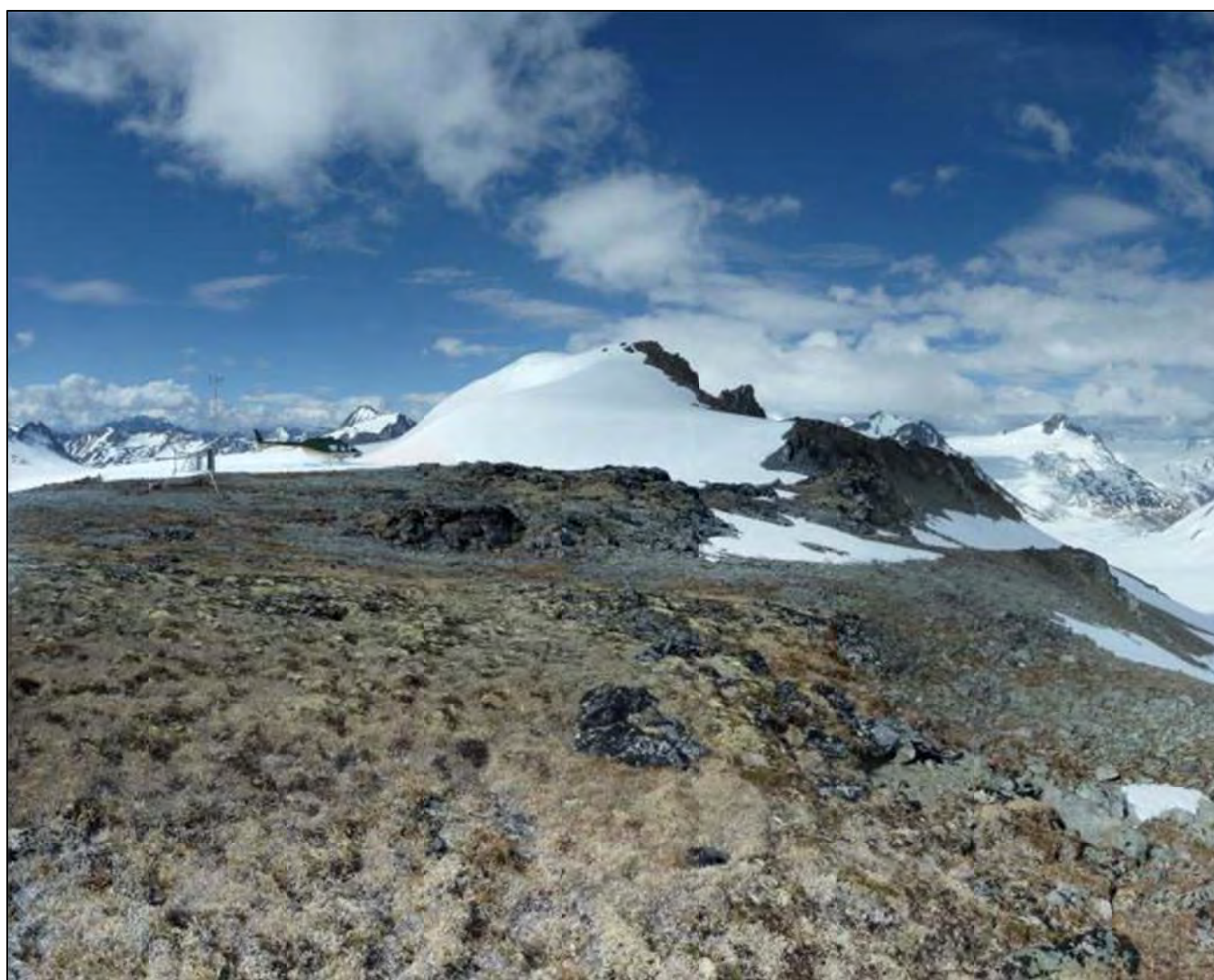




Climate Monitoring in the Southwest Alaska Network

Annual Report for the 2011 Hydrologic Year

Natural Resource Technical Report NPS/SWAN/NRTR—2011/517



ON THE COVER

Remote Automated Weather Station in the Chigmit Mountains, Lake Clark National Park and Preserve.
Photograph by: Michael Shephard

Climate Monitoring in the Southwest Alaska Network

Annual Report for the 2011 Hydrologic Year

Natural Resource Technical Report NPS/SWAN/NRTR—2011/517

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U.S. Department of the Interior
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The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado publishes a range of reports that address natural resource topics of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

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All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

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Abstract

The Southwest Alaska Network Inventory and Monitoring program monitors climate across a region that includes five national park units: Alagnak Wild River, Aniakchack National Monument and Preserve, Katmai National Park and Preserve, Kenai Fjords National Park, and Lake Clark National Park and Preserve. To date, monitoring efforts have focused on the placement and installation of new weather stations and the development, testing, and implementation of a protocol for monitoring climate. In addition to operating and maintaining 10 weather stations in three network parks, weather observations are obtained from an additional 29 stations across the region of interest. This report, the third in an annual series, summarizes weather observations from the recent hydrologic year and provides a regional and historical climatic context.

The Southwest Alaska Network region was colder than average and received less than average to near average precipitation during the 2011 hydrologic year (October 2010 through September 2011). Compared to the climatological normal (the prevailing set of weather conditions calculated over a 30-year period, currently 1981-2010), mean annual temperatures for six long-term weather stations were 0.2 to 2.3 °F below average. Total annual precipitation was 75% to 103% of average. In general, locations on the southern and eastern Kenai Peninsula received less than normal precipitation whereas locations on the Alaska Peninsula and across the northern Aleutian and southern Alaska Ranges received near average precipitation. Several winter months (December, February, and March) and summer months (June, July, and August) were colder than average across the region. When compared to the period of record, temperature and precipitation during the 2011 hydrologic year are consistent with conditions observed during the 2006-2009 hydrologic years, which were also generally colder and drier. Negative (cool phase) Pacific Decadal Oscillation conditions and a La Niña (cool phase) event of the El Niño-Southern Oscillation occurred during the 2011 hydrologic year.

All ten weather stations that are operated by the Southwest Alaska Network were maintained during the 2011 hydrologic year. The Natural Resources Conservation Service, with funding from Kenai Fjords National Park, installed a new weather and snowpack monitoring station near Exit Glacier. A new weather station was installed in Aialik Bay as a result of collaboration between Kenai Fjords National Park, Port Graham Native Corporation, and the Southwest Alaska Network Inventory and Monitoring program. The National Oceanic and Atmospheric Administration and Katmai National Park and Preserve completed a site license agreement for the planned installation of a Climate Reference Network Station at Contact Creek in 2012.

Acknowledgments

The author thanks the dedicated park staff and volunteers who faithfully document weather and snowpack observations throughout the year. The author credits Nat Wilson and Regan Sarwas for their work developing the data processing routines and Bruce Giffen for his dedication and work developing the climate monitoring program in Southwest Alaska Network parks. Careful reviews by Heather Coletti, Bruce Giffen, Kris Holderied, and Pam Sousanes significantly improved earlier versions of this report.

Acronyms

ALAG	Alagnak Wild River
ANIA	Aniakchak National Monument and Preserve
ASOS	Automated Surface Observing System
AWOS	Automated Weather Observing System
BLM	Bureau of Land Management
BUOY	Moored Buoy (NOMAD)
CMAN	Coastal Marine Automated Network
COOP	Cooperative Observing Program
CRN	Climate Reference Network
ENSO	El Niño-Southern Oscillation
FAA	Federal Aviation Administration
GOES	Geostationary Operational Environmental Satellites
IPCC	Intergovernmental Panel on Climate Change
KATM	Katmai National Park and Preserve
KEFJ	Kenai Fjords National Park
LACL	Lake Clark National Park and Preserve
NCDC	National Climatic Data Center
NDBC	National Data Buoy Center
NESDIS	National Environmental Satellite, Data, and Information Service
NIFC	National Interagency Fire Center
NOAA	National Oceanic and Atmospheric Administration
NOMAD	Navy Oceanographic Meteorological Automated Device
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NWS	National Weather Service
P	Precipitation
PDO	Pacific Decadal Oscillation
RAWS	Remote Automated Weather Station
SNOTEL	Snowpack Telemetry
SST	Sea Surface Temperature
SWAN	Southwest Alaska Network
T	Temperature
USFS	United States Forest Service
WBAN	Weather Bureau Army Navy
WRCC	Western Regional Climate Center

Introduction

This report is the third in an annual series detailing the climate of the Southwest Alaska Network (SWAN). The purpose of these annual reports is to summarize observations from local weather stations for the previous hydrologic year and to provide regional and historical contexts for these observations.

Climate Overview

The SWAN consists of five National Park Service units: Alagnak Wild River (ALAG), Aniakchak National Monument and Preserve (ANIA), Katmai National Park and Preserve (KATM), Kenai Fjords National Park (KEFJ), and Lake Clark National Park and Preserve (LACL). The climate of this region is largely influenced by the region's high latitude, proximity to oceans, complex topography, and interaction of those features with global atmospheric circulation (Simpson et al. 2002). The park units in the SWAN are aligned along the northern Gulf of Alaska and the maritime subarctic climate of the eastern, coastal areas of KATM, KEFJ, and LACL is characterized by moderate temperatures and abundant precipitation. Moist air masses are intercepted by the Kenai Mountains, the Aleutian and Alaska Ranges and heavy precipitation falls on their windward (east) sides. The western, more interior region of LACL is generally protected from maritime influence by large mountain ranges. The boreal climate here is more continental in nature and is characterized by a large annual range in temperature and small annual range in precipitation. The climate of the park units on the Alaska Peninsula (ALAG, ANIA, and KATM) is transitional between polar (tundra climate) and maritime (maritime subarctic) (Nowaki et al. 2001). In this region summer temperatures are moderated by the open waters of the Bering Sea (Bristol Bay), but winter temperatures are colder and more polar in nature due to the presence of sea ice in the coldest months (Figure 1). A more detailed discussion of the climate of the SWAN, including maps showing spatial and temporal patterns of temperature and precipitation, is provided by Redmond et al. (2005) and Davey et al. (2007).



Figure 1. Sea ice present in Bristol Bay during the coldest months. In this false-colored satellite image (MODIS bands 7,2,1) taken on March 28, 2008, snow and ice show up as turquoise, bare vegetation is green, and clouds are white. Black line indicates the boundaries of Katmai National Park and Preserve and the Alagnak Wild River. Image: NASA/GSFC, Rapid Response.

Climate vs. Weather

Although the terms climate and weather are sometimes used interchangeably, they differ in temporal perspective. Weather refers to the condition of the atmosphere at a specific point in time or during a short-lived atmospheric event. Climate refers to the aggregation of weather conditions for a location or region and can be defined with averages or representative values for weather elements.

Average, Normal, and Period of Record

Average conditions refer to the prevailing set of climatic conditions based on the most recent 30 year reference period, which is currently 1981-2010. This 30 year reference period is referred to as the climatic *normal*. The *period of record* refers to the prevailing set of climatic conditions during the entire history of observations at a particular weather station. *Average* (i.e. *normal*) and *period of record* values for a specific weather station may differ significantly. It should be noted that this year marks the first for which the new 30 year reference period (1981-2010) will be used for comparison. Climatological comparisons to the “new” normal (1981-2010) conditions will differ slightly from those to the “old” normal (1971-2000) conditions. The 30 year climatic normal is used exclusively for comparison in the Results section. The period of record is used exclusively as a basis for historical context in the Discussion section.

Intrinsic Climate Variation

Fall and winter atmospheric circulation over the North Pacific Ocean is dominated by the Aleutian Low, which is important to the climatology of SWAN parks. Low pressure systems moving from west to east along the polar front usually reach maximum intensity in the area of the Aleutian Low, a semi-permanent low pressure center. Winter storm tracks generally follow the Aleutian Islands and move into the Gulf of Alaska with a frequency of about four to five storms a month where they affect SWAN parks with precipitation and strong winds (Simpson et al. 2002). The Aleutian Low weakens in the summer season and summer storm tracks generally follow the Aleutian Islands and then turn northward into the eastern Bering Sea with a frequency of three to four storms per month (Simpson et al. 2002). The seasonal variability in the location and intensity of the Aleutian Low and associated storm tracks explains much of the seasonal variability in climate patterns and differences in the timing of maximum precipitation in SWAN parks (Bennett et al. 2006).

Annual to decadal climate variability in the SWAN is primarily influenced by large-scale changes in atmospheric and oceanic circulation, such as the El Niño-Southern Oscillation (ENSO) and the Pacific Decadal Oscillation (PDO) (Simpson et al. 2002). The ENSO affects the strength and positioning of the jet stream and the PDO affects North Pacific sea level pressure and sea surface temperature. Both the ENSO and the PDO affect the strength of the Aleutian Low. Although not completely understood, both climatic oscillations are recognized to have important climatic consequences to coastal Alaska, including the SWAN region. ENSO events (El Niño and La Niña) are recognized to influence temperatures by $\pm 2-4$ °F statewide. (Simpson et al. 2002, Papineau 2005). The PDO is correlated with winter temperature anomalies across Alaska and it has a more restricted influence on precipitation that primarily affects the Gulf of Alaska region. The PDO also influences winter season storm tracks, diverting them northward into the Cook Inlet area (Simpson et al. 2002).

Climate Change

The Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report summarized evidence that global climate is changing rapidly and that rates of change are dramatically accelerated at northern latitudes (IPCC 2007). Alaska has warmed over the 20th century, annual precipitation has increased (Weller et al. 1999), and the growing season has lengthened (Keyser et al. 2000). Temperature data from two long-term weather stations in the SWAN region show a significant increase in both mean winter temperatures and mean annual temperatures for 1949-2009. Mean winter temperatures at King Salmon have increased by 7.9 °F and mean annual temperatures have increased by 3.7 °F (Alaska Climate Research Center 2009). Mean winter temperatures at Homer have increased by 5.9 °F and mean annual temperatures have increased by 3.8 °F (Alaska Climate Research Center 2009). It is important to note that these temperature trends span the 1976-1977 Pacific Climate Shift, during which an abrupt increase in winter and spring temperatures occurred, corresponding to a shift in the PDO (Hartman and Wendler 2005); however, 20th century warming is supported by proxy data from sea ice, glaciers, permafrost, vegetation, and snow cover. Climate projections derived from five general circulation models based on an intermediate climate change scenario (IPCC-A1B) indicate that average annual temperatures for SWAN parks will increase by 0.9-1.1 °F per decade (Scenarios Network for Alaska Planning 2008). Precipitation is also generally projected to increase, with 11-26% more snowfall in winter and 10-12% more rain in summer.

Other Resources

Additional climate-related information for the SWAN and surrounding areas include:

- Alaska Center for Climate Assessment & Policy (<http://www.uaf.edu/accap/>)
- Alaska Climate Research Center (<http://climate.gi.alaska.edu/>)
- Alaska Ocean Observing System (<http://www.aaos.org/>)
- Alaska Snow Water and Climate Services (<http://ambcs.org/>)
- Alaska State Climate Center (<http://climate.uaa.alaska.edu/>)
- National Climatic Data Center (<http://www.ncdc.noaa.gov/oa/>)
- NOAA Climate Services (<http://www.climate.gov>)
- National Data Buoy Center (<http://ndbc.noaa.gov>)
- National Weather Service – Alaska Region (<http://www.arh.noaa.gov/>)
- Pacific River Forecast Center (<http://aprfc.arh.noaa.gov/>)
- Western Regional Climate Center (<http://www.wrcc.dri.edu/>)

Methods

Stations

Few weather stations in the SWAN region have long-term reliable records. A complete inventory of land-based weather stations in the SWAN was completed by Davey and others (2007). Climate conditions have been monitored at a few locations near SWAN park units since the late 1930s and 1940s (one station record extends discontinuously to 1908). This report includes climate data from 39 stations operated by six different climate monitoring programs that are currently monitored by the SWAN (Figure 2). General descriptions of those climate monitoring programs are provided in Table 1 and station metadata are documented in Table 2. Collectively, those programs provide consistent monitoring of weather conditions and in some cases, provide a long-term climate record. However, the stations used for analysis in this summary report are the six weather stations with the longest, most complete records located near three SWAN parks.

Data Acquisition, Quality Control, and Data Processing

Six different climate monitoring programs, described in Table 1, maintain official repositories for climate data monitored by the SWAN. Acquisition of climate data and data processing details are provided in the Methods for Monitoring Climate in SWAN Parks (Lindsay et al. *in review*). In short, Remote Automated Weather Station (RAWS) data are obtained from the Western Regional Climate Center (WRCC). Data for National Oceanic and Atmospheric (NOAA) National Weather Service Cooperative Observing Program (COOP), Automated Surface Observing System (ASOS), Automated Weather Observing System (AWOS), and Climate Reference Network (CRN) stations are obtained from the NOAA National Climatic Data Center (NCDC). Snow Course and Snowpack Telemetry (SNOTEL) data are obtained from the National Resources Conservation Service (NRCS). Coastal-Marine Automated Network (CMAN) and moored buoy data (BUOY) data are obtained from the NOAA National Data Buoy Center (NDBC). Data from ancillary stations (e.g. seasonal ranger stations, temporary field data loggers) are not included in this report.

Data quality control procedures are provided by external agencies that manage the six different climate monitoring programs. Data-quality flags indicate missing or suspect data and the use of estimation procedures. RAWS data are subjected to additional data quality control measures that use range checking that follows MesoWest, or more conservative, specifications (Lindsay et al. *in review*). After acquisition, climate data (excluding Snow Course data) are processed using routines that convert data to standardized formats in both metric and U.S. customary units. Climate variables are summarized to daily and monthly measures. Maximum, minimum, and arithmetic means are derived for temperature. Arithmetic means are derived for relative humidity and snow depth. Cumulative values are calculated for precipitation and solar radiation. Scalar and unit vector averaging are used to derive average wind speed and wind direction, respectively. Missing, suspect, or otherwise flagged data are not used for summary purposes. For all derived measures, the percentage of valid observations is reported as a measure of the reliability of the derived mean and cumulative values. Monthly measures should not be considered representative of actual climatic conditions if more than 10% (three days) of observations are missing or suspect. Yearly measures should not be considered representative if more than 17% (five days) are missing from any month.

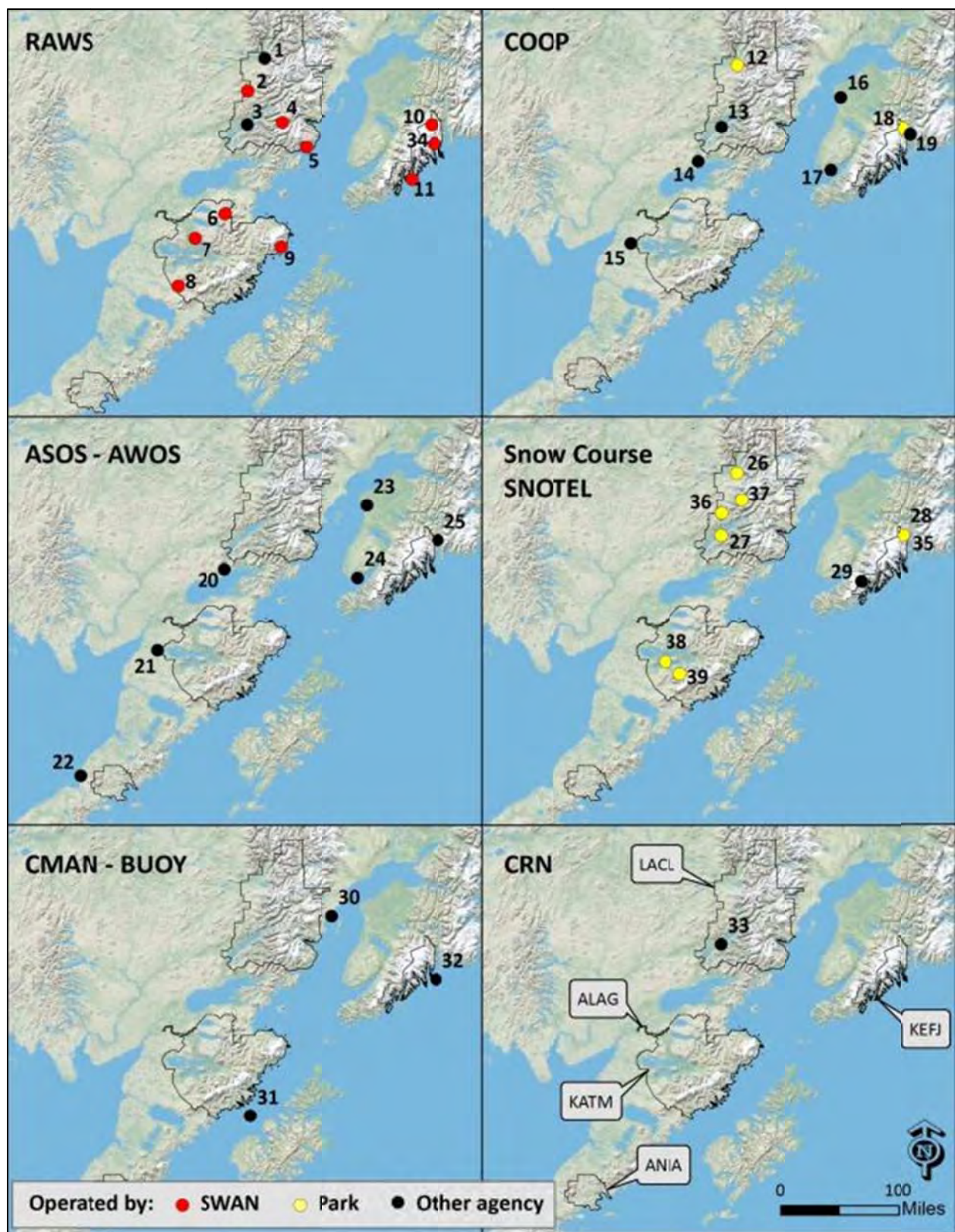


Figure 2. Locations of weather stations included in this report. Station acronyms, identifying numbers, and park acronyms are described in Table 1, Table 2, and the introduction section, respectively.

Table 1. Climate monitoring programs used within in the SWAN.

Climate monitoring program (Acronym in bold)	Responsible agency	Program synopsis
RAWS (Remote Automated Weather Stations)	National Interagency Fire Center (NIFC), NPS, BLM, USFS, etc.	Interagency network of weather stations mostly used by fire-personnel to estimate a fire-danger rating in support of preventative measures, and to forecast the behavior of wildland fires. Automated sensors record hourly air temperature, relative humidity, precipitation, wind speed and direction, solar radiation, and snow depth.
COOP (National Weather Service Cooperative Observing Program)	National Oceanic and Atmospheric Administration (NOAA)-National Weather Service (NWS)	Observer-based program created in 1890 to define the climate of the United States and help measure extreme weather events, climate variability, and long-term climatic changes. Manual observations include daily maximum and minimum air temperature, precipitation, and snowfall.
ASOS (Automated Surface Observing System); AWOS (Automated Weather Observing System)	NOAA-NWS, Federal Aviation Administration (FAA)	Weather stations installed at airports and military bases mostly used to support aviation needs and weather forecasting. Automated sensors record sub-hourly air temperature, relative humidity, precipitation, wind speed and direction, barometric pressure and other elements.
SNCO (Snow Course); SNOTEL (SNOWpack TELelemetry)	National Resources Conservation Service (NRCS)	Observer-based program that manually measures snow depth and snow-water equivalent along permanent transects; Automated stations that provide hourly measurements of air temperature, precipitation, snow depth, snow-water equivalent and other elements.
CMAN (Coastal-Marine Automated Network); Moored BUOY (Navy Oceanographic Meteorological Automated Device or NOMAD)	NOAA-National Data Bouy Center (NDBC)	Weather stations installed at lighthouses, capes, beaches, nearshore islands, and offshore platforms. Automated sensors record hourly air temperature, wind speed, gust, and direction, barometric pressure. Some stations also measure sea water temperature, and wave direction and intensity. Moored buoys equipped with automated sensors that record hourly air temperature, wind speed and direction, barometric pressure and other elements.
CRN (Climate Reference Network)	NOAA-National Climatic Data Center, NOAA-Atmospheric Turbulence and Diffusion Division	Network of weather stations being developed to provide long-term observations of temperature and precipitation that can be coupled to long-term, historical observations for the detection and attribution of present and future climate change. Automated sensors record hourly air temperature and precipitation. Other elements include ground surface temperature, solar radiation, and wind speed.

Table 2. Weather stations include in this report. Map numbers identify locations in Figure 2. ID number is from the climate monitoring network (e.g. NESDIS ID, COOP Station No., WBAN ID, NRCS ID, NDBC No.). Station start is the earliest date listed for that ID number in the NCDC Multi-network Metadata System.

Station name	Acronym	Station type	Map no.	ID no.	Lat. N	Lon. W	Elev ft.	Station start
Brooks Camp	BRCA	SNCO	38	55J01	58.533	155.767	150	1995
Chigmit Mountains	CHMO	RAWS	4	FA6544FC	60.2249	153.4675	4658	7/2009
Contact Creek	COCR	RAWS	8	32803738	58.2076	155.9225	657	6/2008
Coville	COVI	RAWS	7	3280B12C	58.8025	155.5629	1567	6/2008
Drift River Terminal	DRRI	CMAN	30	DRFA2	60.5533	152.1367	53	9/1999
Exit Glacier	EXGL	SNCO	28	49L18	60.1903	149.6212	400	9/1988
Exit Glacier	EXGL	SNTE	35	49L18	60.1903	149.6212	400	7/2011
Fishtrap Lake	FILA	SNCO	36	54L02	60.4913	154.3296	1800	8/1991
Fourpeaked	FOUR	RAWS	9	328135C2	58.7057	153.5179	1074	6/2009
Harding Icefield	HAIC	RAWS	10	FA656210	60.1325	149.7820	4335	7/2004
Hickerson Lake	HILA	RAWS	5	3280C7BC	59.9148	152.8925	1048	6/2008
Homer Airport	HOAI	COOP	17	503665	59.6428	151.4872	64	9/1949
Homer Airport	HOAI	ASOS	24	25507	59.6428	151.4872	64	12/1997
Iliamna Airport	ILAI	COOP	14	503905	59.7539	154.9069	183	9/1949
Iliamna Airport	ILAI	ASOS	20	25506	59.7539	154.9069	183	12/1997
Kenai Airport	KEAI	COOP	16	504546	60.5797	151.2391	91	9/1949
Kenai Airport	KEAI	ASOS	23	26523	60.5797	151.2391	91	5/1999
King Salmon Airport	KISA	COOP	15	504766	58.6829	156.6563	47	7/1955
King Salmon Airport	KISA	ASOS	21	25503	58.6829	156.6563	47	6/1998
McArthur Pass	MCPA	RAWS	11	3280244E	59.4726	150.3337	1266	6/2008
Nuka Glacier	NUGL	SNTE	29	50K06S	59.6943	150.7110	1250	10/1990
Pedersen Lagoon	PELA	RAWS	34	326AD012	59.8944	149.7308	624	8/2011
Pfaff Mine	PFMI	RAWS	6	FA65578A	59.1109	154.8367	2018	6/2008
Pilot Rock	PIRO	CMAN	32	PILA2	59.7417	149.4700	79	12/1999
Port Alsworth	POAL	COOP	13	507570	60.2033	154.3164	260	6/1960
Port Alsworth	POAL	SNCO	27	54L01	60.1921	154.3272	270	10/1991
Port Alsworth	POAL	RAWS	3	FA6102CC	60.1958	154.3200	321	6/1992
Port Alsworth 1 SW	P1SW	CRN	33	USW00026562	60.1958	154.3198	315	9/2009
Port Heiden	POHE	AWOS	22	25508	56.9500	158.6167	95	10/2007
Seward	SEWA	COOP	19	508371	60.1039	149.4439	110	9/1949
Seward Airport	SEAI	ASOS	25	26438	60.1283	149.4167	22	4/1997
Seward 8NW	S8NW	COOP	18	508375	60.1883	149.6275	410	6/1983
Shelikof Strait	SHST	BUOY	31	46077	57.9200	154.2542	0	10/2005
Snipe Lake	SNLA	RAWS	2	328041A8	60.6103	154.3199	2315	6/2008
Stoney	STON	RAWS	1	FA600036	61.0008	153.8958	1250	6/1992
Telaquana Lake	TELA	COOP	12	T.B.D.	60.984	153.924	1250	6/1997
Telaquana Lake	TELA	SNCO	26	53L01	60.983	153.917	1550	8/1991
Three Forks	THFO	SNCO	39	55J02	58.367	155.383	900	1995
Upper Twin Lakes	UTLA	SNCO	37	53L02	60.650	153.800	2000	8/1991

Reporting Interval

Reporting is based on the hydrologic year (October 1 to September 30) instead of the calendar year because it allows for more data completeness and because the timing and seasonality of many physical processes that are driven by climate (e.g. onset and breakup of lake ice, glacial accumulation and ablation dynamics, and the magnitude and timing of streamflow) more closely follow the hydrologic year. Considerable data are not transmitted from many remote weather stations (i.e. RAWs operated and maintained by the SWAN) during winter months because of antenna icing (e.g. interference with GOES telemetry); however, these data are stored on-site, are retrieved during subsequent summer months, and climate databases are updated with the complete record. Reporting based on the hydrologic year is therefore more relevant, complete, and timely than reporting would be if it were based on the calendar year.

Summary Reports and Graphs

Summary reports and graphs for the most consistently measured climate variables from 39 weather stations monitored by the SWAN are included in the Appendices and are organized alphabetically by park, climate monitoring program, and station name. Daily measures are used for generating graphs (with the exception of NRCS Snow Courses) and monthly measures are used for generating summary reports. Mean temperature, total precipitation, mean snow depth, mean wind speed and direction, and maximum wind speed are presented in graphs. Minimum, maximum, and mean temperature data, the number of frost days (where the minimum temperature is below freezing), and the number of ice days (where the maximum temperature is below freezing) are included in the summary reports. Total precipitation, average snow depth, mean and maximum wind speed, maximum wind direction, and cumulative solar radiation are also presented in the summary reports. The percentage of valid observations is reported as a measure of the reliability of the derived mean and cumulative values for all reported climate variables. Climatic normal values (arithmetic mean over a 30-year interval) from the NCDC for the 1981-2010 period and period of record (POR) mean values from the WRCC are included for stations with a long enough observational record.

Analyses

The stations used for analysis in this summary report are six weather stations with the longest, most complete records located near three SWAN parks. These stations are Homer Airport, Iliamna Airport, Kenai Airport, King Salmon Airport, Port Alsworth, and Seward (Table 2).

Results

Regional Overview

Temperature

The SWAN region was colder than average during the 2011 hydrologic year. Compared to the climatological normal (the prevailing set of weather conditions calculated over a 30-year period, currently 1981-2010), mean annual temperatures for long-term weather stations in the SWAN region were 0.2 to 2.3 °F below average (Table 3). Maps showing monthly temperature departures from average, which are calculated by subtracting the 30-year average monthly temperature from the observed average monthly temperature, are shown in Figure 3. The hydrologic year began with warmer than average temperatures during October and November. December was anomalously cold across the region. Iliamna was 9.9 °F below average and King Salmon was 11.6 °F below average during December. A break from the cold temperatures occurred in January with warmer than average temperatures across the western part of the region. February and March were also colder than average. During April and May, locations across the northern part of the region (Iliamna, Port Alsworth, and Kenai) were slightly warmer than average whereas locations across the southern part of the region (King Salmon, Homer, and Seward) were slightly colder than average. The summer months of June, July, and August were colder than average across the region with temperature departures from normal ranging from 0.5 to 3.0 °F below normal. September was characterized by slightly warmer than average temperatures at locations in the western area of the region (King Salmon, Iliamna, and Port Alsworth) and slightly below average temperatures at locations in the eastern part of the region (Homer, Kenai, and Seward). In general, stations with maritime influence (Homer, King Salmon, and Seward) had a greater number of months during the year with below average temperatures than stations with more continental, boreal climate (Iliamna, Kenai, and Port Alsworth).

Precipitation

The SWAN region received less than average to near average precipitation during the 2011 hydrologic year. Compared to the climatological normal, total annual precipitation for long-term weather stations in the SWAN region was 75 to 103 % of average (Table 4). Locations in the eastern part of the region (Homer, Kenai, and Seward) were drier than average, receiving 75 to 92% of average precipitation whereas locations in the western part of the SWAN region (King Salmon and Iliamna) received near average precipitation (102 to 103% of average). Precipitation was not reported for Port Alsworth during the month of December so annual measures are not valid; however, the cumulative precipitation for the remaining months was above average. Maps showing monthly precipitation percent of average, which is calculated by dividing the observed monthly precipitation by the 30-year average monthly precipitation, are shown for long-term weather stations in Figure 4. In general, the first half of the hydrologic year (October to March) was characterized by drier than average conditions across the region. April, June, and August were characterized by average to above average precipitation at locations across the region. May, July, and September were generally drier than average.

Table 3. Average daily temperatures during hydrologic year 2011 (Oct. 1, 2010 to Sep. 30, 2011) and departures from 1981-2010 averages for long-term weather stations in southwest Alaska.

