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Presenting the master of all conductivity meters, and how it tastes streamflow

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For measuring streamflow in small Alpine streams, the salt dilution method is suitable and often used. By injecting a known mass of salt in the stream and measuring the downstream salt concentration as a function of time, we can obtain the streamflow by integration of the time signal. The underlying assumption is that the salt is well mixed within the stream cross-section. In this method, the salt concentration us usually measured through its relation with conductivity.

Several commercial systems exist to do these conductivity measurements and automatically process the results. The problem we encountered when using these systems, however, is that uncertainty is often hidden under the hood. Because the processing happens onboard, researchers may be tempted to put too much trust in the final measurement outcomes. This is somewhat remediated by using a system with two probes which are individually processed to a streamflow outcome. We found that the salt-wave was differently shaped for the faster part of the stream compared to the sides, and therefore gave different readings for the discharge. To come a more probabilistic characterization of streamflow, and to know what is under the hood, we decided to build our own conductivity meter, equipped with eight probes covering the cross section. This enables quantifying some of the uncertainty in the streamflow measurements, which is important for testing hydrological models. This poster shows the first results and the hardware setup.

We based our hardware on the open source hardware platform Arduino, and believe that by sharing both the design and the drawbacks, we contribute to the evolution of better measurement equipment or at least better understanding of its shortcomings.