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Advances in the Rising Bubble Technique for discharge measurement

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Already in the 19th century, d'Auria described a discharge measurement technique that applies floats to find the depth-integrated velocity (d'Auria, 1882). The basis of this technique was that the horizontal distance that the float travels on its way to the surface is the image of the integrated velocity profile over depth. Viol and Semenov (1964) improved this method by using air bubbles as floats, but still distances were measured manually until Sargent (1981) introduced a technique that could derive the distances from two photographs simultaneously taken from each side of the river bank. Recently, modern image processing techniques proved to further improve the applicability of the method (Hilgersom and Luxemburg, 2012).

In the 2012 article, controlling and determining the rising velocity of an air bubble still appeared a major challenge for the application of this method. Ever since, laboratory experiments with different nozzle and tube sizes lead to advances in our self-made equipment enabling us to produce individual air bubbles with a more constant rising velocity.

Also, we introduced an underwater camera to on-site determine the rising velocity, which is dependent on the water temperature and contamination, and therefore is site-specific. Camera measurements of the rising velocity proved successful in a laboratory and field setting, although some improvements to the setup are necessary to capture the air bubbles also at depths where little daylight penetrates.

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