



## Climate change research in support of Hawaiian ecosystem management: An integrated approach

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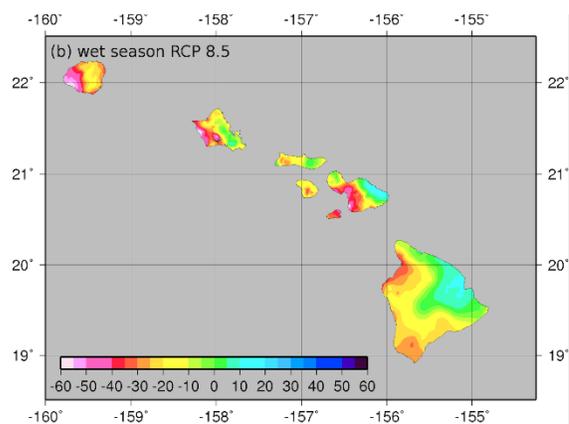
*Rainclouds over Maui. Photo by Sebastien Panouille/ [CC BY NC 2.0](#)*

The Hawaiian Islands are dependent on rainfall for all their fresh water, but climate change is very likely resulting in shifts in the timing and intensity of rainfall in the islands. It is vital to have reliable predictions about future rainfall so that resource managers can begin resilience planning. Global-scale climate models cannot make projections at fine enough scales to capture the complicated local rainfall dynamics of Hawaiian islands, and so it is necessary to combine these coarse-scale climate models with local information using statistical relationships derived from historical station data. This process of statistical downscaling allows us to make projections that are useful for resource managers in Hawai'i.

**We** have produced high-resolution maps showing seasonal rainfall change projections for Hawai'i over the course of this century. Most parts of the main Hawaiian Islands have wet and dry seasons, roughly corresponding to the cold winter and warm summer seasons in the mainland United States. Our work suggests that the climate in Hawai'i will become dryer overall in the second half of the century, but this effect will vary considerably over the islands. The wetter windward sides of some islands may receive

more precipitation during the wet season, but naturally dryer leeward sides are projected to receive less rainfall during both wet and dry seasons. In other words, the wet areas may be wetter for certain parts of the year, but the dry areas will be dryer all year.

Our projections provide information that can be integrated into a variety of projects including ecological research, water resources management, and development planning. However, it is important to note that like all statistical downscaling these projections include uncertainty from a variety of sources including gaps in historical data, propagated errors from global models, and future changes in rain-formation processes due to climate change that the statistics cannot predict. Continuing research on the physical causes of rainfall changes as well as improved weather data measurement will allow refinement of our rainfall projections to allow for the most accurate planning.



Projected precipitation changes will vary greatly by location. Numbers represent percent change relative to present-day values.

## Quick Summary

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- Future changes in rainfall across the Hawaiian Islands will affect natural habitats and hydrology as well as human agriculture, drinking water access, and development. Accurate rainfall projections at appropriate scales will be vital for adaptation and resilience planning.
- Our work suggests that there will be a general drying trend with large amounts of local and seasonal variation, and an increasing contrast between wet and dry regions on each island.
- Our work provides projections at a much finer spatial scale than has historically been available, and represents a basis for ecological impact modelers and natural resource managers to conceptualize scenarios for climate adaptation.



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