

Review to

Freitag et al. : Reconstructing post-Jurassic overburden in Central Europe: New insights from mudstone compaction and thermal history analyses of the Franconian Alb, SE Germany.

In summary: Well written, well explained and reliable data-set!

Comments (please find the same and some additional in the review pdf):

1. Introduction: in general a good overview, only some remarks

Line 37: In contrast to Freudenberger (2013), a separated Upper Permian to Triassic Franconian basin never existed – I had a lot of discussions with him about this theme. There is no evidence for separation from the Central European (Germanic basin) in the sense that the Thuringian forest already existed and even not in the sense of a subbasin. Thickness and facies reflect a subsidence axis extending from Franconia to central Thuringia and further to Saxony-Anhalt to Brandenburg (Stratigraphy von Deutschland XI: Röhling & Lepper 2013)

Line 40: The flooding occurred both from the Tethys and from the north; I suggest skipping of Tethys Ocean.

Line 56: citation - more important than Voigt et al. 2008 and 2021 is Kley and Voigt 2008, content: The main effect of the compression was not the removal of Cretaceous sediments (in maximum some hundred metres of Lower Cretaceous and Cenomanian) but the formation basement uplifts with amounts of several thousand metres at localized faults (Franconian line, Pfahl fault) – please look to Ziegler, or best to the book Littke et al. 2008: Dynamics of complex intracontinental basins.

Line 59: The later domal (?) uplift affects the Central European crust in total, and has probably nothing to do with the formation of the alps. New results and a good overview was published:

von Eynatten, H., Kley, J., Dunkl, I., Hoffmann, V.-E., and Simon, A.: Late Cretaceous to Paleogene exhumation in central Europe – localized inversion vs. large-scale domal uplift, *Solid Earth*, 12, 935–958, <https://doi.org/10.5194/se-12-935-2021>, 2021.

Line 62: The textbooks of Meschede and Walter are not primary sources, they refer to published articles. Please remove.

Line 93: Incomplete, please consider the Wasserburg and Regensburg basin (Cenomanian to Campanian).

Line 95: Even the Regensburg Basin and the northern parts of the Wasserburg basin suffered uplift – Please compare the age of preserved Cretaceous sediments and the AFT-ages – uplift of the basement east of the Franconian line continued, resulting in the deepening of the marginal trough. Campanian to Maastrichtian was removed later.

Line 113: I noted that you know the study of von Eynatten et al. 2021. It should be mentioned a little bit earlier to avoid misunderstandings.

Line 123: a break in organisation of the text: I suggest, to include the subchapter in the chapter “data and methods”

Complete Chapter 2.3

2.3.1.-2.3.3 I am not very familiar with the geophysical approach. My question is how carbonate and quartz content influence the equations. Are the samples represented completely pure mudstones?

Concerning organisation: could you shift the mineralogical part to a position before you consider the density and velocity chapter? This would answer my question before.

Chapter 2.4.

Line 299-302: please explain, why you applied the mineralogy. The sentence should be moved to methods (compaction, density, velocity)

Chapter 35.

Very good discussion! Only some remarks.

Line 461: On which base Wall et al estimated such a high thermal gradient? In which time? How rapid decreased this to the recent values? If the high rates of 40°/km are related to the Eger Rift (what I assume), they can probably not explain the high maturity of Jurassic.

What is the recent regional heat flow aside the anomalies?

Fig. 10: please add localities Mistelgau and Mürsbach on the map

Line 490: Markus Wilmsen and Birgit Niebuhr made many detailed investigations in the Cretaceous of the "Danubian Cretaceous Basin" and in the Bodenwöhr Basin. It would be better to cite them instead of me. You can easily find at least 5 relevant publications.

Line 504: Franconian Alb area is a bit misleading, because no relevant tectonics occurred there. Here it is better to write "close to the Franconian line", because the controlling structure is the Thuringian forest (probably as graben in Late Jurassic to Lower Cretaceous times and/or the Late Cretaceous marginal trough in front of the uprising inversion structure that formed later.

Could you please add a general time-frame in which the sediments were removed? Peterek and Schröder give some interesting data (timing of volcanism, sediment remnants of Cretaceous and Neogene age on the Franconian Alb)

Chapter 4 (conclusions)

Is the reason for the discrepancy of velocity and density data only the distance to the surface (weathering, decompaction and water saturation)? The fact should be already considered in the discussion and a clear statement should be given in the conclusions.

Question: As the velocity and density data only depend on the thickness of overburden and the VR-data solely on temperature and time, could an estimation of the heatflow during burial be possible? Alternatively, a Petromod model would be helpful if you have a vertical section with VR-data.

That is all from my side. Congratulations to a comprehensive, well-written paper. I have to think about whether Late Cretaceous or Paleogene erosion caused the recent surface geology. However, possibly you can put things together, if you look closer to the AFT-data in Franconia (Buntsandstein, eroded pebbles within the Upper Cretaceous).

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