Response to Reviews of Manuscript gi-2014-16

by Ziru Liu, Chad Higgins

December 29, 2014

Reviewers' comments are in *italics*, our responses are in roman.

Reviewer's Comments

In this paper the temperature effect on fine-scale water level measurement was analyzed in labor and in field as well. The results showed high sensitivity of sensors for temperature especially under field conditions. The change of the temperature and the absolute temperature were also related to errors. It is also interesting to note that sensors from the same manufacturers have different response to temperature, therefore a special performance test is needed for each of the sensors if they are used in a not tempered environment.

Minor problems: page 4, 2.1, 5, What does it mean the abbreviation CTD? page 4, 2.1, 10, What can be the situation when the cable length is significantly shorter than 10m? (because for surface water measurements this is the general case)? page 5, 2.2, 8, 30 or 40 cm (on page 13) What is the depth of burial? page 5, 2.2, 17, Where is located the EM50 datalogger? page 10, equation (14) to my mind L2 is miss from the upper part of the division. page 14, 4, 1mm change to 1mm/day page 21 - Figure 2 and page 25 - Figure 6, The scale of water level vertical axis of the graph would be better 150-250.

Response: The authors would like to thank the reviewer for providing us with feedbacks for this manuscript. A point to point response is below:

1. It is also interesting to note that sensors from the same manufacturers have different response to temperature, therefore a special performance test is needed for each of the sensors if they are used in a not tempered environment.

Response: The observation of different responses to temperature among sensors from the same brand is likely caused by the differences in strain gauge components inside the sensors. The seller may purchased strain gauge from another manufacturer to build their sensor. Thus different batches or if the strain gauge has a poor thermal compensation calibration can cause the variation in responding to temperature change in our test. Even all the sensors are from the same brand, we still suggest testing them individually to see if they all perform the same way. And if not, calibrations may be needed for each of them.

2. page 4, 2.1, 5, What does it mean the abbreviation CTD?

Response: The "CTD" stands for conductivity, temperature, and depth. This sensor measures these three values at the same time. This is explained in the following text:"All three CTD sensors measure conductivity, temperature, and water level at the same time."

3. page 4, 2.1, 10, What can be the situation when the cable length is significantly shorter than 10m? (because for surface water measurements this is the general case)?

Response: The cable length can be customized according to the experimental need. For this brand, the cable length can be from 5 meters to about 1000 meters. In general 10 m is a decent length if we consider the length it needs to cover during installation, especially if the logger is not very close to where the sensor is. According to equation 14, ΔP is proportional to the square of the cable length L^2, so for shorter cable length, the error term due to the thermal gradient will be smaller. For a cable with a length of few kilometers, the thermal expansion of air inside the venting tube can cause relatively greater pressure change per temperature gradient.

4. page 5, 2.2, 8, 30 or 40 cm (on page 13) What is the depth of burial?

Response: The burial depth is around 30 cm as stated in page 5, line 8. And it depends on the specific site condition such as slope and the size of the monitoring plot. The one at Alsea site in figure 7 has a burial depth at around 40 cm.

5. page 5, 2.2, 17, Where is located the EM50 datalogger?

Response: The datalogger was installed within few meters from where the CTD sensor is installed. We also installed soil moisture sensors and a rain gauge for the monitoring site so the datalogger was places where all the sensors can reach. The exact location differs for different sites. Figure 1 shows a general idea about how the datalogger is placed.

6. page 10, equation (14) to my mind L2 is miss from the upper part of the division.

Response: Indeed the L^2 is missing here. We didn't notice this during proof reading. Thanks for pointing it out.

7. page 14, 4, 1mm change to 1mm/day

Response: We followed the reviewer's suggestion here to change 1mm to 1mm/day.

8. page 21 - Figure 2 and page 25 - Figure 6, The scale of water level vertical axis of the graph would be better 150-250.

Response: We modified figure 2 and figure 6 as the reviewer suggested. Please see Figure 2 and Figure 3 here.

