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Ocean Science Discussions

Interactive comment on "Shelf sea tidal currents and mixing fronts determined from ocean glider observations" *by* Peter M. F. Sheehan et al.

Anonymous Referee #1

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The paper presents some new glider observations from which (i) tidal currents have been estimated and (ii) the position of tidal mixing front as been established.

My main problem with the paper is that as it is currently written it is poorly focused although the title implies that the paper is methodological but at times it appears to be making claims as to deepening understanding re- shelf sea fronts, which I'm am not convinced it does. More so I beleive as presented, the paper actually obsurces at potentially novel scientific contribution.

Much of the analysis is based on the (now rather old) H/U3 theory for the positioning of shelf sea fronts and appears to push the theory further than it was ever intended. Firstly the theory was derived to explain the position of shelf sea fronts in terms of the balance between the stratifying influence of buoyancy input as surface heating. Yet

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the measurements presented were taken in the autumn, when the net buoyancy is negative and so contributes to mixing and not stratification. As such I would argue that the application of the model in the paper is not correct.

There are also problems with the application of the model: 1) Use of the ancient air-sea heat flux parameterisations (eg. Ivanoff, 1977) - there are much more up to date parameterisations available. This is particularly important as these types of simple models have always struggled to get convection (the consequence of the negative buoyancy flux) correct. 2) The spring-neap motion of the front in response to changing U3. Note that there is an important feedback here - between turbulence driving mixing and stratification which limits the impact of the turbulence and so limits the spring-neap excursion of the tidal mixing front (I beleive Simpson and Bowers, 1984 talk about this). 3) The model does not include the stratifiying influence of freshwater which I believe to be important here.

In particular it this later point which could form the basis of an interesting story, if the paper goes down the science route. The fact that after the disappearance of the thermal stratification there is still a lateral salinity gradient points to the development of seasonal stratification influencing shelf sea residual circulation even after the disappearance of seasonal straficiation. Although not totally up to date with the literature, this is not a topic which I have seen discussed in the literature and so would be well worth persuing.

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