Reply on Comments of Anonymous Referee #2

We thank anonymous referee 2 for her/his detailed comments and constructive recommendations to improve the manuscript. We are pleased to read that, according to the reviewer, the paper is a valuable contribution with an impressive set of data.

The suggestion to reorganize the structure (especially comment 1, 7), and other recommendations to enhance explanations (comment 2,3,8,9,10) are considered in the revised manuscript. Below each comment is addressed in detail. Our response is in blue letters.

Changes in the manuscript, compared to the initial submission, are highlighted in yellow colour.

Comment 1: The problem of lake sediment layering should be already discussed in the introduction together with the characteristic profile that is now shown in the results section. This was already established in Kogelbauer et al. (2013) and it would help readers who are not familiar with lake sediment layering to understand better the scope of the study. Also the lutocline and the different characteristic contents and PR values should be explained in the introduction. In the results section, we can then see how the different layers and lutoclines are in the different sites and ecotypes.

We want to find a compromise of both reviewers and will implement much of the recommendations in the abstract and the introduction.
Revised as follows: It enabled the layer delineation of water-mud-consolidated lakebed sediment due to the striking differences in the interface characteristics. The water-mud interface is delineated by a distinct decrease in the water content determined by the capacitive sensor (Hydra Probe), equivalent to a lutocline. The lutocline is defined as a high density gradient at the interface between clear water on top and the mud suspension underneath (Wolanski et al., 1989). Further the interface mud-consolidated lakebed sediment is delineated at significant penetration resistance measured with the cone penetrometer.

Comment 2: It could also be mentioned that Neusiedler See area is actually a national park.

Indeed, it should be added in the introduction of the study site as the results might be of interest for the national park management. We mentioned this aspect in the revised manuscript.
Revised as follows: The lake is part of the national park "Neusiedler See – Seewinkel" and as such very sensitive to human interventions.

Comment 3: It should be better explained what the ecological relevance of the different sediment layers is. Is there even a special interest from the National Park Managers?

Explanations were implemented in the revised manuscript as follows:
The management of a shallow lake, that is specifically prone to dynamics of extensive sedimentation, relay on extensive research on sediment layering within ecotopes. The investigation of the layer composition and the water depth are of ecological relevance for e.g. the shoreline as vegetation-water-interaction zones. Siltation at the shoreline enables the expansion of reed growth. Moreover it affects the structure and vitality of littoral vegetation like the reed (Csaplovics et al., 1996). The sediment layer compositions are not uniformly

Comment 4: Fig 1 shows an impressive amount of measurements points. Can you please indicate how many sites have actually been measured?

It was added in the revised version, for further details see comment from review 1.

Comment 5: Compared to the large number of measurement sites, we see only few results. Are the results part of a digital map and could this be shown here?

The measurement points are going to be part of a high resolution digital elevation model (DEM) also integrating echo sounding data. The establishment of the DEM is a shared task of all project partners and will be part of our common project output.

Comment 6: Fig 6 shows "representative" CSPS profiles. I am wondering whether there is spatial variation between and within ecotypes? If yes, can you explain part of this variation? E.g. from Fig. 6 A,B it appears that the layering of open water sites can be quite different.

Some additional explanations were implemented; however variations within the ecotopes and across the ecotopes show Table 3 and Figure 5. For the mud interface Table 3 gives the average and the standard deviation of the determined water content θ. Figure 5 compares the characteristic shapes of the penetration resistance PR function of the ecotopes. Accompanying explanations are given in Chapter 3.6 "Ecotope specific characteristics of the CSPS profiles".
In Fig. 6A and B the most striking differences between CSPS profiles occurring at the open water are shown. The obtained water content θ profiles at the open water vary less in shape; but show either a distinct or a rather small mud layer. The penetration resistance PR curves at the open water mainly perform as shown in Fig 5 A and B, indicating either a less consolidated or a highly consolidated bedsediment at variable depth.

Comment 7: In the abstract, it is mentioned that a complementary tool to bridge the gap : : : is still missing.
However, I understood that this method has now been published by Kogelbauer et al. (2013) and is thus no longer missing; however now applied to the full area of Neusiedler See. In this case, I suggest to consider starting the Introduction with the description of Neusiedler See and why information on sediment layer composition is needed there.

We considered the comment in the revised version of the abstract as follows:
Recently, a complementary tool that bridges the gap between land- and hydrographic surveying methods was introduced.

Comment 8: I found the description of the data acquisition tool hard to follow. What is TM N 33/WGS 84? What is a force cell? What is meant by "the large negative values were limited to zero occurring? What is the base offset voltage? The last sentence of section 2.3 could be rephrased.

The explanation was improved according to the suggestions and was put in a more straight forward manner. In this paper the technical description is based on

Kogelbauer et al. (2013), only further adaptations and improvements done are described.

Comment 9: Please define PR0.2.

A definition was added at P10, line 15 as follows: Almost concurrently the penetrometer starts registering the incipient penetration resistance PR_x and increases until the first significant peak $PR_{1st\ peak}$, which is then accompanied by an abrupt change in slope. The penetration resistance $PR_{0.2}$ at 0.2 MPa, is an empirically set value where the layer detection algorithm starts. The HP and CP measurements overlap in height at θ_{HPend} and $PR_{0.2}$ (see 3.4).

Comment 10: P 12, L 21: : : :results from the particle size analysis are shown within the Austrian soil texture triangle (Fig. 4): : :

It was rephrased according to the comment.