Station name	Station ID	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Homer Airport	503665	37.9 (-0.5)	29.7 (0.2)	18.1 (-9.0)	25.0 (0.2)	23.2 (-3.0)	25.5 (-4.4)	35.4 (-1.6)	42.7 (-1.8)	48.2 (-2.4)	51.6 (-3.0)	51.6 (-2.3)	46.8 (-1.3)	36.4 (-2.3)
Iliamna Airport	503905	37.5 (2.5)	24.5 (0.2)	6.9 (-9.9)	21.8 (5.3)	15.5 (-3.2)	21.6 (-0.5)	32.2 (0.2)	43.8 (0.8)	48.6 (-2.6)	52.7 (-2.8)	53.1 (-1.5)	48.5 (0.6)	34.0 (-0.8)
Kenai Airport	504546	39.8 (4.6)	28.2 (5.0)	10.2 (-8.8)	19.4 (3.0)	16.6 (-3.1)	24.6 (-1.1)	38.8 (2.6)	47.4 (1.4)	52.2 (-0.3)	53.9 (-2.4)	52.7 (-2.3)	47.4 (-0.7)	36.0 (-0.2)
King Salmon Airport	504766	35.4 (1.9)	22.8 (-0.1)	7.0 (-11.6)	19.9 (3.7)	16.9 (-1.9)	23.1 (-1.0)	32.6 (-1.1)	45.2 (1.0)	48.7 (-2.8)	52.0 (-3.5)	52.1 (-2.5)	48.0 (0.4)	33.8 (-1.4)
Port Alsworth	507570	39.4 (4.9)	26.3 (2.5)	-- (--)	20.5 (5.0)	17.6 (-1.0)	20.7 (-3.6)	36.3 (1.1)	47.9 (1.9)	52.7 (-1.6)	56.6 (-1.3)	55.0 (-0.5)	49.1 (1.7)	-- (--)
Seward	508371	40.3 (0.7)	32.4 (1.5)	22.4 (-6.5)	26.3 (-0.8)	24.8 (-3.5)	30.8 (-1.3)	38.2 (-0.5)	44.5 (-1.9)	49.9 (-2.3)	55.5 (-0.5)	53.6 (-2.1)	47.3 (-2.2)	39.1 (-1.4)

Temperatures are given in degrees Fahrenheit. Departures from 1981-2010 averages are given in parenthesis. Station IDs are from National Weather Service COOP stations. Monthly statistics are not reported if more than 10% of observations (three days) are missing. Annual statistics are not reported if more than 17% of observations (five days) are missing from any month. The percentage of valid observations are reported in the Appendices.

Table 4. Total monthly precipitation during hydrologic year 2011 (Oct. 1, 2010 to Sep. 30, 2011) and percentage versus 1981-2010 averages for long-term weather stations in southwest Alaska.

Station name	Station ID	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Homer Airport	503665	4.26 (166)	2.81 (101)	1.52 (49)	1.41 (54)	1.99 (116)	0.26 (16)	1.27 (119)	0.40 (49)	0.76 (93)	0.92 (59)	3.28 (140)	3.11 (94)	21.98 (90)
Iliamna Airport	503905	2.83 (88)	1.44 (68)	1.35 (89)	0.69 (54)	0.87 (82)	0.43 (55)	1.13 (133)	0.79 (68)	3.16 (238)	3.10 (108)	6.56 (158)	3.05 (67)	25.42 (102)
Kenai Airport	504546	1.48 (56)	2.81 (204)	0.46 (34)	0.35 (36)	0.66 (75)	0.08 (13)	1.06 (180)	0.43 (47)	1.25 (117)	1.52 (83)	4.90 (182)	1.68 (51)	16.67 (92)
King Salmon Airport	504766	1.70 (82)	0.82 (59)	1.11 (90)	1.27 (125)	0.65 (86)	0.10 (14)	1.09 (112)	1.93 (154)	2.78 (168)	2.21 (96)	4.11 (139)	2.30 (72)	20.08 (103)
Port Alsworth	507570	1.50 (100)	2.75 (188)	-- (--)	0.59 (73)	1.40 (171)	0.12 (18)	0.97 (198)	0.07 (17)	2.93 (396)	2.57 (193)	3.02 (160)	1.00 (45)	-- (--)
Seward	508371	9.82 (105)	5.45 (75)	3.57 (37)	4.98 (62)	2.09 (35)	0.76 (17)	4.30 (95)	2.15 (64)	1.38 (57)	1.32 (47)	8.53 (152)	10.84 (110)	55.20 (75)

Percentages of monthly average precipitation versus 1981-2010 given in parentheses. Station IDs are from National Weather Service COOP stations. Monthly statistics are not reported if more than 10% of observations (three days) are missing. Annual statistics are not reported if more than 17% of observations (five days) are missing from any month. The percentage of valid observations are reported in the Appendices.

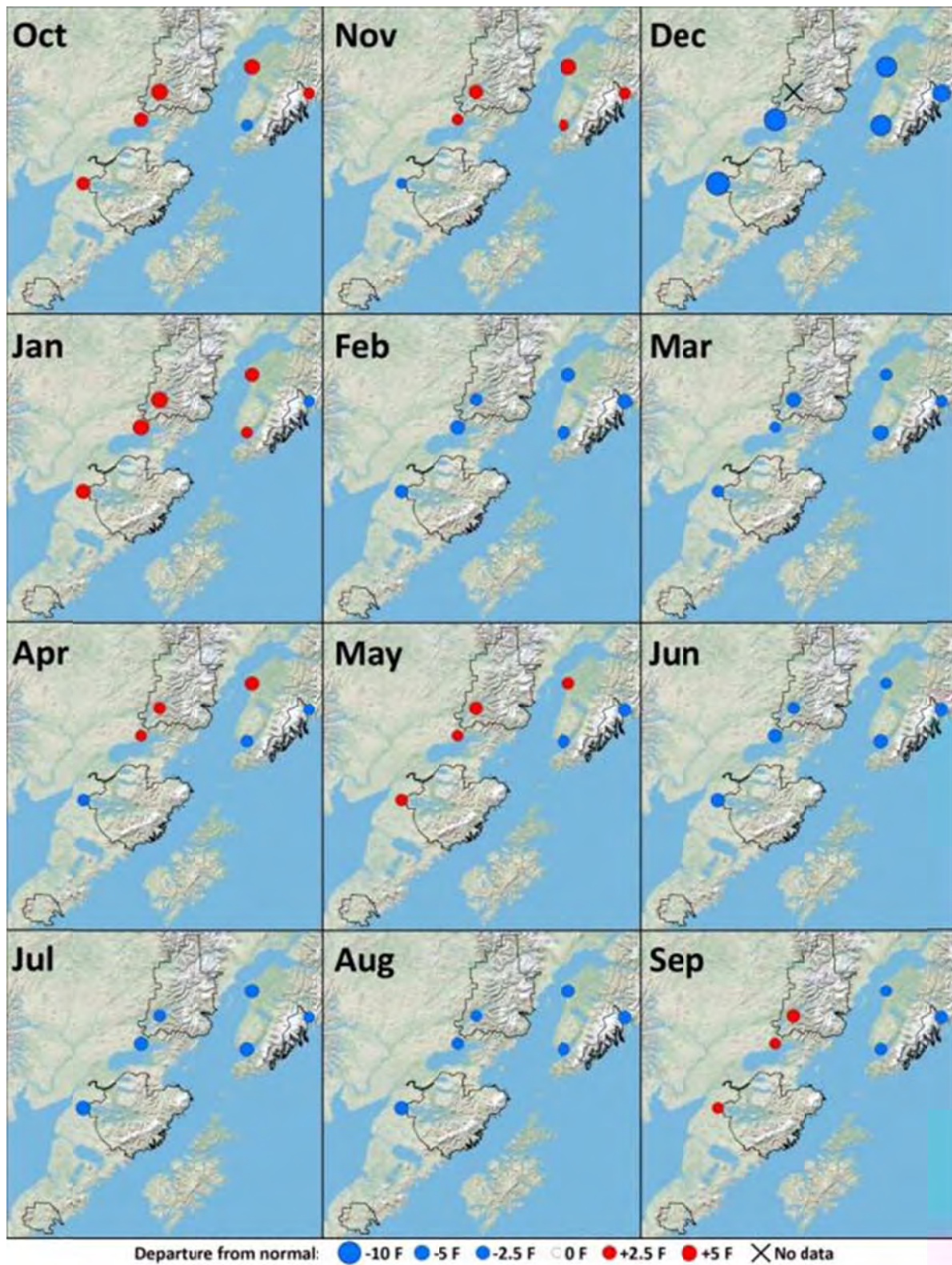


Figure 3. Monthly temperature anomalies (departure from 1981-2010 averages) for long-term weather stations in southwest Alaska during the 2011 hydrologic year. Red symbols indicate warmer than average conditions and blue symbols indicate cooler than average conditions.

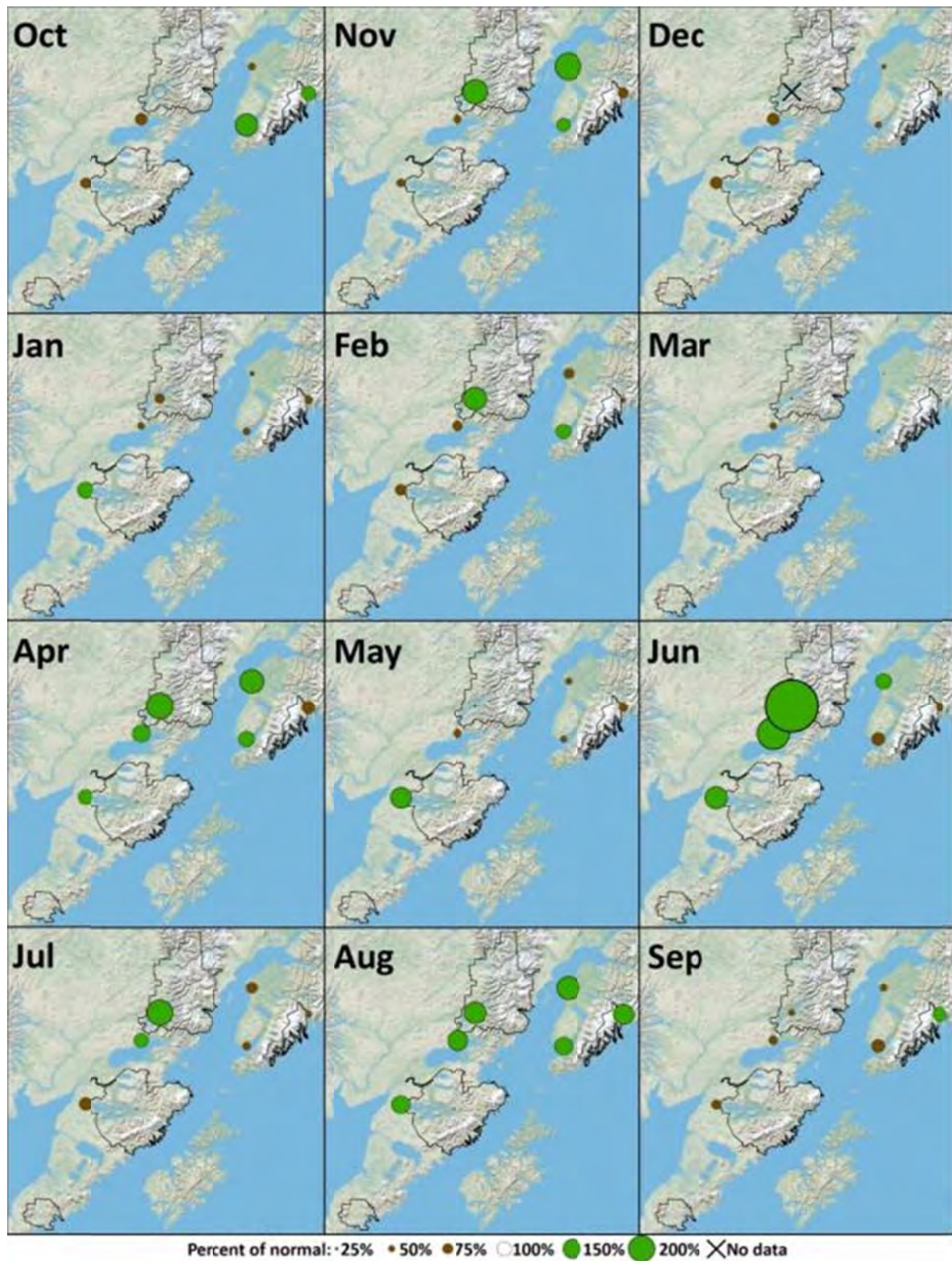


Figure 4. Monthly precipitation anomalies (percentages of 1981-2010 averages) for long-term weather stations in southwest Alaska during the 2011 hydrologic year. Green symbols indicate wetter than average conditions, brown symbols indicate drier than average conditions.

Location of Summary Reports and Graphs for Individual Stations

Summary reports and graphs for consistently measured climate variables from 39 weather stations monitored by the SWAN (shown in Figure 2 and listed in Table 2) are included in the Appendices and are organized alphabetically by park, climate monitoring program, and station name.

Limitations

Measuring winter-time precipitation (i.e. snowfall, snow depth, and snow water equivalent) is difficult to accomplish across the SWAN region. Snow surveys are relatively accurate, but they are only measured once a month and at a few key locations. Most remote weather stations have limited (photovoltaic) power supplies and therefore rely on unheated tipping buckets, which are only capable of accurately measuring liquid precipitation (e.g. rain). Although sonic snow depth sensors are used at many of these stations (e.g. RAWs), snow water equivalent is not measured. A few remote weather stations utilize storage or displacement precipitation gauges or snow pillows (Harding Icefield, Nuka Glacier). The logistical challenges and costs associated with maintaining those gauges or pillows (which are filled with an antifreeze solution) and protecting them from wildlife are significant and make them impractical to operate at more than a few key locations. Undercatch (the difference between the actual amount of precipitation and the amount measured by a precipitation gauge) is a significant problem at the Harding Icefield because of the windy nature of the site. Currently, accurate year-round precipitation is only measured at a few locations within the SWAN, including all of the long term stations (Table 3) discussed above. Summarized precipitation values reported in the tables in the Appendices for individual stations that are only capable of measuring liquid precipitation are indicated with notes. Precipitation values reported for these stations are not considered valid if the maximum air temperature is below 31.1 °F and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values. False precipitation may also be recorded at RAWs during strong wind events. Vibrations from strong winds shaking the station can cause tipping buckets to tip excessively, artificially exaggerating any precipitation that may (or may not) be occurring. Precipitation values reported for these stations are not considered valid when maximum wind speeds exceed 70 mph and this is reflected in the percentage of valid observations.

Discussion

Historical Context

Cautionary Note

Assessments of the historical context of trends and average conditions for SWAN region weather stations should be viewed in the context of the available record. Although the 50 to 80 year observational period for the long-term stations discussed above provides an adequate basis for evaluating the historical context of the recent climate with respect to climatological normal or the period of record, this period may be too short for discerning long-term changes in climate. For example, the period of record at the long-term weather stations discussed herein spans only one complete PDO cycle. The climate data for the long-term stations discussed above has been subjected to a suite of quality assurance checks (NCDC 2011), but it has not been adjusted for bias resulting from historical changes in instrumentation and observing practices. Therefore, long-term climate trends are not calculated or reported here. Period of record means are used exclusively as a basis for historical context in this discussion.

Temperature and Precipitation at Long-Term Stations

Relatively complete daily records of maximum temperature, minimum temperature, and precipitation are available for the last 50 to 80 years from six long-term stations (Homer Airport, Iliamna Airport, Kenai Airport, King Salmon Airport, Port Alsworth, and Seward) located across the SWAN region. Temperature and precipitation data are summarized by hydrologic year for each of the long-term stations in Figures 5 – 10. Mean daily maximum temperatures are plotted in box A. Values for years where no month is missing more than five values are shown with colored symbols. Values for years where one or more months have more than five missing values (sometimes an entire month of data is missing) should not be considered representative and are only shown for reference (these data are shown with white symbols). Mean daily maximum temperature anomalies are plotted in box B. These anomalies were calculated by subtracting the period of record mean daily maximum temperature from the observed mean daily maximum temperature for that year. The sample standard deviation is provided for reference and helps to identify which anomalies are statistically significant. Both the period of record means and anomalies were calculated only for years where no month is missing more than five daily values. Mean daily minimum temperatures are plotted in box C. Mean daily minimum temperature anomalies are plotted in box D. Total precipitation (for the hydrologic year) is plotted in box E. Precipitation anomalies are plotted in box F. Mean annual temperature anomalies for each of the long-term stations for years where no month is missing more than five daily values are shown in Figure 11. The symbols and methods used to generate these plots are identical to those described above.

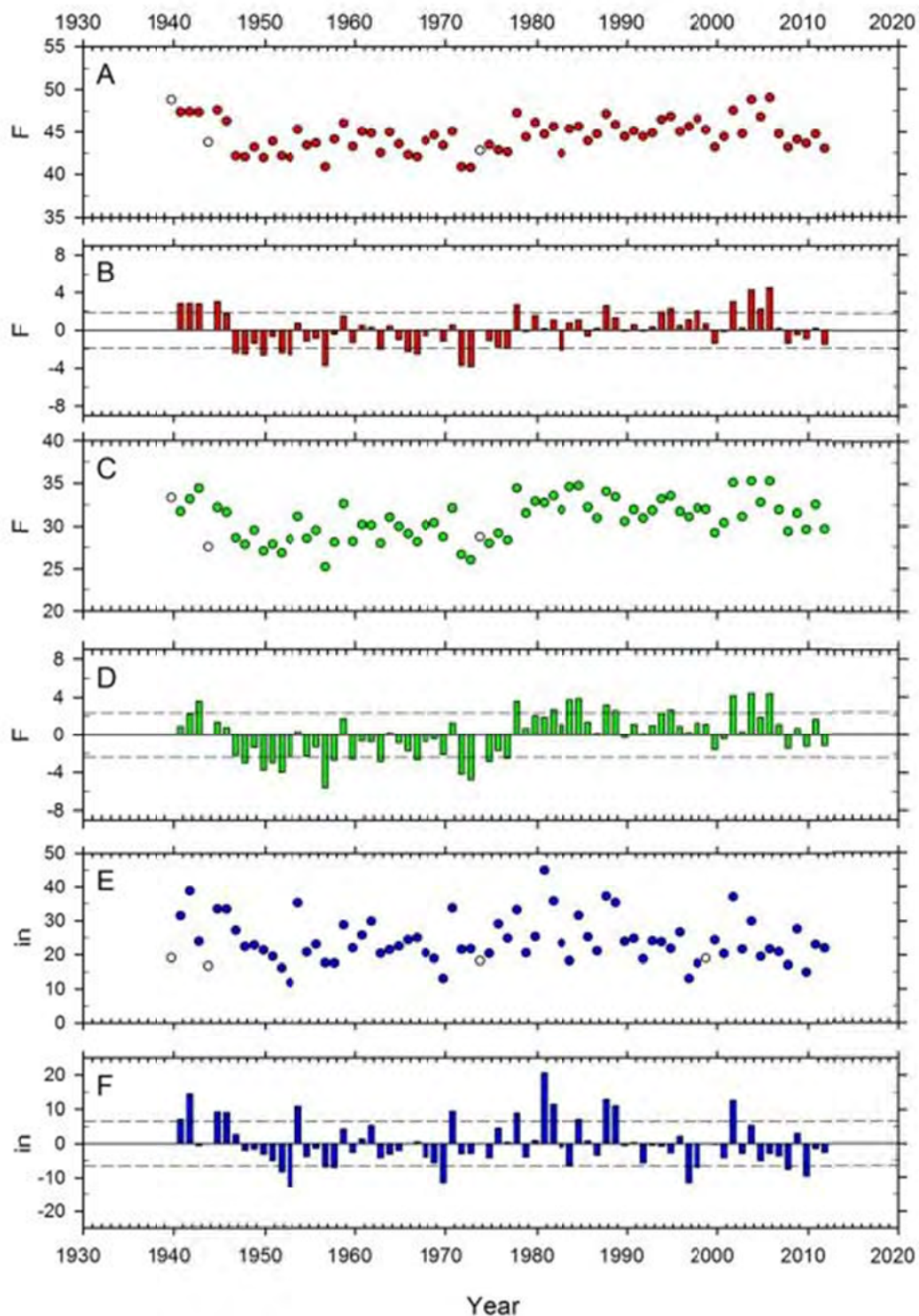


Figure 5. Temperature (T) and precipitation (P) at Homer Airport for 1939-2011 hydrologic years. **A)** Mean maximum T , **B)** maximum T anomalies, **C)** mean minimum T , **D)** minimum T anomalies, **E)** total annual P , **F)** annual P anomalies. Colored symbols represent years where no month is missing >5 values, white symbols represent years where ≥ 1 month is missing >5 values. Anomalies and sample standard deviations (dashed lines) calculated using years where no month is missing >5 values.

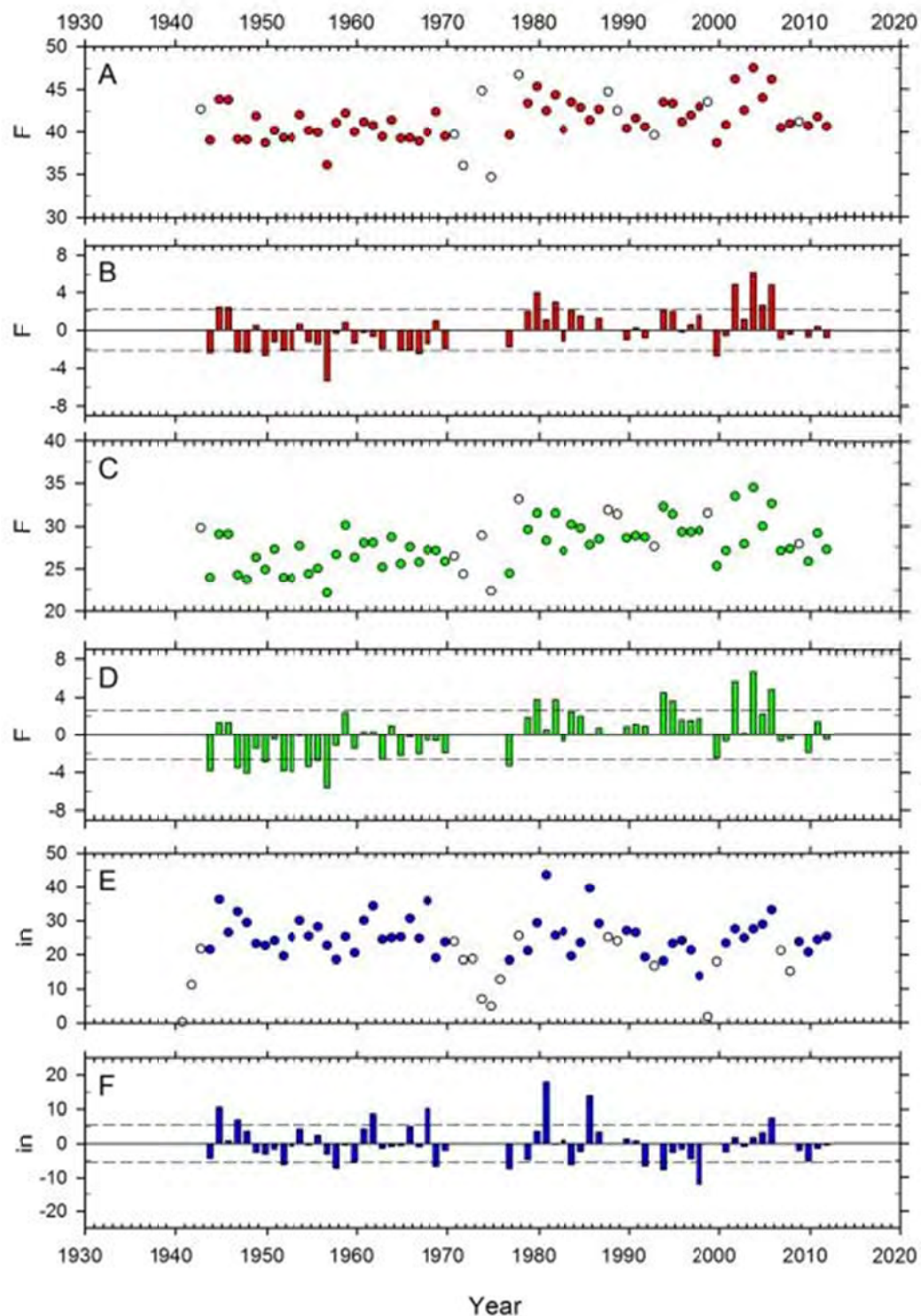


Figure 6. Temperature (T) and precipitation (P) at Iliamna Airport for 1943-2011 hydrologic years. **A)** Mean maximum T , **B)** maximum T anomalies, **C)** mean minimum T , **D)** minimum T anomalies, **E)** total annual P , **F)** annual P anomalies. Colored symbols represent years where no month is missing >5 values, white symbols represent years where ≥ 1 month is missing >5 values. Anomalies and sample standard deviations (dashed lines) calculated using years where no month is missing >5 values.

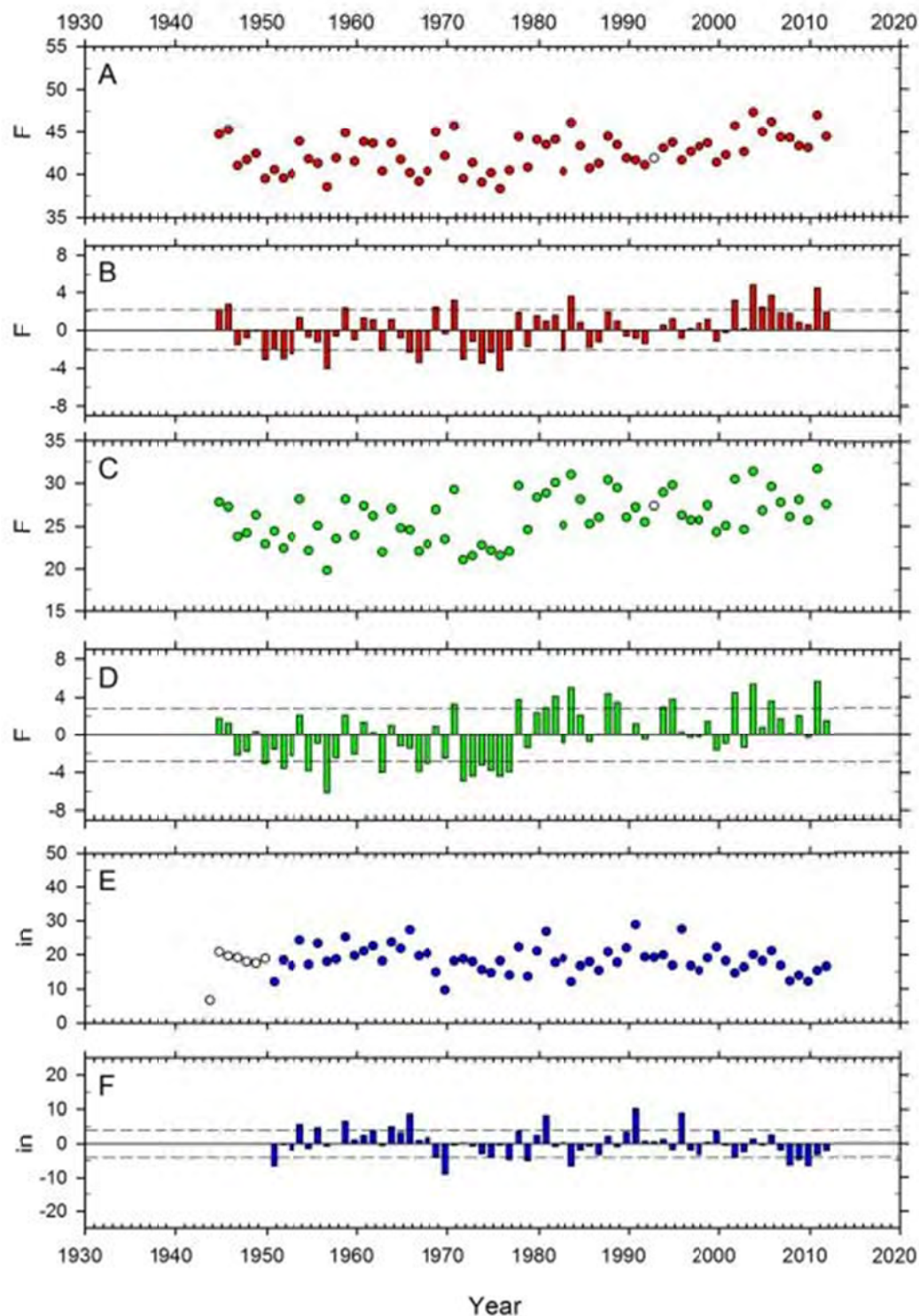


Figure 7. Temperature (T) and precipitation (P) at Kenai Airport for 1944-2011 hydrologic years. **A)** Mean maximum T , **B)** maximum T anomalies, **C)** mean minimum T , **D)** minimum T anomalies, **E)** total annual P , **F)** annual P anomalies. Colored symbols represent years where no month is missing >5 values, white symbols represent years where ≥ 1 month is missing >5 values. Anomalies and sample standard deviations (dashed lines) calculated using years where no month is missing >5 values.

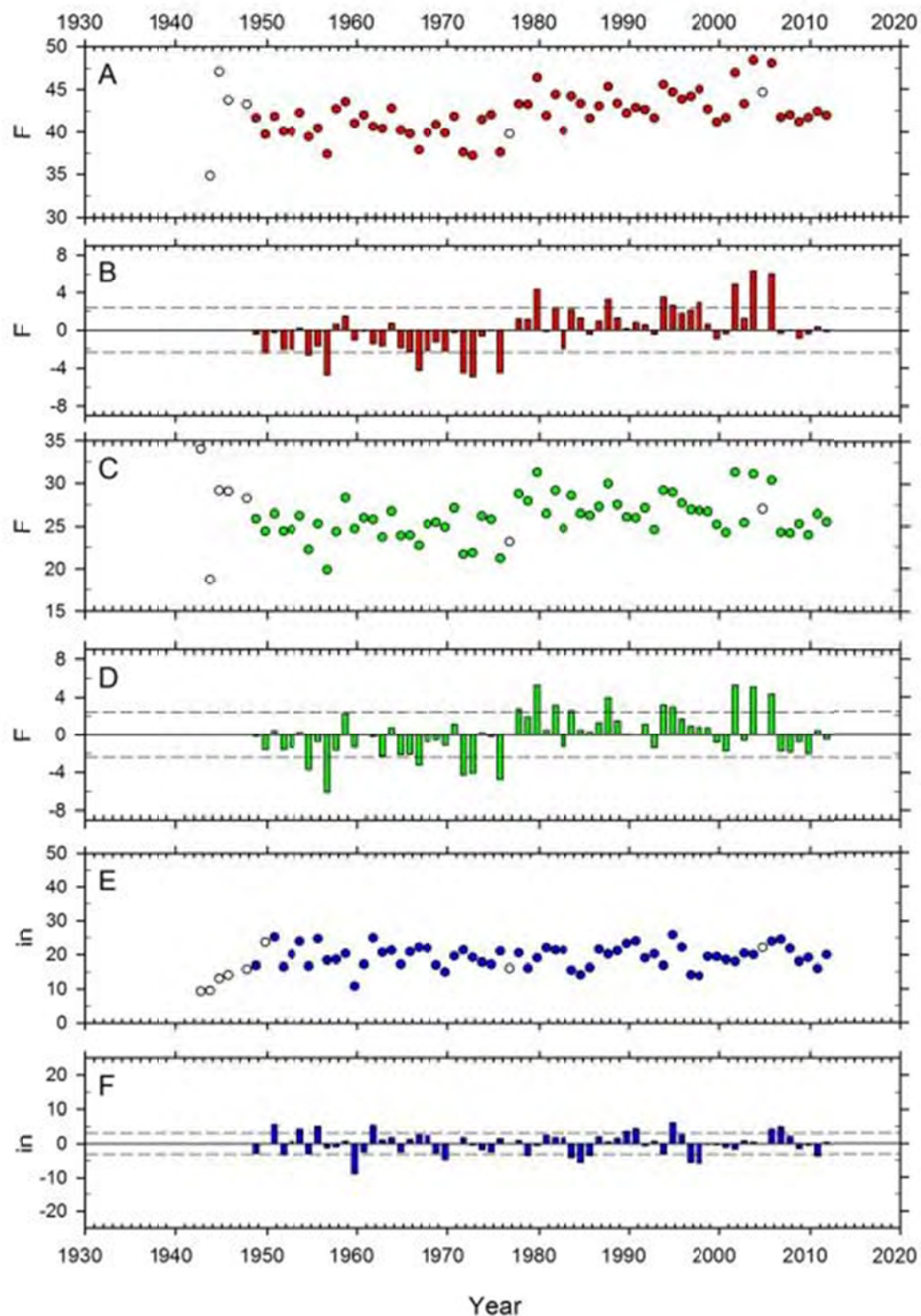


Figure 8. Temperature (T) and precipitation (P) at King Salmon Airport for 1942-2011 hydrologic years. **A)** Mean maximum T , **B)** maximum T anomalies, **C)** mean minimum T , **D)** minimum T anomalies, **E)** total annual P , **F)** annual P anomalies. Colored symbols represent years where no month is missing >5 values, white symbols represent years where ≥ 1 month is missing >5 values. Anomalies and sample standard deviations (dashed lines) calculated using years where no month is missing >5 values.

