

Extreme weather events and climate variability at remote weather stations across southwest Alaska

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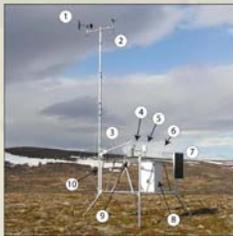


Introduction

In order to address the scarcity of climate information from national parks in southwest Alaska, the National Park Service has recently installed weather stations in three parks. The objective is to record and archive weather observations in locations that are characteristic of the diverse landscape and topography within these parks. This effort will support real-time needs, identify natural variability in weather patterns and long term climate trends, provide reliable climate data to researchers, and help interpret ecosystem changes.

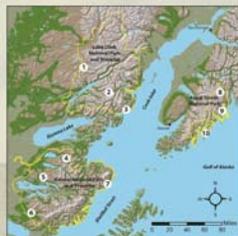
Station design

Weather stations are fully automated and are powered by solar panels. Data is transmitted hourly to a weather satellite and is available on the internet. Weather observations include air temperature, wind speed and direction, rainfall, snow depth, relative humidity, and insolation.



Weather station at Coville Lake, Katmai National Park and Preserve. Sensors and components include: 1) wind direction, 2) wind speed, 3) satellite antenna, 4) pyranometer, 5) air temperature and relative humidity, 6) GPS, 7) solar panel, 8) data logger and batteries, 9) rain gauge, and 10) snow depth.

- Weather station locations were identified to meet the following criteria:
- 1) maximize regional climate exposure and minimize local influences
 - 2) represent basic climatic averages identified by climate models for a variety of ecoregions
 - 3) offset the low-elevation bias of existing weather stations
 - 4) accessibility
 - 5) minimize potential impacts



Weather stations operated by the NPS inventory and monitoring program in southwest Alaska national parks include: 1) Snipe Lake, 2) Chignik Mountains, 3) Hickerson Lake, 4) Pfaff Mine, 5) Coville, 6) Contact Creek, 7) Fourpeaked, 8) Harding Icefield, 9) Pedersen Lagoon, and 10) McArthur Pass.

Methods

Three years (Oct 2008 to Oct 2011) of climate data from nine remote weather stations across southwest Alaska were analyzed to document the range and monthly variability in temperature, wind, rainfall, and snow depth. Common climate indices (frost days, icing days, and growing degree days) and thresholds for extreme wind events, warm minimum temperatures, and cool maximum temperatures were also calculated.

Metrics used for calculating climate variability, climate indices, and thresholds for extreme weather events.

Metric	Description	Metric	Description
Temperature	Monthly mean and maximum and minimum recorded temperatures	Icing days	Mean no. days when maximum temperature is below freezing
Wind speed and direction	Frequency distribution using 16 directional bins and four breaks for speed	Growing degree days	Mean no. growing degree units using a base temperature of 41°F
Wind speed	Monthly mean and maximum recorded gust	Extreme wind event	Mean no. days when average wind speed exceeds 90 th percentile
Rainfall, snow depth	Monthly mean	Warm minimum temperatures	Mean no. days when minimum temperature exceeds 90 th percentile ("warm nights")
Frost days	Mean no. days when minimum temperature is below freezing	Cool maximum temperatures	Mean no. days when maximum temperature is below 90 th percentile ("cold days")

Results

