

# Construction of the Ukrainian Carpathian Wedge from low-temperature thermochronology and tectono-stratigraphic analysis

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Reply to the Topical Editor: Stefano Tavani

Lines numbers refer to the file “egusphere-2022-828-comments-to-authors.pdf”

## 1 Introduction

Line 39: addition to the text of “Thin-skinned fold-and-thrust belts...”

*Modification (39): changes were made as asked.*

Line 41: change asked

*Modification (41): change was done*

Line 54-59: “Somewhere you should mention that all this is valid for piggyback sequences. Also, I would avoid the use of the “proximal” for a basin, since it is commonly used in rifted basin to describe the part of the basin close to the stable continent.”

*Response: The text has been adapted to take into account the wedge-top sediments in the accretion, burial, and exhumation processes explained in the paragraph. We also avoid the term “proximal” for the basin as it is not appropriate for the context we describe here.*

*Modifications (54-60):*

*“Tectonic nappe stacking integrates the pre-existing basin step-by-step into the growing wedge. When the frontal thrust propagates into the adjacent former basin, the latter becomes a nappe that overrides more external areas of the basin. Overthrusting of the basin by the orogenic wedge leads to tectonic burial in addition to initial sedimentary burial. As thrusting propagates outwards and the wedge evolves, the newly formed nappes are sequentially uplifted and exhumed. Syn-orogenic deposits that accumulate on the newly formed thrust sheet, i.e., wedge-top sediments, might also be progressively incorporated into the wedge and eventually buried. This process repeats until plate convergence stops (Davis et al., 1983; Dahlen et al., 1984; Konstantinovskaia and Malavieille, 2005; Hoth et al., 2007).”*

Line 70: “flexuring of the lithosphere due to slab rollback”

*Modifications (70-71): “Foreland subsidence was enhanced by the reactivation of pre-orogenic normal faults during the Miocene (Krzywiec, 2001; Tărăpoancă et al., 2003; Oszczytko et al., 2006), probably also predominantly due to flexuring of the lithosphere through slab rollback.”*

## **2 Geological context**

*The text was modified as asked by the editor*

### **5.2 Apatite (U/Th)/He ages**

*Text was homogenised as asked*

### **5.3 Zircon (U/Th)/He ages**

*Text was homogenised as asked*

### **5.4 Thermal-history models and tectono-stratigraphy**

*Text was homogenised as asked*

### **6.1 Burial and exhumation pathways in the Ukrainian Outer Carpathians**

*Changes were done as asked by editor.*

*The occurrences of “My” were replaced by “Myr” throughout the text.*

### **6.2. Evolution of the Ukrainian Carpathian wedge**

*Text was modified accordingly to the editor comments.*

Lines 568-569 (now 572-573): “Badenian (i.e. middle Miocene)” and “recall its age for readers not familiar with the area”

*Modifications: We indicate the age of the Badenian stage at the beginning of the sentence, and we think that doing so again at the end weights the text. We have added the age of the Sarmatian stage in parentheses.*

*“Badenian (16-12.65 Ma) sediments were found under the Carpathian wedge up to 70 km inward of the frontal thrust (Oszczypko et al., 2006), implying that the Sambir nappe overthrust the foreland by at least this distance after the Badenian. The thrust that delimits the eastern margin of the Sambir nappe, i.e. the Carpathian frontal thrust, crosscuts the early Sarmatian (12.65-11.5 Ma) Dashava formation and must have therefore been active until 11.5 Ma (Andreyeva-Grigorovich et al., 2008).”*

Line 570 (now 576): “were extensionally reactivated”

*Modifications: “Thick-skinned Mesozoic extensional faults on this margin were extensionally reactivated during the Badenian-early Sarmatian phase of wedge propagation and show up to 2.5 km of post-middle-Badenian offset (Krzywiec, 2001).”*

### **6.3 Thermochronometric age pattern and wedge dynamics**

*The text was modified accordingly to the editor's comments.*

### **6.4 Sediment provenance from ZHe ages**

*The text was modified accordingly to the editor's comments.*

### **6.5 Sediment recycling in the Carpathian Wedge and sediment supply to the pro-foreland basin**

*The text was modified accordingly to the editor's comments.*

Line 747 (now 752): “reactivated during flexuring of the lithosphere”

*Modifications: “Pre-orogenic normal faults that were reactivated during the lithospheric flexure created significant accommodation space for the recycled sediment directly in front of the advancing wedge during the final stages of wedge emplacement (Oszczypko et al., 2006).”*

*Author's Response: We hope we have responded thoughtfully to the editor's comment.*

*Marion Roger*