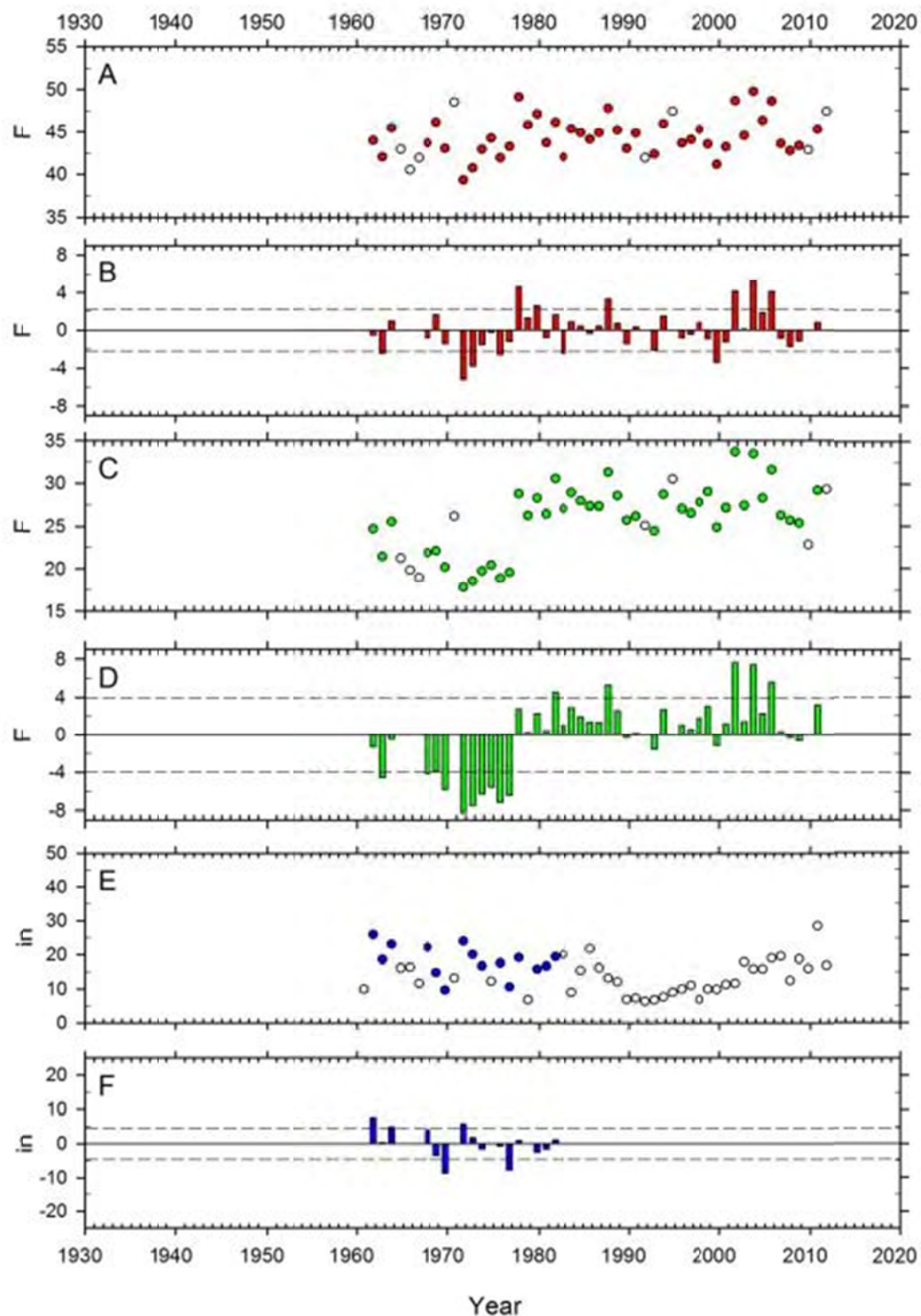


Figure 9. Temperature (T) and precipitation (P) at Port Alsworth for 1960-2011 hydrologic years. **A)** Mean maximum T , **B)** maximum T anomalies, **C)** mean minimum T , **D)** minimum T anomalies, **E)** total annual P , **F)** annual P anomalies. Colored symbols represent years where no month is missing >5 values, white symbols represent years where ≥ 1 month is missing >5 values. Anomalies and sample standard deviations (dashed lines) calculated using years where no month is missing >5 values.

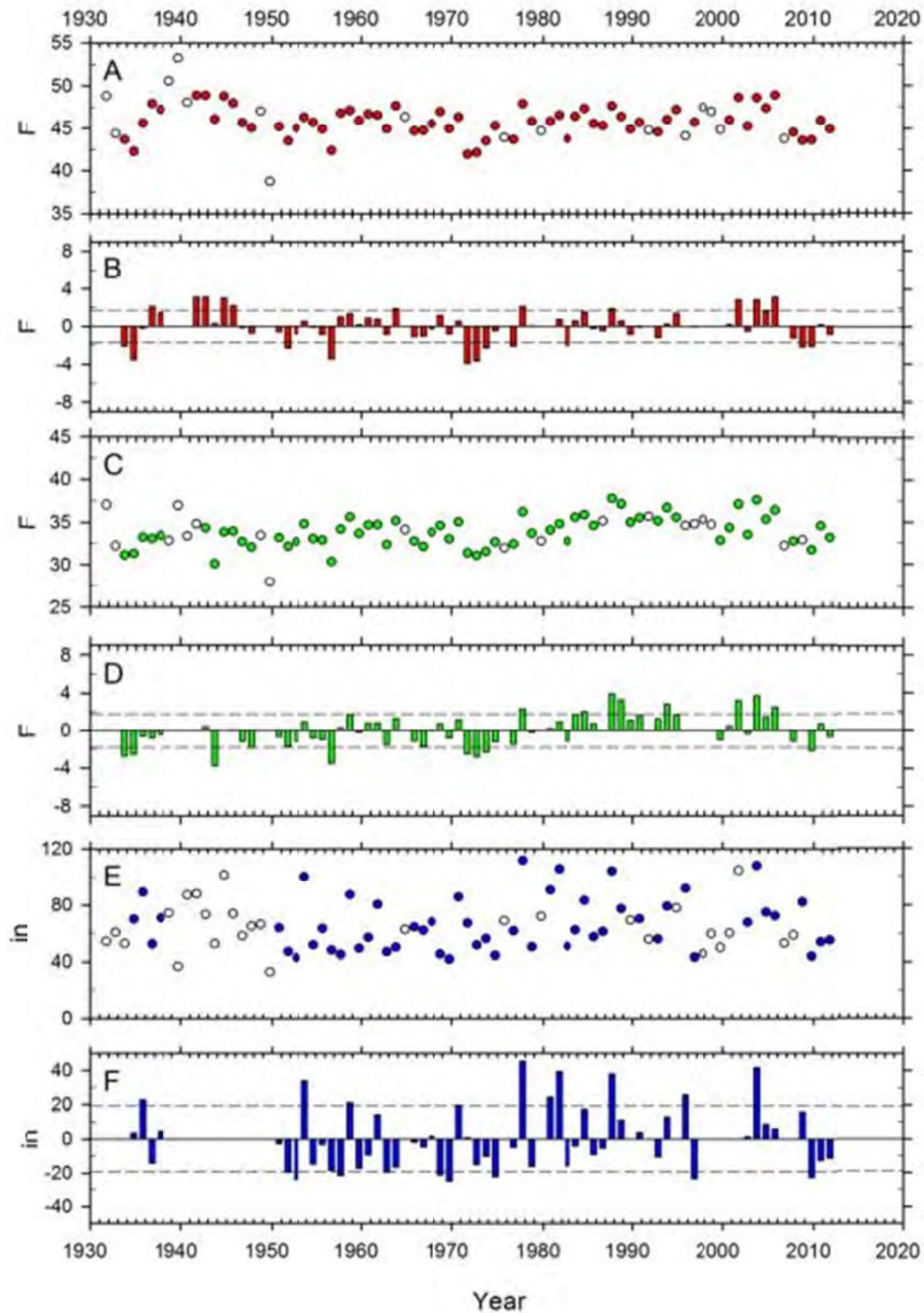


Figure 10. Temperature (T) and precipitation (P) at Seward for 1931-2011 hydrologic years. **A)** Mean maximum T , **B)** maximum T anomalies, **C)** mean minimum T , **D)** minimum T anomalies, **E)** total annual P , **F)** annual P anomalies. Colored symbols represent years where no month is missing >5 values, white symbols represent years where ≥ 1 month is missing >5 values. Anomalies and sample standard deviations (dashed lines) calculated using years where no month is missing >5 values.

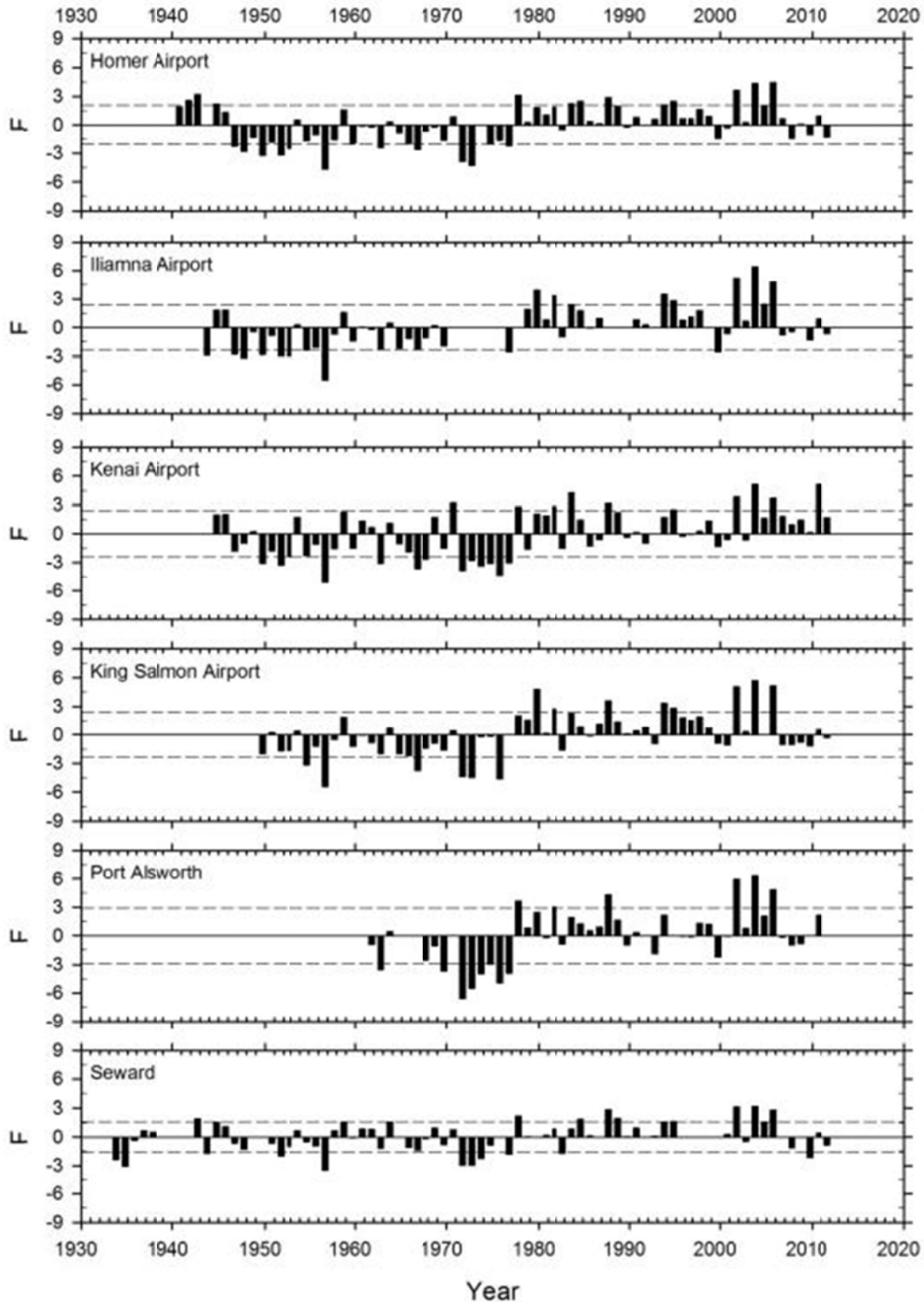


Figure 11. Mean annual temperature anomalies at the Homer Airport, Iliamna Airport, Kenai Airport, King Salmon Airport, Port Alsworth and Seward for the 1931-2011 hydrologic years. Only years where no month is missing more than five daily values are shown. Anomalies and sample standard deviations (dashed lines) calculated only for years where no month is missing more than five daily values.

Assessment

With the exception of the 2010 hydrologic year, the past six hydrologic years (2006-2011) have been characterized by mean annual temperatures equal to or slightly colder than the period of record mean at Homer, Iliamna, King Salmon, Port Alsworth, and Seward (Figure 11). In contrast, mean annual temperatures for these five locations were characterized by mean annual temperatures equal to or significantly warmer than the period of record mean during the 2001 to 2005 hydrologic years. Mean annual temperatures during ten of the past eleven hydrologic years (2001 and 2003-2011) were generally equal to or significantly warmer than the period of record mean at Kenai. The warm temperature anomalies at Kenai during recent hydrologic years are inconsistent with conditions observed at the other long-term stations. The cause of these anomalies isn't clear and should be examined.

An abrupt positive shift in temperature beginning during the 1977 hydrologic year is evident at five of the long-term stations (Kenai, King Salmon, Homer, Port Alsworth, and Seward). This shift is not as noticeable at Iliamna, because it is somewhat obscured by the poor observational record during the 1971-1977 hydrologic years. The increase in minimum temperatures is greater than the increase in maximum temperatures (boxes A and C in Figures 5 – 10). This shift probably reflects generally warmer winter conditions beginning in the late 1970s, and has been well correlated with the shift from negative (cool phase) to positive (warm phase) PDO conditions (e.g. Simpson et al. 2002; Hartman and Wendler 2005).

The historical context for precipitation is less clear. Generally drier than period of record mean conditions have been observed at Homer (for the last eight hydrologic years, with the exception of the 2008 hydrologic year), Iliamna (for the past four hydrologic years), and Kenai (for the last six hydrologic years). Equal to or slightly drier than period of record mean precipitation has been recorded in King Salmon for the last four hydrologic years (2008-2011). Seward is characterized by wide interannual variability in precipitation over the entire period of record (Figure 10). The precipitation record at Port Alsworth in recent years is not complete enough for evaluation.

PDO Conditions

The 2011 hydrologic year was characterized by negative (cool phase) PDO conditions (JISAO 2011). These negative PDO conditions are reflected by cold sea surface temperature (SST) anomalies in the Gulf of Alaska and Bering Sea (within a few hundred miles of shore) and warm SST anomalies in the central North Pacific (Figure 12). Negative (cool phase) PDO conditions have prevailed since August 2006 with the notable exception of much of the 2010 hydrologic year, which was characterized by neutral to slightly positive PDO conditions.

PDO conditions are moderately correlated to temperature. Temperatures in and near the Gulf of Alaska are often cooler than normal when negative PDO conditions exist (Zhang et al. 1996; Mantua et al. 1997). It has also been suggested that drier than normal conditions occur in the Gulf of Alaska region north of about 57° N latitude and on the Alaska Peninsula when negative PDO conditions exist (Mantua et al. 1997; Papineau no date). Other studies, however, found no relationship between PDO and precipitation in this region (L'Heureux et al. 2004).

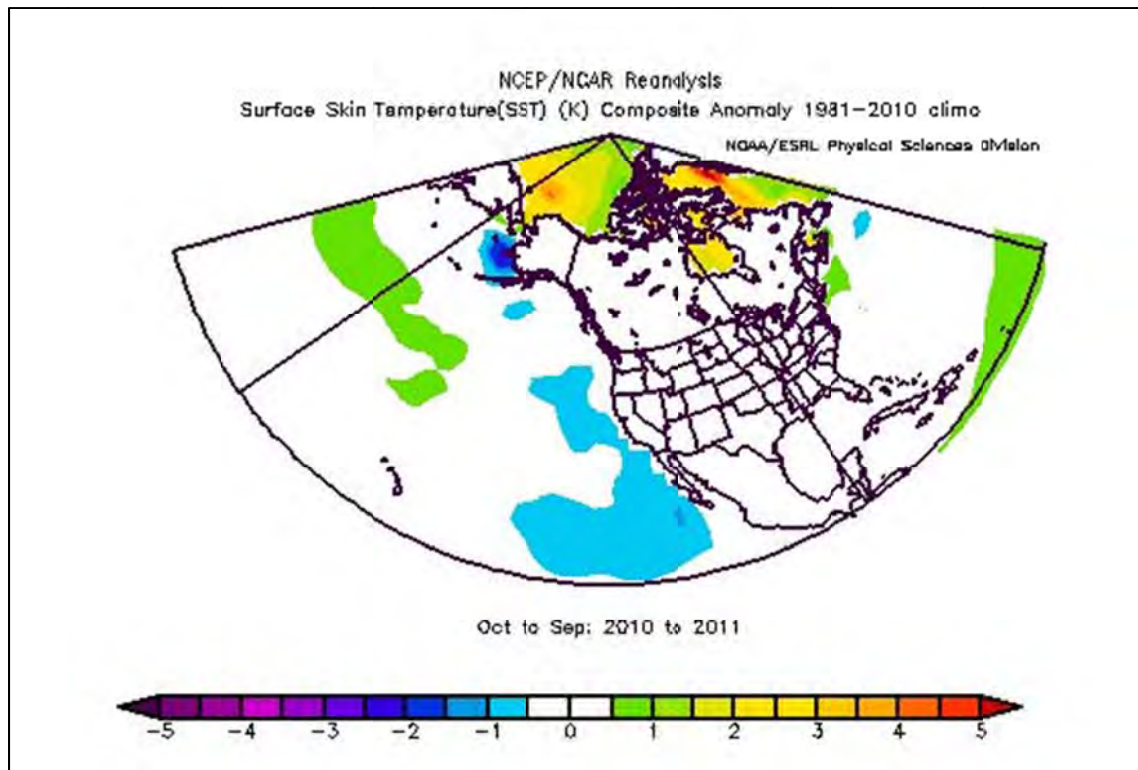


Figure 12. Sea surface temperature composite anomaly for the North Pacific area (October 2010 - September 2011). Figure was generated using the NOAA/ESRL Physical Sciences Division website (<http://www.esrl.noaa.gov/psd/>) using NCEP reanalysis data (Kalnay et al. 1996). Climate means are based on 1981-2010.

ENSO Conditions

The 2011 hydrologic year was generally characterized by La Niña (cool phase ENSO) conditions (NWS Climate Prediction Center 2011). A La Niña event developed in the summer of 2010 and persisted through the spring of 2011. La Niña conditions are moderately-to-highly correlated to temperature and weakly correlated to precipitation. Temperatures are typically cooler than normal and precipitation is drier than normal in the Gulf of Alaska region when La Niña conditions exist (Papineau 2001; Papineau no date).

A rigorous comparison of temperature and precipitation data from long-term stations in the SWAN region to recent ENSO events (listed in Table 5) was not done. However, a cursory analysis suggests that temperature data from the long-term stations are better correlated to El Niño events than La Niña events. Warm annual temperature anomalies occurred during all but two recent El Niño events (1992 and 2007) during the last 30 years, whereas an approximately equal number of both warm and cold annual temperature anomalies occurred during recent La Niña events. This quick comparison did not consider the importance of seasonal temperature anomalies nor the duration and intensity of individual ENSO events.

Table 5. El Niño and La Niña events (since 1950) of varying intensity listed by hydrologic year (NWS Climate Prediction Center, 2011). An event is defined as exceeding ± 0.5 °C Oceanic Niño Index for five consecutive overlapping three-month running (e.g. June-August-September) seasons.

El Niño events	El Niño events	La Niña events	La Niña events
1958	1992	1950	1975
1964	1995	1951	1976
1966	1998	1955	1985
1969	2003	1956	1989
1970	2005	1957	1996
1973	2007	1963	1999
1977	2010	1965	2000
1978		1968	2001
1983		1971	2008
1987		1972	2011
1988		1974	

Climatic Extremes and Significant Weather Events

Climatic extremes during the 2011 hydrologic year are listed in Table 6. Maximum temperatures recorded across the SWAN region range from 56 °F (Chigmit Mountains RAWS) to 81 °F (Stoney RAWS). Minimum temperatures recorded across the SWAN region range from -45 °F (Stoney RAWS) to 19 °F (Shelikof Strait Buoy). The maximum wind speed (instantaneous gust) documented was southeast at 121 mph at the McArthur Pass RAWS (this gust may have been exceeded as wind speed data from this station were missing for almost three months). The number of frost days (a day on which the minimum air temperature falls below 32 °F) range from 72 days (Shelikof Strait Buoy) to 287 days (Chigmit Mountains RAWS). The number of ice days (a day on which the maximum air temperature does not rise above 32 °F) range from 20 days (Shelikof Strait Buoy) to 209 days (Chigmit Mountains RAWS).

Significant weather events that occurred at a large scale (i.e. across the SWAN region) during the 2011 hydrologic year included the following events; pronounced cold snaps in early and late November, most of December, mid-January, mid-February, and early March; mid-winter thaw events in mid-November, around the New Year, and in early February; and significant mid-winter rain events in late November, around the New Year, and in early February. Noteworthy snowfall events occurred in mid-November, early January, early February, late March, and early April. Unseasonably high rainfall occurred in June and August. Strong, regional wind events occurred with an approximate frequency of 2-4 times per month during October-May and 0-3 times per month during April-September.

Table 6. Climatic extremes and significant weather events during the 2011 hydrologic year at weather stations across southwest Alaska.

Station name	Station type	Max temp	Min temp	Max wind speed	Max wind direction	Frost days	Ice days
Chigmit Mountains	RAWS	55.8	-25.4	84.3	245	287	209
Contact Creek	RAWS	70.7	-20.4	66.4	354	206	85
Coville	RAWS	66.7	-18.9	74.7	95	197	100
Drift River Terminal	CMAN	67.5	0.3	56.4		154	91
Exit Glacier	SNTE	--	--			--	--
Fourpeaked	RAWS	66.7	7.2	105.8	122	161	48
Harding Icefield	RAWS	63.5	-14.4	90.6	131	267	201
Hickerson Lake	RAWS	72.1	1.4	77.2	3	177	80
Homer Airport	COOP	79	-4			197	79
Homer Airport	ASOS	79	-2			187	83
Iliamna Airport	COOP	73	-15			183	91
Iliamna Airport	ASOS	72	-15			181	99
Kenai Airport	COOP	74	-21			181	89
Kenai Airport	ASOS	73	-21			172	91
King Salmon Airport	COOP	73	-15			199	95
King Salmon Airport	ASOS	70	-13			196	96
McArthur Pass	RAWS	68.2	11.3	121.0*	300*	166	58
Nuka Glacier	SNTE	68.2	-7.4			207	87
Pedersen Lagoon	RAWS	--	--	--	--	--	--
Pfaff Mine	RAWS	66.0	-18.8	86.6	89	212	123
Pilot Rock	CMAN	--	14.4	--	--	--	--
Port Alsworth	COOP	75	--			--	--
Port Alsworth	RAWS	79	-26	34	8	204	91
Port Alsworth 1 SW	CRN	76	-26			214	102
Port Heiden	AWOS	70.7	-4.7			175	81
Seward	COOP	75	1			143	58
Seward Airport	ASOS	73	2			142	60
Seward 8NW	COOP	76	--			--	--
Shelikof Strait	BUOY	59.0	19.4	62.0		72	20
Snipe Lake	RAWS	70.0	-24.3	70.5	122	216	138
Stoney	RAWS	81	-45	42	74	257	116
Telaquana Lake	COOP	74	-35			211	126

Temperatures are degrees Fahrenheit. Wind speed is miles per hour. Wind direction is degrees (true) from north. Frost days are defined as a day on which the minimum air temperature falls below 32 °F. Ice days are defined as a day on which the maximum air temperature does not rise above 32 °F. Annual statistics are not reported if more than 17% of observations (five days) are missing from any month and are identified with double dashes (--). Elements that are not reported by a particular station are blank. The percentage of valid observations are reported in the Appendices. *Maximum recorded wind gust may have been exceeded as wind speed data was not available from this station for three months.

Status of Climate Monitoring in Network Parks

The SWAN maintained the 10 weather stations that it operates during the 2011 hydrologic year. Four weather stations (Chigmit Mountains, Fourpeaked, Harding Icefield, and McArthur Pass) were accessed by helicopter. The other stations were accessed by fixed-wing aircraft and foot. The McArthur Pass RAWS experienced considerable damage from icing and wind during April 2011. The Hickerson Lake and Contact Creek RAWS were damaged by wildlife in November 2010 and June 2011, respectively. A summary of all maintenance work at SWAN operated and maintained weather stations is summarized in Table 7 and described in detail in a complementary report (Lindsay 2011).

Accurately measuring winter-time precipitation (i.e. snowfall, snow depth, and snow water equivalent) continues to prove difficult to accomplish. Network RAWS rely on unheated tipping buckets, which are only capable of accurately measuring liquid precipitation (e.g. rain). Although sonic snow depth sensors are used at these stations, snow water equivalent is not measured. The sonic snow depth sensors are not performing well at high elevation and coastal weather stations because of the harsh environmental conditions at these sites (condensation develops on the transducer plates). Based on recommendations from the NRCS, SWAN staff tested a Judd sonic snow depth sensor on a coastal weather station located in Homer. It performed well and it is recommended that Judd sensors be used at high elevation and coastal weather stations (including the Chigmit Mountains, Harding Icefield, Hickerson Lake, and Pedersen Lagoon RAWS). It is recommended that existing sonic snow depth sensors be permanently removed from the McArthur Pass and Fourpeaked RAWS due to their poor performance at these locations and the lack of persistent snow cover due to wind transport.

A displacement precipitation gauge (filled with an antifreeze solution) is used at the Harding Icefield RAWS. By design, this gauge is capable of accurately measuring winter-time precipitation. In reality, undercatch (the difference between the actual amount of snow and the amount measured by a precipitation gauge) is a significant problem because of the extremely windy nature of the site. Measured precipitation is only a fraction of the snow water equivalent reflected by the adjacent snowpack (15% over one year - based on detailed snow pit observations made during the 2008 hydrologic year). A study should be completed to determine if this gauge should be removed from the Harding Icefield RAWS and if smaller versions of these displacement precipitation gauges, in combination with effective windshields, would be suitable for use at other RAWS where calmer wind conditions and reasonably good access exist (e.g. Contact Creek, Coville, and Snipe Lake).

A summary of all known issues affecting the performance and data quality of weather stations maintained and operated by the SWAN during the 2011 hydrologic year is provided in Table 8.

Table 7. Maintenance summary for RAWs operated and maintained by the SWAN during the 2011 hydrologic year. Acronyms are as follows: air temperature - relative humidity (AT/RH), wind speed (WS), wind direction (WD), solar radiation (SR), snow depth (SD), Global Positioning System (GPS) antenna, geostationary operational environmental satellite (GOES) antenna, data logger program (DLP), rain gauge-tipping bucket (RG-TB), soil temperature (ST), and photo-voltaic (PV) panel.

Station	Date	Maintenance
Chigmit Mountains	06/30/2011	Scheduled maintenance. Replaced AT/RH, SD, SR, WD, and WS sensors.
Contact Creek	06/14/2011	Scheduled maintenance. Significant wildlife damage to station. Replaced AT/RH, RG-TB, SD, and SR sensors, GOES antenna, and PV panel.
Coville	06/14/2011	Scheduled maintenance. Replaced AT/RH, RG-TB, SD, and SR sensors.
Fourpeaked	06/30/2011	Scheduled maintenance. Replaced AT/RH, RG-TB, SD, WD, and WS sensors.
Harding Icefield	05/02/2011	Scheduled maintenance. Replaced AT/RH, SD, WD, and WS sensors. Serviced all-season precipitation gauge.
Hickerson Lake	07/07/2011	Scheduled maintenance. Significant wildlife damage to station. Replaced AT/RH, GPS antenna, GOES antenna cable, RG-TB, SD, and SR sensors.
Hickerson Lake	07/22/2011	Unscheduled maintenance. Replaced GOES antenna cable.
McArthur Pass	11/18/2010	Unscheduled maintenance. Replaced SR sensor and removed SD sensor.
McArthur Pass	07/05/2011	Scheduled maintenance. Considerable ice and wind damage to station. Replaced 20 ft mast, wind sensor support arm, and guy lines. Replaced AT/RH, RG-TB, SD, WS, and WD sensors. Replaced GOES antenna.
Pedersen Lagoon	08/10/2011	Station installed.
Pedersen Lagoon	09/27/2011	Unscheduled maintenance. Replaced AT/RH sensor.
Pfaff Mine	06/15/2011	Scheduled maintenance. Replaced AT/RH, RG-TB, SD, and SR sensors.
Snipe Lake	06/17/2011	Scheduled maintenance. Replaced AT/RH, RG-TB, SD, and SR sensors. Added new dual ST sensors at 4 in and 20 in depth.

Table 8. Issues affecting performance and data quality of RAWs operated and maintained by the SWAN during the 2011 hydrologic year. Acronyms are as follows: air temperature (AT), relative humidity (RH), wind speed (WS), wind direction (WD), snow depth (SD), solar radiation (SR), soil temperature (ST), and rain gauge-tipping bucket (RG-TB).

Station	Date begin	Date end	Issue
Chigmit Mountains	10/02/2010	10/07/2010	WD/WS sensor not working (iced-up)
Chigmit Mountains	10/17/2010	11/18/2010	WD/WS sensor not working (iced-up)
Chigmit Mountains	11/24/2010	11/30/2010	WD/WS sensor not working (iced-up)
Chigmit Mountains	12/30/2010	01/10/2011	WD/WS sensor not working (iced-up)
Chigmit Mountains	01/28/2011	02/13/2011	WD/WS sensor not working (iced-up)
Chigmit Mountains	04/03/2011	04/13/2011	WD/WS sensor not working (iced-up)
Chigmit Mountains	04/24/2011	05/05/2011	WD/WS sensor not working (iced-up)
Chigmit Mountains	05/16/2011	05/26/2011	WD/WS sensor not working (iced-up)
Chigmit Mountains	08/02/2011	08/03/2011	Some artificial spikes in SD data
Chigmit Mountains	09/12/2011	09/14/2011	Some artificial spikes in SD data
Chigmit Mountains	10/01/2010	09/30/2011	Only liquid (e.g. rain) precipitation recorded
Contact Creek	10/01/2010	12/06/2010	RH sensor not working
Contact Creek	06/04/2011	06/14/2011	AT, RH not working (bear damage)
Contact Creek	10/01/2010	09/30/2011	Only liquid (e.g. rain) precipitation recorded
Coville	10/01/2010	09/30/2011	SD tare artificially high, adjusted (subtracted 0.5 in)
Coville	10/01/2010	09/30/2011	Only liquid (e.g. rain) precipitation recorded
Fourpeaked	10/01/2010	06/30/2011	RG-TB not working
Fourpeaked	10/01/2010	09/30/2011	Only liquid (e.g. rain) precipitation recorded
Fourpeaked	unknown	06/30/2011	WD suspect, fletching broke off WD sensor
Fourpeaked	04/02/2011	06/30/2011	RH sensor not working
Fourpeaked	10/01/2010	06/30/2011	SD sensor not working
Harding Icefield	10/28/2010	11/17/2010	WD/WS sensor not working (iced-up)
Harding Icefield	11/23/2010	12/24/2010	WD/WS sensor not working (iced-up)
Harding Icefield	06/27/2011	09/30/2011	Many artificial spikes in SD data (68.69 in) due to sensor fogging
Hickerson Lake	11/02/2010	07/22/2011	Station not transmitting, observations stored on-site
Hickerson Lake	03/28/2011	07/07/2011	WS sensor cable cut, no WS/WD observations
Hickerson Lake	10/01/2010	09/30/2011	Only liquid (e.g. rain) precipitation recorded
McArthur Pass	10/07/2010	07/05/2011	SD sensor removed and note replaced (cable severed)
McArthur Pass	10/07/2010	10/18/2010	SR sensor intermittently not working (power supply issue)
McArthur Pass	04/03/2011	07/05/2011	WD/WS sensors not working (mast broke due to icing)
McArthur Pass	07/05/2011	06/30/2011	SD tare artificially high, adjusted (subtracted 0.5 in)
McArthur Pass	08/03/2011	08/05/2011	RH sensor not working
McArthur Pass	09/07/2011	09/30/2011	SR sensor not working
McArthur Pass	09/07/2011	09/30/2011	Many artificial spikes in SD data (77 in) due to sensor fogging
McArthur Pass	10/01/2010	09/30/2011	Only liquid (e.g. rain) precipitation recorded
Pedersen Lagoon	10/01/2010	08/10/2011	Station running at test location, data not representative
Pedersen Lagoon	09/06/2011	09/27/2011	AT/RH sensor malfunctioned
Pedersen Lagoon	08/10/2011	09/30/2011	Only liquid (e.g. rain) precipitation recorded
Pfaff Mine	10/01/2010	09/30/2011	Only liquid (e.g. rain) precipitation recorded
Snipe Lake	10/01/2010	06/17/2011	ST sensors not installed, no data available
Snipe Lake	10/01/2010	06/17/2011	SD tare artificially high, adjusted (subtracted 1.2 in)
Snipe Lake	10/01/2010	09/30/2011	Only liquid (e.g. rain) precipitation recorded

The SWAN benefits greatly from, and in turn, supports park-based weather and climate monitoring efforts. The NRCS, with funding from KEFJ, installed a new weather and snowpack monitoring station at the Exit Glacier Snow Course. This SNOTEL station will provide continuous weather observations throughout the year, including times when observations are not currently made at the existing Seward 8 NW COOP station because of staffing or access issues. A new weather station was installed in Aialik Bay as a result of collaboration between KEFJ, Port Graham Native Corporation, and the SWAN. This RAWS was installed on private land located on a ridge near Pedersen Lagoon in Aialik Bay. Another new weather station (also a RAWS) was planned for installation in LACL at Merrill Pass; however the park decided that access for maintenance (by helicopter) would likely prove to be too costly to be sustainable and it was not installed. NOAA and KATM completed a site license agreement for the installation of Climate Reference Network (CRN) Station at Contact Creek, which is planned for 2012. The primary goal of the CRN is to collect three independent measurements of temperature and precipitation at each station, insuring a record of well-calibrated and very precise observations that can be coupled to historic observations. Other meteorological parameters (e.g. relative humidity, solar radiation, etc.) will also be recorded. The existing RAWS at Contact Creek will be moved to a new site on Dumpling Mountain.

