1. Reviewers' comment: The authors present data from time series measurements in a small, semi enclosed stratified basin with anoxic conditions prevailing in the bottom waters for most of the time. In addition to the regular monitoring the authors present data from a sampling directly after a winter storm that apparently lead to a breakdown of the stratification in the estuary and transport of the anoxic bottom waters to the surface, which was associated with strong environmental impact and massive fish kills.

The basin comprises an interesting setting where the impact of anoxic conditions and their validation on estuarine habitats can be studied in detail. The authors present data from well-established parameters that are generally well suited to characterize the conditions in the basin before and after the storm event.

However, the manuscript is rather descriptive, and l lacks a more detailed discussion of the biogeochemical and particularly the physical mechanisms accompanying the water column turnover in the basin.

First of all, I am missing a detailed discussion on the water column circulation in the Aitoliko basin in general and particularly during the storm event. What is the general circulation pattern of the waters in Aitoliko basin? What is the role of the freshwater discharge from the pumping station? To which extent can this water be seen in the T, S distribution? Does the water discharge from the pumping station lead to a general net outflow of water from the Aitoliko basin?

Authors' comment: In the present study, the impact of storm events on water column stability and bottom water hypoxia/anoxia of enclosed coastal basins is investigated. Furthermore, the role of basins' internal load (H_2S, PO_4^{3-} and NH_4^+) was studied. This leads to the disturbance on the main nutrients, dissolved oxygen, hydrogen sulfide and chlorophyll distribution, following total water column mixing. Additionally, the relationship between temporal nutrients variations in surface layers, of permanent anoxic coastal basins with; a) changes in the physicochemical characteristics of the water column, b) changes in the bottom water phosphorus and nitrogen concentrations, and c) their effect on the basin's primary productivity, are studied.

In order to achieve the objectives of this study, two different sets of Aitoliko basin's data were used. The first one includes measurements of physicochemical parameters, nutrients, chlorophyll and sulfides, four days after a storm event and the consequent anoxic crisis in Aitoliko basin on 4th of December 2008. The second one contains a similar data set obtained from a biennial (May 2006-May 2008) Aitoliko basin monitoring.

Two papers have been already published by the authors:

- Gianni, A., Kehayias, G., and Zacharias, I.: Geomorphology modification and its impact to anoxic lagoons, Ecol. Eng., 37, 1869-1877, https://doi.org/10.1016/j.ecoleng.2011.06.006, 2011.
- Gianni, A., and Zacharias, I.: Modeling the hydrodynamic interactions of deep anoxic lagoons with their source basins, Estuar. Coast. Shelf S., 110, 157-167, https://doi.org/10.1016/j.ecss.2012.04.030, 2012.

In these papers there is an analytical description of the Aitoliko lagoon physicochemical characteristics, its hydrodynamics and the interaction with its source basin (Messolonghi lagoon), and the role of D6 pumping station. We reference these papers in the discussion section, where necessary, in order to interpret the changes in nutrients and chlorophyll changes in the basins water column.

We chose not to include analytical information about the basin's circulation in this manuscript in order to avoid a long text, as the Aitoliko lagoon hydrodynamics shows significant changes depending on season (physicochemical characteristics of its water column and its source basin), D6 discharges etc.

We added a reference about these two papers in the introduction section as well.

If you still considered that analytical information about Aitoliko lagoon is necessary in this manuscript, we can add it.

Addition to the manuscript: Page 7, Lines 9-11. An analytical description of the Aitoliko lagoon physicochemical characteristics, its hydrodynamics and the interaction with its source basin (Messolonghi lagoon), and the role of D6 pumping station are given by Gianni et al (2011) and Gianni and Zacharias, (2012).

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2. Reviewers' comment: It would furthermore be good if the physical conditions before and after the storm event are discussed in more detail. E.g. it would be good to know temperature and salinity conditions before the storm event. Do the data presented here allow that the authors give a time line of the relaxation process after the storm event? In their conclusions, they state that the restoration of the geochemical conditions takes several weeks to months and that the recolonization takes even longer. However, these conclusions are neither supported by the data presented in the manuscript not referenced sufficiently.

On page 14, the authors state that waters from the Messolonghi Lagoon that are forced into the basin cause disturbances in the water column of the Aitoliko basin. It would be useful if the authors could give some information on the characteristics (e.g. temperature, salinity (i.e. density), oxygen and nutrient concentrations) of the inflowing waters from the Messolonghi lagoon. Can the Messolonghi waters be traced back in the T, S profiles of the basin after the storm event? Figure 6 indicates that the bottom waters of the basin are pushed upwards in the northern part of the basin -is this a result of the Messolonghi water inflow?

