Response to Reviewer1's comments (RC1 and SC1) about the paper: "A practical approach to lake water density from electrical conductivity and temperature"

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One might expect that, after calibration for a lake, simply measuring conductivity and temperature profiles could provide a density profile. As far as I understand, this is true only if the chemical composition does not change over the water column. Actually, eq. (2) depends on the composition of solutes...

To be exact: eq. 2 does not depend on composition; the value for lambda_0 depends on composition.

… so that, if this quantity keeps changing over the depth, as it happens in weakly mixed deep lakes, it should be recomputed for each depth on the basis, e.g., of RHOMV. Can Authors better explain this point in the Discussion?

Clearly, this numerical approach does not remove difficulties connected to chemical gradients in lakes, it only helps dealing with them. There are cases that pose big problems and some purposes will require accuracies that cannot be met with our approach. – We do not ignore this, but we claim for the majority of lakes, we provide an easily applicable density formula that improves calculation of solute density contributions by factors of typically 5 to 10 compared to usual approaches such as UNESCO or Chen & Millero. Most lakes do NOT show pronounced gradients of chemical composition.

If there is the fear that the chemical conditions change too much within one lake for uniform lambdas (e.g. presented Waldsee), then the lambdas need to be evaluated for more than one water sample. In a second step, the various sets of lambdas can be compared with each other. For most purposes and most lakes, a uniform set of lambda coefficients will be accurate enough. Probably our paper is the first that presents a critical and quantitative assessment of the application of density formulas to more than a single lake.

To deal with the effect of local variability of solute composition, we did not use the same sample for chemical evaluation and density measurement. In some cases, we used literature data for the chemical composition. Hence, the variability within one lake is included in our assessment. – The reviewer is probably right that we could emphasize this issue more in the discussion – especially, as a later

comment shows that he did not grasp this argument in the discussion. – We will include this answer in the Discussion section

List of typos:

All the corrections and suggestions mentioned in the list of typos can be dealt with as written here. There is just one comment we do not understand.

Page 2, line 33: It is a typo, the manual is Hodges and Dalimore (2007) accessed last time in 2014.

Page 3, line 26: $Si(OH)^{-4}$ has been corrected by $Si(OH)_4$

Page 4, line 24: the text "in the remaining part of this manuscript, eq(1), completed by eq(2) and eq(3), will be referenced as RHO_LAMBDA approach", has been to the manuscript added for clarity as suggested by the reviewer.

Page 5, line 14: the value has been corrected to 0.1635 mS cm^{-1} rounding the value present in Table 2.

Page 5, line 19: Here is ρ_{MV} computed according to RHOMV?

Yes, ρ_{MV} is computed using RHOMV (Boehrer et al. 2010).

Page 6, line 19: Probably in place of "our assessment section (Sect. 3)", "this section" would be better.

We have changed to "this assessment section" and we have kept "(Sect. 3)" following the author's guidelines of the Journal.

Page 6, line 21: This phrase could be improved, such as "an alternative approach to compute density, in order to check the accuracy of ρλ".

It has been changed to "a specifically obtained approach to density (e.g., Mono Lake or seawater) to check the accuracy of ρ_λ in general", we hope it is more clear now.

Page 7, line 3-5: "Hence..." Could you kindly explain better?

The comment refers to this sentence: "On purpose, we obtained the chemical composition from a different source (sample) than the density measurement. Hence the error of variable water composition within one lake was included in our

assessment."
We can try to find a better formulation, but we hope that the content is clear: as above mentioned by Reviewer #1, local variabilities of solute composition will result in different lambda values, and hence to inaccurate density calculation. How big this effect is, is incorporated in the assessment, when density measurements and chemical composition are from different samples. In conclusion, the assessment of our lambda method is properly done including all sources of error such as local variability or inaccuracies of chemical analysis.

Page 9, line 11: "most of other of the approaches" corrected to "most of the other approaches"

Page 15, line 24: in this reference Rinke K appears twice. Is it correct?

Yes, there are two authors Rinke K, one is Karsten Rinke and the other one is Kristine Rinke.

I think that tables and Figures must be improved. The editing of lines in Table 1 and 2 must be definitely improved.

Why do not add the DOC in table 1 ?

We will include DOC in the table 1 in the updated version of the manuscript.

As far as Table 2 is concerned, this table is difficult to read due to an improper managing of spacing between lines. Please improve it.

We have corrected the formatting of Table 2 (specially the spacing between lines) to improve readability and included in the text the specific references to Figure 1b.

As far as Figures are concerned, the Reference line in Figure 1 is useless and could be deleted. Morover nowhere appears reference to Figure 1b.

We changed the axis labels to black in all figures. We hope this fulfills the requirements for improved Figure layout. The Reference line is a guide for the eye to give the reader a clear orientation of the zero line. Hence we retain it.

NOTE: All the corrections concerning the text previously mentioned will be included in the final version of the manuscript.