The Inventory and Monitoring Division of the National Park Service (Ft. Collins, Colorado) has recently developed an enterprise database for basic climate data and the Greater Yellowstone Inventory and Monitoring Network has developed tools for acquiring and summarizing multi-station station data sets queried from this database. The SWAN will submit all the data (daily) that was processed for this report to the enterprise database and will test the potential of these resources and determine if they meet the SWAN's needs. Although the SWAN's monitoring objectives and reporting requirements are constrained by the monitoring protocol (Lindsay et al. *in review*), significant adjustments to reporting methods and information delivery formats should be expected over time.

Conclusion

The Southwest Alaska Network region was colder than average and received less than average to near average precipitation during the 2011 hydrologic year (October 2010 through September 2011). Compared to the climatological normal (the prevailing set of weather conditions calculated over a 30-year period, currently 1981-2010), mean annual temperatures for six long-term weather stations were 0.2 to 2.3 °F below average. Total annual precipitation was 75% to 103% of average. In general, locations on the southern and eastern Kenai Peninsula received less than normal precipitation whereas locations on the Alaska Peninsula and across the northern Aleutian and southern Alaska Ranges received near average precipitation. Several winter months (December, February, and March) and summer months (June, July, and August) were colder than average across the region. When compared to the period of record, temperature and precipitation during the 2011 hydrologic year are consistent with conditions observed during the 2006-2009 hydrologic years, which were also generally colder and drier. Negative (cool phase) Pacific Decadal Oscillation conditions and a La Niña (cool phase) event of the El Niño-Southern Oscillation occurred during the 2011 hydrologic year.

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Appendices - Annual Climate Summaries for 39 Weather Stations

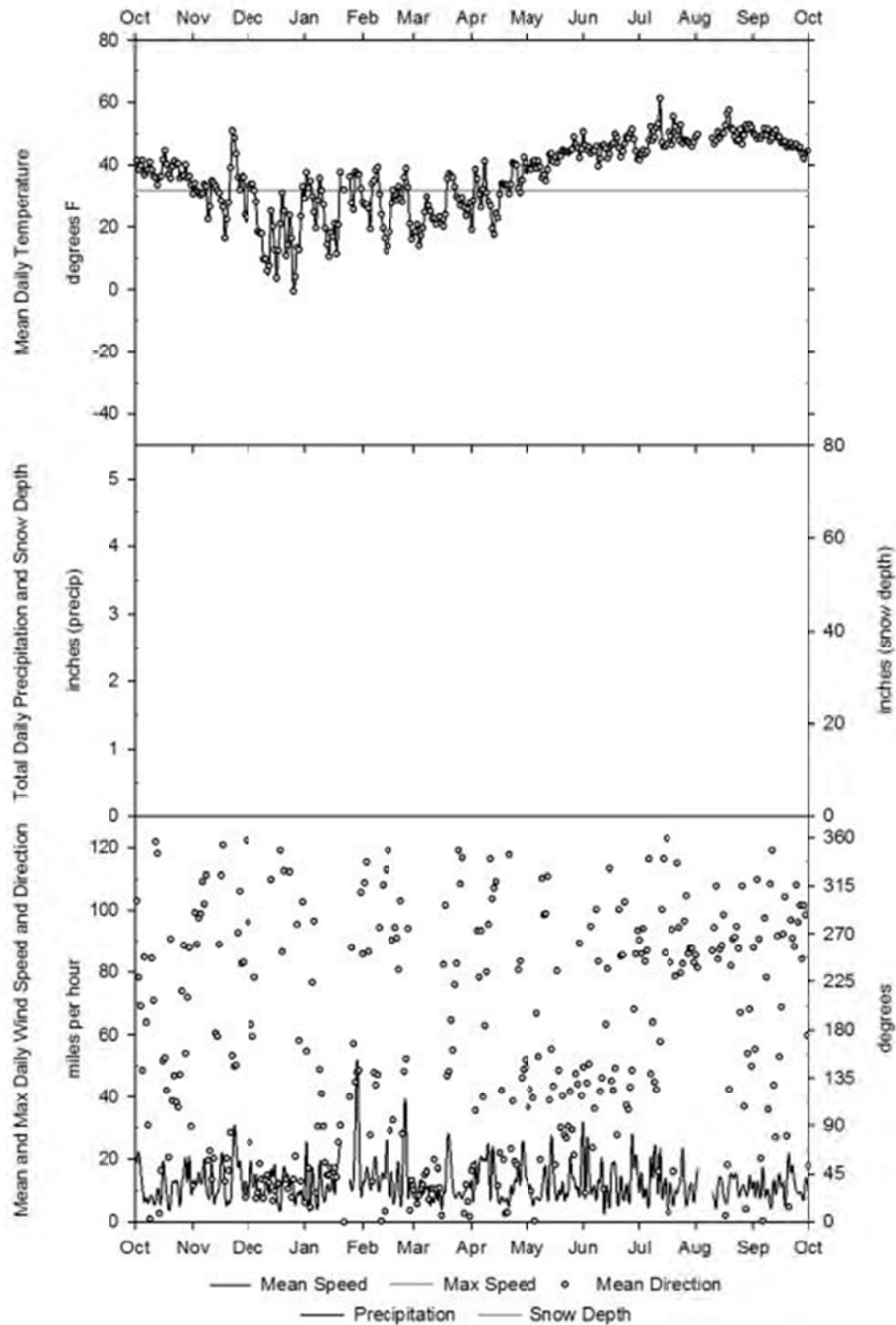
Summary tables and graphs for the most consistently measured climate variables from all weather stations monitored by the SWAN are included in the appendices and are organized by park, climate monitoring program, and station name. Daily measures are used for generating graphs (with the exception of NRCS Snow Courses) and monthly measures are used for generating summary reports. Mean temperature, total precipitation, mean snow depth, mean wind speed and direction, and maximum wind speed are presented in graphs. Minimum, maximum, and mean temperature data, the number of frost days (number of days where the minimum temperature is below freezing), and the number of ice days (number of days where the maximum temperature is below freezing) are included in the summary reports. Total precipitation, average snow depth, mean and maximum wind speed, maximum wind direction, and cumulative solar radiation are also presented in the summary reports. The percentage of valid observations is reported as a measure of the reliability of the derived mean and cumulative values for all reported climate variables. Climatic normal values (arithmetic mean over a 30-year interval) from the NCDC for the 1981-2010 period and period of record (POR) values from the WRCC are included for stations with a long enough observational record.

For all derived measures, the percentage of valid observations is reported as a measure of the reliability of the derived mean and cumulative values. Monthly measures should not be considered representative of actual climatic conditions if more than 10% (three days) of observations are missing or suspect. Yearly measures should not be considered representative if more than 17% (five days) are missing from any month.

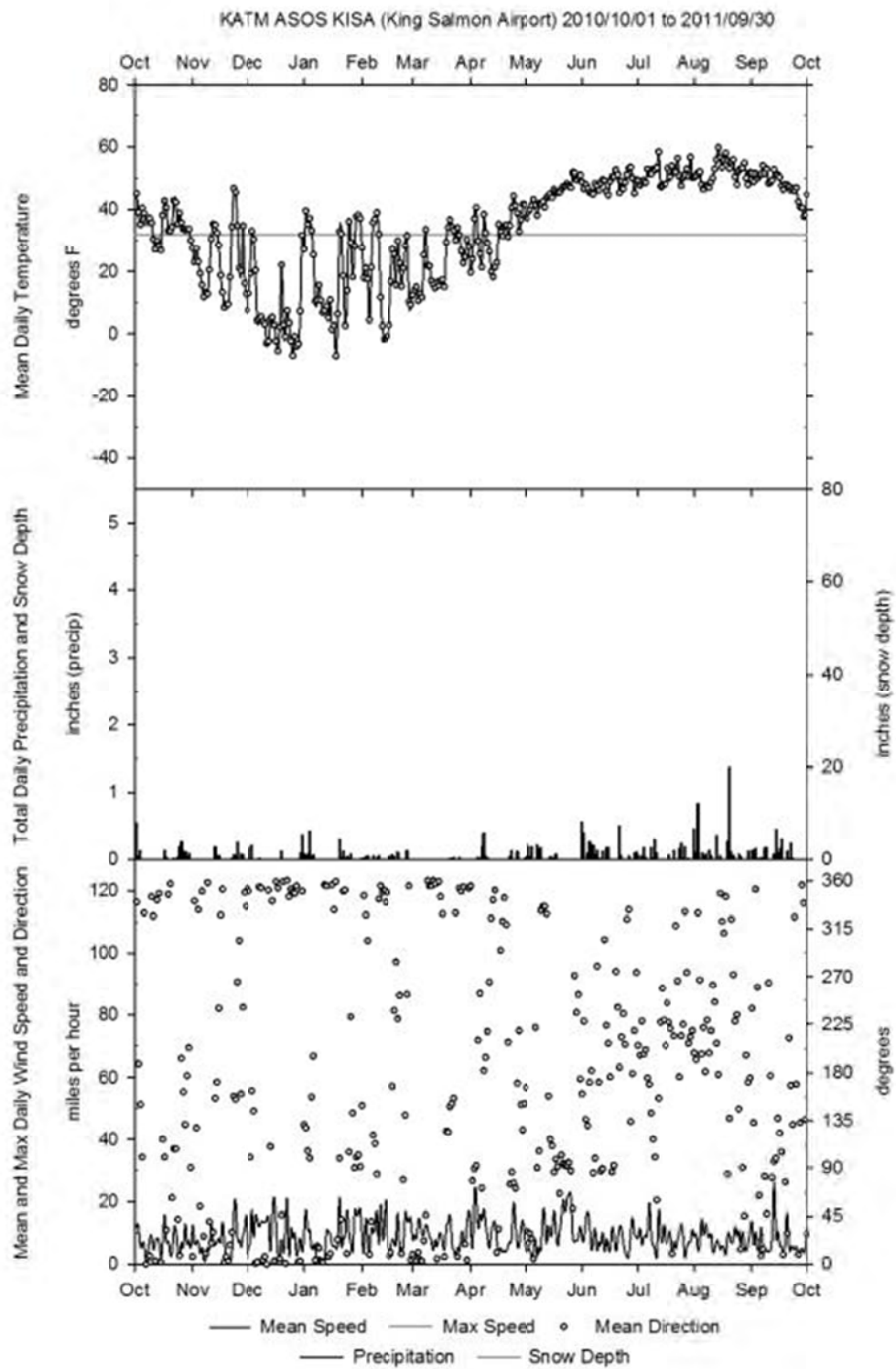
All data used in this report are available upon request from the SWAN. Station data is available in a standardized format - summarized at hourly (where available), daily, and monthly intervals in both metric and U.S. customary units.

2011 Hydrologic Year - ANIA AWOS POHE (Port Heiden)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	25	10	-5	-1	6	8	13	28	36	37	37	34	-5
Max.	37	48	30	37	36	36	36	45	47	48	55	49	55
Mean	32.4	27.4	11.9	22.1	22.0	18.9	25.9	33.4	41.9	44.8	46.0	43.4	30.9
# days <32 F	13	23	31	24	24	28	22	3	0	0	7	0	175
% valid obs	98	95	97	69	89	97	98	98	88	97	72	97	91
Maximum air temperature (F)													
Min	36	25	1	16	16	18	22	37	42	45	48	45	1
Max	49	54	43	43	43	41	47	58	55	71	65	59	71
Mean	43.2	36.2	24.1	32.2	31.3	32.0	39.1	43.0	49.5	53.7	55.0	51.6	41.2
# days <32 F	0	5	19	13	14	17	6	0	0	0	7	0	81
% valid obs	98	95	97	69	89	97	98	98	88	97	72	97	91
Mean air temperature (F)													
Observed	38.0	31.6	18.4	26.1	26.5	25.3	32.4	42.1	45.7	48.6	50.6	47.4	36.0
% valid obs	98	95	97	69	89	97	98	98	88	97	72	97	91
POR mean													
1981-2010													
Precipitation													
Total													
% valid obs													
POR mean													
1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	11.4	13.6	11.2	13.4	15.0	10.7	14.1	12.0	13.0	11.7	11.1	11.3	
% valid obs	99	99	98	72	93	98	98	99	89	99	72	97	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

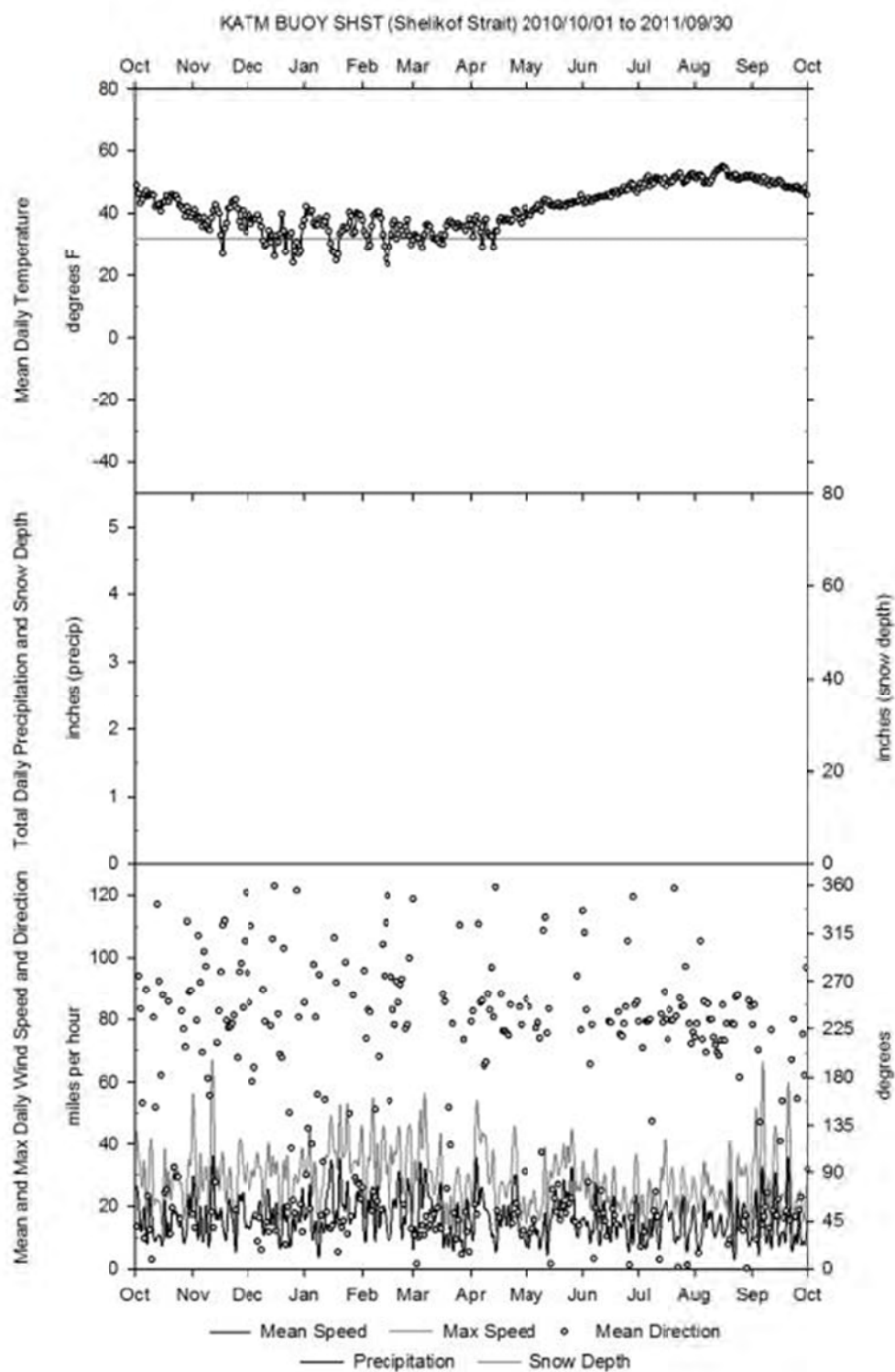
ANIA AWOS POHE (Port Heiden) 2010/10/01 to 2011/09/30



2011 Hydrologic Year - KATM ASOS KISA (King Salmon Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	17	1	-12	-13	-9	0	5	26	32	37	35	28	-13
Max.	40	42	30	36	35	33	37	45	47	50	53	49	53
Mean	27.5	15.1	1.1	12.5	8.9	14.4	23.6	33.9	41.8	44.9	44.8	40.2	26.1
# days <32 F	24	27	31	26	26	29	23	7	0	0	0	3	196
% valid obs	100	99	99	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	35	13	-2	2	2	18	27	44	48	49	51	45	-2
Max	57	52	36	43	41	42	52	63	63	70	70	63	70
Mean	43.4	30.8	13.1	27.4	25.0	31.6	41.2	53.1	55.2	58.5	59.2	55.6	41.3
# days <32 F	0	17	25	18	17	15	4	0	0	0	0	0	96
% valid obs	100	99	99	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	35.3	22.8	7.2	19.7	17.9	22.8	32.6	45.0	48.4	51.1	52.0	47.7	33.7
% valid obs	100	99	99	100	100	100	100	100	100	100	100	100	100
POR mean 1981-2010													
Precipitation													
Total	1.70	0.82	1.11	1.31	0.64	0.10	1.09	1.93	2.77	2.20	3.99	2.25	19.91
% valid obs	100	99	99	100	100	100	100	100	100	100	100	100	100
POR mean 1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	7.3	7.4	10.3	9.0	10.2	9.2	10.2	13.5	8.4	8.7	8.2	7.3	
% valid obs	100	99	99	100	100	100	100	100	100	100	100	100	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

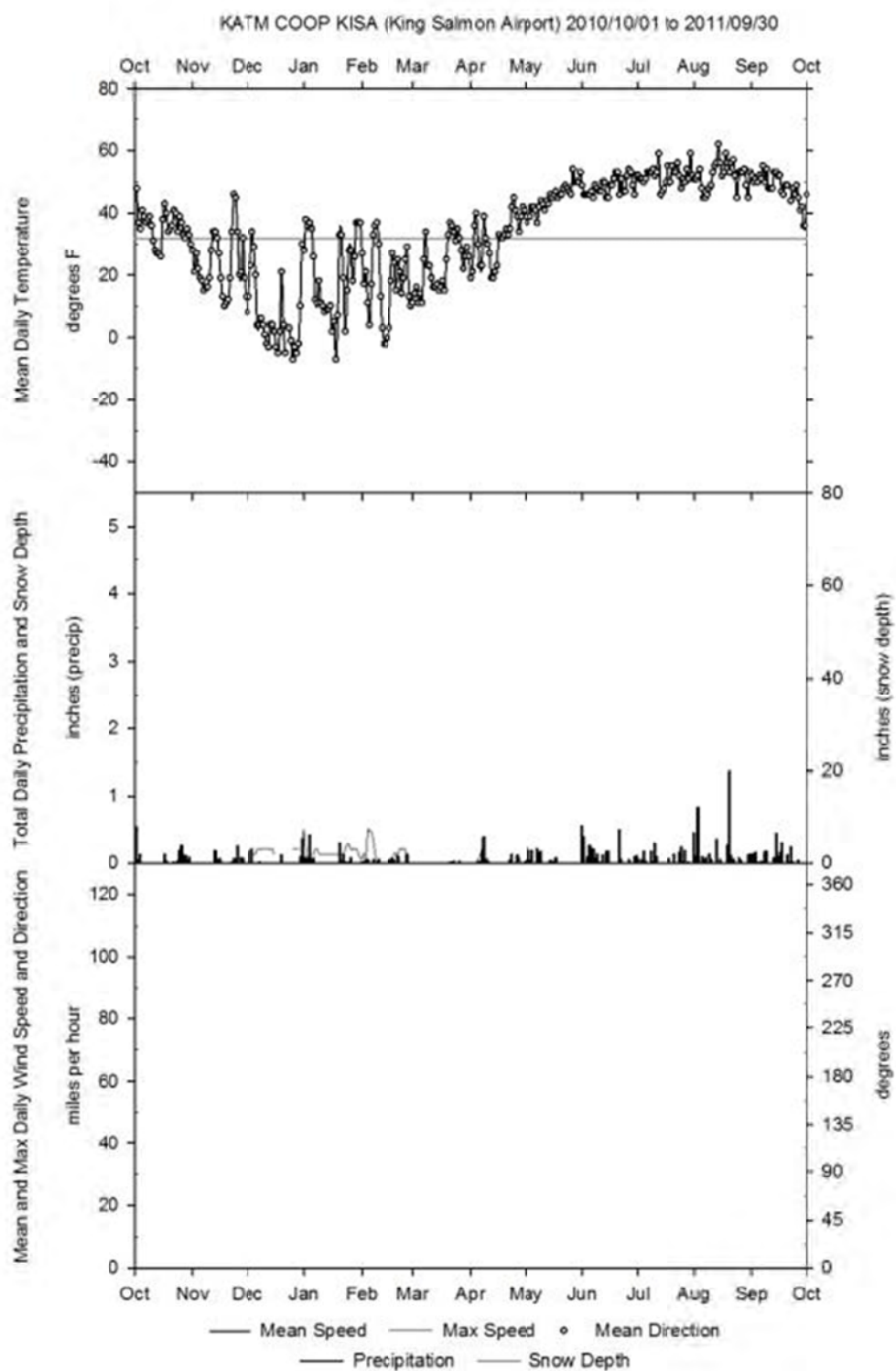


2011 Hydrologic Year - KATM BUOY SHST (Shelikof Strait)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	37.6	25.0	21.6	21.6	19.4	27.0	26.6	33.1	42.1	46.0	47.7	44.2	19.4
Max.	46.8	43.3	37.8	39.9	39.4	37.0	40.3	44.6	48.9	51.4	53.2	50.9	53.2
Mean	42.1	36.2	30.3	33.6	31.2	32.5	34.6	41.5	45.2	49.3	50.6	48.0	39.6
# days <32 F	0	4	21	8	15	14	10	0	0	0	0	0	72
% valid obs	96	97	93	100	100	100	100	100	100	100	100	100	99
Maximum air temperature (F)													
Min	40.1	30.2	28.0	28.9	29.8	31.5	31.6	40.3	43.9	50.0	51.4	47.8	28.0
Max	50.7	46.9	42.3	45.3	42.6	40.3	43.5	51.3	51.6	59.0	57.7	53.2	59.0
Mean	45.7	40.8	36.2	38.3	36.5	35.9	38.8	44.4	47.9	52.8	53.6	50.6	43.5
# days <32 F	0	1	6	4	5	2	2	0	0	0	0	0	20
% valid obs	96	97	93	100	100	100	100	100	100	100	100	100	99
Mean air temperature (F)													
Observed	43.8	38.5	33.2	35.8	33.8	34.2	36.7	42.6	46.3	50.7	52.0	49.1	41.5
% valid obs	96	97	93	100	100	100	100	100	100	100	100	100	99
POR mean													
1981-2010													
Precipitation													
Total													
% valid obs													
POR mean													
1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	15.2	16.7	16.1	19.5	17.7	16.6	16.9	13.4	14.3	13.7	14.0	14.5	
% valid obs	98	98	95	100	100	100	100	100	100	100	100	100	
Max speed	55.9	62.0	40.3	53.2	52.1	55.5	53.9	44.7	38.3	40.7	40.5	61.3	62.0
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													



2011 Hydrologic Year - KATM COOP KISA (King Salmon Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	16	0	-13	-15	-9	0	4	26	30	37	33	25	-15
Max.	40	41	30	36	34	33	37	44	47	49	53	48	53
Mean	26.7	14.4	0.2	11.9	8.3	13.9	23.2	33.2	41.3	44.7	44.2	39.4	25.5
# days <32 F	24	28	31	26	26	29	23	8	1	0	0	3	199
% valid obs	100	100	97	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	35	14	-2	2	2	18	26	45	49	50	51	45	-2
Max	57	52	37	43	41	43	53	65	64	73	71	63	73
Mean	44.1	31.2	13.6	27.9	25.5	32.1	41.9	54.0	56.1	59.3	59.9	56.4	42.0
# days <32 F	0	17	24	18	17	14	4	0	0	0	0	1	95
% valid obs	100	100	97	100	100	100	100	100	100	100	100	97	100
Mean air temperature (F)													
Observed	35.4	22.8	7.0	19.9	16.9	23.1	32.6	45.2	48.7	52.0	52.1	48.0	33.8
% valid obs	100	100	97	100	100	100	100	100	100	100	100	97	100
POR mean ¹	33.2	22.7	15.6	14.8	17.1	22.1	32.6	43.3	50.8	55.1	54.3	47.4	34.1
1981-2010	33.5	22.9	18.6	16.2	18.8	24.1	33.7	44.2	51.5	55.5	54.6	47.6	35.2
Precipitation													
Total	1.70	0.82	1.11	1.27	0.65	0.10	1.09	1.93	2.78	2.21	4.11	2.30	20.08
% valid obs	100	100	97	100	100	100	100	100	100	100	97	100	99
POR mean ¹	2.08	1.45	1.24	1.00	0.77	0.88	1.02	1.29	1.59	2.27	3.01	3.00	19.60
1981-2010	2.08	1.39	1.23	1.02	0.76	0.70	0.97	1.25	1.65	2.30	2.95	3.19	19.49
Snow depth (in)													
Average	0	0	3	2	2	0	0	0	0	0	0	0	
% valid obs	100	100	68	100	100	100	97	100	97	100	100	100	
POR mean ¹	0	1	2	3	3	2	1	0	0	0	0	0	
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

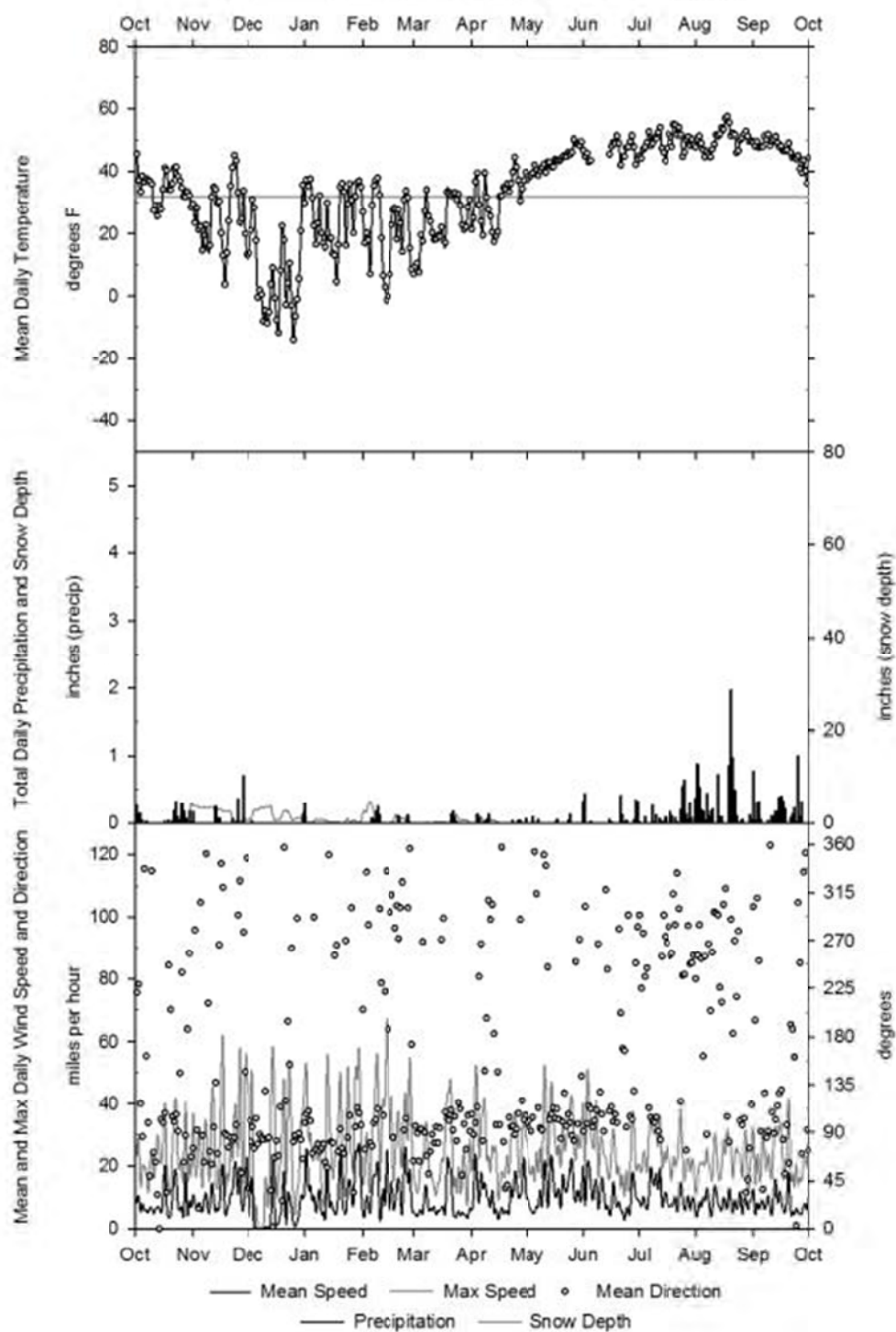
¹Period of record used: 07/01/1955 to 12/31/2010



2011 Hydrologic Year - KATM RAWs COCR (Contact Creek)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	13.3	-2.9	-20.4	-4.9	-6.9	-5.4	-0.6	23.2	33.8	34.7	36.0	23.5	-20.4
Max.	38.3	43.0	31.8	35.8	35.6	30.7	37.2	42.8	45.9	50.5	50.9	45.5	50.9
Mean	26.3	17.0	-3.1	17.2	10.9	13.2	22.9	35.1	40.3	43.1	43.6	39.2	25.2
# days <32 F	24	27	31	25	25	31	22	8	9	0	0	4	206
% valid obs	100	100	100	100	100	100	100	100	68	100	100	94	97
Maximum air temperature (F)													
Min	34.3	11.8	-8.7	13.6	5.2	20.1	23.9	45.1	45.3	46.0	50.4	45.7	-8.7
Max	57.2	47.8	38.8	40.6	41.9	46.9	52.0	61.7	59.9	70.7	70.5	62.4	70.7
Mean	43.6	32.5	15.7	33.0	27.9	35.4	40.6	51.9	53.6	57.0	57.4	54.4	41.7
# days <32 F	0	13	24	12	16	7	4	0	9	0	0	0	85
% valid obs	100	100	100	100	100	100	100	100	68	100	100	94	97
Mean air temperature (F)													
Observed	34.7	24.8	6.7	26.0	19.8	23.5	31.9	43.4	46.5	49.5	50.3	46.7	33.3
% valid obs	100	100	100	100	100	100	100	100	68	100	100	94	97
POR mean													
1981-2010													
Precipitation													
Total ²	2.31	1.51	0.46	0.00	0.93	0.42	0.63	0.72	1.89	3.44	9.09	4.38	25.78
% valid obs	77	34	11	49	29	36	61	99	68	100	100	94	63
POR mean													
1981-2010													
Snow depth (in)													
Average	0.4	2.2	2.0	0.4	1.0	0.3	0.2	0.0	0.0	0.0	0.0	0.0	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	98	
POR mean													
Wind (mph, degrees)													
Mean speed	8.3	10.7	5.6	11.8	12.1	7.3	10.9	12.3	10.2	10.2	8.6	8.1	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	95	
Max speed	40.5	60.2	58.4	57.9	66.4	45.9	49.4	43.3	49.0	38.3	31.5	41.4	66.4
Max direction	109	22	351	120	354	119	95	318	101	93	273	63	354
Solar radiation (kWh/m2)													
Total	52.3	24.7	9.7	15.6	42.6	102.3	122.8	147.5	98.5	113.7	86.9	71.6	888.1
% valid obs	100	100	100	100	100	100	100	100	100	100	100	96	100

²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values.

