

Developing a land-surface meteorological forcing dataset for the Hawaiian Islands



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New project

- Builds on previous work at the University of Hawaii (Tom Giambelluca) on meteorological mapping over the Hawaiian Islands
- Dataset characteristics:
 - Spatial resolution: 250 m (also 12-km)
 - Temporal resolution: hourly
 - Period of record: TBD
- Method
 - Temporal disaggregation of monthly maps (version 0)
 - Probabilistic mapping of meteorological fields
 - Incorporate WRF simulations, radar, satellite
- Status and timeline
 - Project just starting (in scoping phase)
 - Version 0: Fall 2015
 - Version 1: Spring 2016

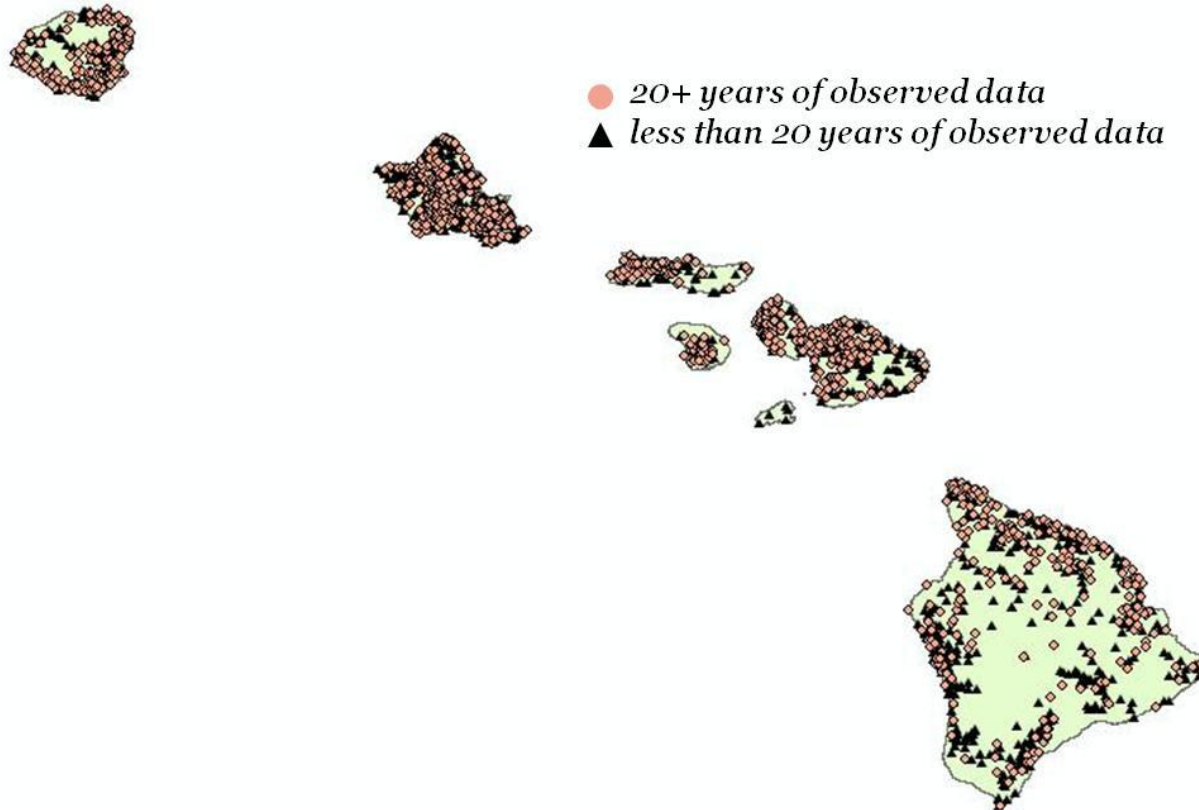
Measurement and Mapping of Hawaiian Rainfall

- Earliest known RF observations taken in 1837 at Nu‘uanu Avenue and Beretania Street
- 106 stations by 1900
- Number of stations increased with the growth of plantation agriculture
- 422 stations by 1920
- Mapping of rainfall patterns began in earnest in the 1920s



