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Monitoring an ephemeral stream with a Teensy 3.2 + audio shield to determine water level only from the noise of a stream

Linus Fässler[1], **Natalie Ceperley**[2], Peter Leiser[1], and Bettina Schaefli[2]
[1]University of Bern, Physical Geography, Hydrology, Switzerland (linus.faessler@giub.unibe.ch)
[2]Institute of Geography (GIUB) and Oeschger Center of Climate Change Research (OCCR), University of Bern, Bern, Switzerland

River networks in the Alps are very complex and hold many unanswered research questions. For example, various assumptions must be made to when studying tributaries and small rivers. Namely, there is not a widely accepted tool to measure streamflow in small, mountain streams that can overcome their specific challenges affordably without large installations. For example, alteration between extremely high and no discharge volume is characteristic of intermittent rivers and ephemeral streams (IRES). Conventional measuring devices all require streambed installation, which exposes them to displacement or destruction by abruptly rising water levels. One solution, thus, is to remove the sensor from the streambed and measure from a distance. We have experimented with an acoustic sound recorder mounted above the stream as an alternative tool to assess water level. We designed a low-cost audio sensor powered by a microcontroller with an audio shield specifically for recording IRES. To ensure reproducibility, we used Arduino for programming the Teensy 3.2. Images of the water level in an IRES were simultaneously captured when possible (daylight) and used for calibration. The water level visible in the images correlated well with that determined from the audio recordings from our self-developed audio sensor (R^2 = 95%). Based exclusively on the audio recording of an IRES, we can obtain a time series of the water level, at least when water was present. We are currently unable to determine consistently whether water is present nor state with certainty when the streambed is dry based solely on acoustic data. Nevertheless, this new sensor allows us to measure an alpine channel network at more locations and over longer time periods than previously feasible.