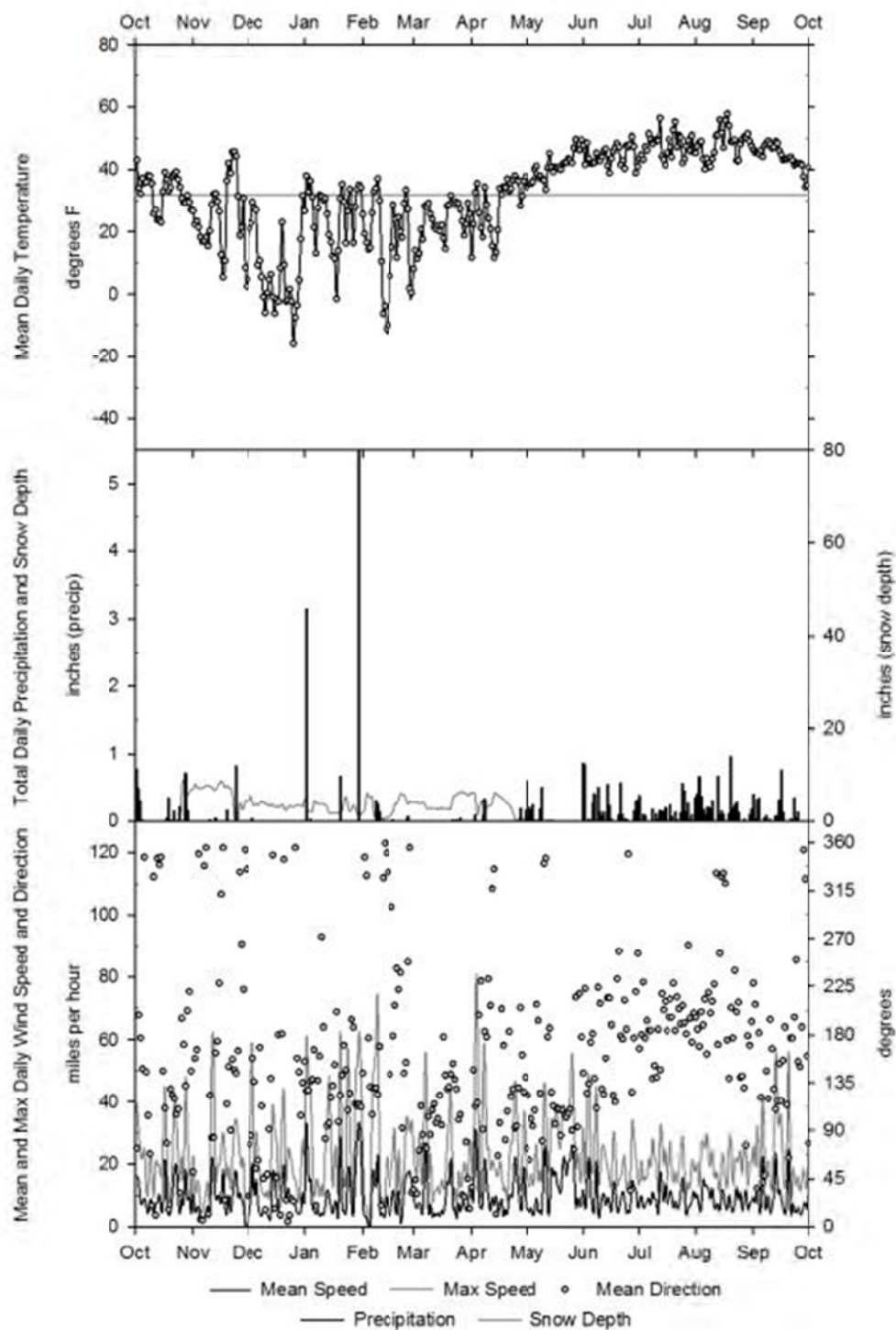
KATM RAWS COCR (Contact Creek) 2010/10/01 to 2011/09/30



2011 Hydrologic Year - KATM RAWs COVI (Coville)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	18.1	-2.0	-18.8	-5.8	-15.3	2.3	3.2	25.5	32.0	37.0	36.9	30.2	-18.9
Max.	38.1	42.8	28.4	35.2	35.2	28.9	33.8	42.3	43.9	47.5	53.4	44.4	53.4
Mean	28.5	18.6	1.4	20.1	9.1	15.9	22.4	35.1	39.0	41.9	43.4	39.3	26.3
# days <32 F	20	25	31	28	27	31	26	7	0	0	0	2	197
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	28.2	5.2	-11.6	8.6	-7.4	15.4	20.1	40.8	40.5	43.3	44.1	39.6	-11.6
Max	52.9	50.9	37.9	40.6	39.7	41.7	52.7	61.7	59.9	66.7	66.4	59.2	66.7
Mean	38.3	30.2	14.5	31.1	22.4	32.0	37.7	43.6	51.1	55.0	53.6	50.2	38.8
# days <32 F	6	17	27	12	20	13	5	0	0	0	0	0	100
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	32.9	24.0	7.6	25.6	16.1	23.0	29.3	41.1	44.3	47.6	48.2	44.0	32.1
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1981-2010													
Precipitation													
Total ²	3.21	1.05	0.06	9.98	0.78	0.08	1.48	2.15	5.18	3.49	6.20	2.75	36.41
% valid obs	67	31	5	44	19	16	55	98	100	100	100	100	61
POR mean													
1981-2010													
Snow depth (in)													
Average	1.6	6.0	3.6	2.7	3.1	4.1	3.1	0.1	0.0	0.0	0.0	0.0	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
POR mean													
Wind (mph, degrees)													
Mean speed	9.5	7.9	8.8	11.7	8.9	8.3	10.9	12.5	9.3	9.1	8.9	9.1	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
Max speed	47.9	55.0	57.9	62.6	71.8	51.2	74.7	55.7	48.5	30.4	29.8	57.3	74.7
Max direction	138	57	140	128	113	64	95	94	111	148	231	101	95
Solar radiation (kWh/m2)													
Total	40.7	17.7	7.6	13.1	31.5	93.0	120.0	146.5	114.2	122.4	86.0	72.9	865.5
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100

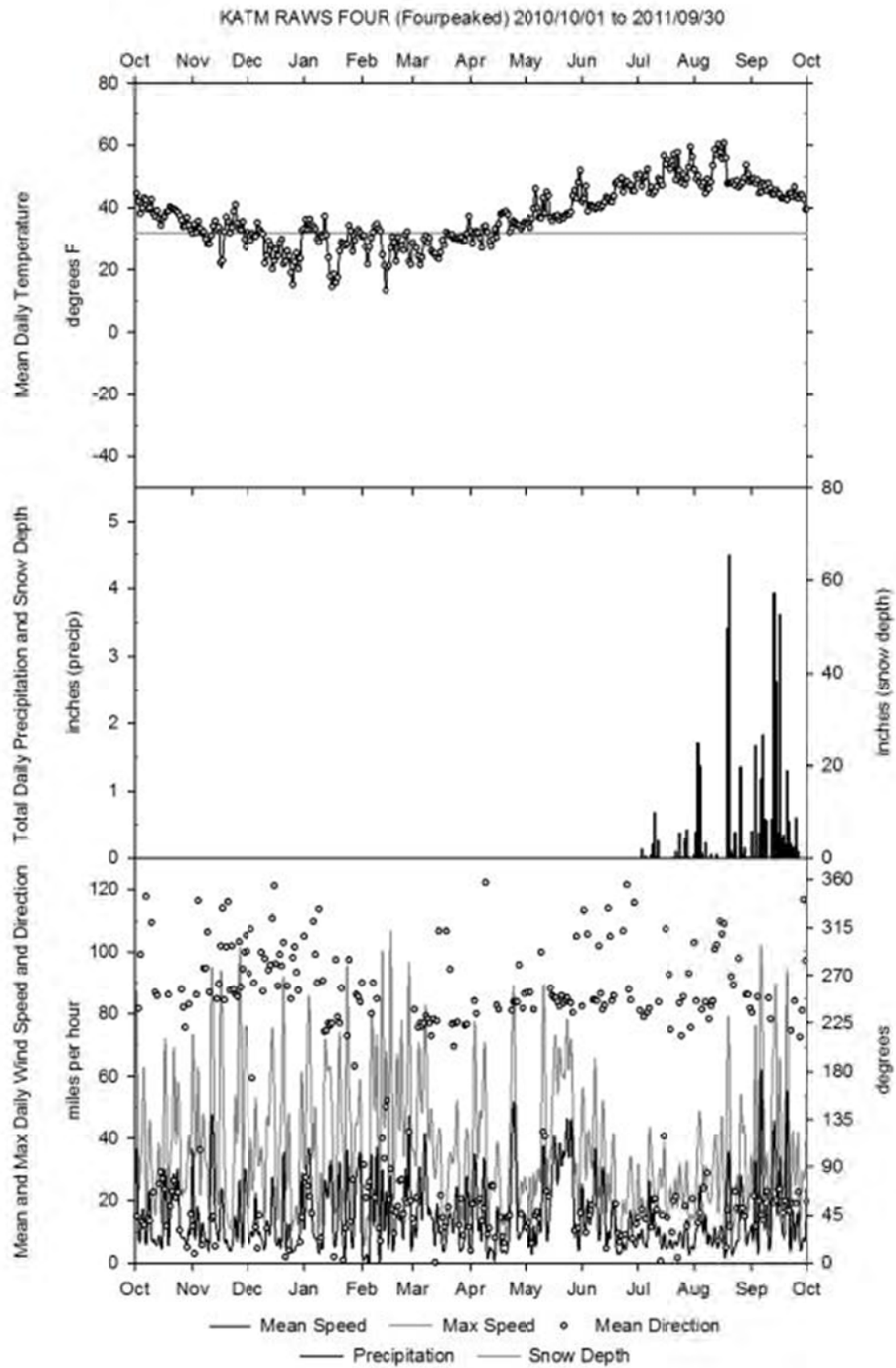
²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values.

KATM RAWS COVI (Coville) 2010/10/01 to 2011/09/30



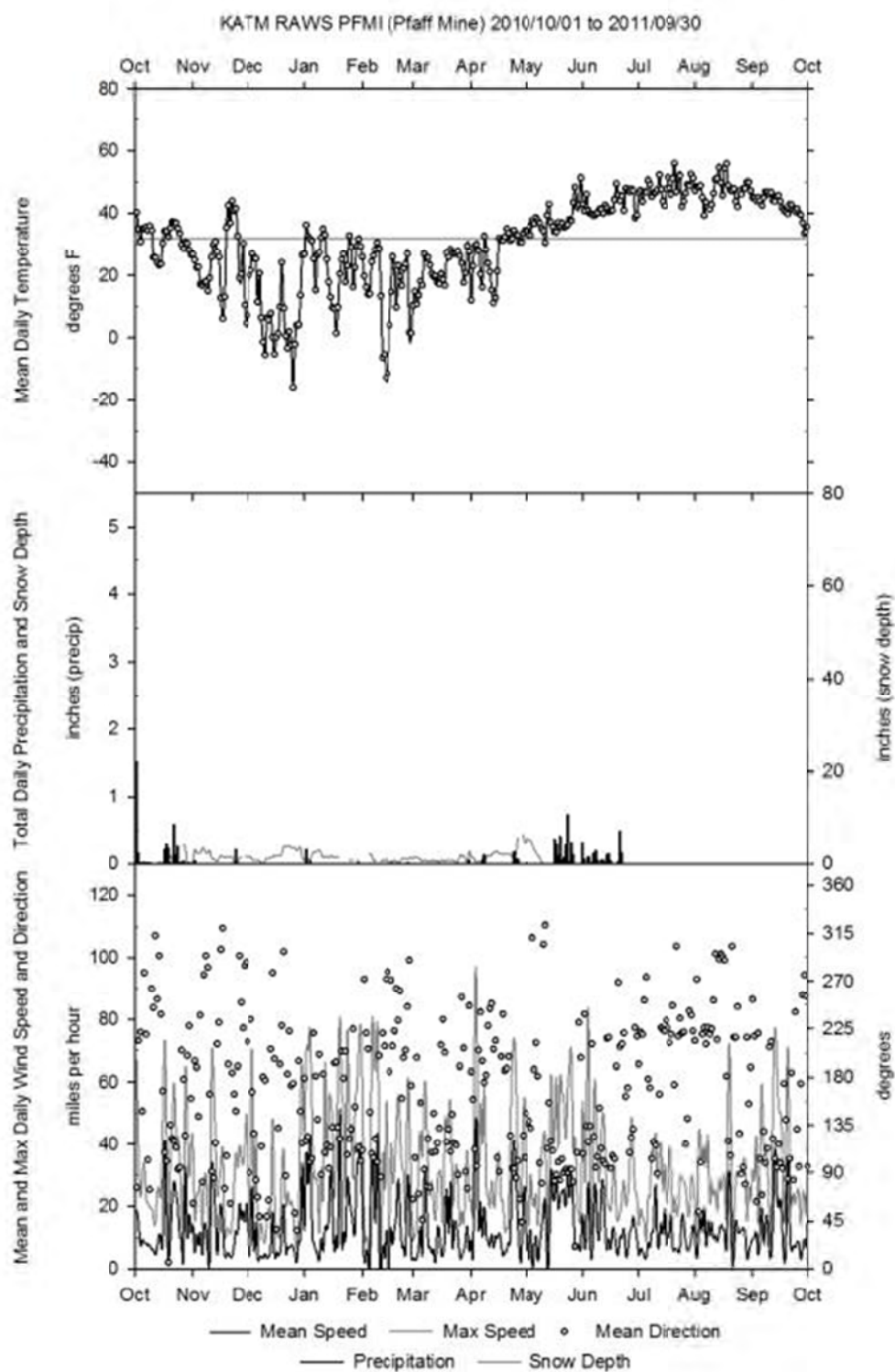
2011 Hydrologic Year - KATM RAWs FOUR (Fourpeaked)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	29.5	12.7	11.1	12.2	7.2	16.5	20.8	31.8	36.0	42.6	41.9	35.6	7.2
Max.	41.7	36.3	30.9	34.0	32.5	32.0	34.7	45.0	45.9	52.3	55.8	46.0	55.8
Mean	35.3	28.2	22.6	25.6	22.5	25.2	29.8	33.1	41.3	46.6	47.1	42.3	33.6
# days <32 F	3	24	31	27	27	30	18	1	0	0	0	0	161
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	33.4	30.4	19.0	16.2	17.1	24.1	32.2	35.4	40.5	45.5	47.3	41.0	16.2
Max	51.3	50.2	39.7	42.8	40.6	46.0	47.1	59.5	58.3	66.7	65.5	56.1	66.7
Mean	42.0	37.4	31.8	32.5	32.7	33.0	38.7	43.9	49.0	56.1	54.8	48.3	41.7
# days <32 F	0	1	14	10	9	14	0	0	0	0	0	0	48
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	38.2	32.5	26.7	28.8	27.2	28.6	33.4	39.8	44.3	51.0	50.7	44.8	37.2
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1981-2010													
Precipitation													
Total ²									0.00	2.66	14.32	23.02	40.02
% valid obs	0	0	0	0	0	0	0	0	2	100	100	94	25
POR mean													
1981-2010													
Snow depth (in)													
Average									0.0	0.0	0.0	0.0	
% valid obs	0	0	0	0	0	0	0	0	2	100	98	96	
POR mean													
Wind (mph, degrees)													
Mean speed	14.7	14.3	11.4	17.7	15.5	14.7	14.3	22.0	12.5	8.5	11.9	19.1	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
Max speed	87.2	97.3	91.9	94.9	105.8	81.2	89.0	83.0	65.5	42.5	72.7	102.2	105.8
Max direction	78	284	297	234	122	243	248	138	258	230	50	50	122
Solar radiation (kWh/m2)													
Total	41.7	19.0	8.5	11.9	36.1	83.6	110.4	113.0	111.9	140.4	94.3	52.8	823.7
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100

²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values.



2011 Hydrologic Year - KATM RAWs PFMI (Pfaff Mine)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	20.7	0.7	-18.8	-3.8	-16.6	3.7	3.4	24.8	34.7	34.9	34.9	31.3	-18.8
Max.	35.4	37.0	23.4	32.2	28.2	25.9	32.0	44.4	43.0	48.7	52.9	43.9	52.9
Mean	28.6	18.8	1.1	18.7	7.5	16.3	21.9	33.2	38.3	42.1	43.2	39.1	25.8
# days <32 F	24	27	31	30	28	31	29	10	0	0	0	2	212
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	24.3	6.3	-6.7	11.3	-11.0	16.9	19.8	35.2	41.5	45.0	45.5	35.8	-11.0
Max	44.1	50.2	33.4	41.0	37.8	34.9	55.0	62.1	59.4	66.0	62.2	55.8	66.0
Mean	35.8	29.7	16.9	28.9	21.1	29.5	35.9	44.9	48.8	55.0	52.4	46.7	37.2
# days <32 F	8	20	29	20	21	20	5	0	0	0	0	0	123
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	31.8	23.7	8.5	23.9	14.3	21.7	27.8	37.9	42.9	48.0	47.3	42.2	30.9
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1981-2010													
Precipitation													
Total ²	3.64	0.26	0.00	0.28	0.03	0.06	0.55	3.17	1.76	0.00	0.01	0.00	9.76
% valid obs	61	26	1	27	6	6	47	95	99	100	100	99	56
POR mean													
1981-2010													
Snow depth (in)													
Average	0.3	1.5	1.9	1.7	0.9	0.8	1.9	0.6	0.0	0.0	0.0	0.0	
% valid obs	81	81	88	53	42	86	53	87	100	100	100	100	
POR mean													
Wind (mph, degrees)													
Mean speed	13.3	12.1	8.9	19.0	12.4	10.5	15.0	15.5	12.2	10.3	11.7	12.9	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
Max speed	73.4	65.5	69.8	80.8	79.0	57.3	86.6	63.7	83.7	43.6	63.3	77.0	86.6
Max direction	113	114	135	121	113	98	89	113	120	128	115	108	89
Solar radiation (kWh/m2)													
Total	39.5	15.9	8.2	13.4	35.6	94.7	140.1	161.4	139.3	137.0	89.1	63.6	937.9
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100

²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values.



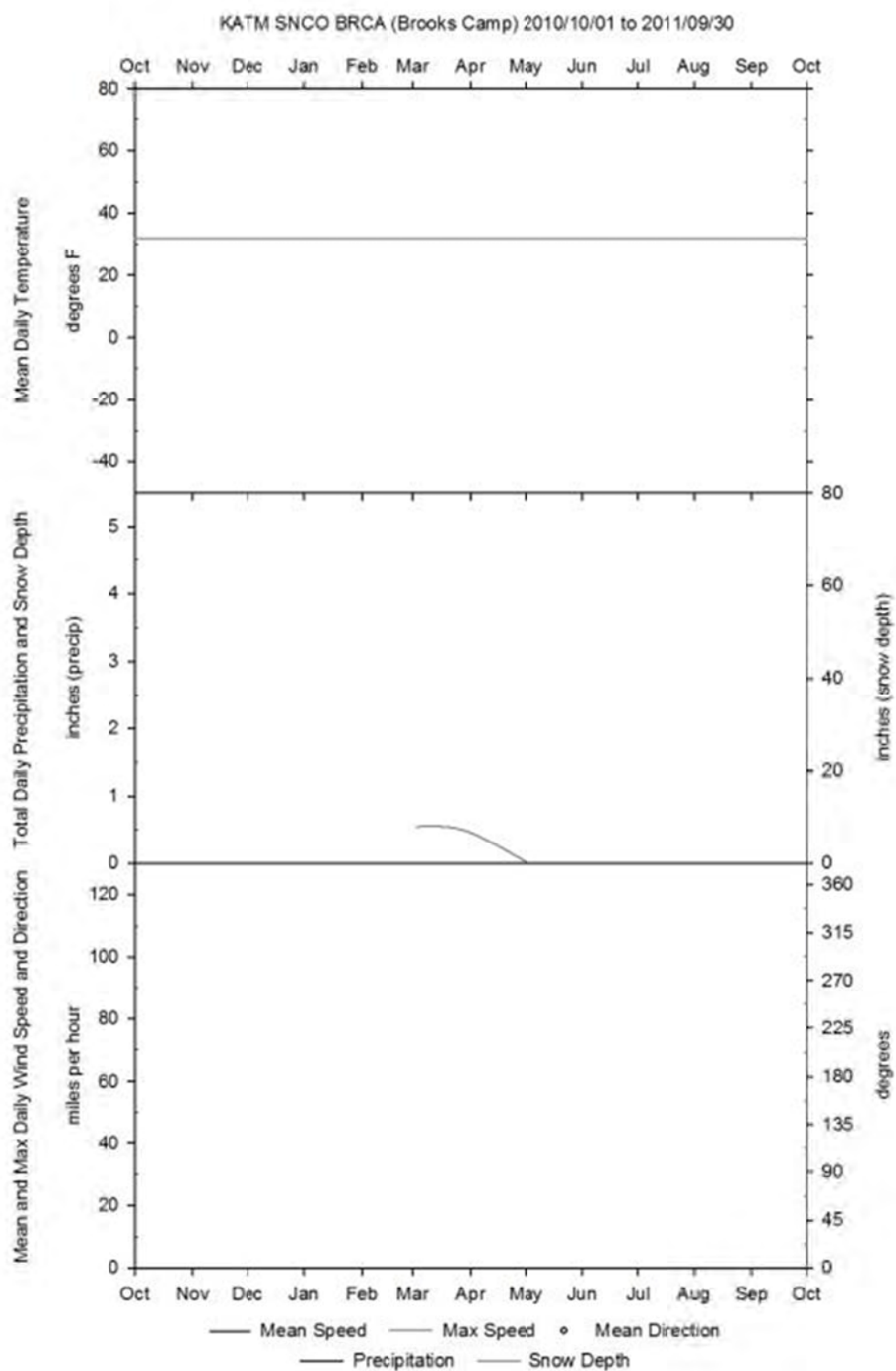
2011 Hydrologic Year - KATM SNCO BRCA (Brooks Camp)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.													
Max.													
Mean													
# days <32 F													
% valid obs													
Maximum air temperature (F)													
Min													
Max													
Mean													
# days <32 F													
% valid obs													
Mean air temperature (F)													
Observed													
% valid obs													
POR mean													
1971-2000													
Precipitation													
Total ³					1.5	1.8	0.0						
% valid obs			0	0	100	100	100						
POR mean													
1971-2000 ⁵													
Snow depth (in)													
Average ⁴					8	7	0						
% valid obs			0	0	100	100	100						
1971-2000 ⁵													
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

³Snow water equivalent measured close to the end of the month listed.

⁴Cummulative snow depth measured close to the end of the month listed.

⁵Values are not available for this snow course.

⁵1981-2010 climatological normals for snow courses were not available at the time of publication.



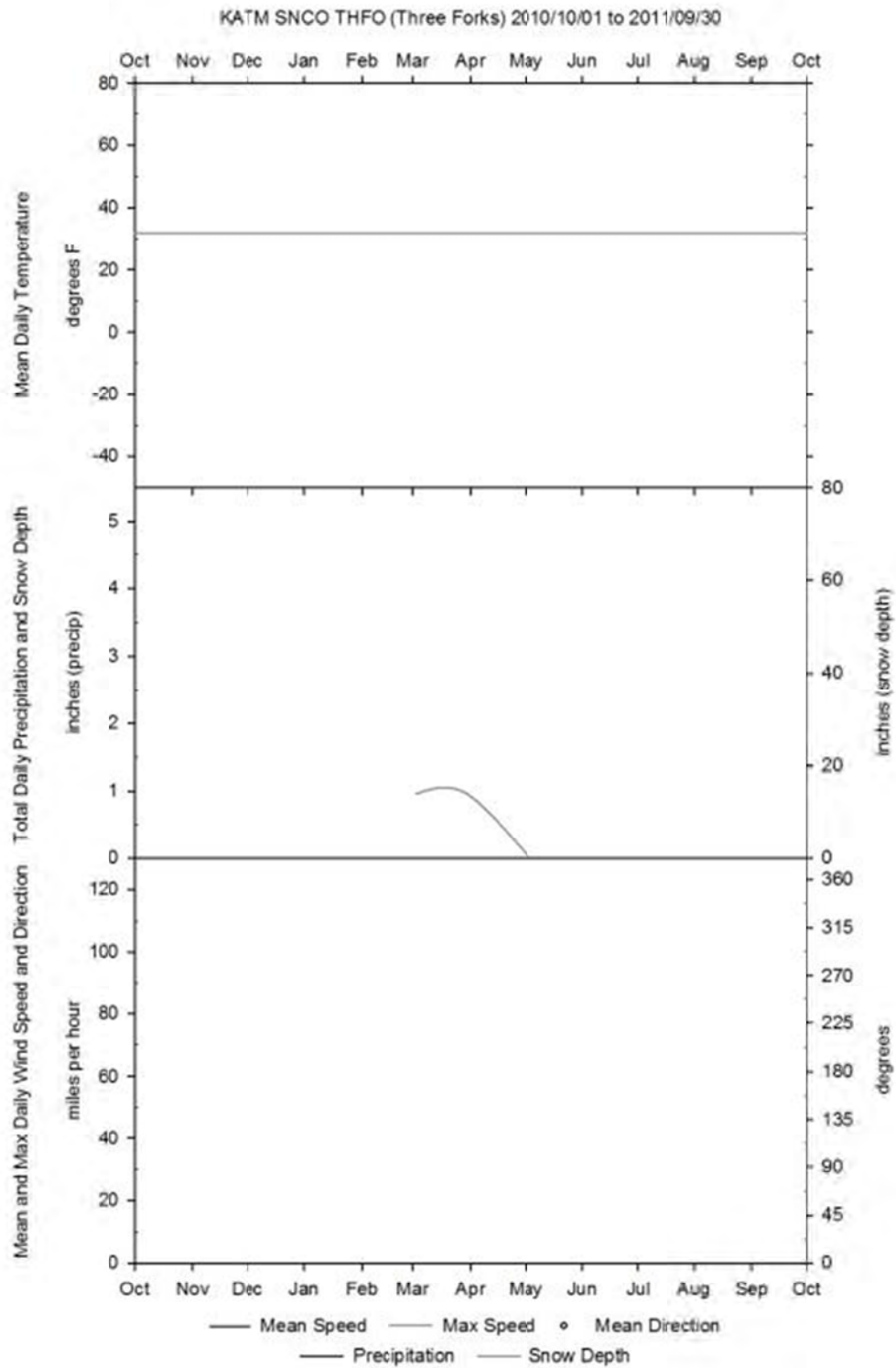
2011 Hydrologic Year - KATM SNCO THFO (Three Forks)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Minimum air temperature (F)											
Min.											
Max.											
Mean											
# days <32 F											
% valid obs											
Maximum air temperature (F)											
Min											
Max											
Mean											
# days <32 F											
% valid obs											
Mean air temperature (F)											
Observed											
% valid obs											
POR mean											
1971-2000											
Precipitation											
Total ³					2.5	3.5	0.0				
% valid obs			0	0	100	100	100				
POR mean											
1971-2000 ⁵											
Snow depth (in)											
Average ⁴					14	14	0				
% valid obs			0	0	100	100	100				
1971-2000 ⁵											
Wind (mph, degrees)											
Mean speed											
% valid obs											
Max speed											
Max direction											
Solar radiation (kWh/m2)											
Total											
% valid obs											

³Snow water equivalent measured close to the end of the month listed.

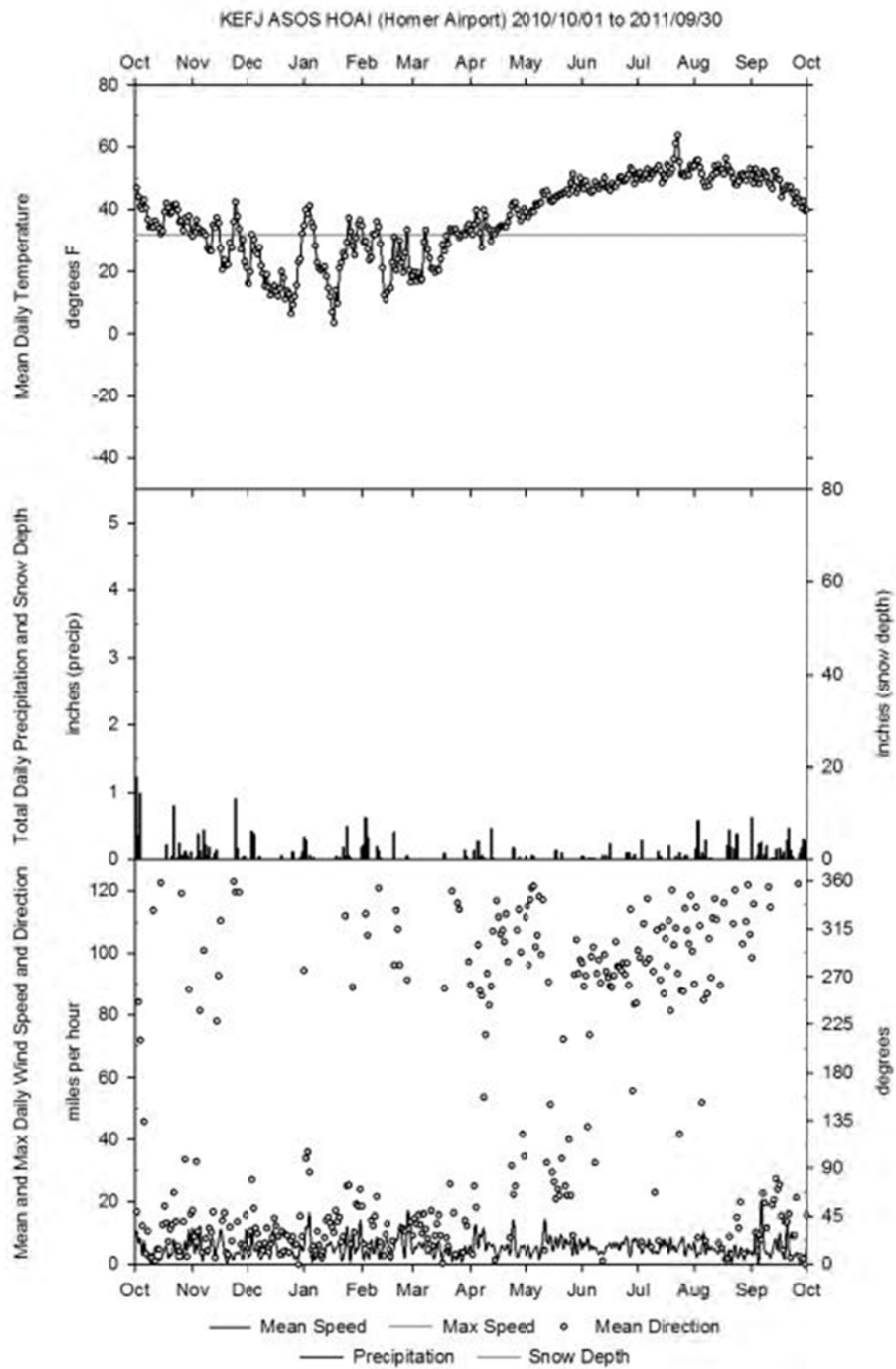
⁴Cummulative snow depth measured close to the end of the month listed.

⁵Values are not available for this snow course.

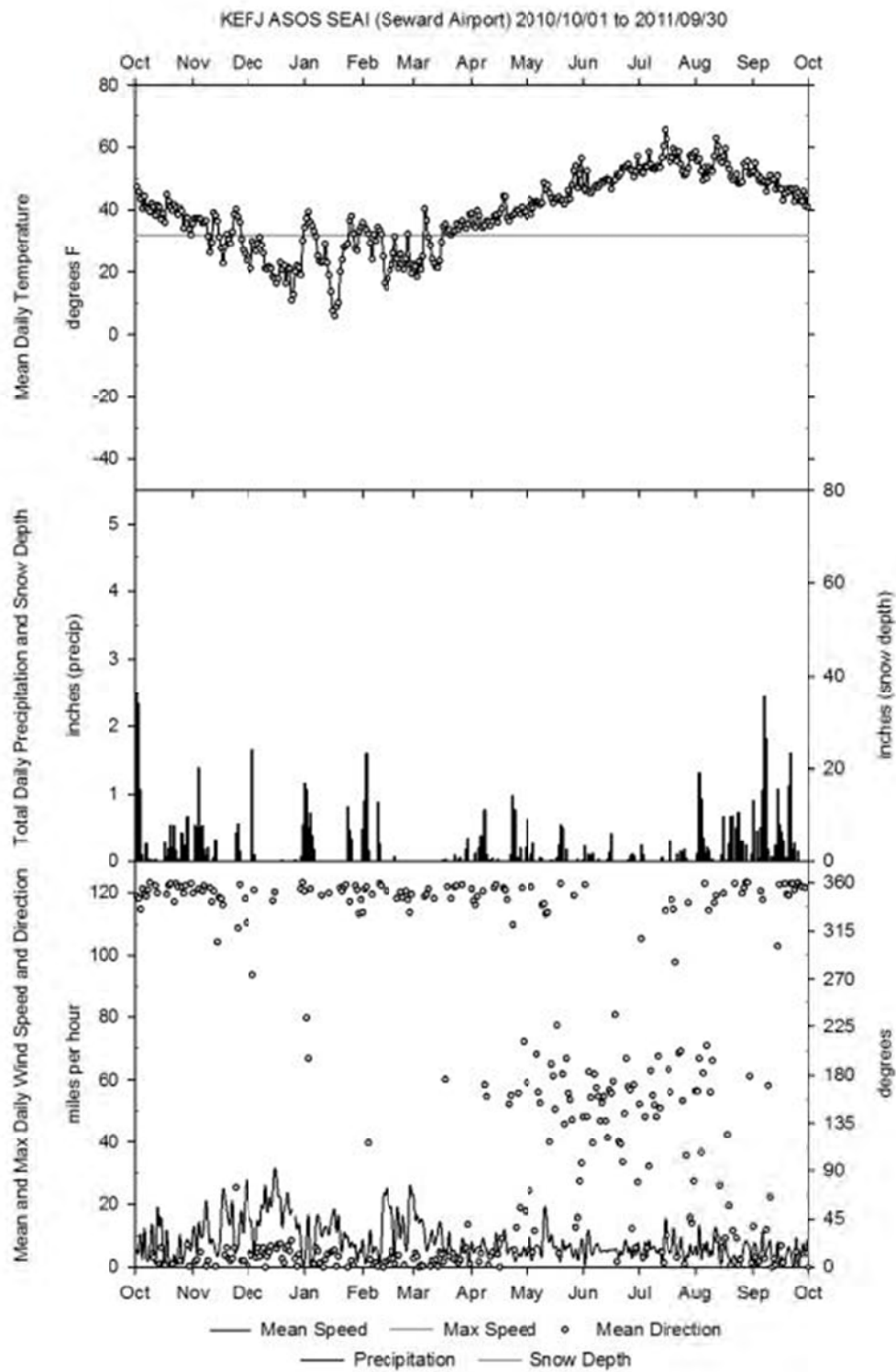
⁵1981-2010 climatological normals for snow courses were not available at the time of publication.



