Hydrol. Earth Syst. Sci. Discuss., 8, C5107–C5109, 2011
www.hydrol-earth-syst-sci-discuss.net/8/C5107/2011/

Hydrology and Earth System Sciences Discussions

Interactive comment on "Technical Note: How image processing facilitates the Rising Bubble Technique for discharge measurement" *by* K. P. Hilgersom and W. M. J. Luxemburg

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Received and published: 29 November 2011

We would like to thank the editor for his suggestions to improve the paper. The method is for sure very useful to set up a rating curve for moderate streams and inclusion of a rating curve for the situation in the lock near Zoutkamp would help convincing the reader of this. However, the specific study site is located at the inflow into a lake with a controlled water level and where the water level is subject to significant wind effects. For this reason, a rating curve for this specific site would not be of any value and would not help convincing the reader. We did compare the results of the Rising Bubble Technique

and the acoustic measurements for varying discharges. Of course, the editor could not have known about the unsuitability of a rating curve from our description of the study site in our manuscript.

The main focus of this paper is showing the value of image processing for the Rising Bubble Technique. We show this for applications under various conditions in both a lock and a natural river. Although we may not have presented this clearly, the method proved itself accurate in both the applications and effects of for example shadow are considered. Of course, we could do measurements for a wider range of situations, but our current results can lead to an estimation of the applicability of the method for various situations, like we have listed in Table 1. Note that this table focuses on the *applicability* of the technique and does not focus on whether the method can be *preferable* in this situation (currently, we regard the method not preferable in rivers of more than 30 meters in width and in rivers with a depth less than 25 centimeters). Like we argued in our reply to referee #1, aspects like the availability of money and time and the demanded accuracy determine whether a method is preferable.

We will add the table to our final manuscript and state more explicitly our findings about how sunlight influences the results.

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Table 1. Applicability of the Rising Bubble Technique for various situations (situations in *italics* were actually applied)

SITUATION	APPLICABILITY
Low-order streams (depth: < 25 centimeters)	Inaccurate method, since the low depth causes the horizontal displacement at the surface to be small
Small rivers (width: 2 - 15 meters, depth: > 25 centimeters)	Accurate method, pictures can be taken from one bank with a normal resolution
Rivers (width: 15 - 30 meters)	Accurate method when pictures are taken with a higher resolution than that of a commercial camera or from above the stream (from a bridge, or if the river is wadeable using equipment in the river)
Rivers (width: > 30 meters)	Accurate method when taking pictures at several points along the cross-section
Canals / structures (artificial cross-section)	Accurate method (subject to the same considerations of depth and width as in the above)

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