Geophysical Research Abstracts
Vol. 17, EGU2015-9933, 2015
EGU General Assembly 2015

A mountain environmental virtual observatory (Mountain-EVO) to support participatory monitoring in a network of Andean catchments

Wouter Buytaert (1), Boris Ochoa Tocachi (1,2), Bert De Bievre (2), and Zed Zulkafli (1)

(1) Imperial College London, Civil and Environmental Engineering, London, United Kingdom (w.buytaert@imperial.ac.uk), (2) Consortium for the Sustainable Development of the Andean Ecoregion (CONDESAN), Lima, Peru

The tropical Andes are a hotspot of environmental change. The combination of dramatic land-use change with global climate change, demographic growth, and increasing water demand is causing extreme pressures on water resources. This is of particular concern to rural upland communities. They are facing a double challenge of maintaining their own livelihoods with dwindling natural resources, and at the same time supporting downstream ecosystem services such as a well buffered stream flow and good water quality.

This challenge is complicated further by the acute lack of data on the hydrological functioning of Andean catchments. The factors controlling their hydrological response are extremely variable in space and time, including meteorological forcing, land cover types, soil properties and geology. This makes it very difficult to predict accurately the impact of human activities such as land use, ecosystem management, and watershed investments. Such predictions are essential for policy-making and sustainable ecosystem management.

To tackle the issue of hydrological data scarcity in the tropical Andes, an initiative was set up to implement a network of hydrological monitoring of upland catchments in a pairwise fashion. Using a trading-space-for-time approach, the initiative intends to use these data to improve predictions about the impact of land-use changes and other ecosystem management practices on the hydrological response. Currently, over 25 catchments are being monitored for precipitation and streamflow in 9 sites located in Bolivia, Peru, Ecuador, and Venezuela. The sites are supported by local stakeholders and communities in a participatory monitoring scheme that otherwise would be impractical or prohibitively expensive.

To overcome the technical challenges of monitoring hydrological variables in remote mountain areas, the initiative has set up a web-based infrastructure to support local technicians and stakeholders. Additionally, using open data standards such as those of the Open Geospatial Consortium, the data can be pooled efficiently for regional-scale analysis, as well as processed and visualized efficiently. Lastly, the datasets can be coupled to web-based hydrological models using rich and interactive interfaces. Such setups, which we refer to as "environmental virtual observatories", can support water and land users at different scales of decision making, from community level to national governance entities, and at different levels of technical and scientific skills.

This paper reports on the effort of building our environmental virtual observatory. We highlight some of the technological breakthroughs, such as exposing hydrological models to the web, using web processing services standards and pooling hydrological data for regionalization. Lastly, we also discuss the major remaining challenges in the technological, hydrological, and social science domains.