We greatly appreciate the thoughtful comments of Dr. Huwald. Below are our responses to his comments. Note that the Referee's comments were **bolded** and our responses maintained the regular font format.

The paper presents a very thorough application of a distributed temperature sensing (DTS) system in a shallow thermohaline environment with the goal of assessing its practical use in solar pond systems. The authors adequately address many problems and questions (calibration, resolution, repeatability, time constants, etc.) relevant for the use of DTS in environmental applications. To obtain a vertical high-resolution sensor, the authors select a novel innovative design (wrapped pipe) which has only very recently been tested used in natural environments (e.g. lake, snow, saturated sediment). Excellent calibration results were achieved with a rigorous approach and design to independently determine three calibration parameters which provided better results than using the instrument manufacturer's native calibration procedure (two parameter calibration). The article is technical in nature and strongly methods-oriented but also provides new information which will be very useful and valuable for anybody using DTS for environmental measurements. In addition, the paper convincingly describes and quantifies physical, thermal and mechanical processes in a thermohaline system which acts as a laboratory model of existing or future larger-scale open-air solar ponds. Overall, the paper is well organized and written, and provides original information which is presented in a clear and concise manner (figures included). The paper should certainly be published. Below are some minor comments and questions which the authors might want to address. My apologies for a slightly delayed review.

Specific comments:

1. p.33, lines 10-11: Please give a number for "highly concentrated brine"? Also, the paper does not give a lot of quantitative information about the salinity in the thermohaline system (20% NaCl at the bottom). On p.39, lines 15-17: What is the decrement in salinity? I think it would be useful to include and discuss this information and perhaps include a salinity profile in one of the figures.

Typically, the salinity in the lower convective zone of solar ponds is in the range between 15% and 25% (in weight). We realize that we were not clear describing the construction of the salinity gradient, thus, we have revised the manuscript in the following way:

"The lower 50 cm of the solar pond (i.e., the lower convective zone) were filled with a 20 wt% sodium chloride (NaCl) solution. Then, eight layers of successively lower concentrations were added up to an elevation of 90 cm measured from the bottom of the solar pond (i.e., the non-convective zone). Each layer had a NaCl concentration that was 2.2% lower than that of the previous layer. The final layer (i.e., the upper convective zone) was filled with tap water. The average water level in the solar pond was 101 cm (measured from the bottom), but the actual level varied from 98 to 103 cm due to evaporation and freshwater resupply."

2. p.35, lines 4-5: How do you know that the heat shrink reduces radiative heating? It adds some inertia to the system and changes the response time.

The white heat shrink is likely to reduce radiative heating compared to the blue plastic jacket tube of the fiber-optic cable that we used. For clarity, we have modified the manuscript in the following way:

"The cable was secured to the pipe using a white heat-shrink plastic, which is likely to reduce radiative heating."

Also, Dr. Huwald is correct that this additional element adds some thermal inertia to the DTS pole. This is why it is important to evaluate the temporal resolution of the system (as presented in the manuscript).

3. p.39, lines 1-6: Include the range of wavelengths for the lamps. What were net radiation and reflected shortwave radiation measurements used for?

The range of wavelengths for the lamps is between 350 and 900 nm. We have modified the manuscript in the following way:

"To mimic the sunlight spectrum, three high-intensity-discharge lamps were installed over the pond. Each lamp consists of a 1000-W dual arc tube with two simultaneously operating arc tubes of metal halide and high pressure sodium with a wavelength range between 350 and 900 nm."

In this investigation, radiation (net longwave and net shortwave) measurements were only used to compare our conditions with natural solar conditions. We also used these measurements to close the energy balance inside of the solar pond (Tyler et al., 2009) and to drive a numerical model previously developed (Suarez et al., 2010). However, these last objectives are out of the scope of this manuscript.

4. p.39, lines 18-22: Was the effect of thermal expansion measurable?

In these experiments the effect of thermal expansion was not measurable.

5. p.39, line 28ff: From Fig.1a it seems that the radiation shield has an L-profile. Is that really the case or was it square? If it has an L-profile, the DTS pipe would get some radiation from one/tow sides. Please clarify or modify the figure. Also, I assume the shielding experiment was performed at the end of the study. How much does the installation and removal of the radiation shield disturb the thermohaline stratification (and thus temperature) in the pond?

It is correct that the radiation shield had an L-profile. We realized that we needed the radiation shield in the middle of our experiment. For this reason, our design of the shield had two main objectives: (1) provide shade to the DTS pole, and (2) be easy to install. Given the location of the DTS pole and the location of the artificial lights, our shield was able to stop direct radiation from the lights. The sides of the DTS pole that were not covered did not receive direct radiation because they faced the sidewalls of the pond (this was assessed by visual inspection). Recently, we have improved this shield using a 4-inch pipe with holes that covers all the sides of the DTS pole (however, this was not done in the experiments presented in this manuscript). The installation and removal of the shield produced small disturbances in the pond. These disturbances were not observed in the thermal profile measured using the DTS system. By visual inspection, we were able to see that weak mixing occurred during the installation of the shield, but because of the strong salinity gradient this mixing stopped in less than 2 minutes and it did not have any measurable effect over the temperature profile.

