

Interactive comment on “Bridging the Faraoni and Selli oceanic anoxic events: short and repetitive dys- and anaerobic episodes during the late Hauterivian to early Aptian in the central Tethys” by K. B. Föllmi et al.

Anonymous Referee #2

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The manuscript by Föllmi et al. presents new data for the Hauterivian to Aptian from the central Tethys. In contrast to many earlier contributions, the authors focus on the time interval between the well-known OAEs, which makes this contribution an important and welcome study. The text is well written but a bit wordy at some points (see comments below) and the figures have to be done in a more illustrative way to support the reader in understanding the author’s point. What is definitely missing is a discussion about possible trigger mechanisms for the formation of the observed organic-rich layers. A scenario of paleoenvironmental changes is promised in the last chapter of the

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discussion but the authors never fulfil this promise. Overall, however, it is a nice and informative contribution and I recommend moderate revision (see comments below).

Abstract:

- In some parts a bit repetitive, could be shortened without losing information.

Introduction:

- Regarding the introduction of the Faraoni-level: is it still a regional (say Tethyan event)? What is the climatic or paleoceanographic significance? This should be shortly discussed in the introduction and not only a list of locations.

Chapter 2:

- How was the magnetostratigraphy “projected” onto the sections?
- How can you use only a single point as a fix point to correct for differences in section thickness? Didn't it need at least two?
- The mention of Bachelor theses can be deleted since they are not available and the students are co-authors.

Chapter 3.1:

- What is the error against VP143h?

Chapter 4.1:

- Lines 13-14: the higher TOC values in the lower Aptian are a result of one measurement of 14 permill. All other values are in the same range than the rest of the section. So how reliable is this statement?

Chapter 4.3:

- The entire paragraph about d18O is not necessary. It is diagenesis and you do not use it later in the discussion (see Chapter 5.3 line 13).

Chapter 4.4:

- To clarify this chapter it might be useful to show the mean values in the figure so that it is more clear where the values deviate from the mean. But: how significant are these mean values given the large spread of values?

Chapter 5.1:

- Lines 18-19: usually, the values are below 4%!
- Line 25: I am not an expert in this, but is a somewhat higher Tmax value of 430°C in contrast to 427°C really a signal?
- What I am missing in this chapter is the meaning of all these data. What does it tell us to come up with a scenario about the formation of these organic-rich layers?

Chapter 5.2:

- For clarification, the Redfield ratio could be included in the figures?
- The entire chapter is more or less a repetition of the results. What is the meaning?

Chapter 5.4:

- The scenario discussed at the end of the chapter is interesting. Could be a hint towards different bottom-water masses (probably warm saline waters) that precondition the basins and then a more local effect (e.g., enhanced productivity?) gives you the regional differences described herein?

Chapter 5.5:

- 1st paragraph: please cite other studies that also show these species as characteristic features of the Faraoni.
- If nannofossil work and stratigraphy was done, why is it not included in the figures?
- Last paragraph: Why is Faraoni not called a single event? What is the evidence

for that apart from two enriched layers in one of the studied sections? These organic rich layers are clearly of regional importance only and therefore vary from section to section.

Chapter 5.7:

- Lines 12-13: That the presence was not excluded doesn't necessarily mean that it is there!

- 4th paragraph: if you mention that the drowning slightly predates the onset of the Faraoni then what is the time? You use an age model for calculation of OML density. Why is it not used to discuss the time differences or synchroneties between the platform drowning, the Faraoni and other occurrences of organic-rich layers in other regions (Chapters 5.7 and 5.8). I know that this is a tough job, but looking at Figure 6, it seems to me that there is some kind of matching between the platform drowning events and the black layers, but it is not really good and identifying the time difference is crucial here to really argue for a common trigger. If there is a million years between the Faraoni and the platform response, it might be not the same mechanism. So given this, I would like to see a bit weaker statement at the end of the paragraph, because the periods of high OML density only fit somehow to the platform drownings but not good enough to really correlate them and to argue for a common trigger.

Chapter 5.8:

- Line 25: add references.

- The d18O data presented show no consistent trends and I don't think that they are really necessary and help to understand the scenario that is promised in the headline.

- Here I got a bit disappointed with the manuscript. The heading of the chapter proposes a scenario of paleoenvironmental change for the local organic-rich layers. But it is only a repetition of the other chapters and some statements about d18O data sets without any hint towards a scenario. The authors speak about teleconnections but

never say what they mean with this. Here, I would like to see a (off course speculative) discussion about possible mechanisms that fit to their data. What about changes in productivity to form the organic-rich layers? What about water-mass changes sensu Friedrich et al (2008; Nature Geoscience) and Berrocoso et al (2010; Geology) for the tropical Atlantic and therefore a better preservation of organic matter? What about orbital forcing? The paper is a really good study of organic-rich layers outside the well-known OAEs and therefore should at least come up with some speculations about the formation of these layers (and probably their differences to OAE formation). Going further along this line: Why are the authors think that all of these black shales are triggered by the same mechanisms? There are plenty of studies out there that show large differences of even closely spaced local black shale layers e.g. in the Aptian of the Vocontian Basin (e.g., studies by Breheret 1997, Herrle et al 2003, Friedrich et al 2003, to mention only a few).

Conclusions:

- How does the proposed synchronicity between platform drowning and black shale formation works? What is the trigger mechanism? See comment above about the missing scenario.
- I disagree with the statement in lines 18-20: There is no real “lead-up” to the OAEs. Especially before OAE 1a, there is a time of low OML-density. For me the OAEs are still looking like singular events. But probably it is a more cyclic pattern that can be seen. Looking at Figure 6, it seems a bit like a cyclicity that forms intervals of higher OML-density at some times and OAEs at others.

Figure 1:

- Is it Stein et al 2011a or b?

Figures 2 and 3:

- Where are the open circles? Writing is very small and hard to read. Overall, the

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figures I have are very hard to read. Please re-draw in a more reader-friendly way.

Figure 6:

- Again very hard to read. Please identify the different lines more clearly.

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