

Interactive comment on “Potential environmental impact of tidal energy extraction in the Pentland Firth at large spatial scales: results of a biogeochemical model” by J. van der Molen et al.

Anonymous Referee #1

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Review of "Potential environmental impact of tidal energy extraction in the Pentland Firth" General The paper sets out the potential issue of marine energy extraction on far field locations. Through the use of hydrodynamic and ecosystem modelling a clear potential for far field effects is shown. The paper is generally clear on the models used and discusses the potential impacts in both the physical and biochemical realms. My only real issue is with the model validation which does not give enough detail to the North Sea spatial region. Validation in the spatial region around the Pentland Firth is shown but the results are discussed in the far field and this area must be validated as well if the results are to have weight.

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Specific

Although the Pentland Firth has been leased by the Crown Estate for 800MW of installed capacity, I don't really believe that this number is likely any time soon. At the moment there is great talking over the potential for 8MW(ish) in the Meygen site. Is it really right to think that 800MW is realistic? Pg 20484 - The 800MW is being uniformly distributed throughout the Pentland Firth and beyond. This is not what has been proposed with the main channel of the Firth actually being relatively empty and the consented sites being either near Orkney or near the main-land. Did you do this because you don't have the resolution to put them in their consented location, and what impact do you expect that this may have? I think that this would change the effective blockage ration of the channel in your model. Pg 20485 - The differences in the reference runs speak about issues around water depths over several hundreds of metres, which if this refers to depth is surely outside the depth of the entire shelf. If it means horizontal length then it is not clear to me at all what you are trying to say. Results of tide validation. The models tidal results are shown as a scatter plot which shows some issues with the model. These are explained to be issues with the Celtic Seas and thus can be safely ignores as the area around the Pentland Firth is OK. The issue though is that this paper is examining impacts at the far field extent and therefore the model must be reasonable in these far field areas. It would be helpful to see a plot of the tidal errors spatially rather than as a scatter plot only. The reader can then understand the potential tidal anomalies in the North Sea and beyond.

Discussion on Tides - A good agreement of the hydrodynamic tidal model within the region of the Pentland Firth does not indicate suitability for examining the impacts of renewable energy across the far field scale. One might ask why the model is failing elsewhere, such as the Celtic Seas, and do these failure mechanisms come into play in the modified tidal system? Just because a model is in agreement with observation in one area does not make it suitable, necessarily, for use in other areas!

Technical

C9825

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Pg 20479, Line 13: "during the last decades" should be changed to either "last decade" or something like "previous few decades" depending on which you are referring to. I assume model "confirmation" means validation?

Scientific significance - 2

Scientific quality - 2 (although this depends on the model validation in the North Sea, which if is not good then the quality must drop as the result are open to reasonable questioning)

Presentation quality - 1

Interactive comment on Biogeosciences Discuss., 12, 20475, 2015.

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