Anonymous reviewer:
As a second-round reviewer, it is my honor to review the paper entitled “The Miocene subsidence pattern of the NW Zagros foreland basin reflects SE-ward propagating tear of the Neotethys slab”. The evolution of a basin's accommodation space and the subsidence mechanism at convergent plate boundaries is a topic worthy of further investigation. In this paper, the authors focus on the basin located in the NW Zagros belt in the Kurdistan region of Iraq. By employing a synthesis of isopach maps, subsidence curves, regional Bouguer gravity anomaly, teleseismic tomographic data, and the magmatic record, the authors propose that the Zagros foreland basin subsided as a consequence of the combined loads exerted by the surface topography and the subducting slab during the early Miocene. Furthermore, they suggest that the basin was influenced by dynamic topography as a result of the Neotethys horizontal slab tear and northward flow of the Afar plume during the middle-late Miocene. In conclusion, the paper is well written and suitable for publication after minor revisions.

Dear second-round reviewer,
Thank you for the detailed reading and the helpful comments. We agree with all your points, and we have edited the manuscript accordingly.

Comments:
(1) I agree with the author that dynamic processes, such as slab tearing, played a role in the extra subsidence that occurred during the middle to late Miocene. But additional petrological evidence would be beneficial in order to support the hypothesis of slab tearing of the subducted Neo-Tethys lithosphere.

A paragraph addressing the petrological evidence has been added in the discussion section (5.2) as below:

Furthermore, when slab breakoff occurs, the geochemical properties of igneous rocks are anticipated to transition from primarily calc-alkaline (Ca-rich) to more alkaline (Na- and K-rich), accompanied by a shift in εNd values from negative to positive. This geochemical shift is attributed to the cessation of slab-derived fluids following slab breakoff. Similar patterns have been observed in eastern Turkey, where alkalinity has increased since the middle Miocene from north to south (Keskin, 2003; Şengör et al., 2008). In northwestern Iran, the geochemical compositions of the late Miocene-Quaternary Sablan, Sahand, and Saray volcanoes, which are located across the Arabia-Eurasia suture zone from northeast to southwest, respectively, in addition to slab subduction signatures, show medium to very high K content (ultrapotassic), positive εNd values (Sablan), and possibility of hot asthenospheric inflow (Saray) driving partial melting of an already metasomized mantle wedge (Moghadam et al., 2014; Ghalamghash et al., 2019; Chaharlang et al., 2023). Additionally, Miocene magmatism from northwest to southeast, from SE Turkey to NW Iran, shows εNd values shifting from positive to negative (Grosjean et al., 2022), suggesting that the magmas in SE Turkey originated from a primitive mantle melt (slab detached), whereas those in NW Iran resulted from a crustal contaminated melt (slab partially detached),

aligning with the hypothesized southeastward slab tearing proposed in this study (Figs. 7a,b, 10).

2) In section 5.2, the subheading is "Dynamic Subsidence and the Northward Flow of the Afar Plume." After reading this subheading, I was looking forward to seeing how the Afar plume affected subsidence. However, this section only emphasized in one sentence that “The early development of the northward flow of the Afar mantle material and its arrival at the Arabia-Eurasia suture zone by the middle Miocene possibly facilitated the slab tearing process”. It would be beneficial if the authors can provide more details.

Thank you for your suggestion. We have added a new paragraph in the discussion section (5.2) to address this issue as below:

Taking into account that the collision between northern Arabia and Eurasia occurred during the early Oligocene, slab mechanical weakening and necking were already underway before the arrival of the Afar asthenospheric mantle material during the middle Miocene. Three-dimensional analogue models simulating the Arabia-Eurasia collision suggest that slab tearing began in northwestern Arabia due to the lateral transition of the Arabian continental crust into the oceanic crust toward the Mediterranean region. This transition led to the subduction of the oceanic plate at the Eurasian margin while the continental plate collided, due to buoyancy differences (Faccenna et al., 2006). The oblique convergence between Arabia and Eurasia (McQuarrie et al., 2003; Navabpour et al., 2008) may have further promoted slab tearing, as this obliquity caused an earlier continent-continent collision compared to adjacent regions where oceanic subduction continued, as demonstrated by numerical models (Boonma et al., 2023). During the middle Miocene, the arrival of the hot asthenospheric mantle likely accelerated slab tearing by thermally weakening the slab necking zone, reducing its viscosity and strength (Keskin, 2007; Menant et al., 2016; Boutelier and Cruden, 2017). By the late Miocene, as the southeastward horizontal tearing of the slab progressed, the northward flow of the Afar plume asthenospheric mantle material advanced into eastern Anatolia. This process triggered a dynamic uplift along western Arabia and the TIP, accompanied by dynamic subsidence on the east side (e.g., Daradich et al., 2003; Craig et al., 2011). Additionally, as the Neotethys oceanic plate remained attached to the Arabian continental plate on its eastern side, several numerical models indicate that mantle downward flow along the subducting slab also contributes to the dynamic subsidence (e.g., Bottrill et al., 2012; Duretz and Gerya, 2013; Balázs et al., 2022).

(3) Line 119 N—north, NE—northeast
(4) Line 184 and 186, 188,189 Formations—formations
(5) The font size of the latitude and longitude in figures 3 and 6 is too small.
Points 3-5 were edited accordingly.

(6) What does the yellow color in Figure 7A represent?
Neogene basin isopach maps as written in the caption, but for clarity, a legend is now provided.

(7) Maybe I don't have a good sense of three-dimensionality. Is the direction of N in Figure 10 correct? In addition, I suggest that the authors divide the subducted slab into a lower subducted Neotethys oceanic slab and an upper Arabian continental slab.
Thank you. The N arrow has been modified. Additionally, we colored the continental and oceanic plates differently and edited labels.

Yang Chu, Editor
I have received two reviews, one from previous reviewer, and one new reviewer. I have checked the comments carefully and find that only minor revision is required before acceptance. I agree with the second reviewer that some part still needs clarification. After that, I think this manuscript can be accepted. This work would bring new insights into the geodynamic evolution of the subduction of the NeoTethys. Here I also give my suggestions.

Dear Yang Chu, Editor,
Thank you for your careful reading and comments. We have edited the manuscript accordingly.

Line 13: 3-4. Also change it elsewhere.
Line 34: I am not familiar with this mantle orogen. To my knowledge, this kind is generated by basal shear of asthenospheric mantle flow, and mantle here can lithospheric or asthenosphere. mantle.
Line 37-39: foreland basin formation is also part of orogeny.
Line 61: why is thermal emphasized here?
Line 62: slow vs fast? Do you mean tomography? Or low and high velocity bodies?
Line 77-78: this sentence has no meaning here. Delete it. (This was not clear which sentence)
Line 110:afterwards
Thank you for pointing out the issues above; they are fixed accordingly.

Line 269, figure 7:put numbers on the profiles.
The profiles in Fig. 7 are labeled as I, II, III

I am also curious if magmatism by the slab tearing can be marked on any figure. This will demonstrate directly the tearing.
figure10: there is a long section on the Afar influence, while it is not shown on the final model.

Thank you for your comment. We have added a new paragraph in the discussion section (5.2) to address magmatism in more detail (see the response to the anonymous reviewer). We also updated Fig. 10 to reflect the content better; however, we prefer to keep it simple and more conceptual.