Geophysical Research Abstracts
Vol. 19, EGU2017-263, 2017
EGU General Assembly 2017

Cyberinfrastructure for remote environmental observatories: a model homogeneous sensor network in the Great Basin, USA

Scotty Strachan (1), David Slater (2), Eric Fritzinger (3), Bradley Lyles (4), Graham Kent (2), Kenneth Smith (2), Sergiu Dascalu (3), and Frederick Harris (3)

(1) Department of Geography, University of Nevada, Reno, United States (scotty@dayhike.net), (2) Nevada Seismological Laboratory, University of Nevada, Reno, United States, (3) Department of Computer Sciences and Engineering, University of Nevada, Reno, United States, (4) Division of Hydrologic Sciences, Desert Research Institute, Reno, Nevada, United States

Sensor-based data collection has changed the potential scale and resolution of in-situ environmental studies by orders of magnitude, increasing expertise and management requirements accordingly. Cost-effective management of these observing systems is possible by leveraging cyberinfrastructure resources. Presented is a case study environmental observation network in the Great Basin region, USA, the Nevada Climate-ecohydrological Assessment Network (NevCAN). NevCAN stretches hundreds of kilometers across several mountain ranges and monitors climate and ecohydrological conditions from low desert (900 m ASL) to high subalpine treeline (3360 m ASL) down to 1-minute timescales. The network has been operating continuously since 2010, collecting billions of sensor data points and millions of camera images that record hourly conditions at each site, despite requiring relatively low annual maintenance expenditure. These data have provided unique insight into fine-scale processes across mountain gradients, which is crucial scientific information for a water-scarce region. The key to maintaining data continuity for these remotely-located study sites has been use of uniform data transport and management systems, coupled with high-reliability power system designs. Enabling non-proprietary digital communication paths to all study sites and sensors allows the research team to acquire data in near-real-time, troubleshoot problems, and diversify sensor hardware. A wide-area network design based on common Internet Protocols (IP) has been extended into each study site, providing production bandwidth of between 2 Mbps and 60 Mbps, depending on local conditions. The network architecture and site-level support systems (such as power generation) have been implemented with the core objectives of capacity, redundancy, and modularity. NevCAN demonstrates that by following simple but uniform “best practices”, the next generation of regionally-specific environmental observatories can evolve to provide dramatically improved levels of scientific and hazard monitoring that span complex topographies and remote geography.