

Project Summary

We propose to develop a prototype web-based portal for Critical Zone data from the Hawaiian Islands. We and our colleagues have collected extensive data sets on key CZ parameters including but not limited to bedrock and soil chemistry, water chemistry, and biomass composition. The exploitation of the climate and age gradients available in Hawaii has served as a model to the community of researchers interested in Critical Zone research and biogeochemistry. While significant portions of these data are published, they are scattered among many publications produced over more than a decade. Important supporting data remain unpublished, and there is no central resource where these data and related geological, biological and climatological data sets can be readily accessed. Importantly, because of the extensive characterization of Critical Zone parameters across gradients, many researchers have come to us with new techniques, tools or ideas that they would like to test against the natural laboratory that Hawaii offers. In most cases, these tests would not be possible without the large extant database. We propose to make the database of soil and water properties and chemistry available in a georeferenced framework, through the development of a modular, extensible, web-based user interface; the CyberCZEN System.

Scientific Merit

The CyberCZEN system will archive in an interactive and highly accessible way an irreplaceable resource of Critical Zone data developed over many years, and a considerable investment of public and private funds and human resources. The database will contain the several thousand soil analyses, including both basic parameters and less common measurements such as isotope ratios. Parent composition data will be provided whenever possible. Geographic location will be utilized to integrate these data with existing GIS data sets on elevation, geological substrate, rainfall, temperature, vegetation type, insolation, evapotranspiration, and other “state variables.” It will also contain hundreds of data from precipitation, stream, and groundwater chemistry at multiple locations and dates. Importantly, the CyberCZEN system will not just be a data archive, but will have online search and GIS spatial analysis capabilities achieved through the use of the GRIP web portal and a web-served version of ArcGIS®, and interoperability with ArcGIS® and Google Earth®. The CyberCZEN system will facilitate development and testing of hypotheses using the Hawaii time-climate matrix of sites. It will also provide an extensible model for the CZEN community to use or adapt for dynamic data access that should be readily adaptable to any CZEN site.

Broader Impacts

The web-based system we propose to develop will be readily extensible so that it can link to emerging data sets on biological diversity and processes, and to new data collections of historical and cultural significance. We are working in partnership with a group of GIS and Web design experts who are beginning to develop a major “Digital Collaboratory” that will include these other resources. The ultimate goal of the Digital Collaboratory is to develop and host a geographically integrated knowledge management system at the interface of cultural and scientific understanding. While our Hawaii CyberCZEN system will be fully capable of functioning independently, it will ultimately be a node on this larger, truly integrative system. This will allow us to extend our reach beyond the CZEN community, to include researchers and educators whose interests span the sciences and the humanities.