

Interactive comment on “Turbulence and hypoxia contribute to dense zooplankton scattering layers in Patagonian Fjord System” by Iván Pérez-Santos et al.

Anonymous Referee #3

Received and published: 19 December 2017

Summary: The article analyses a dataset of ADCP, echosounder, CTD, turbulence and biological data in a fjord which is showing suboxic conditions in the deeper water column. The ADCP, echo sounding and biological data show a clear daily vertical migration pattern within the upper 100 m of the fjord. Turbulence measurements in the main fjord and in the Jascaf channel show different regimes, with strongly increased levels of turbulence in the Jascaf fjord. The authors try to correlate oceanographic conditions with abundance of zooplankton and its daily vertical migration.

Comment: While this is a very nice combined dataset of physical parameters and biology the processing and conclusions from this work have to be more elaborated before

C1

its ready for publication. One fundamental parameter used is the relative abundance of zooplankton derived from acoustic backscattering. To my understanding the authors have the data to calculate this correlation by using the data in Fig. 4 and 5. It is not clear what turbulence data is used in this article. While there are two devices (SCAMP and VMP-250) the data suggest that only the VMP-250 is used (Fig. 10 and 11), that has to be clarified. Temperature microstructure is problematic in low as well as high turbulence regions, I wonder which device was used where. I would also like to see example temperature microstructure profiles with examples of fitted data, showing that the fit is reasonable. I can imagine that the temperature microstructure has problems in the deeper part of the Puyuhuapi Fjord (Fig. 10c) as well as in the extremely high dissipation region in the Jacaf channel (Fig. 10d). Since tides are usually an important energy input for mixing, a section containing information about tides is necessary. Without a proper discussion I see no point in correlating all sorts of parameters against abundance of zooplankton (Fig. 9). The correlation does basically show that the zooplankton stays in the oxygenated water, which is already visible from the echo sounding transects. For a person who is not familiar with DVM, it is from the article itself not clear, why zooplankton should migrate at all, a discussion about the reasons is needed. Vertical oxygen concentrations are not steadily decreasing towards deeper layers, Fig. 2f shows, that towards the bottom oxygen increases again, are there reasons for that? A parameter which was not discussed at all is nitrate: There are nitrate lines, it is hard to see if they are coinciding with the thermocline or halocline. Has nitrate a connection to zooplankton? Maybe via phytoplankton? There is data from different seasons, is there a seasonality? The abundance ($O(4000 \text{ ind m}^{-3})$) of May (Fig. 4) seems to be much higher than in January ($O(200 \text{ ind m}^{-3})$). In the introduction it was stated that the difference between the two echo sounding frequencies is used, the figures do anyhow show both frequencies separated (Fig. 7, 8), why is it so? Phytoplankton was not really discussed through the article but is mentioned in the conceptual figure and briefly in the discussion. Are there any hints about the abundance and temporal evolution of it? Fig. 12 also neglects that higher mixing might also deepen the mixed layer. A

C2

comparison of vertical profiles of the VMP directly above the sill and in the fjord would be instructive.

Details: Fig. 2: A conceptual vertical profile at different position is needed. Too many profiles are on top of each other.

Fig. 3: Scale of salinity can be changed, the lower 15 gkg⁻¹ are not used. Fig. 10 e+f: What does this correlation say?

Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2017-89>, 2017.