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Hydrology and Earth System Sciences Discussions

Interactive comment on "Assessment of a vertical high-resolution distributed-temperature-sensing system in a shallow thermohaline environment" *by* F. Suárez et al.

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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.

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

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?

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

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

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.

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

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?

Minor comments and edits:

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

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

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

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.

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

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

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

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 29, 2011.