RESPONSES TO REVIEWER 1

We thank the reviewer for the constructive comments and suggestions and respond to them below in blue type.

This paper provides essential information to the researchers in the same study field, particularly scientists interested in mass transport and water quality in an enclosed basin. The authors conducted significant field observations with respect and completed further analysis by using numerical simulations. However, there are some incoherences in the manuscript. For example, the authors mention the importance of the Coriolis effect on a gyre, but there is no detailed explanation and discussion. Also, the authors need to add more literature on a gyre in an enclosed basin.

Please see responses below.

Please see more details below. As mentioned above, this study could provide significant contributions after revising the manuscript. Therefore, I recommend a substantial revision of the manuscript.

1) Is only one meteorological station available despite the huge lake size?

In the vicinity of the lake, there are other meteorological stations (on land). The Buchillon station was chosen because it is located in the nearshore zone of the lake. Please note, however, that the data from this station are only used to confirm that the COSMO data (described in Section 2.2, with references), which include meteorological variables on a 1 km × 1 km grid over the entire lake (and surroundings), are realistic and can be relied upon for forecasting purposes and for the data analysis.

2) Why is there only one transect in the eastern area?

In this study, we focused on the center and western part of the lake because numerical results indicated stronger gyral flow fields in those areas. However, the eastern area was measured two times during the October and November campaigns. Transect T1H was not measured during the November campaign because the main objective of that campaign was to measure all three gyres within one day, and it was physically impossible to cover both horizontal and vertical transects with the single boat available to our team.

3) In the Materials and Methods, the authors need to mention more details about the field observations, such as the observation period.

The observation period was added to Table S1. The duration of each field campaign is now given in the text.

Modifications were made at L345-346, L383-384, L386-387, L399 and L427-428.

4) In lines 291 to 293, the authors mentioned, “the three-gyre pattern in the first mode is predominantly controlled by the spatial and temporal variations of wind stress”. However, there is only one meteorological station. How did the authors investigate the spatial effect of wind on a gyre?

Section 4.1.3 already addressed this comment. We did not use any meteorological station data to find the link between external forces and the three-gyre pattern; see also our response to comment 1. To investigate the spatial effect of wind on a gyre, we use meteorological parameters obtained from the validated COSMO data which covers the full lake surface with a 1-km resolution (see Section 2.2 for details on COSMO). Cosmo data are also used to drive our model.

We added L291-294 for clarification.

5) Spatially variable winds are one of the major driving forces in many lakes and bays, such as Lake Michigan [Schwab and Beletsky, JGR, 2003], Lake Kinneret [Laval et al., L&O, 2003], Lake Tahoe [Rueda et al., JGR, 2005], Lake Biwa [Shimizu et al., L&O, 2007], and Tokyo Bay [Nakayama et al., JGR, 2014]. Could you provide any information on the spatial variation of the wind in Lake Geneva? Also, please add more discussion about the effect of wind stress curl on the occurrence of surface-layer circulation.

The averaged wind field and wind stress curl during the studied events are presented in new Figure 7. This is now further discussed in Section 5.3 (L503-519). We added the suggested references to the revised manuscript

6) The authors mention, "Coriolis force plays an important role in the formation of gyres since the width of the lake is much larger than the internal Rossby radius of deformation". I agree with it. Indeed, the authors included the Coriolis effect in numerical simulations. However, there is no investigation and discussion about the Coriolis effect on a gyre. For example, in the northern hemisphere, the vertical velocity at the gyre centre is positive when the wind curl is positive. However, there is a criterion that the vertical velocity changes from negative to positive, depending on whether the Ekman pumping is dominant. Could you add more explanation about the Coriolis effect on a gyre in the Results and Discussion?

We added a new section (Section 5.5) and a new Figure 14 to the revised manuscript to address this comment.

7) In Figures 7 and 8, the arrows need to be improved as it is difficult to understand what they show.

These figures have been improved; now Figures 8 and 9 in the revised version.

8) In lines 513 to 516, the authors mention the importance of upwelling and downwelling on large lake ecological systems. Only the authors describe the upwelling phenomenon in line 415 in the Results (Figure 10). There is no detailed explanation for it.

We describe the upwelling phenomenon at the center of CG1 by providing field observations. Further discussion can be found in new Sections 5.4 and 5.5. Please note, however, investigating pelagic upwelling or downwelling induced by cyclonic/anticyclonic gyres is beyond the scope of the present study.

9) The paper includes vital information and outcomes. However, it is not easy to follow how the authors obtain the consequences. Could you restructure the study contents to let readers efficiently understand the significance of the study?

We are not sure what is meant by "consequences." The primary objective of this study is to present a new procedure based on numerical modeling results. Every effort was made to structure the paper logically by first explaining, step-by-step, the proposed procedure, as outlined in flow chart Figure 2. We then give examples of field measurements taken on different dates that were planned and successfully executed based on the model predictions of the procedure. These campaigns demonstrated the reliability and robustness of the procedure under changing stratification. We added two new sections describing Coriolis and stratification effects on gyre flow fields, and gave more information about the spatial patterns of the wind field and wind stress curl over the lake surface during the study period, as suggested by the reviewer. Please note, however, that the focus of this paper is on the procedure to detect gyre patterns, not on the physics of gyre formation.