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# Comment on se-2021-99

Anonymous Referee #3

Referee comment on "Late Cretaceous – early Palaeogene inversion-related tectonic structures at the NE margin of the Bohemian Massif (SW Poland and northern Czechia)" by Andrzej Głuszyński and Pawel Aleksandrowski, Solid Earth Discuss., https://doi.org/10.5194/se-2021-99-RC4, 2021

The Authors claim that in the Sudetes, during the late Cretaceous–early Palaeogene, several macro-scale tectonic structures were formed in Permo-Mesozoic cover, mainly due to shortening in NE-SW/NNE-SSW direction, which also affected a crystalline basement. However, most previous papers on that issue indicate an earlier extensional stage which preceded inversion in a subsequent compressional stage. This earlier stage is not considered by the Authors who focus on structures that apparently developed only by contraction. Consequently, the ms. is based on rather incomplete review of the existing literature and on reprocessed seismic reflection data once acquired by industry in two Sudetic synclinoria. The interpretted time-migrated sections are the only new element in the ms.

Eventually, the literature-based description of the reviewed tectonic units is accompanied by the cross-sections to geological maps of those units and by the seismic profiles of two of them. However the seismic profiles are poorly discussed while offering only colored arbitrary interpretations. Any verification is hampered by the paucity of boreholes in the region on one side and by the scarcity of Authors' own field studies on the other. The only exception is a single cataclastic shear zone observed near Lewin KÅ□odzki (Fig. 18b), which is speculated to be part of a strike-slip transition between the PoÅ□ici-Hronov reverse fault and the Zieleniec thrust or just a continuation of the latter. Unfortunately, the Zieleniec thrust is one of ambiguous features in the Sudetes and it is nowhere exposed (Cymerman, 1990). Although there is no doubt that mica schists have been drawn easterly over Cretaceous sedimentary rocks along the contact of the two lithologies, their structural relationships might be variously interpreted in view of both the recently drilled borehole Zieleniec PIG-1 (Kozdrój, 2014; in the ms., Fig. 12 is a conceptual ideograph but not a real, geometrically rigorous cross-section) and detailed field observations along strike. Kozdrój (2014) mentioned three feasible options: thrusting of unknown exact age, rejuvenate faulting with reverse motion over earlier deformed footwall, or landslide down the steep slope during later Neogene extension, Besides, he pointed to multi-stage evolution of the Nysa KÅ□odzka Graben under extensional and then under compressional regime with strike-slip component. Such conclusion is in line with other views on the graben (e.g. Don & GotowaÅ□a, 2008; Badura & Rauch, 2014). The present Authors neglect (without justification) evidence of fault-controlled syndepositional subsidence of the graben floor, strikingly do not comment on subsequent open folding of its infill and entirely omit the data presented by Badura & Rauch (2014) except for copying their blockdiagram (Fig. 17). Instead, they emphasize later E-W extensional rejuvenation and thus reshaping of the graben. Such an approach clearly disagrees with the overall message of the ms. stating that 'all the reviewed structures are due to the Late Cretaceous-Early Palaeogene tectonic shortening episode".

The above message is also inconsistent with the multi-stage (extension□compression□extension) formation of the WleÅ□ graben (SW edge of the North-Sudetic Synclinorium") recently described by Kowalski (2020), which otherwise is similar to the tectonic evolution of the Nysa Graben. Again, the ms. Authors see problematic (without any argument) interpretation by Kowalski because his remark that seismic survey might help to better understand geometry of that structure. The North-Sudetic Synclinorium itself has been long considered as due to consecutive operation of the extension□compression couple. The ms. Authors, based on the reprocessed seismic profiles, see this unit as an exclusively compressional structure being effected by down-warping of the basement-cover interface, low-angle thrust faulting and detachment folding. Although all these features may quite feasibly occur, no detachment is indicated, no small-scale folds and reverse faults reported from the field, whereas the concave base of Permo-Mesozic strata might still be effected by early normal faulting in the basement. The Authors provide no verification of their interpretation, which leaves the reader dissatisfied. Similar uncertainty comes from their consideration of the Intra-Sudetic Synclinorium.

An appealing structure of the Lusatian Fault (Coubal et al., 2014) has received meticulous field documentation. This is badly missing in the reviewed ms. The Lusatian feature shows high structural variability along strike, which calls for caution in simple duplication of that example, no matter how much it is attractive. Also caution has to be exerted while orthogonal (sub)vertical jointing in Cretaceous sandstones is attempted to be related to contraction imposed on a sedimentary infill in the Sudetic synclinoria and arbitrarily assigned to the same stress field. This is another weak point of the ms., which requires more meticulous study and consideration. Another interesting topic, only skimmed in the ms., is the reactivation of fracture pattern in the crystalline basement during late Cretaceous–Cenozoic times and how much such process has controlled/influenced development of joint and fault systems in the Permo-Mesozoic cover.

At the moment, all those failures and omissions render the ms. rather immature for publication. A resubmission would be welcome with focus on the seismic profiles, their decent discussion (with alternatives) and on collecting the small-scale field observations to support the assumed interpretation, especially in the face of likely high improbability of any drilling project in the region in not too distant future.