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Application of a meteorological wireless sensor network to a small alpine watershed

R. Mutzner (1), G. Barrenetxea (2), S. V. Weijs (1), S. Simoni (1), M. Vetterli (2), and M. B. Parlange (1)

(1) School of Architecture, Civil and Environmental Engineering, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland, (2) School of Computer and Communication Sciences, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

Since 2008, an alpine watershed in the Swiss Alps is heavily monitored with a network of wireless meteorological stations. The study area is located along the southernmost ridge that borders Italy, covering a total surface of 20.4 km2 with altitude ranges from 1775 m at the outlet to 3206 m above sea level. The area is characterized by steep and complex terrain. The wireless network relies on Sensorscope technology and consists of a self-organized multi-hop system of master and slave stations. The data is transmitted to a local server through the GPRS network and then displayed on a Google Maps-based Web interface, allowing easier maintenance of the sensors. The stations are appropriate to deployment in complex terrain like mountains since they are autonomous, relatively robust, light and easy to deploy. Each station measures precipitation, solar radiation, air temperature and humidity, skin temperature, wind speed and direction, soil temperature and humidity, soil matrix potential and snow height during winter. During the summer 2011 campaign, 26 stations were deployed over the watershed, covering a large part of the total area. The stations were installed on the most representative sites with respect to slope, aspect and elevation. Two stations were used at gauging sites with water level monitoring. The applications of the station network are manifold. Among others, the collected data is used as forcing parameters in distributed hydrological models and also for assessing the impact of the spatial and temporal heterogeneity of meteorological variables such as near-surface air temperature and precipitation over a complex terrain. We present some results from the previous summer campaigns, sharing experiences and challenges on the use of a wireless network in a complex environment.