Dear Editor,

We greatly appreciate all of editor and reviewers' comments and suggestions which have been accepted in revised version of our manuscript: Dynamics of environmental conditions during a decline of a Cymodocea nodosa meadow (bg-2019-484). We believe we have satisfactorily addressed them.

Associate Editor Decision: Publish subject to minor revisions (review by editor) (19 May 2020) by Minhan Dai

Comments to the Author:

Dear Authors,

Thank you for submitting your revised MS, which has been further reviewed by two reviewers who had previously looked at your MS. Your paper is now potentially acceptable for publication at Biogeosciences with some additional discussion referring to the comment by reviewer #1 with respect to multiple stressors.

I look forward to seeing your further revised MS.

Sincerely,

Minhan Dai

Editor

Please find below our point-by-point response to reviewer #1comments:

COMMENT: In terms of the underwater light conditions, the authors argued, and responded with the edited sentence as follows " *C. nodosa* decline was most likely triggered in April 2018 when light availability to the plant was drastically reduced due to increased seawater turbidity that resulted from increased terrigenous input combined with resuspension of sediment and elevated autotrophic biomass."

Increased terrigenous input and reduced transparency should be supported with the data In fig. 1, in which the PM increased and salinity decreased, supporting the authors' argument.

***RESPONSE*:** The Abstract and discussion were slightly modified in order to better present the evidence supporting our arguments. Specific data were mentioned with reference to Fig.1b.

CHANGE (page 2, lines 21 – 25): The amended sentence in the Abstract now reads: The *C. nodosa* decline was most likely triggered in April 2018 when light availability to the plant was drastically reduced due to increased seawater turbidity that resulted from increased terrigenous input, indicated by a decrease in salinity accompanied with a substantial increase in particulate matter concentration, combined with resuspension of sediment and elevated autotrophic biomass.

CHANGE (page 19, lines 559 - 563): The complementing sentence in the Discussion now reads: In April 2018, *C. nodosa* had been most probably exposed to increased siltation, due to an intensification of terrigenous input as indicated by a decrease in salinity (Δ 1.5 with respect to March) and a substantial increase in particulate matter concentration (up to 3 times higher than in March, Fig. 1b) combined with resuspension of sediment, provoking an elevated autotrophic growth.

COMMENT: In terms of multiple drivers impact, the authors responded as "It all began with the increased water turbidity which weakened the plant and made it susceptible to other stressors such as lack of oxygen and H2S penetration within the plant tissue"

Well, reduced availability or lack of O2 usually helps photosynthetic performance, since it affects the competition of oxygenation and carboxylation catalyzed by Rubisco. This has been evidenced in seagrass as follows:

Kim, M., Brodersen, K. E., Szabó, M., Larkum, A. W. D., Raven, J. A., Ralph, P. J., & Pernice, M. (2018). Low oxygen affects photophysiology and the level of expression of two-carbon metabolism genes in the seagrass Zostera muelleri. Photosynth Res., 136, 147-160. https://doi.org/10.1007/s11120-017-0452-1.

RESPONSE: We acknowledge the value of the comment regarding the effect of reduced oxygen availability on photosynthetic performance as presented by Kim et al. (2018) where they report that the net photosynthetic rate increased in response to reduced O_2 concentration in water. In our study, during the critical phase for the plant (in April 2018), the bottom waters was fairly oxygenated (O_2~125 μM, Fig. 6); therefore it can be assumed that an increased photosynthetic performance was not stimulated as shown under experimental conditions (O_2~ 8 μM) by Kim et al. (2018). What we meant by a lack of oxygen was referring to the oxygen levels within the plant tissue since the photosynthetic activity was probably suppressed by the sediment coating of the leaves and the overall high turbidity of the water column. Since from April to June 2018, O_2 in the bottom water drastically decreased, the sentence in discussion was added in order to compare our observations with the study presented by Kim et al., (2018). The increased photosynthetic activity with the reduction of light and oxygen availability in the water column might have occurred in late spring but was not sufficient to compensate the oxygen requirement of the plant tissues. This oxygen deficiency combined with an intrusion of H_2S resulted in *C. nodosa* die-off.

CHANGE (page 20, lines 578 – 582)*:* The added sentence now reads: Although in such conditions of limited light and O_2 the seagrass might be capable for rapid modulation of metabolic pathways and enhance the photosynthetic rate, as shown for *Zostera muelleri* (Kim et al., 2018), it appeared that O_2 content of the *C. nodosa* below-ground tissue was still too low to maintain the internal pressure and therefore, the plant tissues became potentially accessible to sulfide intrusion (Pedersen et al., 2004). The reference Kim et al. is added ***(page 26, lines 770 -772)***.