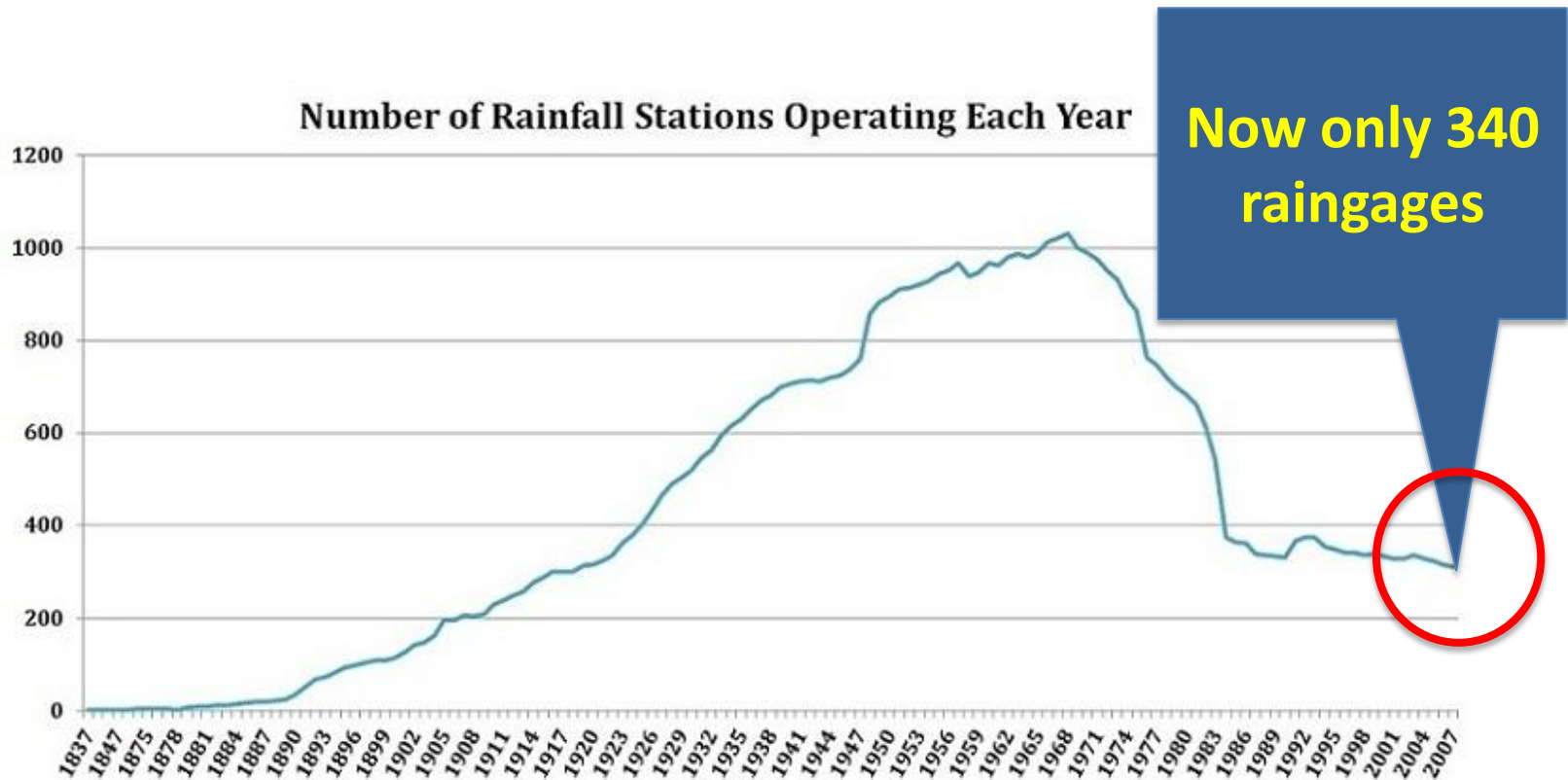
The Rainfall Network

- We compiled a monthly RF database of 2,188 raingage sites
- 517,017 station-months (43,085 station-years) of data
- Average length of record: 40 years



The Rainfall Network

Number of station operating at any given time peaked at 1030 stations in 1968



The Web Site

With the help of the EPSCoR Cyberinfrastructure Team at UH Hilo, we developed a web platform for the new rainfall atlas

Rainfall Atlas of Hawai'i
Geography Department - University of Hawai'i at Mānoa

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What is the Rainfall Atlas of Hawai'i?

The Hawaiian Islands have one of the most diverse rainfall patterns on earth. The mountainous terrain, persistent trade winds, heating and cooling of the land, and the regular presence of a stable atmospheric layer at an elevation of around 7,000 ft. interact to produce areas of uplift in distinct spatial patterns anchored to the topography. The resulting clouds and rainfall produced by this uplift lead to dramatic differences in mean rainfall over short distances. Knowledge of the mean rainfall patterns is critically important for a variety of resource management issues, including ground water and surface water development and protection, controlling and eradicating invasive species, protecting and restoring native ecosystems, and planning for the effects of global warming.

