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Interactive comment on "Inorganic carbon fluxes on the Mackenzie Shelf of the Beaufort Sea" *by* Jacoba Mol et al.

Anonymous Referee #3

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The manuscript of "Inorganic carbon fluxes on the Mackenzie Shelf of the Beaufort Sea" by Jocoba Mol et al. reports the distribution of carbonate parameters on the Mackenzie shelf with data collected on a summer cruise in 2014, aiming to investigate the cycling of inorganic carbon. The authors conclude that wind forces controlled upwelling and downwelling play the key factors on regulating the inshore/offshore transport of inorganic carbon in both the surface mixed layer and the subsurface layer. In addition, the authors quantify the shelf export and further discuss the potential impacts of inorganic carbon transport on ocean acidification.

The manuscript is well structured and this work is solid although it is just coming from one cruise data. With the working circulation model, the authors successfully connect the potential influence of onshore/offshore carbon transport to ocean acidification.

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Discussion paper

However, the authors focus more on the mechanism controlling the inorganic carbon flux and the onshore/offshore transport over the shelf break only, rather than on the inorganic carbon flux coming from all sources. High paper numbers might bury the highlights while the manuscript could be further well organized starting from results.

I recommend a revision addressing the comments listed below and comments picked up by other reviewers. 1) It must be better to list major findings and quantified numbers in the abstract. 2) P4L27, UHL water has a salinity range, it's usually defined with salinities centered at S=33.1. 3) P4L28, Atlantic water is characterized by a temperature maximum while the salinity is not the largest in the salinity depth profile. Please define these water masses either by ranges of salinity, temperature, and or potential density, as well as depth range. 4) P4L30, have you considered the influence of denitrification on the conservation of TA? And how much error it will introduce into your calculation? 5) "p" in pCO2 is italic. 6) P5L15, where are the values of DIC from for these endmembers in Table 1? 7) P6L20, could you please list the uncertainties? 8) P6L30, please mark "Amundsen Gulf" in fig. 1. Not all readers know where it is. 9) P7L28, for fMW and fSIM, "MW" and "SIM" should be subscripted. 10) P7L34, "TA is conservative" is not really true. Given the authors discuss biological production, photosynthesis/respiration will change TA. In addition, denitrification also changes TA and pH. 11) P9L14, use period "break; it did". 12) P9L21, how long the wind should sustain to introduce upwelling or upwell subsurface water into the surface water on the Mackenzie shelf? 13) P11L32, Fig.10 is wrong. 14) P12L18, where is the flux of TA? 15) P13L18, how the bottom water impact the air-sea exchange? Is it more related to wind speed or the air-sea pCO2 difference? 16) P14L7, what's the importance of H+ flux? How is it related to DIC flux? Linear or exponential? 17) P14, p4.4, how low the aragonite saturation will impact the calcifier? And how low the saturation you observed? list the numbers. 18) Fig.11, list stations 428 and 435.

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