

## ***Interactive comment on “The internal seiche field in the changing South Aral Sea (2006–2013)” by Elena Roget et al.***

### **Anonymous Referee #2**

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The authors use two datasets from the largest residual basin of the former Aral Sea coupled with numerical modeling to analyse the internal wave weather in this recently formed natural water body. The basin-scale internal oscillations are known to be the major mediator of the energy transport to the bulk of the water column in enclosed stratified basins. In this regard, the study makes an important contribution into the fundamental understanding of the vertical energy transport in large strongly stratified lakes. The reported findings are especially relevant to dynamics of extreme aquatic environments, where strong vertical stratification is created by salinity gradients. The analysis is based on observational data separated by several years, allowing to trace the changes in the internal wave dynamics caused by continuous decrease of the water level and strengthening of the density stratification. The example of the Aral Sea is both unique and extendable on other saline lakes and seas subject to dessication/temporary

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filling with freshwater/strong seasonal variations in external forcing. Taking into account the uniqueness of the recent Aral Sea development, the results reported in the study definitely deserve a wider dissemination and can eventually be published by HESS. In order to deliver the message to the target audience, the presentation style of the paper should be significantly improved.

## 1 General comments

- While not the most critical drawback, the grammar and style require improvement. The language should be checked, preferably with the help of a native speaker, to ensure correct understanding of the results by the reader.
- The structure of the results presentation and the superficial discussion are my major critical points. Jumping there and back between results from 2013 and 2006, between simulations, observations, and results of a previous unpublished study (Forcat 2013) makes it extremely difficult to follow the authors' findings and ideas. After several readings, I suggest the major result reported here is the existing of standing waves of complex forms, in particular, the "high vertical modes" as the result of the specific multilayer vertical density structure of the present Aral Sea. This result should be addressed in Discussion in a more general context:
- Reasons for the differences in the internal waves filed between 2006 and 2013 (discussed only briefly in the present paper)
- Reasons for excitement of "high vertical modes" and consequences for the basin-scale hydrological and biogeochemical regimes. (left practically unattended in the present discussion. What are specific features of the vertical density structure in the modern Aral Sea favoring the multilayer seiche modes? Do these oscillations change the transport of heat and mass in the Aral Sea, or is this only an odd

phenomenon? Even if an ultimate answer to these questions is impossible in frames of this paper, they still should be discussed in the context of the current knowledge).

- Outlook: comparison to observations from other seas/lakes. The three sentences comprising the last paragraph of the paper can be hardly considered as a serious discussion on this subject.

To make it comprehensible for the reader, the structure of the ‘Results’ section should be amended by:

- adding a subsection on the vertical density structure and external forcing in 2006 vs 2013 before the presentation of the spectral energy distribution in both years [now (3.1)]
- starting with data of 2006, or giving a reason why results of 2013 should be discussed first.
- presenting results on the 36h gravest mode from 2006 instead of referencing to a conference presentation.
- merging the subsections 3.4 and 3.5

## 2 Specific comments

### 2.1 Abstract

P1L8: ‘decreased to’ or ‘decreased by’ 3.2m?

P1L17 Remove double period

## 2.2 Introduction

P1L21 Lakes were treated as multilayer systems before Mortimer (1979), e.g. by Heaps (1961)

P2L24-25 replace 'below the inertial period. . . and larger than 3 h' with 'shorter than inertial period and longer than 3 h'

## 2.3 Materials and Methods

P3L6-7 Replace 'from 27-30' with 'on 27-30'. Add 'on' to '29 October'

P3L14 'Seahorse' – there is no such instrument. It is called 'TCM-1 tilt current meter' manufactured by 'Lowell Instruments LLC'. Provide configuration, resolution and accuracies for all instruments used in the campaign.

P3L23 Replace 'dry residue' with 'dry rest'

P4L1-2 What do you mean with 'the maximum density gradient decreases'? Clarify

P4L20 Any justification for the 5-day spin-up of the model?

P5L14 replace 'thermal' with 'temperature'

P5L14-15 Are salinity profiles available for the period of campaigns? Are they vertically homogeneous?

## 2.4 Results

P6L6 Replace 'according to' with 'in agreement with'

P6L10 Remove 'as can be observed'; replace 'accordance' with 'agreement'

P6L17 Add 's' to 'period'

P6L24 According to which simulations? Those of Forcat et al. (2013)? Present all relevant results in the paper.

P6L25-P7L1 Move the sentence to the figure legend.

P7L1-P7L2 Move the sentence to the introduction, or delete.

P7L16-17 Remove the sentence, it the figure legend repetition.

## 2.5 Conclusion

First paragraph: it is not a conclusion. Remove.

P11L3: see remark on P1L8

PL18: Explain how strong stratification can favor high vertical modes.

## 2.6 Literature

P30: replace 'Ueda' with 'Rueda'

## 2.7 Figures

Fig. 2: add minor ticks

Figs. 7, 10: explain what the horizontal and vertical straight lines mean.

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