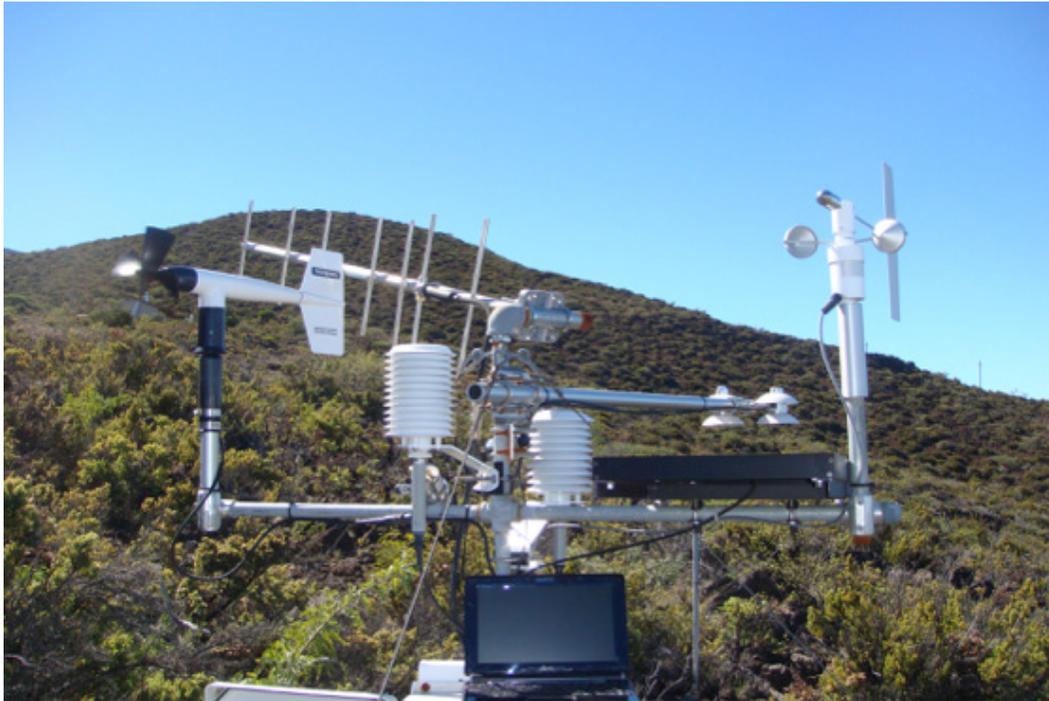




Monitoring and analysis of climate variability and change in Hawai'i

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HaleNet stations monitor a variety of climate variables.

Environmental monitoring networks provide vital data for a wide range of users involved with climate research and modeling as well as resource management. Hawai'i's climate and native ecosystems are particularly sensitive to climate change, making the long-term data gathered by HaleNet on Maui especially valuable. HaleNet, or the Haleakalā Climate Network, is an array of high-elevation monitoring sites on the upper slopes of Haleakalā volcano. Since 1988, the network has been collecting measurements of a wide variety of climate variables, resulting in a long-term dataset that allows us to determine historical baselines and discover trends in climate and climatologic processes.

For this project we looked at a range of 11 climate variables—from rainfall to variability of solar radiation with changes in cloud cover—and found that most had significantly changed over the more than 25 years of data collection. Solar radiation and potential evapotranspiration increased, while precipitation and relative humidity decreased. Taken together, these changes suggest a hotter, drier, and sunnier environment on the high-elevation slopes of Haleakalā, a shift that can be attributed to changes in the frequency of the trade wind inversion, or TWI.

When the TWI is present upper cloud heights are 'capped off', typically around 2000-2500 m elevation, thereby limiting precipitation volume and distribution. The increasing frequency of days with the TWI has resulted in significant environmental shifts detectable by the HaleNet network during both the wet and dry seasons. Already such changes are affecting native Hawaiian ecosystems.



Clouds capped below the peak of Haleakalā by trade wind inversion.

By improving our understanding of how and why the climate around the HaleNet sites is changing, we can make more accurate projections about future conditions. This will allow development of more effective adaptation and management plans to help preserve ecosystems and manage freshwater resources, as well as providing a basis for future research.

Quick Summary

- The Haleakalā climate monitoring network, or HaleNet, began collecting data in 1988 and has monitored data at 11 sites, many with over 25 years of publicly available data on a wide variety of climate variables. This provides us with an unusually robust source of data which we can use to determine historical baselines as well as define trends as our climate changes.
- Our analysis shows that precipitation and humidity have significantly declined over time, while solar radiation and potential evapotranspiration during the dry season increased. These changes can be attributed to increases in the frequency of the trade wind inversion over Haleakalā.
- Our data provide solid evidence of how the climate on Maui and in Hawai'i has been changing, and the analysis can form the basis of future research as well as helping stakeholders to develop adaptive plans for ecosystems and freshwater resources.



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