6. p.42, lines 6-7: Why does the instrument spatial resolution depend on connectors, testing method and cable layout?

We incorrectly stated that spatial resolution depended on connectors, testing methodology and cable layout. What we meant to say is that temperature resolution is dependent on the previous factors (not spatial resolution). These factors can have an impact on signal strength and thus, an impact on temperature resolution. We have removed that misleading information and we apologize for this confusion.

7. p.47, lines 4-5: Why do you expect a curvature of the temperature profile in the air? Significant extinction of solar radiation occurs in water or snow; in the air it will have no effect over the delta_z considered here.

Dr. Huwald is correct that no (or minimal) extinction of solar radiation should occur in air, and this is why we observed the linear temperature profile when we shaded the DTS pole. When the DTS pole was not shaded, we observed a curvature in the air temperature profile that was due to the absorption of energy in the DTS pole (that varies vertically along the pond), as described in the manuscript.

8. p.47, line 11: is 243W/m2 the net radiation? Please specify.

The daily average radiation level of 243 W m^{-2} corresponds to net radiation. We now have specified this in the final version of the manuscript:

"Radiative heating of the DTS pole, for the radiation levels tested here (net radiation of 243 W m^{-2} at the water surface – limited by the intensity of the artificial lights)…"

9. p.58, Fig.6b: Why is there much more noise in section of the lower convective part of the profiles compared to the profiles in Fig.5?

The noise in the lower convective zone occurred because these measurements were performed using a 10-seconds integration-time interval to be able to capture potential fast changes in the thermohaline environment when the DTS pole was shaded (as opposed to the 5-min integration time used elsewhere in the manuscript). We apologize because we did not include this important information in the methods section. We have modified the caption of Figure 6 to include this information:

"Figure 6. Assessment of radiative heating of the DTS pole. (a) Thermal evolution at different depths in the water column and in the air. (b) Temperature profile measured with the DTS system at different times of the experiment. These measurements were obtained using a 10-seconds integration-time interval and using the manufacturer-internal calibration method."

In the methods section, we have also specified the integration time of the measurements:

"…Then, the pond was typically exposed to the artificial lights 12 hours per day (from 6:00 a.m. to 6:00 p.m. with the exception of the first day that was from 9:00 a.m. to 6:00 p.m.) and its thermal response was monitored using 5 min integration-time intervals.

In a separate investigation to assess the impact of radiative heating on the DTS pole, the lights over the pond were operated continuously. When the solar pond was close to thermal steady state, the DTS pole was shaded using a white expanded-foam PVC shield (Figure 1a). Holes were made in the shield to allow air (above the water surface) and water to move across it. The DTS pole was covered for approximately 60 min until a new steady state was reached. After this, the DTS pole was uncovered and temperatures were recorded using 10 s integration-time intervals until the initial value was reached."

Minor comments and edits:

1. p.30, line 25: what is "diel cycles"?

Diel cycles are diurnal cycles. We realized that diurnal cycles are a better term to use in this case and we have changed this in the final version of the manuscript.

2. p.35, line 2: ": : :plastic jacket tube filled with: : :".

Thanks, we have corrected this.

3. p.35, line 13: Add the word "Instrument" after "DTS".

Corrected

4. p.39 line 23: I would add in parenthesis "from 9am to 9pm" after "12h per day" to help the reader to put the times shown in Figs. 2 and 5 into context.

We have clarified the times of light exposure over the pond. The manuscript has been modified in the following way:

Then, the pond was typically exposed to the artificial lights 12 hours per day (from 6:00 a.m. to 6:00 p.m. with the exception of the first day that was from 9:00 a.m. to 6:00 p.m.) and its thermal response was monitored using 5 min integration-time intervals.

5. p.39, line 28: ": : :in the shield to allow air (above the water surface) and water: : :".

Corrected.

6. p.40, line 20: Replace "same" with "equal".

Corrected.

7. p.48, line 2: What systems? Be a bit more specific.

We apologize for being so general. We meant to say: "…changes in natural and managed aquatic systems". We have corrected this in the revised version of the manuscript.

Finally, we want to thank Dr. Huwald and we do appreciate his thoughtful comments.

References

Suarez, F., Tyler, S.W., Childress, A.E. 2010. *A fully coupled, transient double-diffusive convective model for salt-gradient solar ponds*. Int. J. Heat Mass Trans. 53: 1718-1730.

Tyler, S.W., Hausner, M.B., Suarez, F., Selker, J.S. 2009. *Closing the energy budget: Advances in assessing heat fluxes into shallow lakes and ponds*. EOS Trans. AGU, 90(52) (Fall Meet. Suppl.), Abstract H44B-03