

Interactive comment on “Ice sheet and palaeoclimate controls on drainage network evolution: an example from Dogger Bank, North Sea” by Andy R. Emery et al.

Anonymous Referee #2

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General comments

In the manuscript Emery and coauthors study the postglacial paleolandscape evolution of Dogger Bank by using geophysical and CPT data and try to understand the involved paleoclimate controls by utilizing paleoclimatic modeling. As they study the changes of the Earth's surface and the influencing factors, the manuscript is well within scope of the journal Earth Surface Dynamics.

The study is well designed and based on a wealth of geophysical and geological data. The results are presented in a clear and concise manner and their interpretation is well argued in later sections of the manuscript. To summarize, the authors pre-

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pared a very interesting paper which will allow the community to better understand the postglacial environments and evolution in the North Sea. The paper undoubtedly represents a valuable contribution in the understanding of this region.

My only major concern regarding this manuscript is the lack of any chronostratigraphical data. However, as regional chronostratigraphical constraints are well established and the authors take them in account, this is not a critical limitation of the paper. There are two other minor issues that are also described in the Specific remarks. Firstly, in parts of the paper (especially in the sections describing the results of the seismic interpretation) the authors very vaguely present where a described feature is shown in figures. For example, they refer only to a figure number. These often contain 2 geophysical profiles which leaves the reader struggling with finding out to which profile the authors were referring. I suggest the authors modify the manuscript in order to make the reading a bit easier. Secondly, I have some suggestions regarding the artwork. Generally it looks very nice; I appreciate the use of uninterpreted and interpreted profiles in the same figure and I really approve of the use of “scientific colours”. However, the reader would really benefit, if locations of maps from Figs. 4 and 5 would be included in a study area figure (in Fig. 3 or 6, for example). In addition, the figures are sometimes a bit cramped (see Specific remarks for Fig. 1).

Overall, in my opinion the authors prepared a very good and interesting paper which only needs some minor modifications before publication.

Specific remarks

L113: Maybe a reference to Fig. 3 would be suitable in this part of the manuscript to refer the reader to the CPT locations?

L136-142: “The GLAC-1D ice-sheet . . . representation of climate thereafter.” – this part of the manuscript could be a part of the discussion section.

Section 4: The results of palaeoclimate modelling are not presented in the Results

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section. I suggest the authors dedicate a sentence or two to these results (maybe refer the reader to Fig. 10).

Section 4.1.1: The authors could refer to Fig. 2A in this part of the manuscript.

Section 4.1.2: The authors could provide the figures depicting the different appearances of Horizon Z (e.g. "... coincident with the seabed (profile A-A' in Fig. 5)."

Section 4.1.3: Similarly to the previous comment, the authors could provide the figures depicting the different types of appearances of the channel fill on the seismic sections (for example, for the acoustic blanking). Additionally, it would be beneficial for the readers, if the authors specify more in detail, where different details of the acoustic facies can be observed. The description between L171-172 could be "(middle part between 38 and 28 ms on profile A-A' in Figure 4)" instead of just "Figure 4". The described details are sometimes difficult to find in the figures (for example, I don't see the prograding fill in Fig. 4 and I don't even know which profile to observe).

Section 4.1.4: Again, I suggest the authors provide more in detail where the described features of the acoustic facies can be observed in the profiles.

L189-190: "In the north of the study area, the largest elongate feature can be observed to incise through the channel-fill unit and into the basal seismic unit" I suggest the authors refer the reader to a figure with a map which demonstrates this.

L293: Subdued by what process? I suggest the authors use a word that is more descriptive or also reflects the possible process (e.g. relief was eroded, compacted, leveled out...).

L305: A reference to a figure would be appropriate after "accretion".

L307: Maybe "1st part of Figure 8"

L309: Do the authors have any idea, why the widths are relatively narrow and constant? Is it possible, that they were previously confined by relief (which is not preserved?). Are

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there any indices in the geophysical datasets for this?

L316: The authors want to demonstrate that Channel 2 was located in a valley and probably mistakenly refer to the isopach map (Fig. 2B) instead to the horizon-depth map (map in Fig. 3). Nevertheless, I am not really convinced from Fig. 3 that channel 2 is located in a valley as it seems to be located on a topographical high of Horizon Z (between -30 and -33 m).

L343: On which profile and where specifically is cross-bedding visible in Fig. 4?

L377-378: The authors state that the warmer-climate drainage network is best developed over the proglacial lake-fill sediments, however, the largest feature (Channel 3) is developed outside the bounds of the proglacial lake.

L396-397: "sigmoidal to oblique reflectors in the upper seismic unit" - a reference to a figure would be appropriate in this part of the manuscript. "infill of the channels and the tidal scour features" - a figure showing a profile across the proposed tidal scours would be appropriate in this part of the manuscript.

L487-489: "Palaeoclimate modelling showed a cold, arid period between ice sheet retreat at 23 ka BP and 17 ka BP, when the climate became increasingly warm and wet, which correlates to marsh environments at Dogger Bank c. 14.9 – 13.5 ka BP:" - Correlates in what way? A part of the sentence seems to be missing, as a cold period is regarded as a warm period. Or should "when" be "then"?; maybe "during ice sheet retreat between" instead of "between ice sheet retreat at"

L772-773: As this report is cited very often and is available online, I suggest the authors add the hyperlink to the report, if the journal guidelines allow.

Fig. 1: The font for the scale bar is disproportionately large compared to the other text on the figure. I also suggest to put the text for the depth and elevation colourbars below the colorbars. In that way, both texts are physically separated from the Forewind and Study area part of the legend and the legend becomes clearer. But these are just my

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personal preferences. . .

Maps in Fig. 4, 5 and 9: It would be really beneficial for the readers to have the location of Figs. 4, 5 and 9 marked on one of the smaller scale Figures (Fig. 2B or Fig. 6 or ...).

Fig. 3: What is the “m OD” abbreviation on the Horizon Z depth map?

L786: Personally, I really appreciate the authors using “scientific colours” and hope others will follow.

Fig. 9: In L100 the authors mention that the reflections can be recognised up to 150 m deep. However, according to Fig. 9, the tunnel valley is more than 200 meters deep. If this is a mistake, the authors should correct the figure, otherwise I suggest you also include a reference to a previous study or a figure with a profile showing the tunnel valley (possibly 2 profiles to show the relation of the uneroded and eroded channel with the valley).

Fig. 11: The location of Oyster Ground is not marked on the map

Technical corrections

L18: probably “represent a terrestrial” instead of “represent terrestrial”?

L19: “comprises” instead of “comprise”

L28: probably “9 ka BP” instead of “8 ka BP”

L108: maybe “and the extended interpretation of” instead of “and extended for interpretation of ”

L114: “proxy for” instead of “proxy to”; alternatively you could use grain-size proxy

L119: “truncated. Using” instead of “truncated, using”

L151: probably “Generally the area” instead of “Generally the”?

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L160-161: “Figure 2” should be “Figure 2b”?

L186: Is “Figure 2” appropriate here? As “(Figure 2)” is placed at the end of the sentence, it seems that the authors are referring to a seismic profile and not an isopach map. If they are indeed referring to the map, I suggest they put “(Figure 2B)” after “thickest” in L185.

Interactive comment on Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2020-41>, 2020.

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