EGU21-12426
https://doi.org/10.5194/egusphere-egu21-12426
EGU General Assembly 2021

A low-cost wireless sensor network for citizen science water quality monitoring

Elena von Benzon[1], Elizabeth Bagshaw[1], Michael Prior-Jones[1], Isaac Sobey[2], Rupert Perkins[1], and Simon Browning[3]

[1]Cardiff University, Earth and Environmental Sciences, Cardiff, United Kingdom
[2]University of Bristol, Faculty of Engineering, Bristol, United Kingdom
[3]Westcountry Rivers Trust, Plymouth, United Kingdom

We present the first trial of an accurate, low-cost wireless sensor, the 'Hydrobean', and base station designed for use by citizen scientists in catchment water quality monitoring. This novel wireless sensor network addresses key concerns identified with current volunteer monitoring programmes, including temporal discontinuity and insufficient data quality. Hydrobean continuously measures electrical conductivity, temperature and pressure and wirelessly transmits these data to an online portal for observation and download by users. These parameters can be used to assess catchment water quality status, with excursions from baseline conditions detected in real time at high temporal resolution. Citizen scientists have an increasingly important role to play in enhancing our scientific understanding of catchment water quality, but their contribution has so far been limited by barriers to access suitable monitoring equipment. Traditional grab sampling techniques result in key contamination incidents being missed and trend analysis limited as samples are analysed discretely, typically on a weekly or monthly basis. Additionally, the quality of data obtained from basic chemical test kits commonly used by citizen scientists does not meet the requirements of many data users. This research explores the role of low-cost wireless sensor networks in advancing the potential of citizen scientists in monitoring catchment water quality. Monitoring equipment available to citizen scientists generally needs to be low cost, so is unlikely to rival professional standard monitoring techniques in the foreseeable future. However, reliable, low-cost sensors which enable continuous, real-time monitoring do now exist for a limited range of water quality parameters and have been used in the development of the wireless sensor network presented here. Critically, Hydrobean and its base station are low cost, low maintenance, portable and robust in order to meet the requirements of community monitoring programmes. Ultimately, a model will be integrated into the real-time analysis of data collected by the wireless sensor network to predict when and where contamination incidents are expected to be affecting catchment water quality. We report initial field results of the Hydrobean wireless sensor network and will discuss ways in which the basic design can be improved in future versions.