2011 Hydrologic Year - KEFJ ASOS HOAI (Homer Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	23	10	0	-2	2	-1	24	28	34	40	37	30	-2
Max.	44	39	28	37	33	30	40	45	48	54	53	49	54
Mean	31.3	24.9	12.7	19.9	17.2	19.6	29.5	33.4	43.1	45.2	45.8	41.0	30.6
# days <32 F	17	26	31	25	27	31	22	7	0	0	0	1	187
% valid obs	100	100	99	100	100	99	99	99	100	100	100	100	100
Maximum air temperature (F)													
Min	36	24	12	11	15	24	31	43	48	53	51	48	11
Max	53	45	40	45	39	43	46	58	58	79	68	60	79
Mean	43.8	34.5	24.3	30.2	29.6	33.7	41.2	49.6	53.2	59.1	57.0	52.7	42.5
# days <32 F	0	9	27	18	16	11	2	0	0	0	0	0	83
% valid obs	100	100	99	100	100	99	99	99	100	100	100	100	100
Mean air temperature (F)													
Observed	37.7	29.9	18.7	25.4	23.9	27.1	36.0	44.0	48.6	52.8	51.4	47.0	37.0
% valid obs	100	100	99	100	100	99	99	99	100	100	100	100	100
POR mean 1981-2010													
Precipitation													
Total	4.27	2.83	1.51	1.40	1.98	0.26	1.26	0.40	0.75	0.92	3.27	3.10	21.95
% valid obs	100	100	99	100	100	100	100	100	100	100	100	100	100
POR mean 1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	4.4	4.8	4.3	5.8	6.1	4.1	6.1	6.1	5.8	5.6	4.1	5.1	
% valid obs	99	100	99	100	100	98	99	99	100	100	100	100	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

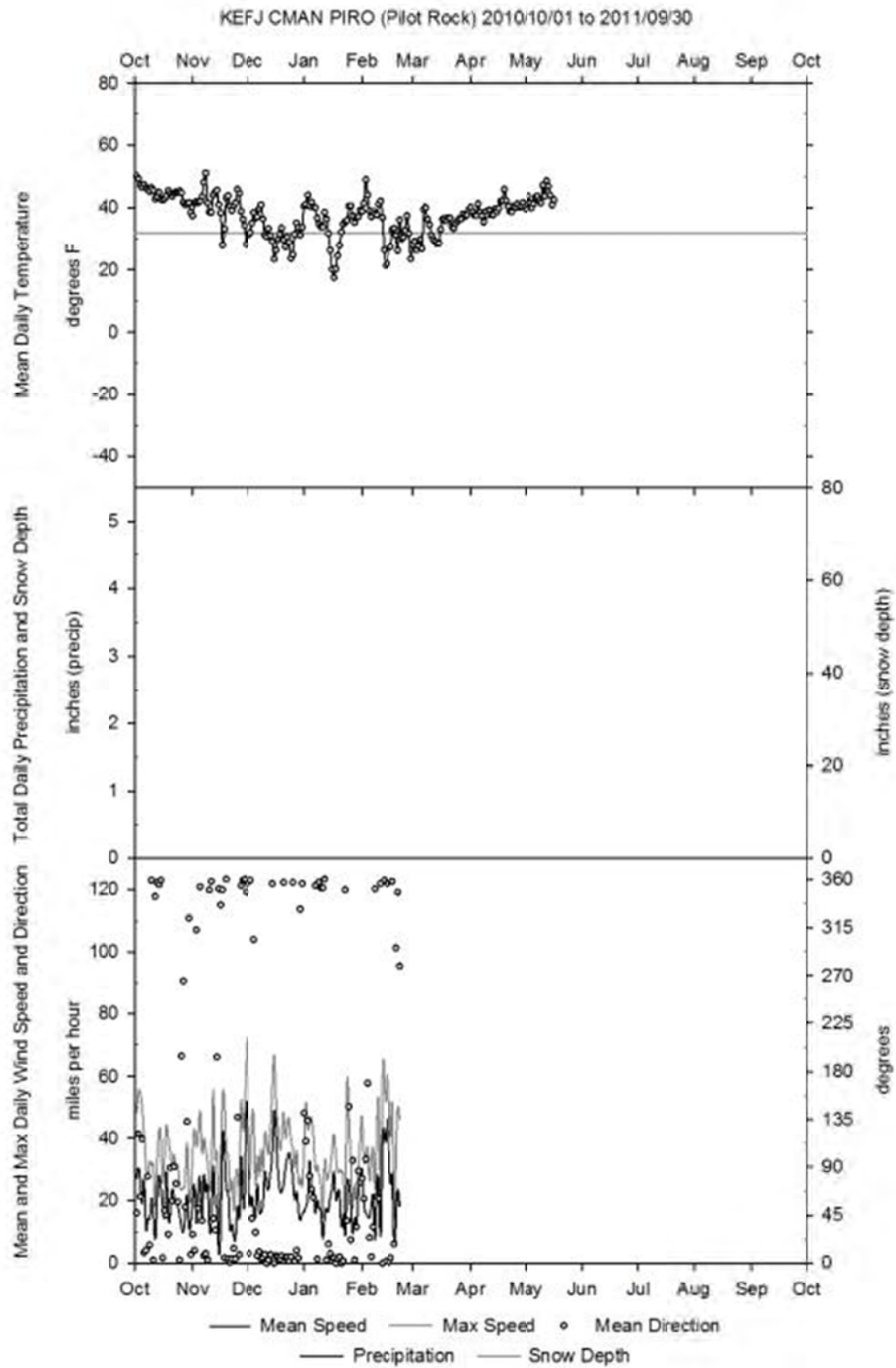


2011 Hydrologic Year - KEFJ ASOS SEAI (Seward Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	27	17	9	2	10	10	26	30	37	43	44	33	2
Max.	45	37	32	37	33	35	36	49	51	61	55	48	61
Mean	35.3	28.3	18.8	21.5	20.7	23.8	32.3	37.5	44.9	49.2	48.6	42.5	33.7
# days <32 F	5	18	30	24	25	26	12	2	0	0	0	0	142
% valid obs	96	100	99	100	100	100	100	100	99	100	100	100	99
Maximum air temperature (F)													
Min	36	25	15	10	16	25	37	43	48	53	51	46	10
Max	52	43	39	42	45	45	55	68	66	72	73	66	73
Mean	44.9	36.5	25.6	31.3	31.4	37.8	44.0	51.4	54.8	61.9	58.4	52.0	44.2
# days <32 F	0	6	25	13	12	4	0	0	0	0	0	0	60
% valid obs	96	100	99	100	100	100	100	100	99	100	100	100	99
Mean air temperature (F)													
Observed	40.0	32.6	22.3	26.4	25.9	30.5	38.1	45.1	50.2	55.8	53.5	46.9	39.0
% valid obs	96	100	99	100	100	100	100	100	99	100	100	100	99
POR mean 1981-2010													
Precipitation													
Total	9.81	5.45	3.57	4.97	3.87	0.77	4.69	2.14	1.45	1.32	8.53	12.67	59.24
% valid obs	100	100	99	100	100	100	100	100	99	100	100	100	100
POR mean 1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	6.4	13.4	16.0	9.7	12.5	8.2	5.8	6.8	5.6	5.9	5.5	4.6	
% valid obs	96	100	88	99	97	100	100	100	99	100	100	100	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													



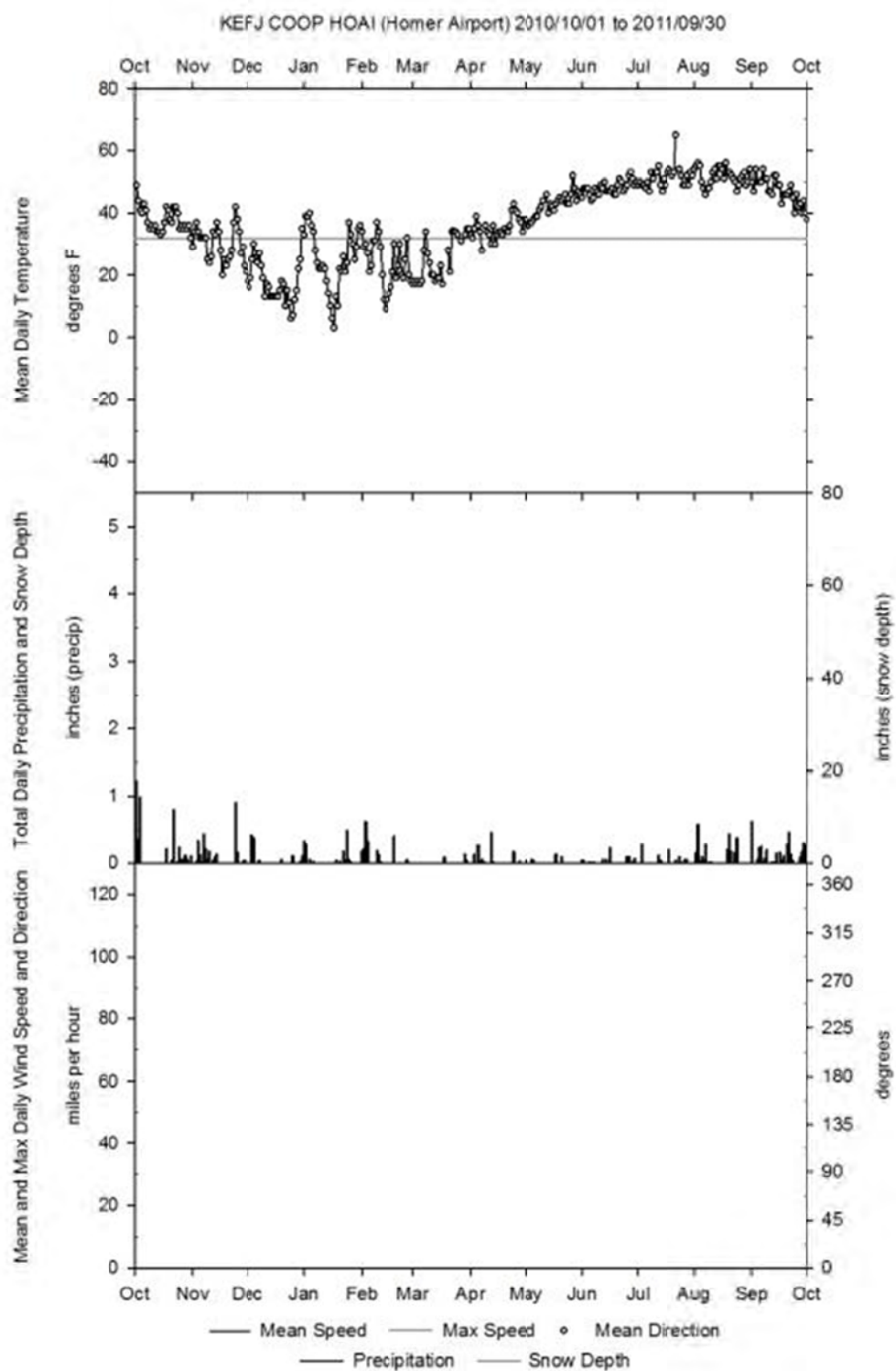
2011 Hydrologic Year - KEFJ CMAN PIRO (Pilot Rock)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	33.3	25.5	20.3	14.4	19.8	22.8	32.2	37.8					14.4
Max.	47.5	46.8	37.9	40.5	42.1	38.5	42.8	47.7					47.7
Mean	41.6	37.5	29.1	32.0	30.3	31.6	37.1	41.4					34.7
# days <32 F	0	5	21	8	17	12	0	0					63
% valid obs	100	100	100	100	100	100	100	35					61
Maximum air temperature (F)													
Min	41.5	30.9	26.6	19.9	22.5	30.0	39.2	40.8					19.9
Max	52.9	55.4	44.2	47.1	52.2	43.2	50.0	51.6					55.4
Mean	47.1	44.0	35.5	37.6	37.5	37.0	42.8	45.9					40.6
# days <32 F	0	1	6	6	7	3	0	0					23
% valid obs	100	100	100	100	100	100	100	35					61
Mean air temperature (F)													
Observed	44.3	40.4	32.2	34.6	33.6	34.0	39.7	42.6					37.3
% valid obs	100	100	100	100	100	100	100	35					61
POR mean													
1981-2010													
Precipitation													
Total													
% valid obs													
POR mean													
1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	18.8	21.7	25.0	19.5	23.1								
% valid obs	100	100	100	100	75								
Max speed	55.3	69.6	66.7	57.9	60.6								69.6
Max direction													
Solar radiation (KWh/m2)													
Total													
% valid obs													

Station stopped working on 05/16/2011.



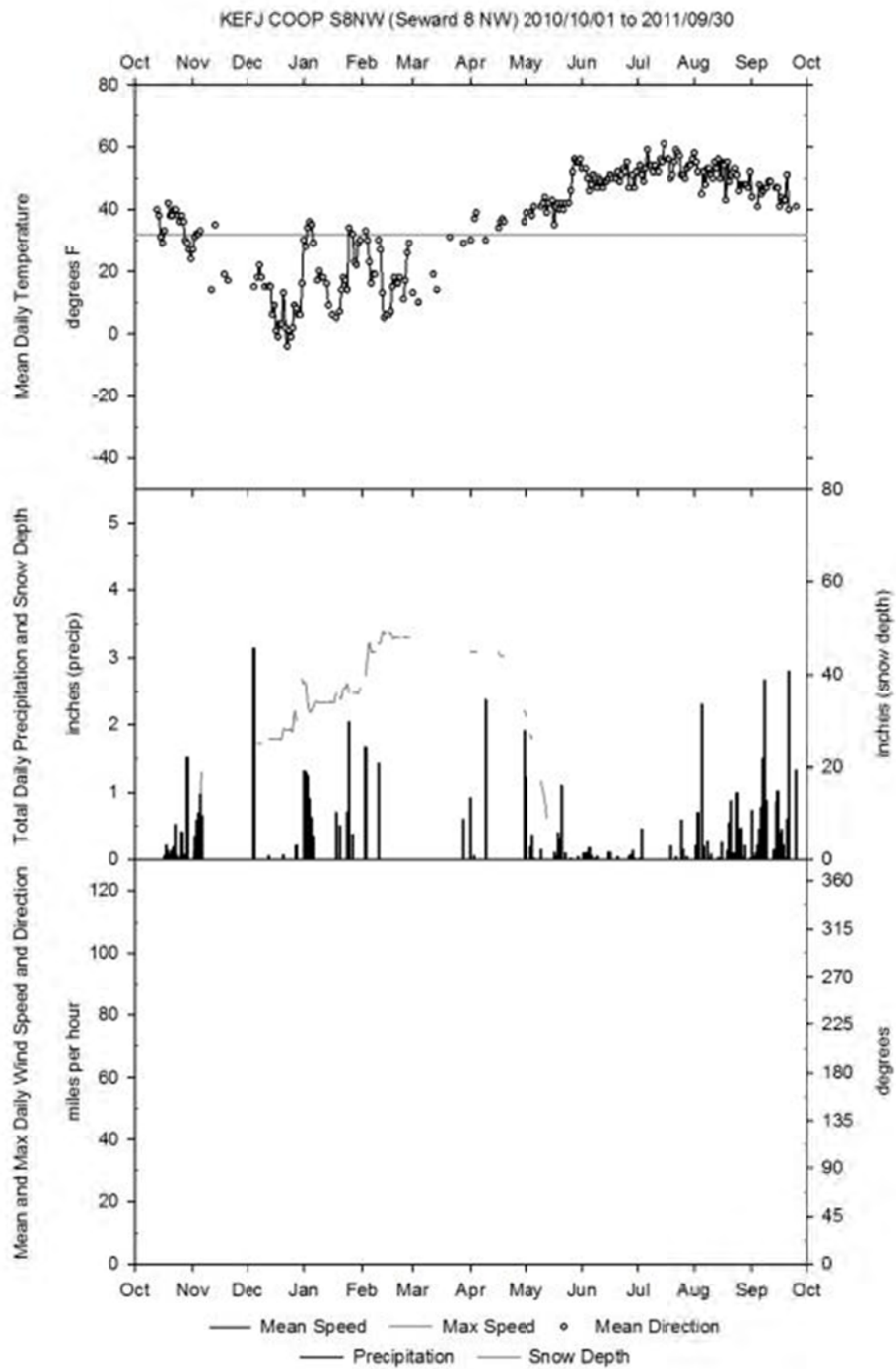
2011 Hydrologic Year - KEFJ COOP HOAI (Homer Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	22	9	-1	-4	2	1	22	26	34	38	37	28	-4
Max.	44	38	28	36	33	31	39	44	47	51	53	47	53
Mean	30.5	24.1	11.4	19.0	16.1	17.2	28.9	35.3	42.5	44.0	45.2	40.1	29.7
# days <32 F	20	27	31	26	27	31	22	10	0	0	0	3	197
% valid obs	100	100	100	100	100	87	97	97	100	100	100	100	98
Maximum air temperature (F)													
Min	36	24	13	11	15	24	31	43	48	53	51	48	11
Max	54	46	41	45	40	44	46	59	59	79	69	61	79
Mean	44.3	35.2	24.9	31.0	30.0	34.3	41.8	50.1	53.9	59.5	57.9	53.3	43.0
# days <32 F	0	6	27	17	16	11	1	0	0	1	0	0	79
% valid obs	100	100	100	100	100	100	100	100	100	97	100	100	100
Mean air temperature (F)													
Observed	37.6	29.7	18.1	25.0	23.2	25.5	35.4	42.7	48.2	51.6	51.6	46.8	36.4
% valid obs	100	100	100	100	100	87	97	97	100	97	100	100	98
POR mean ¹	37.9	29.0	24.1	23.0	25.6	28.5	36.0	43.2	49.7	53.6	53.3	47.6	37.6
1981-2010	38.1	29.5	27.1	24.8	26.2	29.9	37.0	44.5	50.6	54.6	53.9	48.1	38.7
Precipitation													
Total	4.26	2.81	1.52	1.41	1.99	0.26	1.27	0.40	0.76	0.92	3.28	3.11	21.98
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean ¹	3.13	2.76	2.80	2.23	1.74	1.55	1.20	0.98	0.96	1.57	2.46	3.03	24.42
1981-2010	2.57	2.79	3.08	2.63	1.71	1.65	1.07	0.82	0.82	1.55	2.34	3.31	24.34
Snow depth (in)													
Average													
% valid obs													
POR mean ¹	0	1	4	4	5	5	2	0	0	0	0	0	
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

¹Period of record used: 09/01/1932 to 12/31/2010



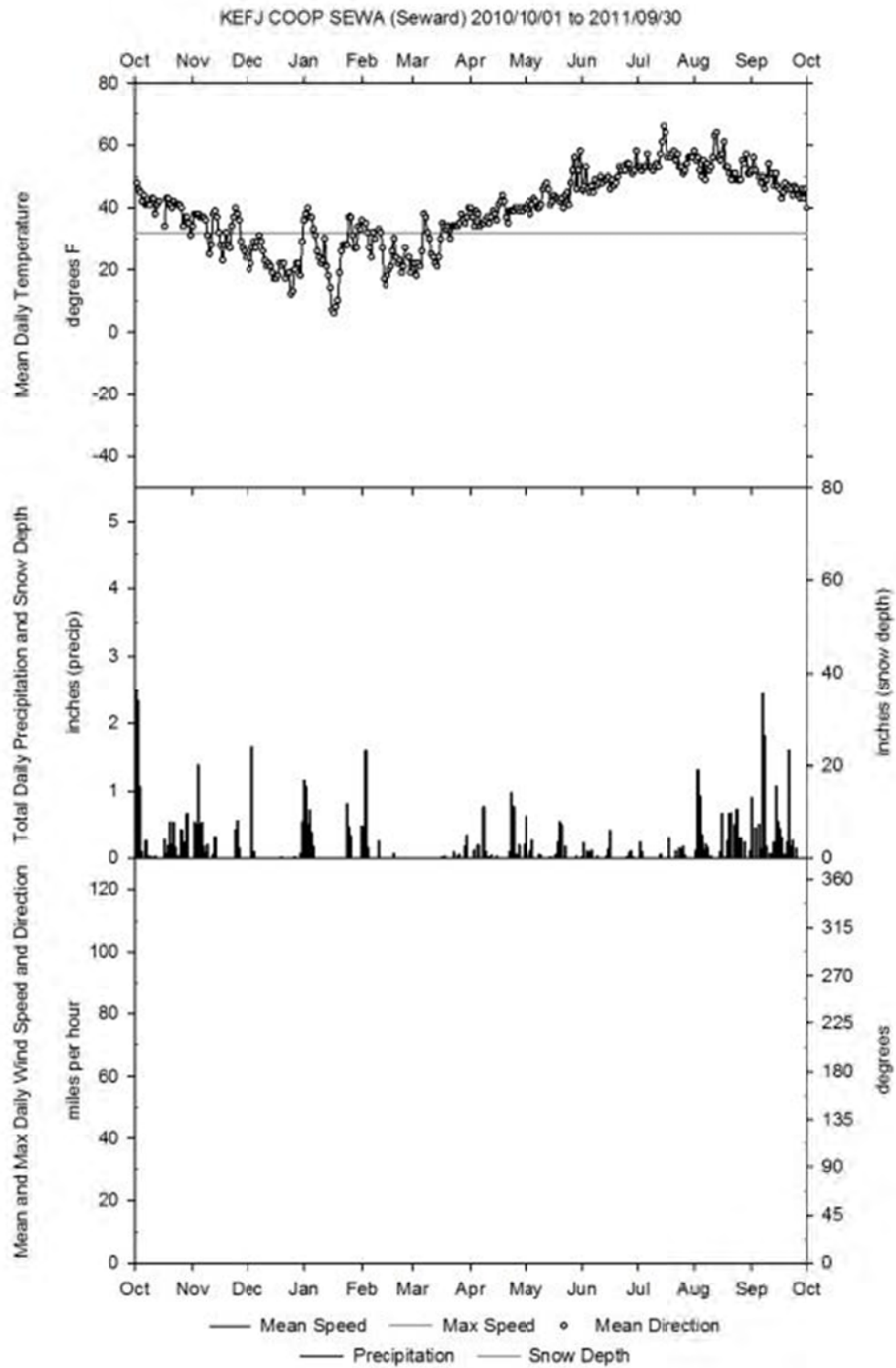
2011 Hydrologic Year - KEFJ COOP S8NW (Seward 8 NW)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	15	-10	-17	-17	-8	-11	15	22	26	32	17	27	-17
Max.	35	30	24	30	28	14	33	41	44	48	48	49	49
Mean	25.6	18.9	-1.2	6.6	4.6	2.7	22.4	31.5	38.0	40.6	38.9	37.4	24.4
# days <32 F	16	9	25	26	23	6	9	10	3	0	3	3	133
% valid obs	65	30	81	84	82	19	33	77	97	97	97	63	69
Maximum air temperature (F)													
Min	33	19	5	23	18	30	44	45	52	56	55	49	5
Max	60	39	36	41	41	48	53	75	70	76	70	62	76
Mean	43.6	34.4	19.2	34.0	31.2	41.7	48.7	57.3	61.1	67.9	61.9	53.9	48.1
# days <32 F	0	1	20	6	8	1	0	0	0	0	0	0	36
% valid obs	61	27	81	77	82	19	30	77	90	97	97	60	67
Mean air temperature (F)													
Observed	34.4	26.6	9.1	21.3	18.0	22.2	36.0	44.4	50.0	54.2	50.5	45.2	36.2
% valid obs	61	27	81	77	82	19	30	77	90	97	97	60	67
POR mean ¹	34.8	23.5	19.0	18.8	21.7	28.0	35.4	43.8	51.3	55.3	53.0	46.1	35.9
1981-2010	34.9	22.9	20.2	17.7	21.9	27.3	35.7	44.2	51.4	55.1	53.2	46.1	36.0
Precipitation													
Total	3.46	3.25	4.81	8.73	3.10	1.52	5.56	2.88	1.19	1.52	8.32	14.48	58.81
% valid obs	61	23	77	84	82	19	13	74	100	100	97	67	67
POR mean ¹	10.53	6.05	8.77	6.89	5.69	4.71	3.97	3.31	2.62	2.59	6.35	9.06	70.55
1981-2010	9.34	5.75	8.96	6.97	5.24	5.16	4.16	2.97	2.10	2.67	5.66	8.43	67.41
Snow depth (in)													
Average	0	15	28	35	47	45	42	5	0	0	0	0	
% valid obs	58	30	74	90	82	19	37	71	97	68	90	63	
POR mean ¹	1	8	23	36	47	55	48	13	0	0	0	0	
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

¹Period of record used: 07/01/1983 to 11/19/2010



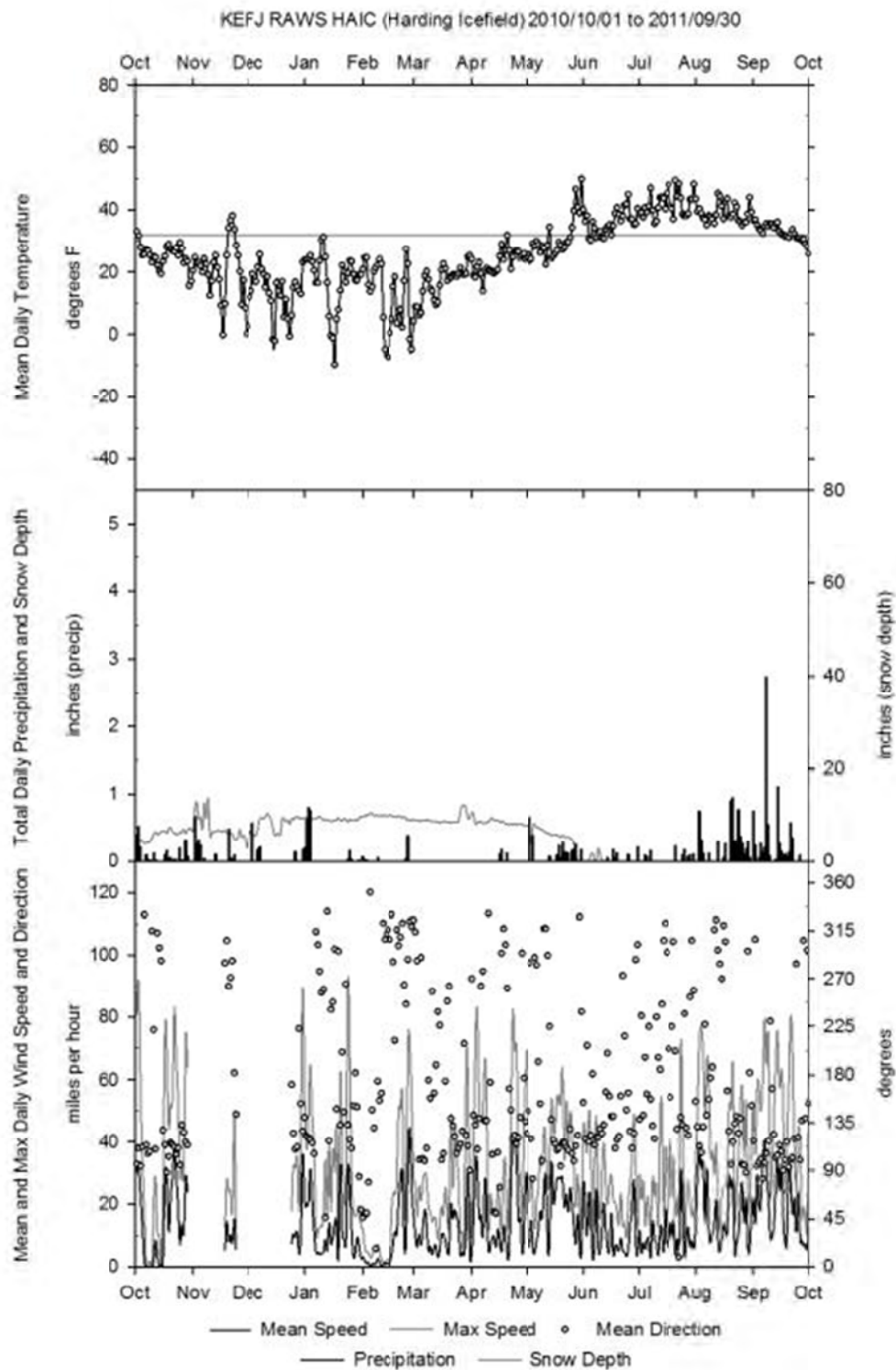
2011 Hydrologic Year - KEFJ COOP SEWA (Seward)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	27	17	8	1	10	9	26	30	36	43	44	32	1
Max.	44	36	32	37	32	33	36	47	50	60	54	48	60
Mean	35.1	27.9	18.3	20.7	18.8	23.3	31.8	37.0	44.5	48.4	48.4	42.0	33.2
# days <32 F	5	18	29	24	24	27	14	2	0	0	0	0	143
% valid obs	94	100	97	100	89	100	100	100	100	100	100	97	98
Maximum air temperature (F)													
Min	36	25	16	11	16	25	38	43	48	54	51	46	11
Max	52	44	40	43	38	47	56	69	67	75	75	66	75
Mean	45.6	37.0	26.4	32.0	31.0	38.4	44.7	52.1	55.4	62.7	59.0	52.6	44.9
# days <32 F	0	6	24	12	12	4	0	0	0	0	0	0	58
% valid obs	94	100	97	100	89	100	100	100	100	100	100	97	98
Mean air temperature (F)													
Observed	40.3	32.4	22.4	26.3	24.8	30.8	38.2	44.5	49.9	55.5	53.6	47.3	39.1
% valid obs	94	100	97	100	89	100	100	100	100	100	100	97	98
POR mean ¹	39.6	31.1	26.6	25.2	27.5	31.1	38.1	45.5	51.9	56.1	55.7	49.5	39.8
1981-2010	39.6	30.9	28.9	27.1	28.3	32.1	38.7	43.4	52.2	56.0	55.7	49.5	40.5
Precipitation													
Total	9.82	5.45	3.57	4.98	2.09	0.76	4.30	2.15	1.38	1.32	8.53	10.84	55.20
% valid obs	100	100	94	100	89	97	93	100	97	100	97	97	97
POR mean ¹	9.94	7.17	7.57	6.15	5.77	3.81	4.05	3.92	2.30	2.63	5.16	10.13	68.60
1981-2010	9.35	7.31	9.54	8.07	6.05	4.42	4.52	3.37	2.42	2.80	5.61	9.86	73.32
Snow depth (in)													
Average													
% valid obs													
POR mean ¹	0	1	4	6	8	7	2	0	0	0	0	0	
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

¹Period of record used: 09/01/1949 to 09/30/2008



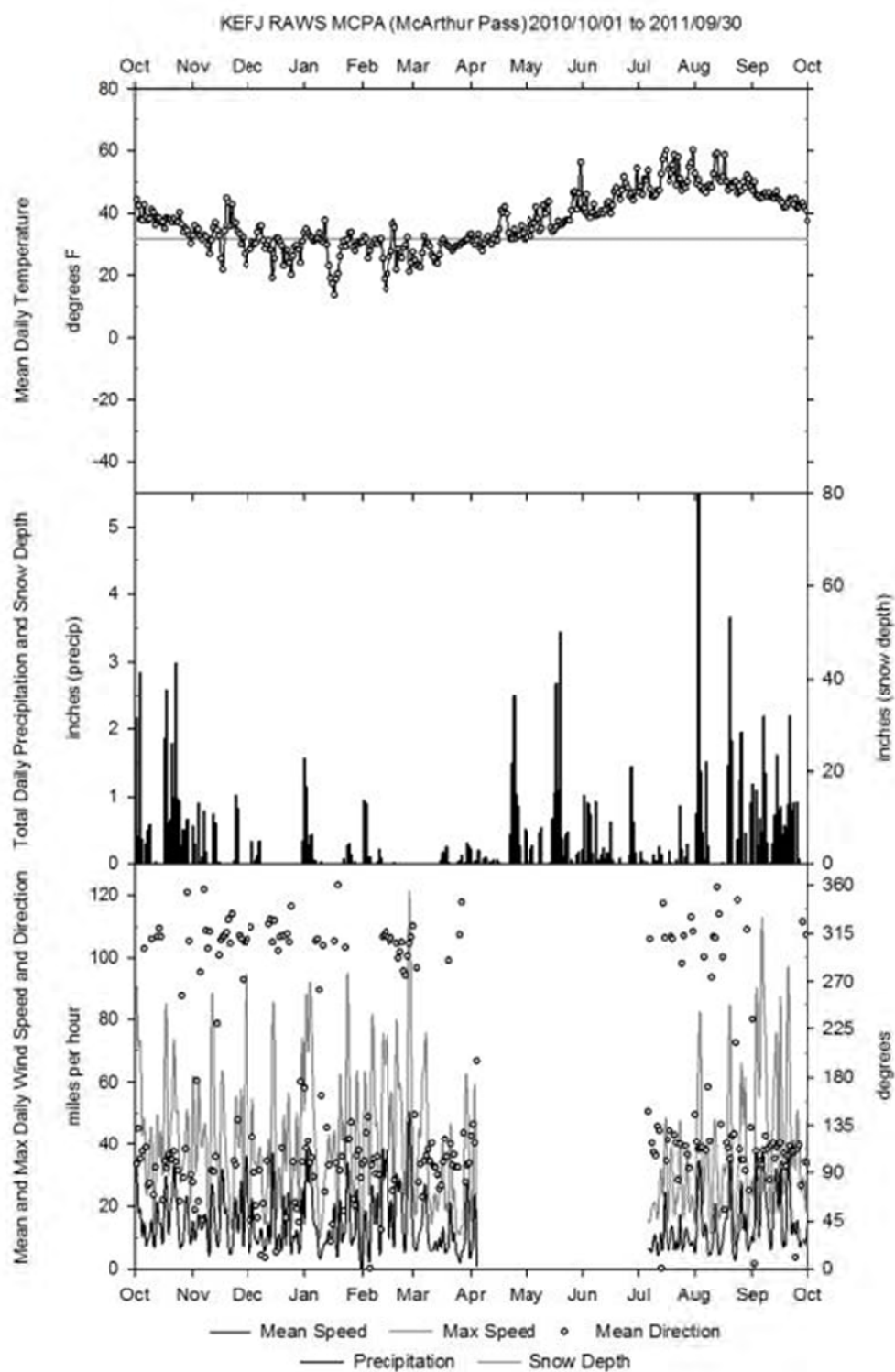
2011 Hydrologic Year - KEFJ RAWs HAIC (Harding Icefield)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	12.7	-1.5	-8.5	-14.4	-11.0	-2.9	8.8	13.2	27.1	32.5	32.0	21.2	-14.4
Max.	29.1	36.1	22.6	24.8	22.5	22.8	24.4	33.3	38.8	43.7	41.7	34.2	43.7
Mean	22.2	15.4	8.8	13.3	5.6	11.9	18.3	25.8	32.0	37.3	35.6	30.2	21.5
# days <32 F	31	29	31	31	28	31	30	25	15	0	0	16	267
% valid obs	100	100	100	100	100	100	100	96	92	100	100	99	99
Maximum air temperature (F)													
Min	18.9	1.6	2.8	-2.7	-5.4	9.5	20.1	27.3	32.4	41.2	36.9	29.5	-5.4
Max	38.8	44.8	28.8	36.7	38.5	35.6	48.7	63.5	51.4	59.7	56.8	45.0	63.5
Mean	28.4	24.1	19.0	20.9	17.3	24.4	29.9	37.6	42.1	48.6	43.3	37.1	31.1
# days <32 F	26	26	31	28	27	28	22	12	0	0	0	1	201
% valid obs	100	100	100	100	100	100	100	96	92	100	100	99	99
Mean air temperature (F)													
Observed	25.0	19.8	13.7	17.3	11.3	16.8	23.0	30.8	36.3	41.9	38.9	32.7	25.6
% valid obs	100	100	100	100	100	100	100	96	92	100	100	99	99
POR mean													
1981-2010													
Precipitation													
Total ²	2.50	2.29	1.49	2.50	0.51	0.00	0.43	3.50	0.73	1.10	6.88	7.24	29.17
% valid obs	97	100	100	100	100	100	99	97	92	100	99	97	98
POR mean													
1981-2010													
Snow depth (in)													
Average	6.0	7.3	8.2	9.2	9.7	9.2	8.4	5.1	0.2	0.0	0.0	0.0	
% valid obs	91	91	100	100	100	100	100	97	89	97	3	0	
POR mean													
Wind (mph, degrees)													
Mean speed	14.3	10.3	15.0	11.8	9.5	9.8	16.8	17.2	10.6	9.7	17.4	19.5	
% valid obs	89	20	23	100	100	100	100	97	92	100	100	99	
Max speed	90.6	49.7	89.7	90.6	71.1	61.5	82.6	62.9	49.7	71.1	76.5	79.9	90.6
Max direction	114	150	117	131	322	132	128	108	132	128	108	115	131
Solar radiation (kWh/m2)													
Total	41.4	12.0	5.1	7.9	32.8	91.8	147.6	201.6	197.7	204.3	124.2	71.5	1138.4
% valid obs	100	100	100	100	100	100	100	97	92	100	100	99	99

²A displacement precipitation gauge (filled with an antifreeze solution) is used at the Harding Icefield RAWs. By design, this gauge is capable of accurately measuring winter-time precipitation. In reality, undercatch (the difference between the actual amount of snow and the amount measured by a precipitation gauge) is a significant problem because of the extremely windy nature of the site. Measured precipitation is only a fraction of the snow water equivalent reflected by the adjacent snowpack.



