

Interactive comment on “Seismic reflection data reveal the 3D structure of the newly discovered Exmouth Dyke Swarm, offshore NW Australia” by Craig Magee and Christopher A.-L. Jackson

Jonathon Hardman (Referee)

jonathon.hardman@cgg.com

Received and published: 9 February 2020

This paper describes, in detail, vertical zones of distribution located on the Gascoyne Margin offshore NW Australia, ultimately concluding that they are likely to be the expression of a late Jurassic dyke swarm, here named the Exmouth Dyke Swarm. The distribution of this swarm and the tectonic setting of the margin during the Jurassic are used to argue in favour of a mantle plume being the source of the dykes.

Overall, I enjoyed the paper and found it to be written to a high standard. Additionally, the paper is illustrated well and both these points are reflected in the small number of comments I have to make regarding the paper. Nonetheless, I have a few lingering

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questions upon finishing the paper. Should these questions be addressed, I would have no problem recommending that the paper be accepted.

—Errors— I'm glad that errors have been taken to account throughout the paper and section 3.3 was well written, clearly outlining the errors that could contribute to the measurements within the paper. However, it was unclear to me how $\pm 10\%$ was assigned for errors in time and ± 50 m for distances. Could the authors clarify why these numbers were chosen (presumably closely related to resolution)?

—VZD Heights— It is mentioned in section 3.1 that defining the base of the VZDs can be troublesome due to the variable data quality of the surveys. I was left wondering whether higher quality surveys have an easier to define VZD base where they can be related to structural features? Furthermore, to what extent do the authors think it's possible to constrain whether VZD height is related to imaging at depth or a geological process? Lastly, are the heights measured reasonable when constraining a source for the VZDs? In summary, it would be great if the authors could elaborate on whether their measurements of the height of the VZDs are geologically plausible and whether they are consistent throughout the study (i.e. if survey quality has an accountable effect on height estimation)

—Data Resolution and the Quantity of Dykes— Taking into account the resolution of the seismic, is the number of dykes mapped within the Gascoyne Margin comparable to the number of dykes observed in onshore swarms? A comment regarding the number of dykes not imaged might be appropriate as a caveat to the calculated dyke spacings.

—Evidence for a Mantle Plume— Have other studies attempted to map the amount of denudation prior to deposition of the Barrow Group? If erosion increases towards the south of the area that could be further independent evidence for the presence of a plume during the Jurassic.

—Specific Comments—

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Line 121 – There is also some more recent work that has been conducted on the area: Mark, N.J., Holford, S.P., Schofield, N., Eide, C.H., Pugliese, S., Watson, D.A. and Muirhead, D., 2019. Structural and lithological controls on the architecture of igneous intrusions: examples from the NW Australian Shelf. Petroleum Geoscience.

Line 164 – I had to look up what Weibull distributions are and it appears they can be quite variable. Could you clarify what you mean by this statement? Is it referring to a shape or the statistics of the range of dyke thicknesses?

Line 170 and Figure 5 – I found the l, s, h and w difficult to read when overlaid on the seismic, could you make these more visible? Also, for the strike of the VZDs, could the angle you are referring to be made clear on the image? Currently, it looks quite similar to the tip-to-tip length.

Figure 1 – I found the depiction of the radiating dyke swarms to be slightly unclear, particularly in northeast America. I wonder whether shading of the radiating swarms could help make them clearer.

Figure 3 – Considering the detail exhibited in the image, I find Figure 3c to be too small (although it does highlight the key geological features for the paper. I would like the figure to be larger, particularly so that the Turonian and Intra-Hauterivian unconformities are easier to see.

—Technical Corrections—

The referencing throughout the paper was neither chronological nor alphabetical. Is it journal standard to adhere to one of these?

Line 16 – I found the choice of 'latest' to be odd as my initial thought was that it refers to multiple dyke swarms in the Jurassic. Would Late be sufficient?

Line 150 – Should "...we were able to" be the start of a new sentence?

Line 940 – Form should be from

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Figure 16 is lacking a colour bar and key for the yellow points on the east of the stereonet.

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2019-201>, 2020.

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