INTEGRATING SPATIO-TEMPORAL MEASUREMENTS AND ENVIRONMENTAL MODELLING WITH A LOW COST HYDRO-CLIMATE SENSOR NETWORK FOR REAL-TIME MEASUREMENTS

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ABSTRACT

Holistic-integrated approaches are needed to apply state-of-the-art knowledge to explain, explore, and predict hydrological phenomena in the landscape (Klug and Kmoch, 2014b). Specific location-based environmental information is required to ensure a proper understanding of hydrological processes in time and space (Klug and Kmoch, 2014a). Wireless sensor networks can monitor the environment in-situ and are available since decades and have been regularly reviewed and continuously improved (Akyildiz et al., 2002, Baronti et al., 2007, Yick et al., 2008, Schimak et al., 2010). From a holistic and integrated science view, the mentioned approaches often do not consider energy autarchic field installations corresponding with low cost, open source developments and near real-time data transmission capabilities with the provision of standard compliant data for direct integration with environmental modelling tools (Voinov and Cerco, 2010).

With this presentation we provide a science base structure to organise and technically implement a near real-time transmission of information from wind direction, wind speed, air temperature, rainfall, soil moisture and soil temperature in three different depths, and the groundwater level. The whole system is based on low cost sensors and has been implemented on a platform independent and open source basis. For data transmission the ZigBee protocol is used but other protocols such as Wi-Fi, Bluetooth or mobile networks are available, too. Datasets are provided in the OGC standards compliant data encodings Observations & Measurements and Water Markup Language 2.0. The sensor metadata is available in Sensor Markup Language. Energy autarchy is ensured with a small solar panel and a battery connected to the sensor units.

The low cost setup enables us to allow for more hydro-climate stations to be spread in designated case study areas, like in the Alpine / pre-Alpine border where especially rainfall is varying extremely. Thus, large-scale variations of environmental parameters can be captured at higher resolution with a greater spatial accuracy.

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