2011 Hydrologic Year - KEFJ RAWs MCPA (McArthur Pass)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	29.3	17.8	14.7	11.3	13.5	18.5	22.8	30.9	37.0	43.0	43.2	36.0	11.3
Max.	39.6	39.7	33.8	32.4	31.5	31.8	36.9	49.5	46.9	53.2	53.6	46.4	53.6
Mean	34.9	29.5	25.8	26.5	23.7	25.8	30.3	35.6	41.2	47.5	47.0	41.9	34.2
# days <32 F	4	17	29	29	28	31	26	2	0	0	0	0	166
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	32.4	25.5	23.0	16.5	16.9	25.9	31.1	34.0	40.5	49.1	48.9	38.7	16.5
Max	48.2	50.2	40.8	43.3	53.4	42.3	54.1	63.3	62.4	68.2	67.8	57.4	68.2
Mean	40.5	37.3	32.7	31.8	33.3	33.2	37.5	43.7	48.7	57.7	54.0	47.4	41.5
# days <32 F	0	6	13	13	12	11	3	0	0	0	0	0	58
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	37.7	33.1	29.0	29.0	27.7	28.6	33.2	39.3	44.2	51.8	50.1	44.2	37.4
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1981-2010													
Precipitation													
Total ²	22.85	5.59	2.77	3.22	2.32	1.58	8.24	12.48	7.79	2.60	23.20	18.66	111.31
% valid obs	95	71	36	44	32	32	78	100	100	100	97	92	73
POR mean													
1981-2010													
Snow depth (in)													
Average	0.0									0.0	0.0	0.0	
% valid obs	21	0	0	0	0	0	0	0	0	75	66	32	
POR mean													
Wind (mph, degrees)													
Mean speed	16.2	16.3	12.7	14.6	20.7	10.2	13.8			9.4	13.6	18.1	
% valid obs	100	100	100	100	100	100	9	0	0	85	100	100	
Max speed	90.8	93.7	77.2	94.2	121.0	73.6	59.1			47.7	83.7	112.1	121.0
Max direction	113	295	294	79	300	120	111			120	92	99	300
Solar radiation (KWh/m2)													
Total	15.8	13.2	10.6	12.9	43.3	81.2	112.7	138.5	137.2	174.1	99.5	9.3	848.5
% valid obs	67	100	100	100	100	100	100	100	100	100	100	23	91

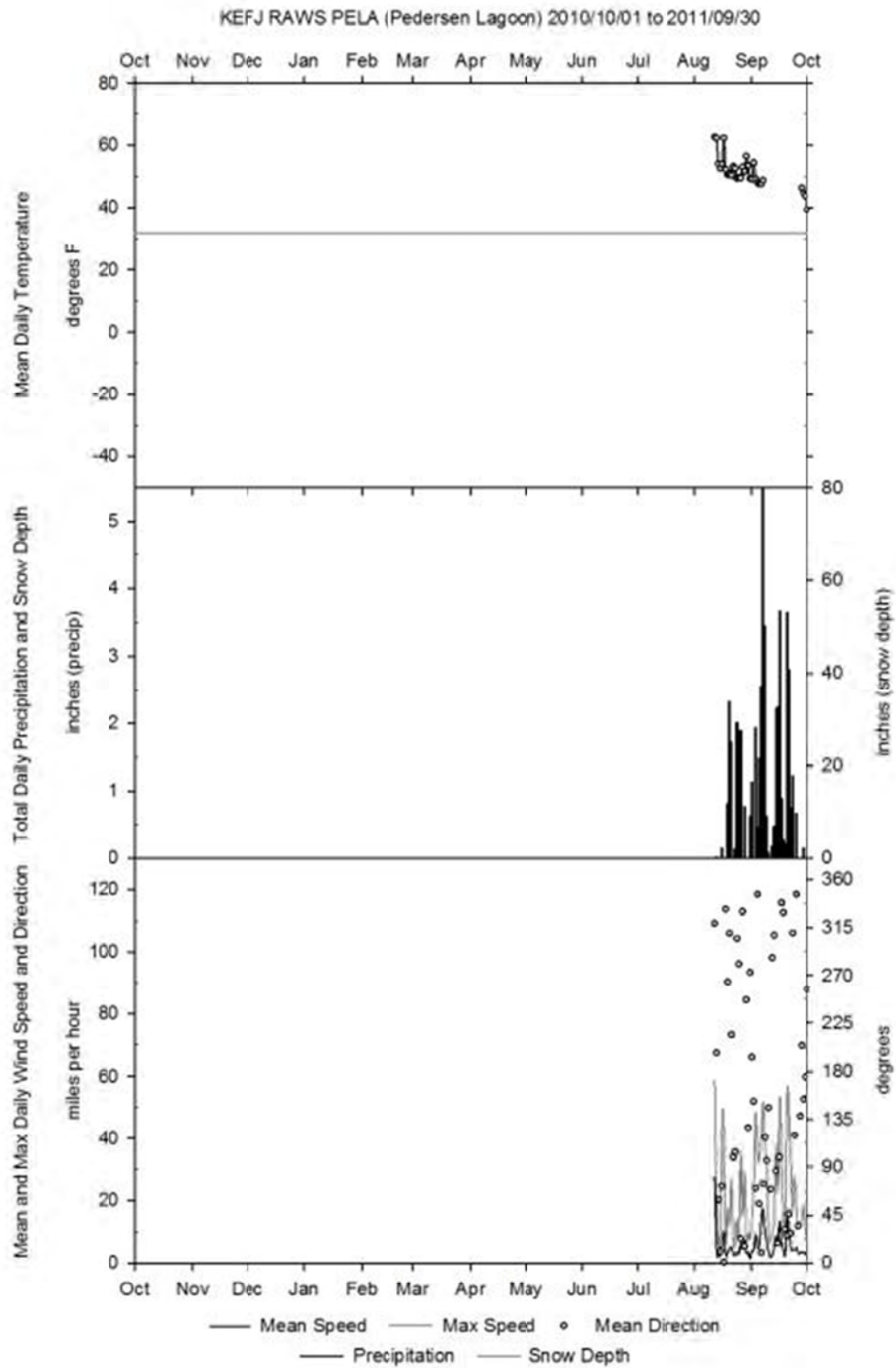
²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values.



2011 Hydrologic Year - KEFJ RAWs PELA (Pedersen Lagoon)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.											45.1	37.4	
Max.											58.3	47.5	
Mean											49.3	44.2	
# days <32 F											0	0	
% valid obs											68	30	
Maximum air temperature (F)													
Min											51.1	41.4	
Max											73.8	63.5	
Mean											58.2	51.0	
# days <32 F											0	0	
% valid obs											68	30	
Mean air temperature (F)													
Observed											53.3	47.1	
% valid obs											68	30	
POR mean													
1981-2010													
Precipitation													
Total ²											12.61	36.23	
% valid obs											68	99	
POR mean													
1981-2010													
Snow depth (in)													
Average											0.0	0.0	
% valid obs											68	100	
POR mean													
Wind (mph, degrees)													
Mean speed											5.3	6.4	
% valid obs											68	100	
Max speed											58.8	53.9	
Max direction											313	107	
Solar radiation (kWh/m2)													
Total											59.2	47.2	
% valid obs											68	100	

Station began operation 08/11/2011. Yearly summaries were not calculated.

²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values.



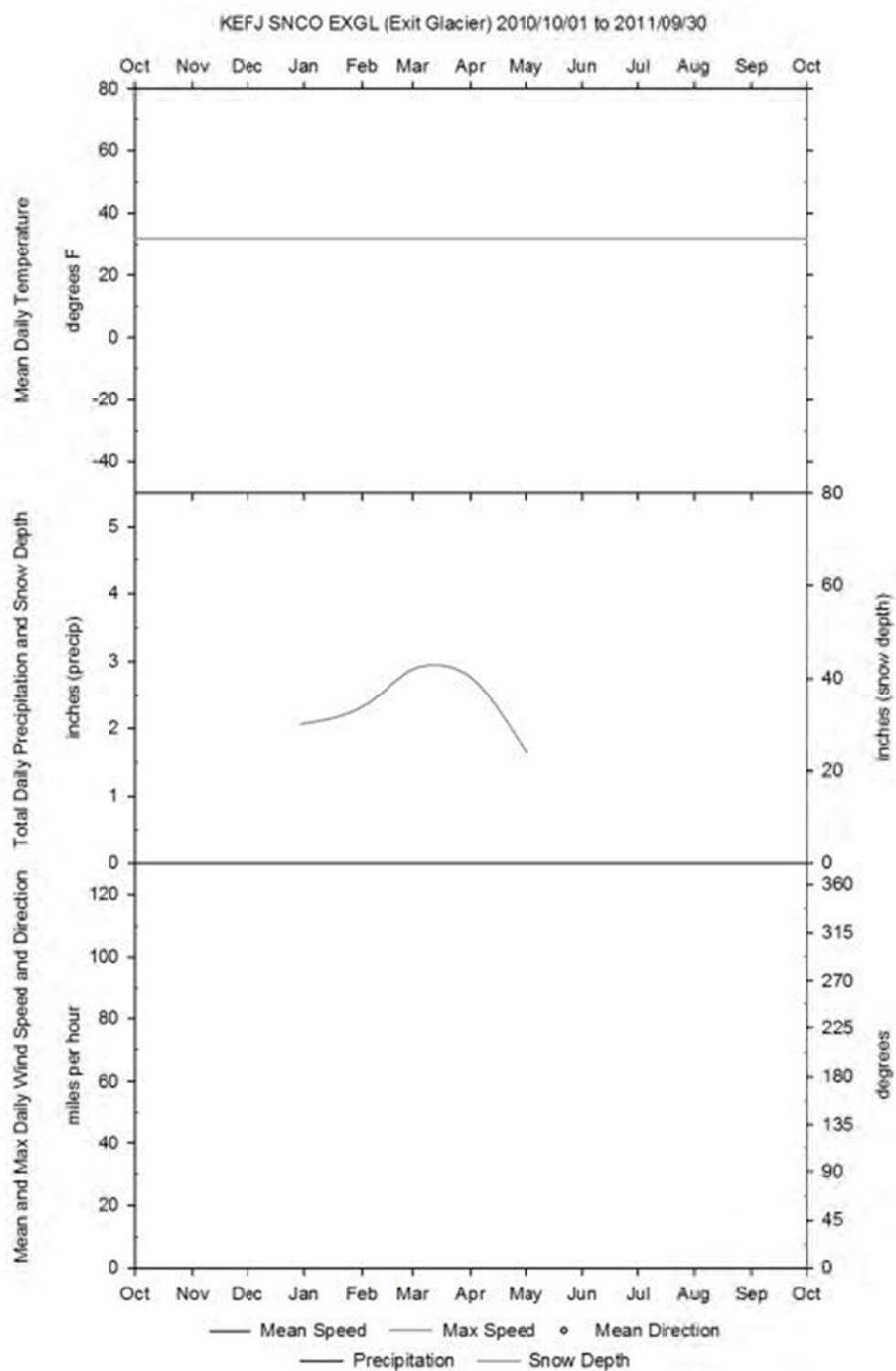
2011 Hydrologic Year - KEFJ SNC0 EXGL (Exit Glacier)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Minimum air temperature (F)											
Min.											
Max.											
Mean											
# days <32 F											
% valid obs											
Maximum air temperature (F)											
Min											
Max											
Mean											
# days <32 F											
% valid obs											
Mean air temperature (F)											
Observed											
% valid obs											
POR mean											
1971-2000											
Precipitation											
Total ³			8.4	9.6	12.1	11.4	8.2				
% valid obs			100	100	100	100	100				
POR mean											
1971-2000 ⁵				11.7	13.7	15.9	13.3				
Snow depth (in)											
Average ⁴			30	34	42	40	24				
% valid obs			100	100	100	100	100				
1971-2000 ⁵				48	53	57	32				
Wind (mph, degrees)											
Mean speed											
% valid obs											
Max speed											
Max direction											
Solar radiation (kWh/m2)											
Total											
% valid obs											

³Snow water equivalent measured close to the end of the month listed.

⁴Cummulative snow depth measured close to the end of the month listed.

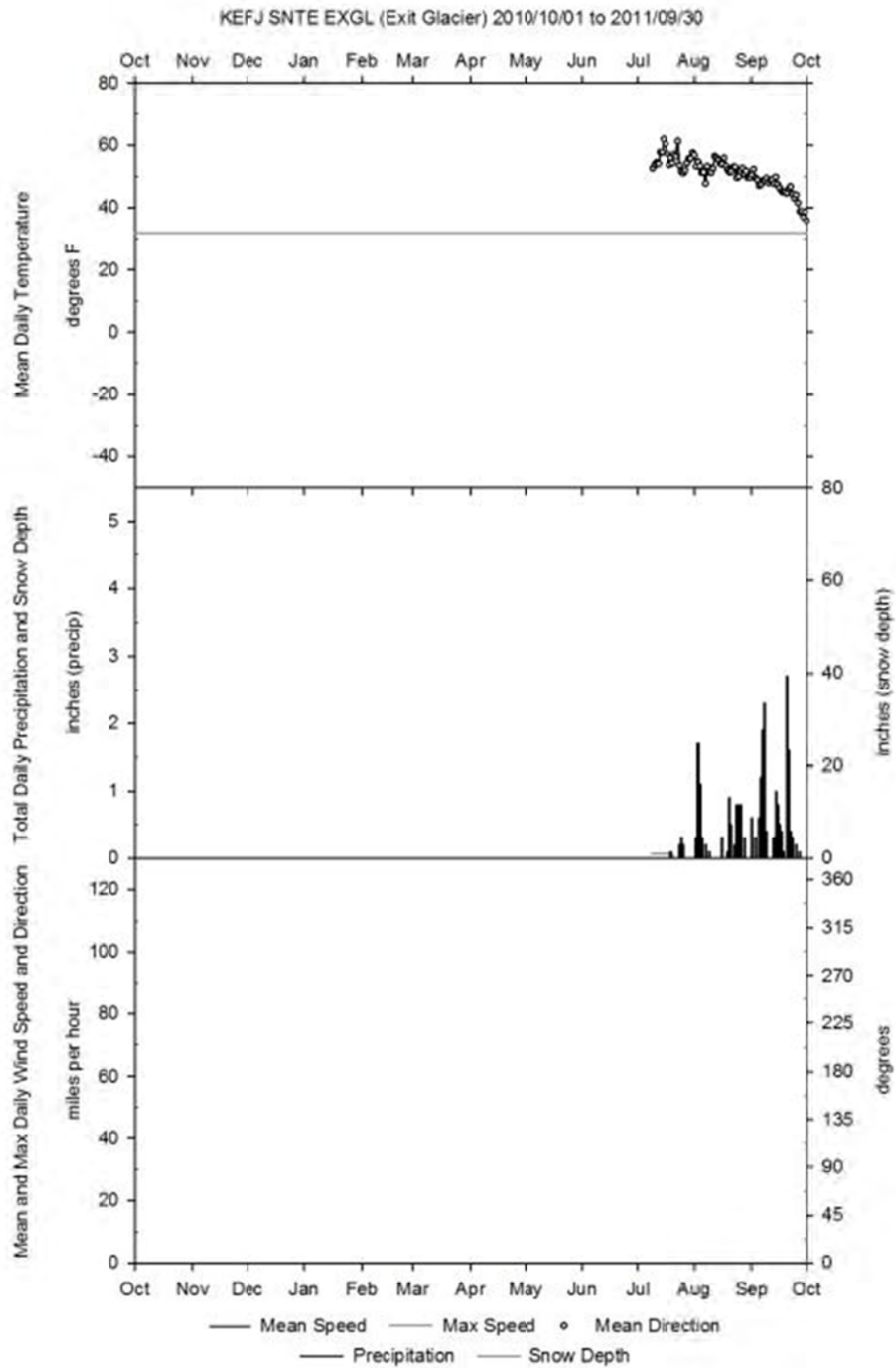
⁵Values cited are from http://www.ambcs.org/pub/sc_sum_ak/SNOWCOURSE.HTM (current 11/30/2011).

⁵1981-2010 climatological normals for snow courses were not available at the time of publication.

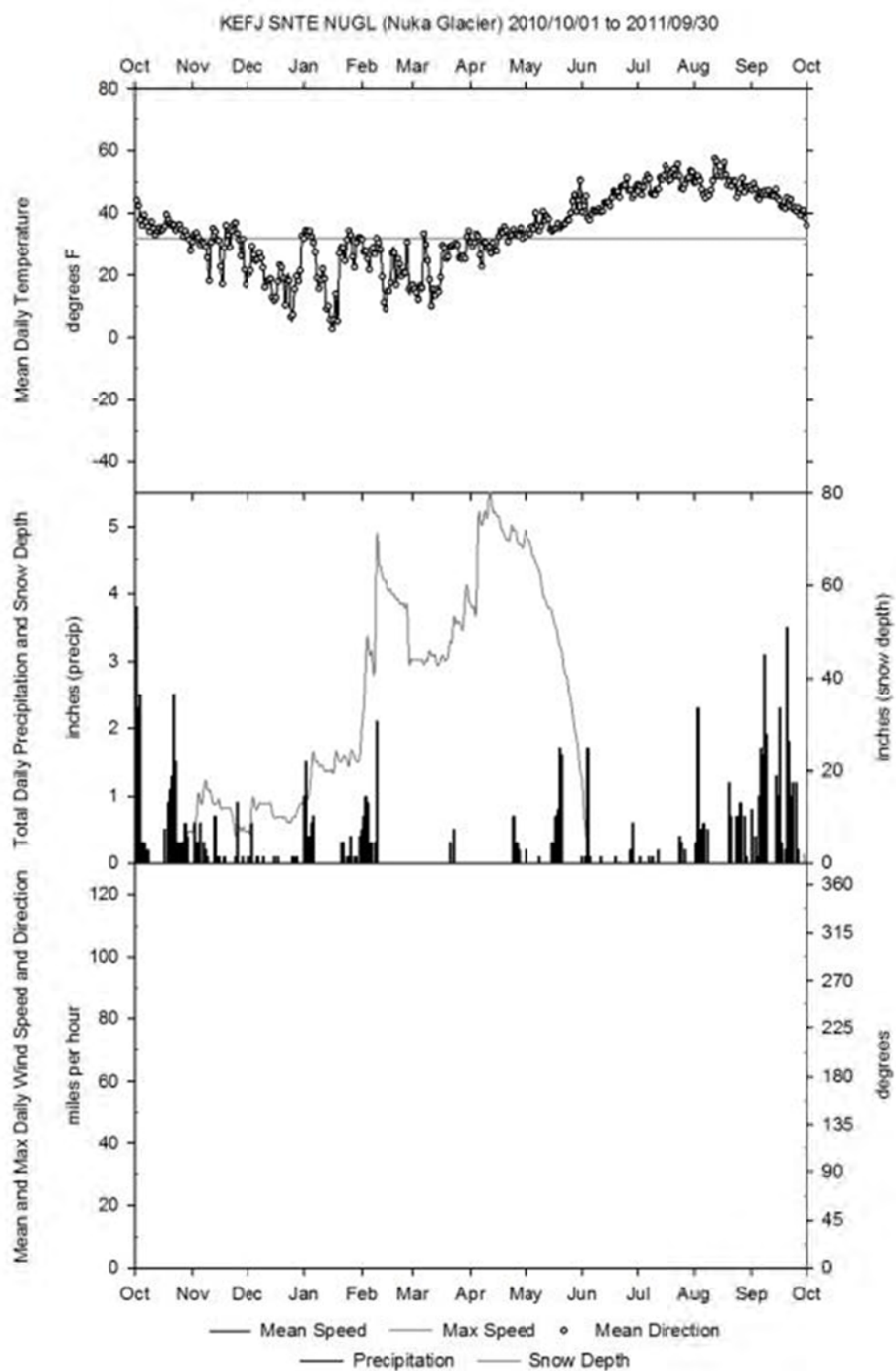


2011 Hydrologic Year - KEFJ SNTG EXGL (Exit Glacier)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.										36.3	33.6	23.4	
Max.										53.1	50.7	46.0	
Mean										43.5	44.8	38.7	
# days <32 F										0	0	7	
% valid obs										81	100	100	
Maximum air temperature (F)													
Min										54.0	53.1	47.3	
Max										77.5	71.2	63.1	
Mean										67.4	60.7	53.5	
# days <32 F										0	0	0	
% valid obs										81	100	100	
Mean air temperature (F)													
Observed										55.6	52.3	45.5	
% valid obs										81	100	100	
POR mean													
1981-2010													
Precipitation													
Total										0.80	8.30	15.10	
% valid obs										48	100	97	
POR mean													
1981-2010													
Snow depth (in)													
Average										0.0	0.0	0.0	
% valid obs										81	100	100	
POR mean													
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

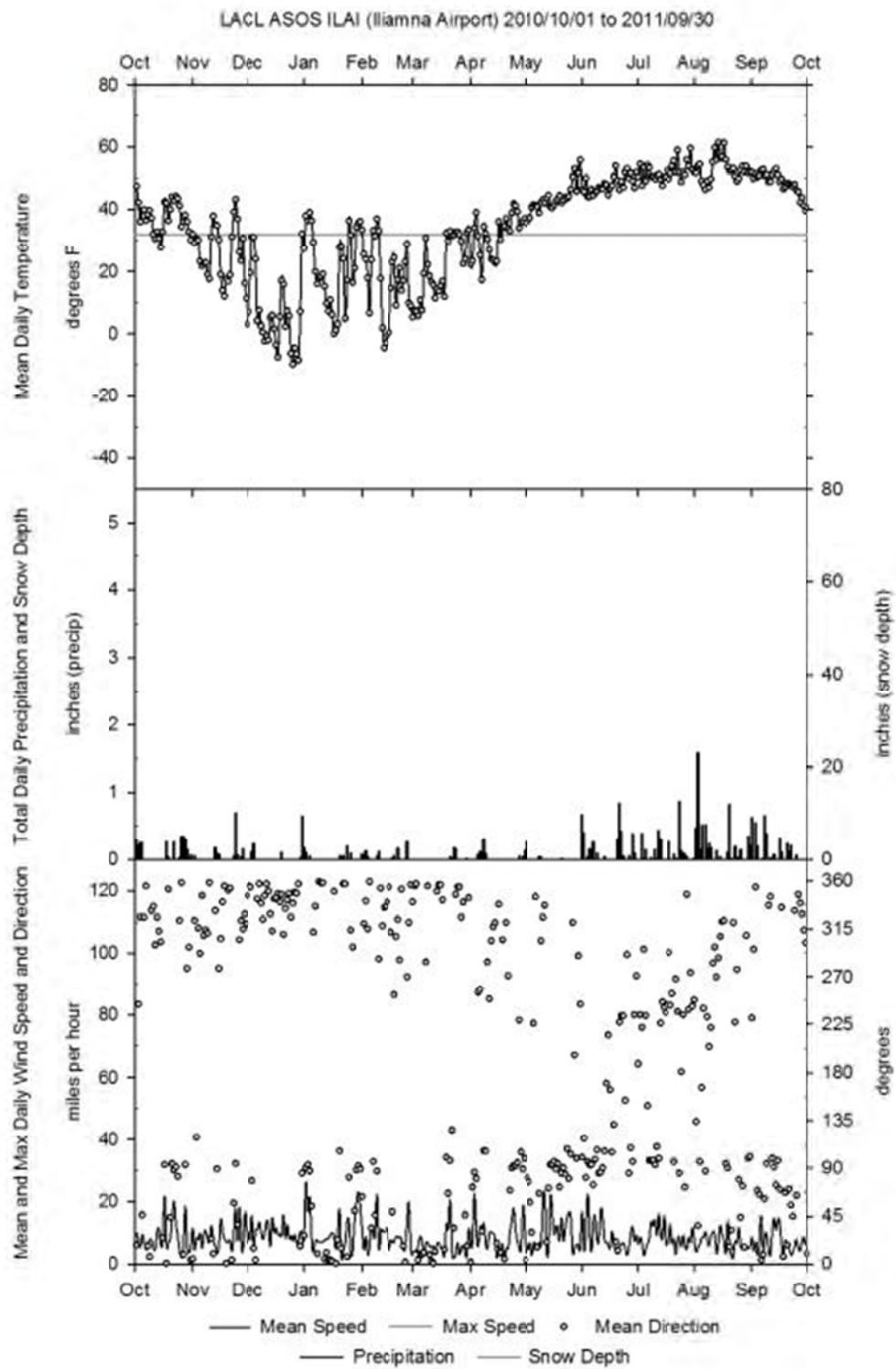
Station began operation 07/08/2011. Yearly summaries were not calculated.



2011 Hydrologic Year - KEFJ SNTG NUGL (Nuka Glacier)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	21.0	11.5	1.4	-7.4	5.5	-4.5	16.5	25.9	29.8	34.2	34.7	26.6	-7.4
Max.	39.0	35.1	27.7	32.4	30.9	31.6	32.7	41.5	43.7	48.9	50.2	45.3	50.2
Mean	30.9	24.3	13.6	16.6	15.0	13.8	25.4	33.3	38.8	42.3	44.0	39.3	28.1
# days <32 F	17	28	31	30	28	31	28	9	1	0	0	4	207
% valid obs	100	100	100	100	100	100	100	100	100	100	100	97	100
Maximum air temperature (F)													
Min	32.2	19.0	10.2	8.4	11.5	18.7	29.3	35.2	40.1	48.9	48.0	42.3	8.4
Max	50.4	41.7	36.0	37.8	38.8	54.1	53.8	62.1	61.5	68.2	67.1	56.7	68.2
Mean	40.4	33.9	24.9	29.2	28.0	33.4	37.6	43.6	50.2	58.3	55.2	48.8	40.3
# days <32 F	0	9	26	19	19	10	3	0	0	0	0	1	87
% valid obs	100	100	100	100	100	100	100	100	100	100	100	97	100
Mean air temperature (F)													
Observed	35.6	29.3	19.7	23.2	22.2	23.4	31.3	37.9	44.5	50.5	49.6	43.9	34.3
% valid obs	100	100	100	100	100	100	100	100	100	100	100	97	100
POR mean 1981-2010													
Precipitation													
Total	19.50	4.60	2.30	5.90	5.50	0.80	1.60	5.50	2.90	1.40	10.00	23.90	83.90
% valid obs	100	100	100	94	100	74	27	100	97	52	55	87	82
POR mean 1981-2010													
Snow depth (in)													
Average	1.0	11.5	11.2	21.5	53.8	47.6	71.2	49.1	0.6	-0.1	0.0	0.1	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	97	
POR mean													
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

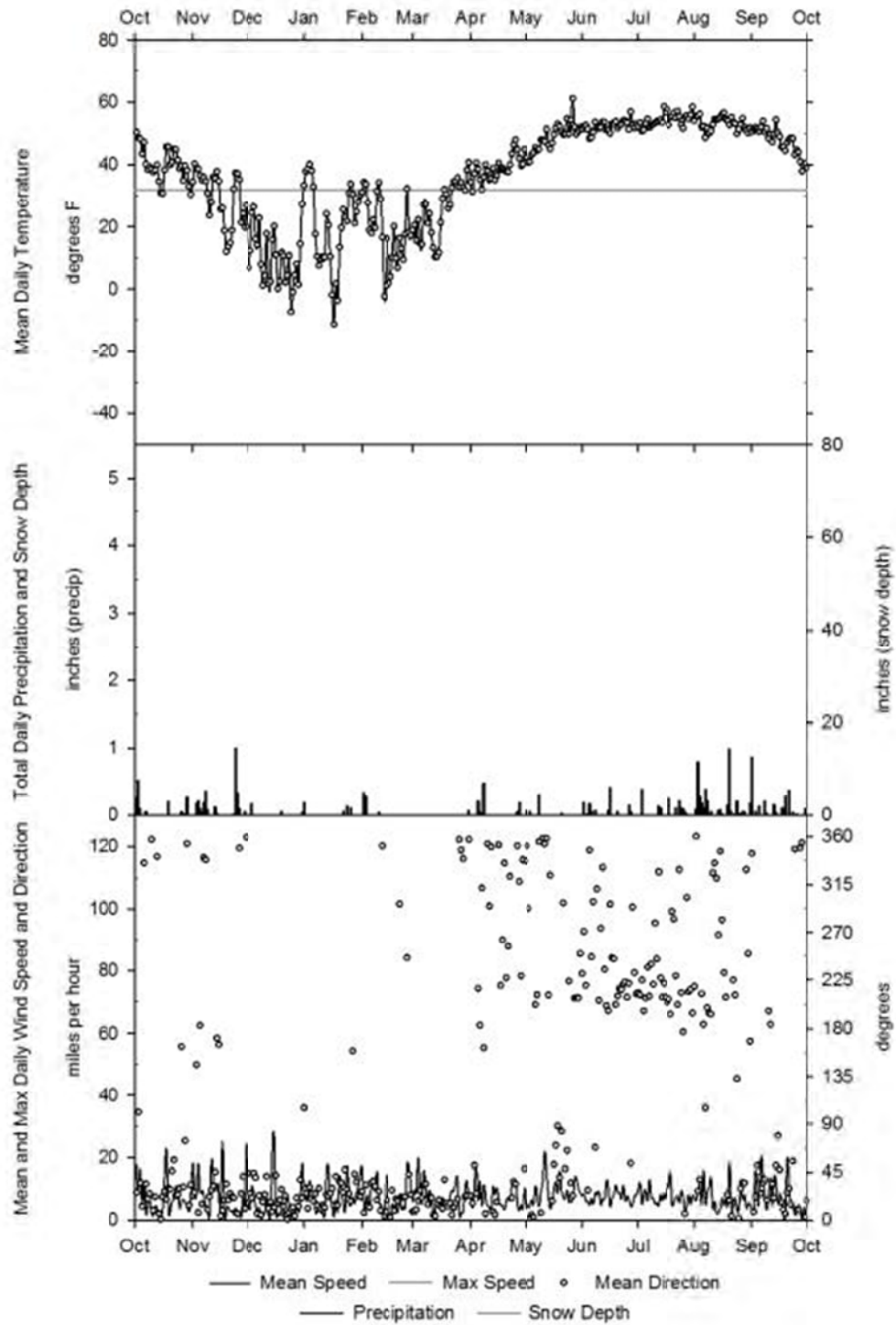


2011 Hydrologic Year - LACL ASOS ILAI (Iliamna Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	20	-2	-15	-6	-7	-4	6	26	36	36	41	31	-15
Max.	44	42	30	37	36	31	38	46	47	51	58	50	58
Mean	32.5	19.8	1.1	16.2	8.2	12.6	25.2	33.9	42.7	46.6	47.6	43.2	27.8
# days <32 F	13	26	31	24	27	31	22	6	0	0	0	1	181
% valid obs	100	100	99	100	99	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	34	9	-4	4	-1	16	27	43	46	52	49	46	-4
Max	54	45	36	41	38	41	49	64	63	72	70	59	72
Mean	42.5	29.4	12.6	27.3	23.1	30.5	38.8	50.3	53.8	58.3	58.4	53.5	40.0
# days <32 F	0	17	26	18	19	15	4	0	0	0	0	0	99
% valid obs	100	100	99	100	99	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	37.4	24.8	6.7	21.5	16.5	21.4	32.2	43.5	48.1	52.0	52.9	48.2	33.9
% valid obs	100	100	99	100	99	100	100	100	100	100	100	100	100
POR mean 1981-2010													
Precipitation													
Total	2.83	1.44	1.35	0.69	0.87	0.43	1.13	0.79	3.16	3.10	6.56	3.04	25.39
% valid obs	100	100	99	100	99	100	100	100	100	100	100	100	100
POR mean 1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	8.8	9.0	10.2	10.8	8.9	6.4	9.0	9.9	8.6	8.7	7.2	7.4	
% valid obs	100	100	99	100	99	100	100	100	100	100	100	100	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													



