



H43E-2127: Citizen Science: Near-surface atmospheric and surface soil temperatures from the southern aspect of Mt. Baker, WA (July 2018 - July 2023) deployed by a high school outdoor program and analyzed by a high school data science program

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Motivation

Part 1: Geophysical

Pacific Northwest (PNW) glaciers and snowpack are at risk due to impacts of climate change.

Very observations of climate or snowpack health on Mt. Baker's southern aspect.

Part 2: Geoscience Education

There is a lack of diversity in geoscience professions

Students winnow self-image in high school years or earlier, yet there is little exposure to authentic Geosciences until undergraduate or graduate school.

Field Methods and Deployment







Locations: nine sites on southern aspect of Mt. Baker

Sensor: 18-22 iButtons

Configurations: Buried (3-5 cm) Exposed (2 m air, 0-2.5 m air) Shaded (2 m air)



Lundquist and Lott (2008) Lundquist and Huggett (2008)

Partnerships

Lakeside School

An independent school with a social-justice oriented mission to train 'global citizens'. *Outdoor Program Service Learning Program*

Earth and Space Research

A non-profit with a mission to 'increase understanding of the Earth System' through research and education. ESR-LSRI (youth geoscience program)

Ballard Data Science

An LLC with a mission to provide equitable, data-based education and solutions for the betterment of all.

The United States Forest Service

A governmental organization with the mission to sustain the health, diversity, and productivity of the nation's forests and grasslands.

The ESR-LSRI

Earth and Space Research – Lakeside Summer Research Institute

A mentored, service-oriented geoscience experience (4 week)

Our tagline: Learning real-world skills by solving real-world problems

Equitable education

- Student-centered instruction 1:7 instructor:student
 growth-based achievement students build skills to
- solve problems and track their own growth • *intrinsically motivated projects* – service to others motivates action and learning
- *external accountability* interaction with professional world also drives performance



 Lundquist, J. D., and F. Lott (2008), Water Resour. Res., 44, W00D16, doi:10.1029/2008WR007035.



Figure 4. Extension of temperature time series at 1000 m using multiple linear regression with northside of Mt. Baker temperature composited by season and precipitation rate.

Conclusions

Part 1: Geophysical

iButtons provide foundation for *temperature* and *hydrologic* monitoring in remote area (Mt. Baker).

Simple ML models *magnify* the *value* of these data.

Next: Use data to assess reanalysis (e.g. ERA5)

Part 2: Geoscience Education

Authentic geoscience is *needed* and *possible* before undergraduate studies.

Partnerships with access and/or stable logistics provide foundation for field-based experiential learning.

Science as service *includes* and *motivates* broad spectrum of *learners*.

More partnerships are *welcome*!

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- Erin Uloth of the USFS permitted this work.
- iButtons were paid for by Ballard Data Science and Lakeside School.
- Over 40 students participated in the deployment and retrieval of the iButtons used here.