

## ***Interactive comment on “Upper Jurassic carbonate buildups in the Miechów Trough, Southern Poland – insights from seismic data interpretation” by Łukasz Słonka and Piotr Krzywiec***

**Łukasz Słonka and Piotr Krzywiec**

lukasz.slonka@twarda.pan.pl

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Authors response to Reviewer 3 (RC3):

We would like to thank Gabor Tari for his thorough review of our paper, it certainly helped to increase its clarity and, we hope, an overall quality. Please find below our response to your comments.

Comment from referee (RC3):

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RC3: “1) On figure 2, the analogue areas mentioned should be annotated and a few more relevant examples should be added, “closer to home”, i.e. in Austria, Czech Republic and Poland. Adámek, J., 2005. The Jurassic floor of the Bohemian Massif in Moravia—geology and paleogeography. *Bulletin of Geosciences* 80(4), pp.291-305. Zimmer W., Wessely G. (1996): Exploration results in thrust and subthrust complexes in the Alps and below the Vienna Basin in Austria. In: Wessely G., Liebl W. (eds) *Oil and gas in Alpidic Thrustbelts and Basins of Central and Eastern Europe*. EAGE Special Publication 5, Geological Society, London, 81–107. Wessely G. (2006): *Geologie von Niederösterreich*. Geologische Bundesanstalt, Wien. Mysliwiec, Michał, Zenon Borys, Beata Bosak, Bogusław Liszka, Kazimierz Madej, Andrzej Maksym, Krystyna Oleszkiewicz, Małgorzata Pietrusiak, BoÅijena Plezia, Grzegorz Staryszak, GraÅijyna ÅŻwiÅŻtnicka, Czesława Zielińska, Krystyna Zychowicz, Piotr Gliniak, Radosław Florek, Jarosław Zacharski, Andrzej Urbaniec, Adam Gorka, Piotr Karnkowski, and Paweł H. Karnkowski, 2006, Hydrocarbon resources of the Polish Carpathian Fore-deep: Reservoirs, traps, and selected hydrocarbon fields, in J. Golonka and F. J. Picha, eds., *The Carpathians and their foreland: Geology and hydrocarbon resources: AAPG Memoir* 84, p. 351 – 393.”

Authors response:

In the submitted version of the paper we cited selected papers dealing with various aspects of seismic interpretation of the Upper Jurassic carbonate buildups in central-western Europe, but we might have missed some papers that should have been mentioned; we have supplemented our reference list and added suggested references (line 50). Amended list of other relevant seismic studies has been also reflected on map from the Figure 2.

Comment from referee (RC3):

RC3: “2) I would certainly include the reference to this paper and also paint the position of the Polish Upper Jurassic reefs in a global context, such as reef types and reef

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builders: Wolfgang Kiessling, Erik Flügel and Jan Golonka (1999) Paleoreef Maps: Evaluation of a Comprehensive Database on Phanerozoic Reefs. AAPG Bulletin, 83, 1552–1587.”

Authors response:

We agree that description of global context for the Upper Jurassic carbonate buildups would be useful, especially for international readers from outside of Europe. Accordingly, we modify chapter 2.2. (new text was added from line 112), and also, the above-mentioned reference (Kiessling et al., 1999) was cited in the revised version of the manuscript.

Comment from referee (RC3):

RC3: “3) Frankly, on some of these seismic sections, the detection limit for the interpretation is a challenge. It would be good to provide some close-ups on some of the features, e.g. on Figure 9, the singular carbonate build-up. . . .”

Authors response:

This is a very helpful comment. In order to better visualize carbonate buildups we supplemented Figures 8, 9, and 10 with additional zooms of the carbonate buildups so their external geometries and relationship to the surrounding deposits could be better appreciated, also because these zooms are less vertically exaggerated.

Comment from referee (RC3):

RC3: “I wonder whether some other seismic attribute displays, such as inst. frequency or interval velocity, may be more helpful to show the presence and outline of these build-ups in a more convincing manner?”

Authors response:

We agree that seismic attribute displays would be helpful for a more detailed investigation of the outline of the buildups, this is however fairly important issue requiring

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(and deserving) lengthy treatment and we decided, even before submitting our paper to Solid Earth, to devote a separate paper to this problem. Having this topic included in this paper would require either rather condensed treatment of this problem or would significantly expand the length of the text, and we found both options unviable.

Comment from referee (RC3):

RC3: “Any sensitivity work on the potential use of velocity pull-up, i.e. could one expect to see one at all, or all these carbonates have pretty much the same velocity, i.e. variations less than, say, 5-10%?”

Authors response:

The seismic velocity considerably differs between the massive and bedded facies. Interval velocity of the massive carbonates is about 5000–5500 m/s as suggested by modern Chopin-1 and Belvedere-1 wells, while bedded facies are characterized by lower values, in order of 3800 – 5000 m/s as proved by older wells. This may suggest that lateral seismic velocity variations between massive and bedded facies sometimes might exceed 10%, and such differences might be responsible for producing velocity pull-up effect that might be observed beneath the carbonate buildups. We'd like to stress however that reliable, good quality velocity data is available only for the massive facies as there are no modern wells drilled within the basinal bedded facies, so information on lateral velocity variations is rather sparse and qualitative. Nevertheless, we agree that some additional comments regarding lateral velocity variations, velocity pull-up effects etc. would be a welcome addition so we added paragraph on that to the corrected version of our manuscript. The new text starts from line 326.

Comment from referee (RC3):

RC3: “Any analogue studies in this regard? How about those stunning Miocene examples from the Far East, Natuna, etc.? I am sure that some of those reefs could provide some analogues.”

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Authors response:

Yes, we agree, and a sentence concerning analogous studies was added (it is included in the new paragraph that starts from line 326). We refer to the large Miocene carbonate buildups from the Far East (Luconia) where similar velocity pull-up effects were observed.

Comment from referee (RC3):

RC3: "4) Figure 16 is an interesting attempt to compare "apples and oranges", but I would not do it. Regardless of the order of magnitude difference in scales, the outcrop photos are just not that convincing to see the difference between the massive and bedded facies. I suggest to drop this figure."

Authors response:

With little hesitation we agree with this suggestion, perhaps comparison of outcrop and seismic profile presented in Figure 16 was a little bit to far reaching. By presenting this comparison we wanted to stress that some geometrical relationship between the massive and bedded carbonate facies, although in different scales, could be observed both in outcrops and on seismic data. However, we agree that our attempts to compare the geometrical relationship between main facies observed in outcrops and on seismic data might be not be fully convincing due to the too large differences in scales. Taking this into account, and also due to the fact that similar concerns have been raised by another Reviewer, we decided to remove this comparison from our paper. Similarly, we removed also all corresponding parts in the text including lines 68–71 (Introduction) and lines 396–410 (Discussion). These changes did not, however, influence any of the key elements of our interpretation and they all still hold fully valid.

Authors changes in manuscript: List of specific changes in our manuscript has been attached as the supplement file.

Again, many thanks for the comments and suggestions, they all significantly helped us

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to improve our paper.

Łukasz Słonka (on behalf of the authors)

Please also note the supplement to this comment:

<https://www.solid-earth-discuss.net/se-2019-178/se-2019-178-AC3-supplement.pdf>

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Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2019-178>, 2019.

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