correlation of seismic horizons dedicated by Sheremet et al. [2016b] for the Paleocene-Quaternary sedimentary cover towards the Eastern Black Sea Basin and Andrusov Ridge. The same sedimentary units that are mentioned by Sheremet et al. [2016b] according to their Fig. 9 are labelled in the right side of the Fig. 1.

To facilitate the comparisons between different interpretations Fig. 2, *a* shows the seismic section of Stovba et al. [2020] in their Fig. 6. Fig. 2, *b* demonstrates the best approximation of interpretation by Sheremet et al. [2016b] for the Paleocene-Quaternary sedimentary cover on the seismic section with the same scale/display that was used by Stovba et al. [2020]. The seismic profile in Fig.

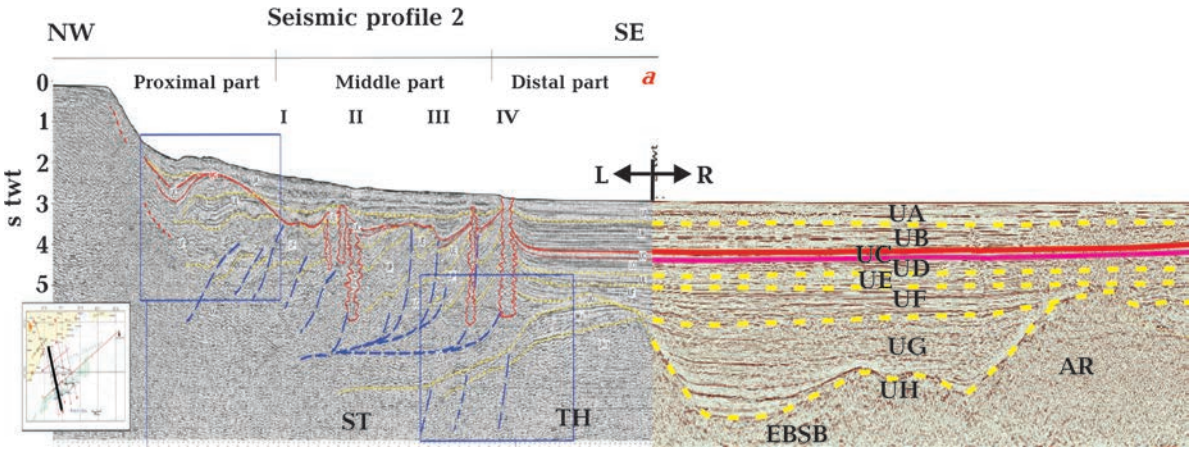

Fig. 1. Left part (L) shows the interpreted seismic section of Sheremet et al. [2016] in their Fig. 4 and the right part (R) is the continuation of the same profile showing prolongation of seismic horizons of Sheremet et al. [2016b] for the Paleocene-Quaternary sedimentary cover. The diapiric structures and mud volcanoes according to [Sheremet et al., 2016] are represented by zigzag red lines. Main abbreviations for the sedimentary units are according to Fig. 9 from [Sheremet et al., 2016]: UA — Quaternary; UB — Pliocene; UC — Late Miocene; UD — Middle Miocene; UE — Oligocene—Early Miocene; UF — Eocene; UG — Paleocene; UH — Cretaceous. Abbreviations of tectonic units: AR — Andrusov Ridge; EBSB — Eastern Black Sea Basin; ST — Sorokin Trough; TH — Tetyaev High (Shatskiy High). Other explanations can be found in [Sheremet et al., 2016b].

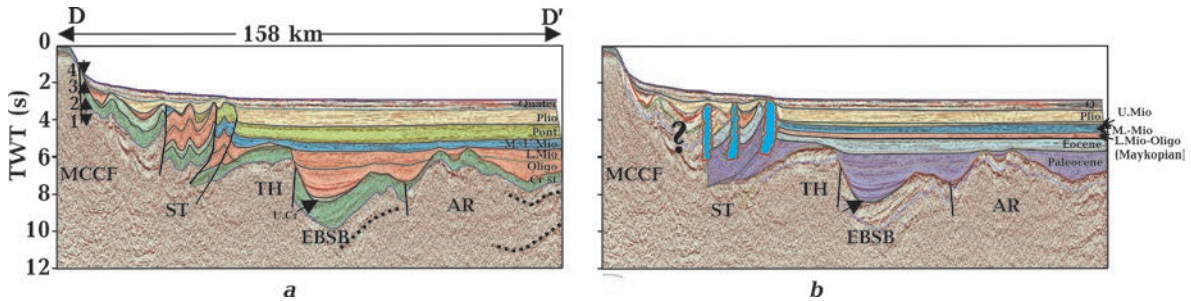

Fig. 2. The seismic section of Stovba et al. (2020) in their Fig. 6 (*a*) and the same seismic section as in (*a*) with the approximation of the interpretation by Sheremt et al [2016b] for the Paleocene-Quaternary sedimentary cover (*b*). The question mark in the northern part of the section shown in (*b*) means that any seismic horizons can be found to transfer the interpretation from the seismic section demonstrated in the left part of Fig. 1. Quarter — Quaternary; Plio — Pliocene; Pont — middle and upper Pontian; M.-U. Mio — Middle and Upper Miocene; L. Mio — Lower Miocene (upper part of Maykopian sediments); Oligo — Oligocene (lower part of Maykopian sediments); U. Cr — post-rift Upper Cretaceous; Cr sr — Lower and Upper Cretaceous syn-rift sediments. Abbreviations of tectonic units: MCCF — the Marine Continuation of the Crimean Folds; other abbreviations are the same as in the Fig. 1. Additional explanations for (a) can be found in Stovba et al. [2020].