Be sure to check out the [interactive map](#)! It may need a few minutes to load on your first visit.

MODIS Image of Hawai'i, NASA Earth Observatory

Mean Annual Rainfall State of Hawai'i

2011 Rainfall Atlas of Hawai'i
Department of Geography, University of Hawai'i at Mānoa

Annual Rainfall (mm)

204 - 750
751 - 1,200
1,201 - 2,000
2,001 - 2,750
2,751 - 3,500
3,501 - 4,400
4,401 - 5,400
5,401 - 6,400
6,401 - 7,300
7,301 - 10,271

0 25 50 100 150 200 Kilometers

The Rainfall Atlas of Hawai'i is a set of maps of the spatial patterns of rainfall for the major Hawaiian Islands. Maps are available for mean monthly and annual rainfall. The maps represent our best estimates of the mean rainfall for the 30-yr base period 1978–2007. However, for many reasons, it is not possible to determine the exact value of mean rainfall for any location. Therefore, for every map of mean rainfall, we provide a corresponding map of uncertainty. Uncertainty tends to be greatest where we have the poorest information about rainfall, for example in remote locations far from the nearest raingage.

This web site was developed to make the rainfall maps, data, and related information easily accessible. The maps depict rainfall patterns by color and/or by isohyets (lines of equal rainfall). The [interactive map](#) allows users to see the patterns of mean monthly and annual rainfall and corresponding uncertainty, zoom in on areas of particular interest, navigate to specific locations with the help of a choice of different base maps, and click on any location to get the mean annual rainfall and a graph and table of mean monthly rainfall. The locations of stations can also be shown on the interactive map. Clicking on a station gives both station and mapped estimates of monthly rainfall along with station metadata.

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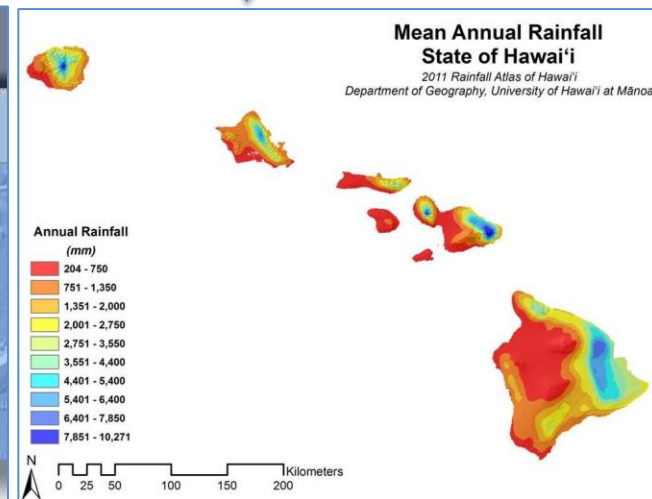
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Mean Monthly Rainfall (mm)
Location: 21.496° N, 157.987° W
Station: Kaha 18

Month	Map	Mean	Station	Uncert.
January	248.8	32.2	282.2	39.0
February	169.8	26.3	185.1	26.2
March	282.2	27.4	299.4	40.0
April	235.1	31.5	279.7	35.2
May	178.0	37.0	214.1	36.5
June	232.3	40.4	288.8	35.0
July	224.1	49.0	272.0	29.0
August	193.9	30.1	219.2	24.1
September	196.3	47.8	218.0	38.0
October	239.3	32.0	213.4	38.4
November	230.0	39.7	214.0	48.0
December	277.2	38.3	274.1	36.0
Annual	2284.8	347.8	2268.8	91.1

