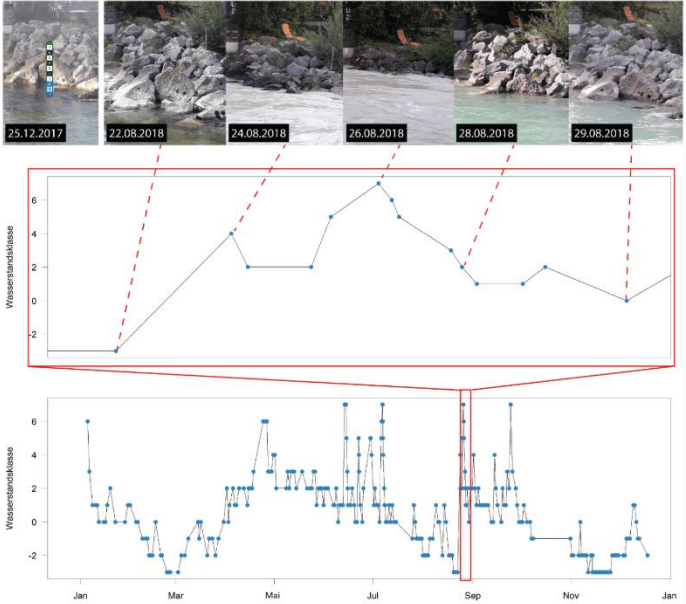|	
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Titel:	**Water level estimation from time series of crowd-sourced images**
Project description:	This **Master thesis project** is a collaboration of the **University of Zurich and ETH Zurich**. Hydrological observations are crucial for decision making for a wide range of water resource challenges. Citizen science is a potentially useful approach to complement existing observation networks to obtain this data. The CrowdWater project (www.crowdwater.ch) aims at engaging the public in contributing hydrological observations such as stream level data using a smartphone app. Opposite to previous projects, which been based on the use of an installed staff gauge, here we use a virtual staff gauge. The smartphone app allows collection of stream level information at any place without any physical installation. This approach is similar to geocaching, with the difference that instead of finding treasure-hunting sites, hydrological measurement sites can be generated by anyone and at any location and these sites can be found by the initiator or other citizen scientists to take measurements at another time. The app is based on the virtual staff gauge approach, where a picture of a staff gauge is digitally inserted into a photo of a stream bank or a bridge pillar, and the stream level during a subsequent field visit to that site is compared to the staff gauge on the first picture. The participant uses the existing picture with the staff gauge to estimate the current water level. In addition, the participant is encouraged to take a new picture. For quality control, a game has been implemented (https://crowdwater.ch/en/crowdwater-game/), where participants estimate the water level classes based on two pictures (one including a virtual staff gauge). So far, about a year and a half after the launch of the smartphone app, 252 users have submitted 2740 observations, and for 108 of the 731 measuring points, more than five values were submitted (as of 8. October 2018). This means that we have an interesting data set of photos with time series of water levels and for each photo two level class estimates, one from the original observer and one from the participants of the game. The goal of this **master thesis project** is to use this data set to implement and evaluate a machine learning/deep learning approach to estimate the stream level class based on an automated analysis of the photos. Potentially this could also be used to derive a higher resolution of stream level classes (e.g., half or quarter classes).
Required skills:	Programming: Python (or C++, C, Java and motivation to learn Python) Education: computer science, machine learning, geomatics, computational geography, remote sensing, computer vision