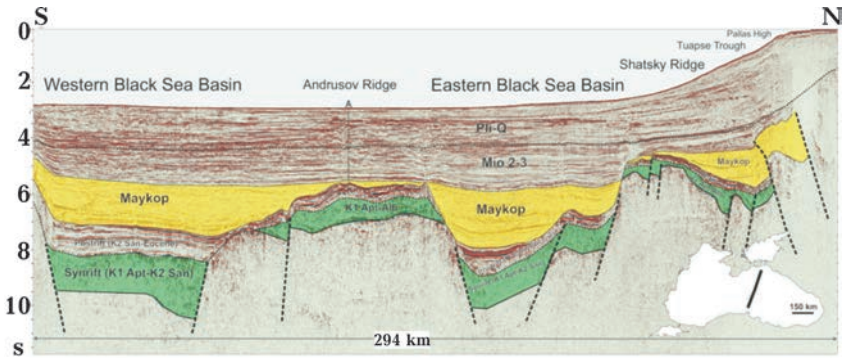

Fig. 3. The interpreted seismic section published by Nikishin et al. [2015c, Fig. 21].

2 is located parallel to the section in Fig. 1 on the distance of 3.4 km and between profiles 1 and 2 shown by Sheremet et al. [2016b] in their Fig. 2.

Fig. 3 demonstrates the interpreted seismic section from Nikishin et al. [2015c]. The section illuminates the sedimentary structure of the Eastern Black Sea Basin and Andrusov Ridge nearby the area under the discussion.

From the comparisons of interpretations shown in Fig. 1—3 anybody can easily conclude that the interpretations of Nikishin et al. [2015c] (Fig. 3) and Stovba et al. [2020] (Fig. 2, *a*) are comparable with each other at least from the sea bottom to the base of Oligocene (Maykopian). However, these two interpretations drastically contradict in most aspects to the interpretation, which is followed the one by Sheremet et al. (2016b) (Fig. 1 and 2, *b*). Really, Sheremet et al. [2016b] demonstrate the much thinner thickness and shallower position of the Middle—Upper Miocene sequence, the negligible thickness of the Lower Miocene—Oligocene (Maykopian) sediments and the huge thickness of Eocene—Palaeocene sequence in the deep-water area (Fig. 1) in comparison with Stovba et al. [2020] (Fig. 2, *a*) and Nikishin et al. (2015c) (Fig. 3). Meanwhile, the interpretations of Stovba et al. [2020] and Nikishin et al. [2015c] are not only similar to each other, but also in a good agreement with all other seismic sections of previous regional seismic surveys [e. g. Tugolesov et al., 1985; Finetti et al., 1988]. Moreover, they correlate well with the results of wells in different parts of the Black Sea, including with the Sinop 1 well, which was drilled on the Andrusov Ridge in the northern part of the Turkish sector of the Black Sea. Thus, readers can easily conclude that the seismic interpretation of Sheremet et al. [2016b] completely contradicts all previous studies of the Black Sea region [e.g. Tugolesov et al., 1985; Finetti et al., 1988].

If the interpretation of Sheremet et al. [2016b] is correct, all previous results of studies of the geological structure and evolution of the Black Sea and geophysical studies of the crustal structure should be radically revised (e. g. Peklo et al., 1976; Tugolesov et al., 1985; Finetty et al., 1988; Nikishin et al., 2015a, b, c; Belousov, Volvovskiy, 1989; Starostenko et al., 2004; Yegorova et al., 2010]. However, Sheremet et al. [2016b] in their work do not provide any reasonable explanations for their radical approaches to the interpretation of seismic data. They also do not give strong arguments in favor of their ideas. The references to the fact that the results of their and all other regional studies are based, inter alia, on the tie to wells on the Subbotin structure, do not stand up to any criticism. These wells were drilled *after*, and not *before* the regional seismic surveys of Tugolesov et al. [1985] and Finetti et al. [1988]. At the same time, the wells perfectly confirmed the results of previous regional seismic works. It is quite obvious that one profile, which was used by Sheremet et al. [2016b] to calibrate seismic data in the study area using sections of wells on the Subbotin feature, is clearly not enough to correctly illuminate the structure of the highly deformed sedimentary cover in the Sorokin Trough.

Actually, further discussion about the comments by Kornienko Sheremet [2020] does not make sense. Nevertheless, let us briefly discuss the results of the interpretation of local structures by Sheremet et al. [2016b] in the Sorokin Trough (Fig. 1). As it has been shown by many researches, the folds bounded by reverse faults and thrusts are widely occurred in the trough (Fig. 2, *a*) as it was also shown by Stovba et al. [2020]. In contradiction with the present-day knowledge the seismic sections of Sheremet et al. [2016b] demonstrate numerous diapiric structures with their deep bases at the level of the Paleocene sediments (Fig. 1). The numerous seismic profiles crossing the Sorokin Trough demonstrate that such purely diapiric structures are absent in the Sorokin Trough (compare Figs. 2, *a* and 2, *b*). Nevertheless, it is possible that shale diapirism could take some part in the formation of local folds. However, it was not the main driving mechanism for the formation of anticline structures. It is problematic to establish the possible contribution of diapirism using only 2D seismic survey data. Therefore, the final solution to this issue is possible only after 3D seismic surveys and drilling in this part of the Ukrainian sector of the Black Sea.

At the end I would like to wish Ye. Kornienko Sheremet success in her future scientific activity and getting more experience on interpretation of seismic and other geological data.

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