



Sampling bacteria with a laser

Kordula Schwarzwälder and Peter Rutschmann

Chair of Hydraulic research and water resources engineering, Technische Universität München, München, Germany
(schwarzwaelder@tum.de)

Water quality is a topic of high interest and it's getting more and more important due to climate change and the implementation of European Water Framework Directive (WFD). One point of interest here is the inflow of bacteria into a river caused by combined sewer overflows which lead untreated wastewater including bacteria directly into a river. These bacteria remain in the river for a certain time, they settle down and can be remobilised again.

In our study we want to investigate these processes of sedimentation and resuspension and use the results for the development of a software module coupled with the software Flow3D. Thereby we should be able to simulate and therefore predict the water quality influenced by combined sewer overflows.

Hence we need to get information about the bacteria transport and fate. We need to know about the size of the bacteria or of the bacteria clumps and the size of the particles the bacteria are attached to. The agglomerates lead to different characteristics and velocities of settlement. The timespan during this bacteria can be detected in the bulk phase depends on many factors like the intensity of UV light, turbidity of the water, the temperature of the water, if there are grazers and a lot more. The size, density and composition of the agglomerates is just a part of all these influencing factors, but it is extremely difficult to differ between the other effects if we have no information about the simple sedimentation in default of these basic information. However we have a big problem getting the data. The chaining between bacteria or bacteria and particles is not too strong, so filtering the water to get a sieving curve may destroy these connections.

We did some experiments similar to PIV (particle image velocimetry) measurements and evaluated the pictures with a macro written for the software ImageJ. Doing so we were able to get the concentration of bacteria in the water and collect information about the size of the bacteria. We also compared these data to samples of usual collection and filtering. The results of these laser measurements are very promising.