Authors comment: As the systematic monitoring of the Aitoliko lagoon stopped in April 2008 and the storm event occurred on December 2008 we do not have data before the storm event. In order to have an assessment of the situation before the storm event in the discussion we use date from typical winter time in Aitoliko lagoon (Winter of 2006 and 2007).

Because our funding was limited, we did not have the we were not able to follow the evolution of the storm event phenomenon. In our discussion, related with the relaxation process after the storm event, and basin's restoration we used bibliographical information, from previous works (Dassenakis et al., 1994; Leonardos and Sinis, 1997; Demetriou et al., 2010) where this process was analytically monitored.

The Messolonghi waters can by tracked into Aitoliko lagoon during the typical stratified periods (Gianni et al., 2011, Gianni and Zacharias, 2012) but not during the storm events (Gianni and Zacharias, 2012, see calibration scenarios).

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3. Reviewers' comment: I am also wondering if the stratification that can be seen in Figures 5-7 reflects the fact that the turnover of the water body in the basin is indeed not complete, and that the processes related to the storm event could partly be described by advective rather than by mixing processes. If this is the case, the authors should revise the paper accordingly (the term total mixing event might be misleading).

Authors comment: The sampling related with the December 2008 storm event was occurred four days after the storm event of the 4th of December 2008. This could be justified the weak stratification in the basin's water column. This, of course, does not exclude the fact that the processes related to the storm event could partly be described by advective processes. In any case we consider that both processes are involved. We choose to use the term «mixing» in agreement with bibliographic references (Baric et al.,

2003; Fallesen et al., 1999; Luther et al., 2004; Dassenakis et al., 1994; Leonardos and Sinis, 1997; Demetriou et al., 2010; Ram et al., 2014).

Reviewers' comment: I would furthermore assume that an inflow of Messolonghi water leads to a concurrent outflow of (surface) water from Aitoliko basin – how does this exchange of waters affect the nutrient budget of the basin?

Authors comment: Unpublished data about the Messolonghi lagoon trophic state show that there is no statistically significant difference between nutrient content of the surface layer of Aitoliko lagoon and Messolonghi lagoon. In particular, during the winter period (storm event) the differences are minimal.

Reviewers' comment: To estimate the importance of storm events for the basin's turnover it would furthermore be useful to quantify the number of storm events over time and to relate the time series data to the sampling from the storm event.

Authors comment: All the recorded storm events in Aitoliko lagoon are reported in page 19, Lines 10-22. This phenomenon it is not periodical, and the number of the storm events for Aitoliko basin is not to high (6 events in 45 years), but the results of the lagoons mixing are severe affected the basin's physical, chemical and biological characteristics and all the human activities on the lagoon.

Reviewers' comment: Title: I found the title somewhat cryptic and would suggest to change it to something that is more descriptive to the study.

Authors comment: The title was changed.

Addition to the manuscript: The new title is "The impact of the water column stability, in physicochemical characteristics and biological parameters distribution, in anoxic coastal basins"

Reviewers' comment: Page 1, Line 17: replace "water column total mixing" with "complete mixing of the water column"

Authors comment: The text was replaced.

Reviewers' comment: Page 1, Line 19: "the basin becomes anoxic" I would be careful with the term "anoxic" here. I agree the authors that the transport of anoxic bottom waters to the surface causes the environmental disturbances and the observed fish kills associated with "anoxic events". However, this does not necessarily mean that the entire basin becomes anoxic. The data shown in Figure 6 indeed indicate that not the entire basin is anoxic after the storm event.

Authors comment: Here the phrase "the basin become anoxic" constitutes a general reference with literature basis. Relative references are given in the first paragraph of page 3. This conclusion does not come from the results of the present study's observations.

Reviewers' comment: Page 1, Line 20: replace "interface" with "intermediate"

Authors comment: The word was replaced.

Reviewers' comment: Page 1, Line 20: replace "promoting" with "promote"

Authors comment: The word was replaced.

Reviewers' comment: Page 1, Lines 21-22: "Bottom layer can […] stratification": this sentence is somewhat contradictory to the hypothesis stated in the previous sentences where it is stated that "storm events can result in water column mixing". If the water column is completely mixed, this means that the stratification is broken up. Please specify how the mixing through storm events affects stratification and nutrient supply to the surface waters.

Authors comment: In the present study, the impact of storm events on water column stability and bottom water hypoxia/anoxia of enclosed coastal basins is investigated. Furthermore, the role of basins' internal load (H_2S, PO_4^{3-} and NH_4^+) was studied. This leads to the disturbance on the main nutrients, dissolved oxygen, hydrogen sulfide and chlorophyll distribution, following total water column mixing. Additionally, the relationship between temporal nutrients variations in surface layers, of permanent anoxic coastal basins with; a) changes in the physicochemical characteristics of the water column, b) changes in the bottom water phosphorus and nitrogen concentrations, and c) their effect on the basin's primary productivity, are studied.

