

Long-term monitoring of Mount St. Helens micrometeorology

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Funding information

National Science Foundation, Grant/Award Numbers: DEB-0614538, DEB-1257360; U.S. Forest Service

Handling Editor: William K. Michener

Abstract

The 1980 volcanic eruption of Mount St. Helens had profound impacts on the geology, hydrology, and ecology of its surrounding landscapes. Consequently, the event provided a unique opportunity to study ecological change over time in relation to abiotic factors. To better assess the role localized environmental conditions play in these larger processes, we have monitored micrometeorological conditions across six disturbance zones on Mount St. Helens created by the eruption. We deployed 823 environmental sensors at 191 sites from 1997 to 2022 to measure the temperature and relative humidity of aquatic (temperature only) and terrestrial habitats in these areas, collecting over 4.2 million measurements in total. Measurements were typically recorded every 30 min from late spring through mid-fall, with the exception being Spirit Lake, where temperatures have been measured hourly on a year-round basis since 2002. These data have been used to address two broad research questions: (1) how small-scale environmental conditions influence patterns of survivorship and/or establishment on Mount St. Helens post-eruption for a range of organisms, including plants, small mammals, birds, amphibians, arthropods, fish, and other aquatic biota, and (2) to quantify and compare these environmental conditions across different disturbance zones, which vary in disturbance type, intensity, and history of post-eruption secondary disturbances. Due to the repeatability of these measurements over many years, these data lend themselves to exploring the relationship between forest succession and microclimate, especially with respect to forest-dwelling organisms whose spread and demography are sensitive to temperature and relative humidity. In addition, this dataset could be used to investigate additional questions related to early succession, disturbance ecology, climate change, or volcano ecology. This dataset is available in the R data package MSHMicroMetR, which also includes an R Shiny data visualization and exploration tool. There is no copyright on the data; please cite this data paper *Ecology* when using these data.

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KEYWORDS

air temperature, disturbance ecology, ecological disturbance, micrometeorological measurements, Mount St. Helens, post-eruption, relative humidity, Southern Washington Cascade Range, volcano ecology, water temperature

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The complete data set and R data package MSHMicroMetR are available as Supporting Information and in Zenodo at <https://doi.org/10.5281/zenodo.7327714>. This Zenodo release also contains the R code used to tidy these data.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

How to cite this article: Che-Castaldo, Christian, and Charlie M. Crisafulli. 2023. “Long-Term Monitoring of Mount St. Helens Micrometeorology.” *Ecology* 104(3): e3950. <https://doi.org/10.1002/ecy.3950>