



Evaluation of suspended sediment concentrations in a hydropower reservoir by using a Laser In-Situ Scattering and Transmissometry instrument

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Sediment transported by rivers start to settle when they enter a reservoir due to reduced flow velocities and turbulences. Reservoir sedimentation is a common problem today and eliminates about 1% of the worldwide existing storage capacity annually. However, depending on the climate conditions and the geology in the catchment area this value can increase up to 5% and higher. Among the results of reservoir deposition is the loss of the storage capacity, a loss of flood control benefits or even blockage of intakes due to sediment accumulation in front of the structure. As a consequence, management tasks have to be planned and conducted to guarantee a safe and economical reservoir operation. A major part of the sediment particles entering the reservoir is transported as suspended sediment load. Hence, accurate knowledge of the transport processes of these particles in the reservoir is advantageous for planning and predicting a sustainable reservoir operation. Of special interest is the spatial distribution of the grain sizes in the reservoir, for example, which grain sizes can be expected to enter the waterway and have a major contribution in turbine abrasion.

The suspended sediment concentrations and the grain size distribution along the Sandillal reservoir in Costa Rica were measured in this study by using a Laser In-Situ Scattering and Transmissometry instrument (LISST-SL). The instrument measures sediment concentrations as well as the grain size distributions instantaneously (32 grain sizes in the range between 2.1 and 350 μm) with a frequency of 0.5 Hertz. The measurements were applied at different pre-specified transects along the reservoir, in order to assess the spatial distribution of the suspended sediment concentrations. The measurements were performed in vertical lines, at different depths and for a period of 60 seconds. Additionally, the mean grain size distribution was calculated from the data for each measured point.

The measurements showed that the suspended sediment concentrations were low during the field campaign. However, they gave insight of the spatial distribution of the suspended sediments along the reservoir and at different depths. The measurements in front of the intake were especially interesting, since the concentration and the sizes of the particles, which will furthermore enter the intake, could be evaluated.