In order to achieve the objectives of this study, two different sets of Aitoliko basin's data were used. The first one includes measurements of physicochemical parameters, nutrients, chlorophyll and sulfides, four days after a storm event and the consequent anoxic crisis in Aitoliko basin on 4th of December 2008. The second one contains a similar data set obtained from a biennial (May 2006-May 2008) Aitoliko basin monitoring.

The phrase in page 1, Lines 21-22 is referred in the second data set.

Reviewers' comment: Page 4, Line 6: "The importance […] has emerged." It is not clear to me what the authors are referring to.

Authors comment: The sentence was rephrased.

Addition to the manuscript: The new sentence is "Furthermore, the role of basins' internal load (H_2S, PO_4^{3-} and NH_4^+) was studied."

Reviewers' comment: Page 5, Lines 5-6: This sentence should be rephrased. "Large freshwater inflows arise from…"

Authors comment: The sentence was rephrased. to "Large quantities of freshwater inflow to Aitoliko lagoon through a pumping station (Fig. 1B) which is located near the basin's sill."

Addition to the manuscript: The new sentence is "Large quantities of freshwater inflow to Aitoliko lagoon through a pumping station (Fig. 1B) which is located near the basin's sill."

Reviewers' comment: Page 5, Line 6: replace "are implicated both for the" with "implicate both the"

Authors comment: The text was replaced.

Reviewers' comment: Page 5, Lines 11-13: How were the sensors calibrated?

Authors comment: The sensors were calibrated according to the manufacture's instruction. For temperature, conductivity, redox potential and pH sensors' calibration, a standard multiparameter solution (Quickcal solution) was used, while the optical DO sensor was calibrated separately. The 100% saturation point was calibrated against air while the 0% point against N_2 deaerated water.

Reviewers' comment: Page 6, Lines 9-10: were the daily mean wind speed data used in the analysis at all? In the discussion of the storm event.

Authors comment: This was a mistake. Daily data were not used for the analysis of the storm event. The sentence was deleted.

Reviewers' comment: Page 6, Line 23: replace "studying" with "studied".

Authors comment: The word was replaced.

Reviewers' comment: Page 14, Line 3: replace "these winds caused, the forcible enter…" with "these winds forced water from Messolonghi lagoon to enter the Aitoliko basin, disturbing".

Authors comment: The sentence was replaced.

Reviewers' comment: Page 16, Line 18: replace "mean ammonium concentration determined at the 10 surface meters" with "mean ammonium concentration in the upper 10m".

Authors comment: The sentence was replaced.

Reviewers' comment: Page 17, Line 1: "About 0.8mg/l …" is this the H_2S concentration at 10m or the mean concentration in the upper 10m?

Authors comment: 0.8mg/l is the concentration at 10m depth. The sentence was rephrased.

Addition to the manuscript: The new sentence is "About 0.8mg/l sulfides were determined at 10m depth, while a maximum value of 33mg/l was characterized the 20m depth."

Reviewers' comment: Page 18, Line 1: replace "are referred in" with "report".

Authors comment: The sentence was replaced.

Reviewers' comment: Page 18, Line 2: "H_2S sulphide release" delete "sulfide".

Authors comment: The word was deleted.

Reviewers' comment: Page 18, Line 9: when did the deepening of the sill between Messolonghi lagoon and Aitoliko basin take place?

Authors comment: The sill was dredged in May 2006. The information was added in the manuscript.

Addition to the manuscript: This fact was ascribed to the anthropogenic deepening of the sill (in May 2006) that connects Aitoliko and its source basin (Messolonghi lagoon).

Reviewers' comment: Page 20, Lines 10-21: is this statement correct? The profiles shown in Fig.7 show a clear Chlorophyll b maximum in the bottom water.

Authors comment: In these lines we try to connect changes in chlorophyll profiles with the water column mixing and the change in the nutrients and sulphides concentrations in the water column. And for this reason, we use bibliographic references. Chlorophyll b profile presents a maximum near the basin's bottom after the storm event. The typical winter profile for the Chlorophyll b (Fig. 3) is characterizer by low concentration throughout the water column.

Reviewers' comment: Page 21, lines 21-27: "This increase could be […] external loading scenario". This paragraph should be rephrased. For me it was hard to perceive the conclusion of the authors that the D6 pumping station indeed does not explain the increased PO_4^{3-} inventory at station A9.

