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Opportunistic sensing in hydrology

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Traditionally hydrologists rely on dedicated measurement equipment to do their business (e.g. rainfall-runoff modeling). Such instruments are typically owned and operated by government agencies and regional or local authorities. Installed and maintained according to (inter)national standards, they offer accurate and reliable information about the state of and fluxes in the hydrological systems we study as scientists or manage as operational agencies. Such standard instruments are often further developments of novel measurement techniques developed in the research community and tested during dedicated field campaigns.

One drawback of the operational measurement networks available to the hydrological community today is that they often lack the required spatial and/or temporal resolution for high-resolution real-time monitoring or short-term forecasting of rapidly responding hydrological systems (e.g. urban areas). Another drawback is that such networks are often costly to install and maintain, which makes it a challenge for nations in the developing world to operate them on a continuous basis.

Yet, our world is nowadays full of sensors, often related to the rapid development in wireless communication networks we have witnessed in the recent past. Let's try to make use of such opportunistic sensors to do our (hydrologic) science and our (water management) operations! They may not be as accurate or reliable as the dedicated measurement equipment we are used to working with, let alone meet official international standards, but they typically come in large numbers and are accessible online. Hence, in combination with smart retrieval algorithms and statistical treatment, they may provide a valuable complementary source of information on the state of our environment.

The presentation will focus on some recent examples of opportunistic sensing techniques in hydrology, from rainfall monitoring using microwave links from cellular communication networks, via crowdsourcing urban air temperatures using smartphone battery temperatures to high-resolution urban rainfall monitoring using hobby meteorological stations.