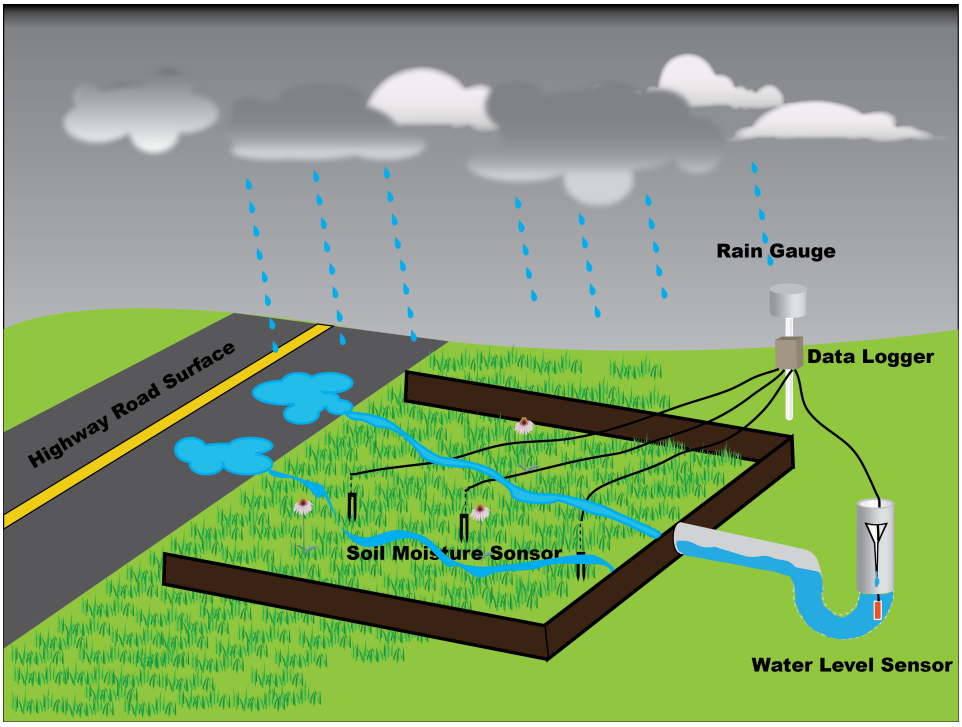

Figure 1: Schematic of field installation.

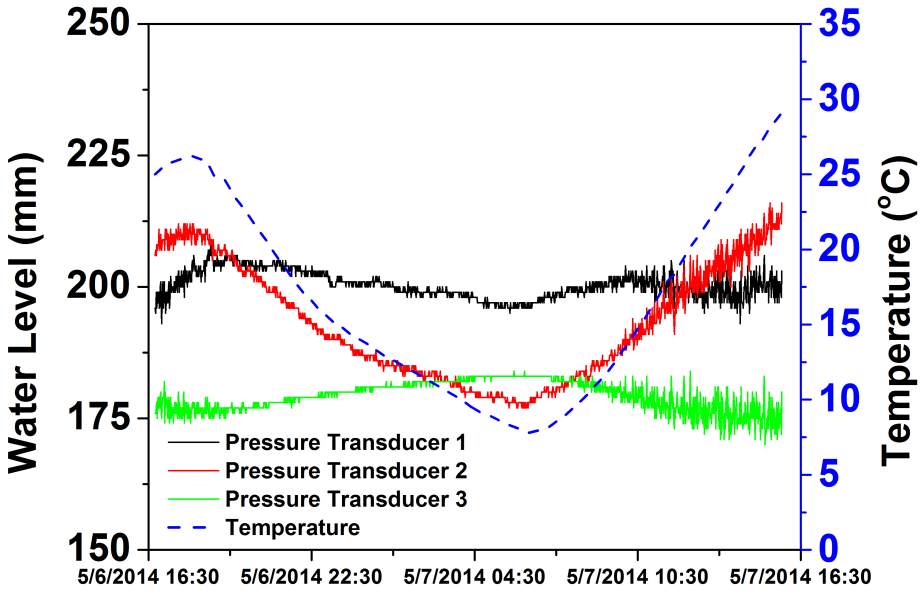

Figure 2: Figure 2 with new left Y axis.

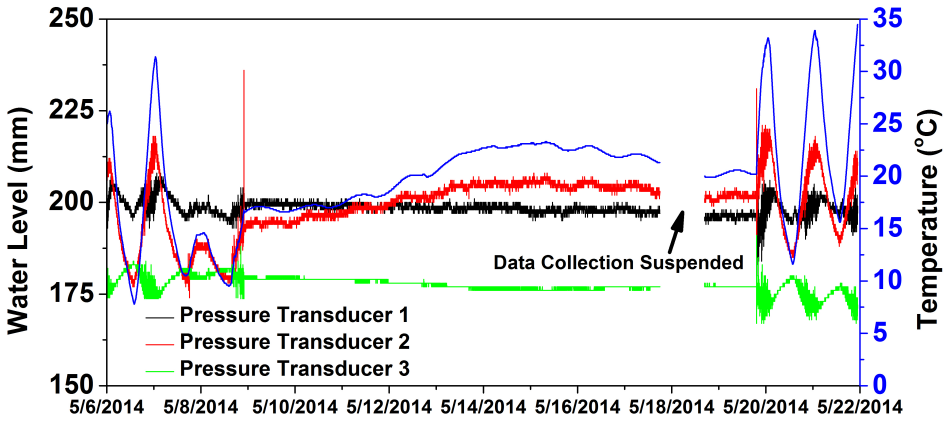

Figure 3: Figure 6 with new left Y axis.