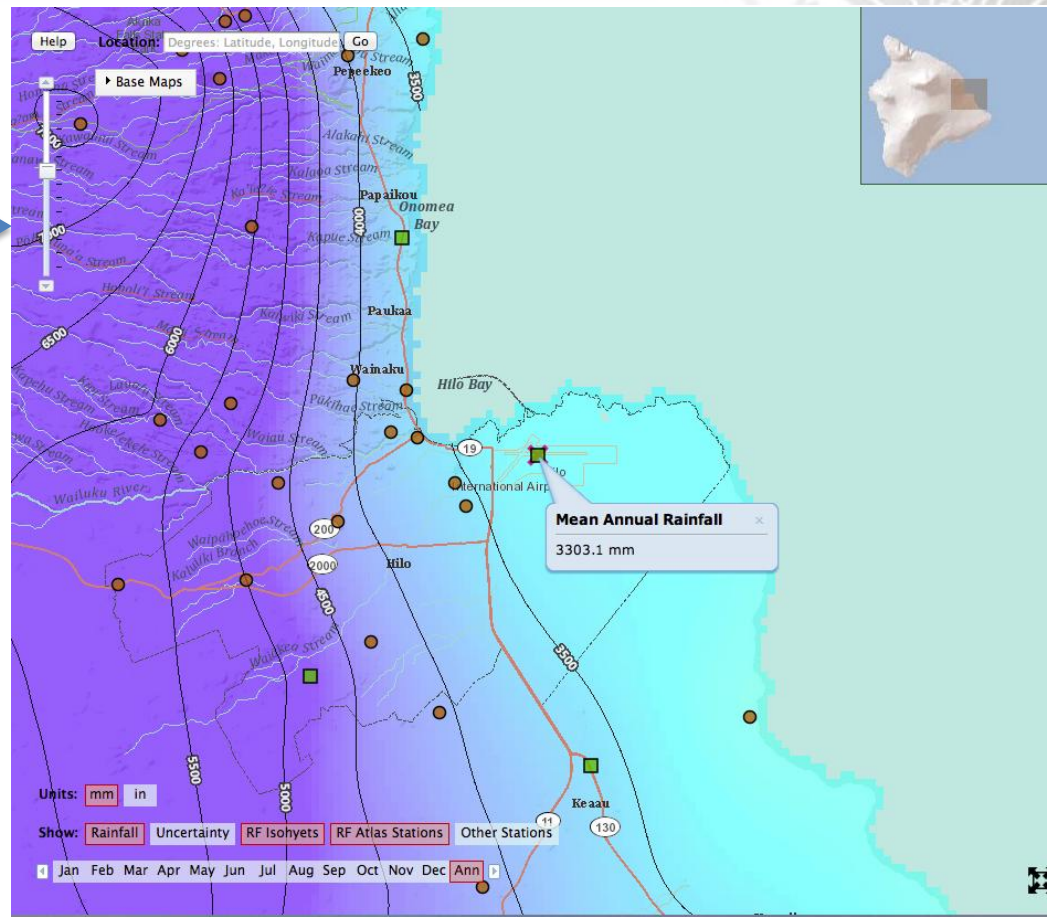
Station Information

ID: 813
Name: Kaha 18
Observer: US ARMY
Date: 01-01-1978
Location: 21.496° N, 157.987° W
DMS: 21° 29' 46.1" N, 157° 59' 8.7" W
UTM: 48QUR7, 237410
Elevation: 421.9 meters / 1382 feet
Record Period: 1947 - 1999
Data Sources: FGI, NCDC, NCEP, State, State/NCDC



The Web Site

Locate any point of interest on the interactive map and click to get mean annual and monthly rainfall statistics

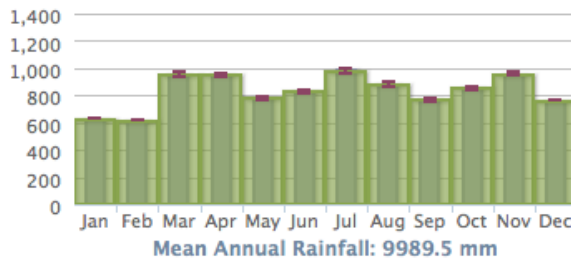


The Web Site

Mean Monthly Rainfall (mm)

Rainfall Atlas of Hawai'i 2011, University of Hawai'i

Map: 22.071° N, 159.498° W
Station: Mt. Waialeale — Uncert.



▼ Rainfall Data (mm)

Month	Map	Uncert.	Station	Uncert.
January	633.0	27.4	629.4	0.9
February	620.7	30.0	620.4	0.2
March	955.4	50.2	961.0	0.5
April	954.4	48.8	958.4	0.3
May	780.3	44.5	782.2	0.1
June	833.2	49.7	835.9	0.4
July	984.1	57.6	986.8	1.0
August	881.4	52.3	884.1	0.4
September	767.4	48.0	768.6	0.1
October	855.3	45.5	857.5	1.2
November	957.9	49.7	955.1	0.5
December	766.4	30.8	764.7	2.2
Annual	9989.5	157.6	10004.0	3.0

▼ Station Information

SKN	1047
Name	Mt. Waialeale
Observer	USGS
Location	Deg.: 22.071° N, 159.498° W DMS: 22° 4' 15.2" N, 159° 29' 52.7" W UTM Zone 4: 448624, 2440757
Elevation	1570.1 meters / 5150 feet
Record Period	1950 - Present
Data Sources	Fill, USGS
Station Status	Current

Clicking on a station gives both map and station estimates of mean annual and monthly rainfall statistics

Thank You

