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Climate of the Past Discussions

Interactive comment on "Early westward flow across the Tasman Gateway" *by* W. P. Sijp et al.

Anonymous Referee #1

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Sijp et al have conducted some middle-to-late Eocene modeling sensitivity studies, primarily with the UVIC model to study how flow direction through the Tasman Gateway changes as various southern ocean gateway parameters are changed. This is a follow on to an extensive set of papers recently published by Sijp et al with the same model, and by others with other models, although motivated in this particular case by an interpretation of dinoflagellate cyst biogeographic patterns.

There are now dozens of papers exploring sensitivity of climate to southern ocean gateway changes, and within the past couple of years there has been a resurgence of interest in such studies, although generally speaking they all produce similar and convergent results when it comes to the circulation patterns and climate responses. And actually, this paper produces the same results as the others as well, in terms of those variables, and the modelling itself is weaker, so I guess the only reason to think of a study like this as novel is if the resolution of the dinoflagellate story is both impor-

tant and convincing. I do not see evidence of that. Because of various weaknesses, but most importantly because I do not see this paper as novel or answering a well formulated and important question, I do not recommend publication.

Main Weaknesses. Winds are not prognostic in the UVIC model and most of the results will depend sensitivity on the wind stress (curls). This seems to be a huge weakness. Simulations are conducted in which continents are shifted 6 degrees south, but as far as I can tell, the wind fields are fixed. What kind of sense does that make? Also, feedbacks between ocean circulation and the atmospheric circulation are impossible, so I do not have confidence that the results, even as presented, would be reproduced in a truly coupled model. Also, how might all this change as ice sheets grow, wax and wane over Antarctica, might this not be an easier explanation for the observed dino patterns?

There is no explicit comparison with the dinoflagellate cyst biogeographic patterns, instead passive tracer trajectories are calculated and described in terms of their fit with paleogeographic patterns. This is related to the fact that the underlying conceptual model for these patterns is in question. The paper does not address the fact that the conceptual model explaining dino patterns in this region in the past, presented in Huber et al., 2004 is rather in conflict with that in Bijl et al., 2011. The former relies on cold temperature in a 'cold trap' in the Ross Sea, whereas the latter utilizes a local temperature record to infer that environmental conditions had little to do with the interpreting biogeographic patterns. If the original conceptual model is used how does that affect the interpretation? On a more technical level, how does variability fit in with the trajectories? Advection across streamlines is primarily by ocean eddies or by non-steady atmospheric forcing, how are those handled in these simulations?

On balance I am not convinced that the results presented are robust or correct. And even worse, as this sentence indicates "Finally, our numerical study is not consistent with the idea that such an oceanographic change can cause a significant and uniform Antarctic cooling", which of course is the main reason that people work on this problem.

So the results are equivocal and without much importance even if true?

Interactive comment on Clim. Past Discuss., 11, 5021, 2015.