Authors comment: The text was rephrased, we hope that it is clearer now.

Addition to the manuscript: The new text is "In addition, during the 2006-2007 winter period, a PO_4^{3-} concentration increase in the surface layer of the Aitoliko basin, was recorded. This increase could be attributed to external sourcing with inorganic phosphorus. Aitoliko lagoon is mainly supplied with fresh water through a pumping station (D_6) which is located near the basin's entrance. Water comes from you an extensive channels network which drains the adjacent cultivated land, and thus is burdened with nutrient residues. Nonetheless, the seasonal PO_4^{3-} maximum surface concentrations coincide with the minimum flow of the D_6 pumping station (Table 1) and is lagging 3-4 months behind the main fertilization period, weakening the external loading scenario. In a second scenario, the observed epilimnetic PO_4^{3-} increase could be attributed to the surface layers enrichment from the deeper waters. The hydrodynamic processes that control the small-scale mixing of Aitoliko basin water column, introducing oxygen into the halocline and the bottom waters, without destroying the stratification (Gianni et al., 2011; Gianni and Zacharias, 2012), probably also governs the nutrients transport from the deep pool."

Reviewers' comment: Page 22, Line 17: "The spring […] and was enhanced in the anoxic layers of the Aitoliko basin." This sentence does not make sense to me.

Authors comment: The sentence was rephrased.

Addition to the manuscript: The algal bloom occurred in spring 2007 resulted in the basin's organic load increase.

Reviewers' comment: Page 23, Lines 2-3: "Hydrogen sulphide […] algal blooms": the data shown in the manuscript do not necessarily support this statement. The nutrient profiles (Fig. 7) show a clearly stratified water column. Compared to the time series data shown in Figures 2 and 3 the surface water

nutrient concentrations are relatively low. I agree that chlorophyll a and c concentrations in the surface are enhanced, but for a full interpretation of the impact of the storm event it would be necessary to know the conditions before the storm.

Authors comment: We agree with this comment, that but for a full interpretation of the impact of the storm event it would be necessary to know the conditions before the storm. We believe that study's available data can support the assumption that chlorophyll increase in the surface layer after the storm event resulted from nutrients supply from the deeper layers.

Reviewers' comment: Figure 2C and D: is it correct that Fig. 2C shows the distribution of nitrate over time, while Fig. 2D shows the nitrite inventory in the surface layer at the station A9 and not the corresponding nitrate inventory? If this is the case, I think it would make sense to add two more panels to the Figure that additionally show the nitrite distribution and the nitrate inventory.

Authors comment: The diagram is correct. We decided to present in this way the nitrate and nitrite distribution in an effort to focus on the most important findings of our measurements/ observations.

Reviewers' comment: Table 1: I found it confusing that Table 1 shows H_2S concentrations and not PO_4^{3-} concentrations together with the discharge rates of the D6 pumping station. In the discussion section, it is the PO_4^{3-}concentration, which is discussed in relation to the freshwater discharge, not the H_2S.

Authors comment: We splited the table in two.

Table 1. Mean monthly D6 pumping station, discharge, during the period May 2006-May2008.

and

Table 2. Sulfide concentrations at the maximum sampling depth (25m) throughout the sampling period (May 2006-May 2007).

Addition to the manuscript:

Table 1. Mean monthly D_6 pumping station, discharge, during the period May 2006-May2008.

Year	**Month**	**D_6 Discharge ($x10^6$ m^3/month)**
2006	M	1,02
	JN	1,16
	JL	1,33
	AU	1,65
	S	1,23
	O	0,77
	N	0,71
	D	0,69
2007	J	0,63
	F	0,56
	MR	0,70
	AP	0,78
	M	0,72
	JN	0,69
	JL	0,64
	AU	0,64
	S	0,66

Year	Month	D_6 Discharge ($x10^6$ m^3/month)
	O	0,78
	N	0,85
	D	0,80
2008	J	0,74
	F	0,71
	MR	0,87
	AP	0,98
	M	1,28

Table 2. Sulfide concentrations at the maximum sampling depth (25m) throughout the sampling period (May 2006-May 2007).

Year	Month	Sulfide concentration A9 (25m) (mg/l)
2006	M	41,1
	JN	41
	JL	47,6
	AU	42,6
	S	47,8
	O	48,8
	N	50,8
	D	50,8
2007	J	49
	F	31
	MR	44,24
	AP	52,2
	M	52,92
	JN	46,12
	JL	55,16
	AU	51,8
	S	39,4
	O	46,1
	N	50,67
	D	55,6
2008	J	55,36
	F	30
	MR	44,6
	AP	55,48
	M	56,8