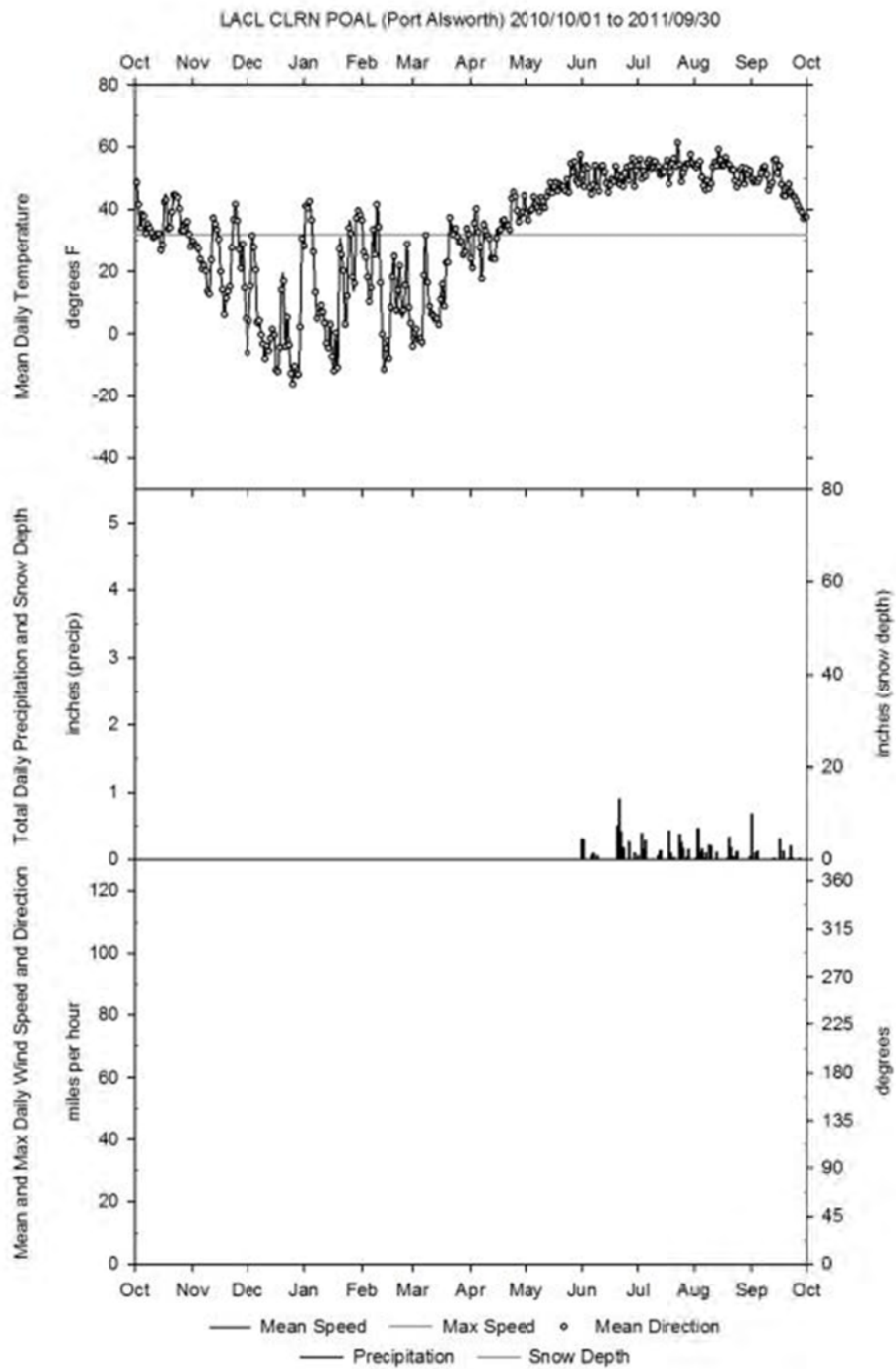
2011 Hydrologic Year - LACL ASOS KEAI (Kenai Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	19	2	-12	-18	-21	-8	22	26	33	36	36	26	-21
Max.	48	36	23	38	33	36	43	47	50	53	53	50	53
Mean	32.6	22.9	1.6	13.0	6.8	14.9	31.3	33.4	45.5	46.9	46.2	40.2	28.5
# days <32 F	14	20	31	28	27	27	17	4	0	0	0	4	172
% valid obs	100	100	99	100	100	100	100	100	100	99	100	100	100
Maximum air temperature (F)													
Min	37	22	5	3	14	21	36	47	53	54	53	45	3
Max	55	44	38	43	39	47	54	73	65	70	67	61	73
Mean	47.3	33.5	19.0	26.2	26.8	34.9	46.3	53.4	58.6	60.7	59.1	54.6	43.7
# days <32 F	0	13	28	20	21	9	0	0	0	0	0	0	91
% valid obs	100	100	99	100	100	100	100	100	100	99	100	100	100
Mean air temperature (F)													
Observed	39.9	29.0	10.6	20.2	17.7	25.7	39.1	43.7	52.3	54.4	53.0	47.3	36.6
% valid obs	100	100	99	100	100	100	100	100	100	99	100	100	100
POR mean 1981-2010													
Precipitation													
Total	1.47	2.82	0.46	0.34	0.66	0.08	1.06	0.42	1.26	1.50	4.90	1.67	16.64
% valid obs	100	100	99	100	100	100	100	100	100	100	100	100	100
POR mean 1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	7.3	7.9	5.8	7.8	7.2	7.9	7.4	9.0	7.6	7.7	6.9	7.3	
% valid obs	100	100	99	100	100	100	100	100	100	99	100	100	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

LACL ASOS KEA1 (Kenai Airport) 2010/10/01 to 2011/09/30



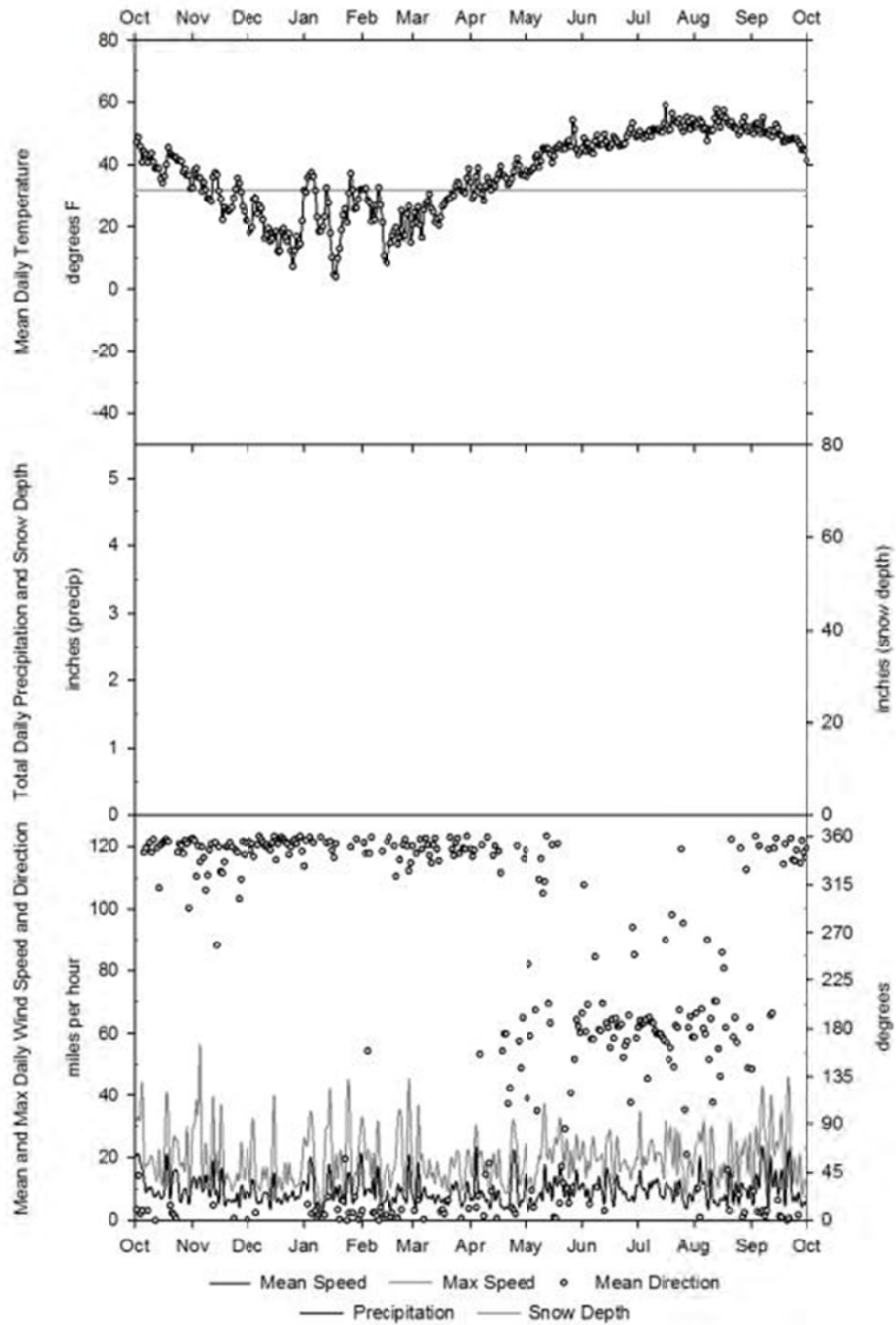
2011 Hydrologic Year - LACL CLRN P1SW (Port Alsworth 1 SW)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	14.5	-12.8	-25.8	-20.2	-19.1	-20.0	1.4	19.6	28.9	36.1	33.6	20.8	-25.8
Max.	39.4	39.2	24.6	38.7	38.5	26.4	40.5	47.3	47.7	50.4	53.8	50.0	53.8
Mean	27.7	14.2	-6.4	7.8	2.0	3.2	22.8	33.0	39.9	44.6	43.5	37.6	22.6
# days <32 F	23	28	31	26	27	31	23	13	5	0	0	7	214
% valid obs	99	100	100	100	100	100	97	94	99	100	100	100	99
Maximum air temperature (F)													
Min	32.5	1.6	-8.5	-1.1	-2.4	16.5	29.5	47.8	51.6	52.5	49.3	46.9	-8.5
Max	57.0	45.5	37.4	48.0	44.4	46.4	53.6	70.7	70.0	75.7	68.7	65.5	75.7
Mean	43.5	29.2	10.4	26.3	23.3	32.2	43.3	53.5	60.1	62.6	60.4	56.2	42.1
# days <32 F	0	18	26	17	21	16	4	0	0	0	0	0	102
% valid obs	99	100	100	100	100	100	97	94	99	100	100	100	99
Mean air temperature (F)													
Observed	35.8	22.3	2.6	17.3	13.5	17.5	34.0	43.1	50.4	53.5	52.0	46.9	32.7
% valid obs	99	100	100	100	100	100	97	94	99	100	100	100	99
POR mean													
1981-2010													
Precipitation													
Total ²									2.90	2.57	2.83	0.97	
% valid obs									98	100	100	100	
POR mean													
1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total	30.9	8.7	1.8	3.5	23.3	81.9	110.3	136.6	106.1	97.2	69.1	48.0	717.4
% valid obs	99	100	100	100	100	100	97	96	99	100	100	100	99

²Precipitation (rain and snow) was not accurately measured using the weighing bucket and wetness sensor because of issues with the data logger that weren't resolved until 05/19/2011. A total of 19.60 in of precipitation (liquid) was measured by the tipping bucket, but water equivalent of solid precipitation (e.g. snowfall) is not measured by this sensor.



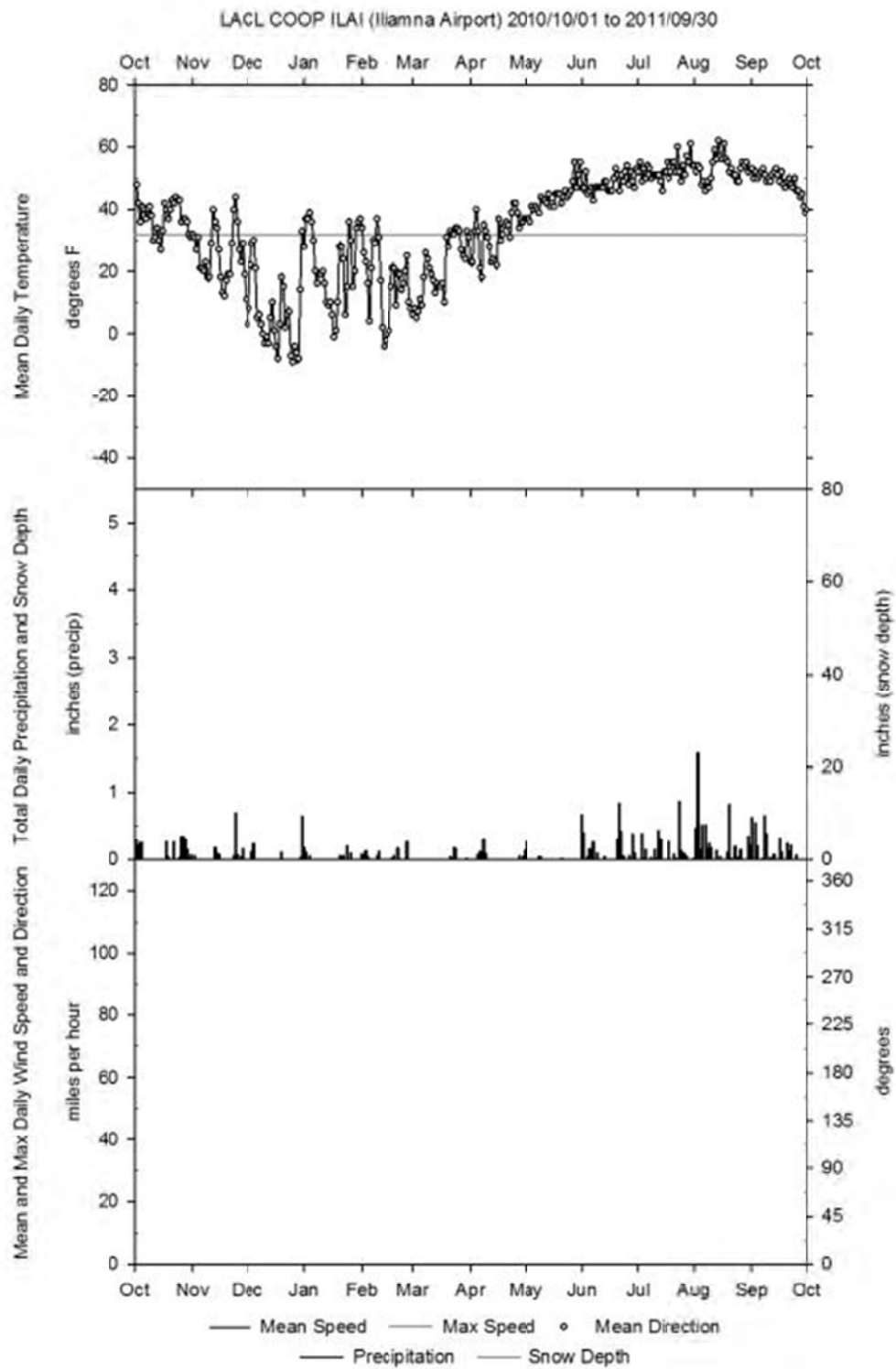
2011 Hydrologic Year - LACL CMAN DRRI (Drift River Terminal)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	29.1	17.4	1.4	0.3	1.6	10.2	23.5	33.8	38.5	44.4	43.7	36.0	0.3
Max.	45.7	34.7	29.3	34.3	32.0	35.1	39.0	47.7	48.9	53.1	53.2	51.4	53.2
Mean	37.0	27.0	14.2	21.0	16.1	23.5	31.3	40.0	45.1	49.3	49.5	45.7	33.4
# days <32 F	4	24	31	26	27	30	12	0	0	0	0	0	154
% valid obs	100	100	100	100	97	100	100	100	100	100	100	100	0
Maximum air temperature (F)													
Min	34.9	25.7	13.8	8.2	14.0	23.2	32.5	39.6	45.3	49.5	52.3	45.1	8.2
Max	52.9	43.2	33.8	40.6	41.5	41.7	46.8	63.7	58.8	67.5	63.7	59.9	67.5
Mean	44.8	34.2	23.6	29.0	26.9	32.3	39.7	49.0	50.7	55.7	56.1	52.6	41.3
# days <32 F	0	12	27	16	21	15	0	0	0	0	0	0	91
% valid obs	100	100	100	100	97	100	100	100	100	100	100	100	68
Mean air temperature (F)													
Observed	40.5	30.3	18.5	24.7	20.8	27.8	35.3	43.9	47.6	52.0	52.6	49.0	37.1
% valid obs	100	100	100	100	97	100	100	100	100	100	100	100	100
POR mean													
1981-2010													
Precipitation													
Total													
% valid obs													
POR mean													
1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	11.6	9.6	8.2	10.3	9.0	8.0	8.9	9.6	9.5	9.5	9.2	11.4	
% valid obs	100	100	100	100	97	100	100	100	100	100	100	100	
Max speed	44.1	56.4	39.8	43.2	45.4	36.7	32.0	33.9	28.6	34.7	31.5	43.8	56.4
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

LACL CMAN DRRI (Drift River Terminal) 2010/10/01 to 2011/09/30



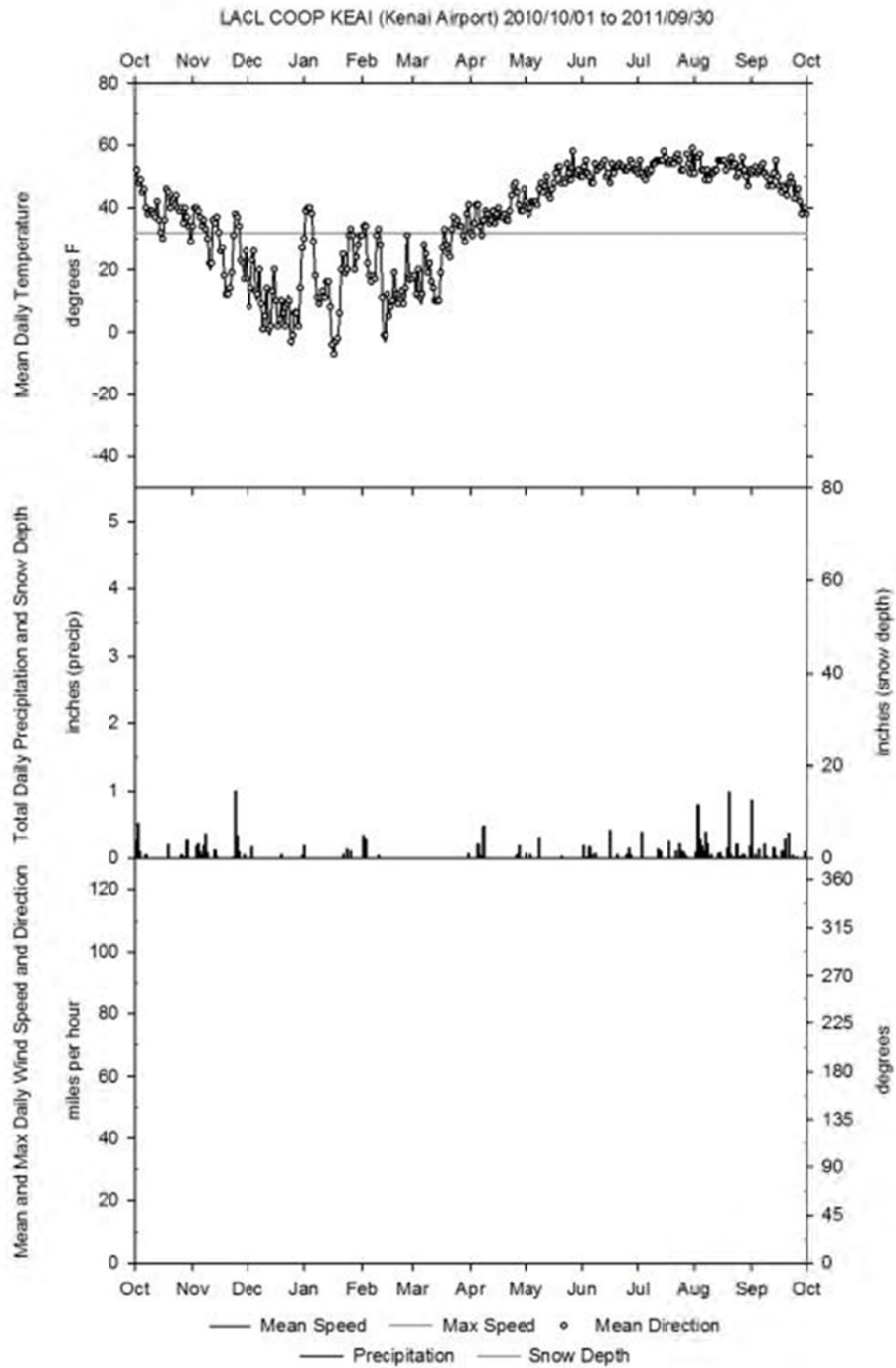
2011 Hydrologic Year - LACL COOP ILAI (Iliamna Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	19	-3	-15	-7	-7	-6	5	26	34	36	41	31	-15
Max.	43	42	30	37	36	31	37	46	47	51	58	50	58
Mean	31.9	19.1	0.7	15.8	7.3	11.8	24.7	33.3	42.3	46.4	47.0	42.9	27.3
# days <32 F	13	26	31	24	27	31	22	8	0	0	0	1	183
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	35	9	-4	4	0	16	28	43	47	52	50	47	-4
Max	54	45	37	41	39	42	50	65	64	73	72	60	73
Mean	43.0	29.9	13.1	27.9	23.8	31.4	39.6	51.1	54.8	58.9	59.0	54.0	40.6
# days <32 F	0	17	25	17	18	12	2	0	0	0	0	0	91
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	37.5	24.5	6.9	21.8	15.5	21.6	32.2	43.8	48.6	52.7	53.1	48.5	34.0
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean ¹	35.0	24.3	16.8	16.5	18.7	22.1	32.0	43.0	51.2	55.5	54.6	47.9	34.8
1981-2010	35.1	24.7	20.8	17.5	19.7	23.5	33.1	44.0	51.7	56.1	54.8	48.0	35.8
Precipitation													
Total	2.83	1.44	1.35	0.69	0.87	0.43	1.13	0.79	3.16	3.10	6.56	3.05	25.42
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean ¹	3.08	2.00	1.55	1.30	1.13	1.11	1.06	1.18	1.49	2.69	4.55	4.37	25.52
1981-2010	3.22	2.13	1.52	1.27	1.06	0.78	0.85	1.17	1.33	2.88	4.16	4.56	24.93
Snow depth (in)													
Average													
% valid obs													
POR mean ¹	0	2	4	8	9	10	7	1	0	0	0	0	
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

¹Period of record used: 11/10/1939 to 12/31/2010



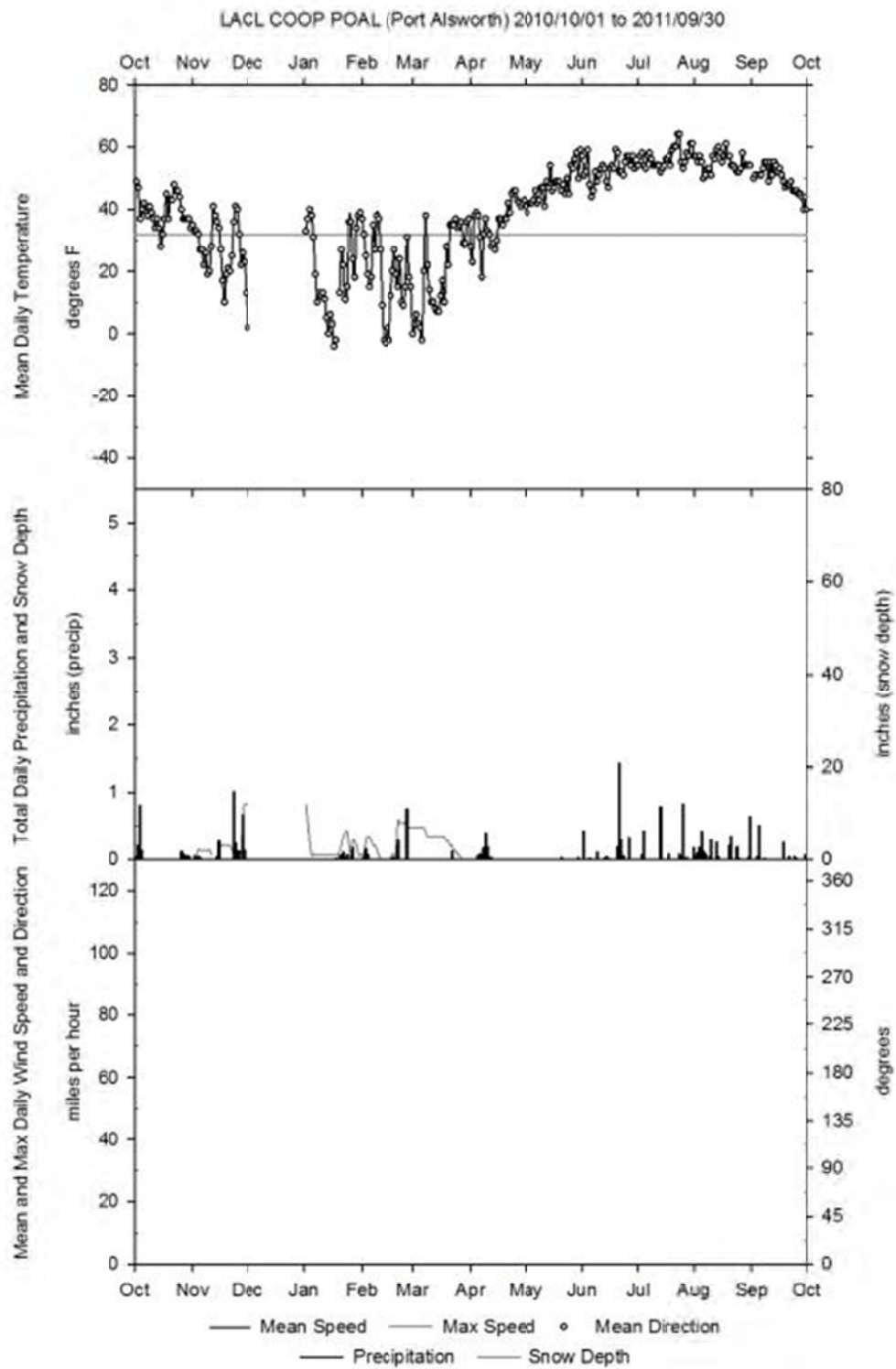
2011 Hydrologic Year - LACL COOP KEAI (Kenai Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	18	1	-12	-18	-21	-10	22	25	33	36	34	25	-21
Max.	48	36	23	38	33	35	42	47	50	53	53	50	53
Mean	31.8	22.2	0.7	12.0	5.4	13.7	30.5	37.5	44.8	46.1	45.6	39.3	27.5
# days <32 F	15	20	31	28	27	28	20	7	0	1	0	4	181
% valid obs	100	100	100	100	100	100	100	100	100	97	100	100	100
Maximum air temperature (F)													
Min	37	22	5	4	14	21	38	48	54	54	53	48	4
Max	56	44	38	48	39	47	54	74	67	71	68	63	74
Mean	47.9	34.0	19.6	26.9	27.7	35.4	47.0	57.3	59.7	61.7	59.7	55.5	44.5
# days <32 F	0	13	27	20	21	8	0	0	0	0	0	0	89
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	39.8	28.2	10.2	19.4	16.6	24.6	38.8	47.4	52.2	53.9	52.7	47.4	36.0
% valid obs	100	100	100	100	100	100	100	100	100	97	100	100	100
POR mean ¹	35.0	22.0	14.9	12.7	17.4	22.9	34.5	44.3	50.9	54.9	54.0	47.2	34.2
1981-2010	35.2	23.2	19.0	16.4	19.7	25.7	36.2	43.0	52.5	56.3	55.0	48.1	36.2
Precipitation													
Total	1.48	2.81	0.46	0.35	0.66	0.08	1.06	0.43	1.25	1.52	4.90	1.68	16.67
% valid obs	100	100	100	100	100	100	100	100	97	100	100	93	99
POR mean ¹	2.45	1.52	1.34	1.01	0.96	0.82	0.74	0.90	1.20	1.89	2.60	3.28	18.72
1981-2010	2.63	1.38	1.35	0.96	0.88	0.64	0.59	0.91	1.07	1.84	2.69	3.27	18.21
Snow depth (in)													
Average													
% valid obs													
POR mean ¹	1	3	8	4	12	13	12	3	0	0	0	0	
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

¹Period of record used: 09/03/1949 to 12/31/2010



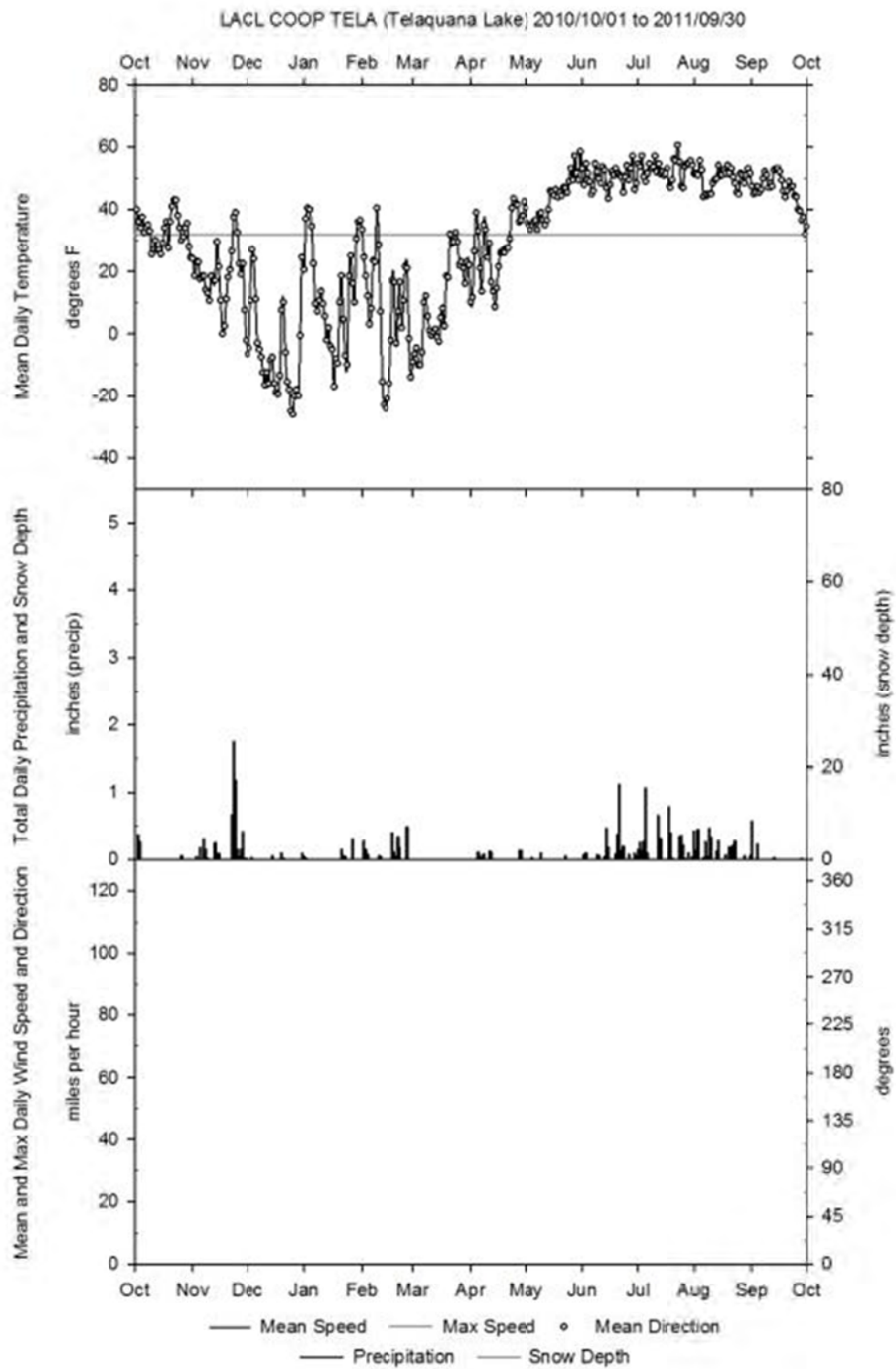
2011 Hydrologic Year - LACL COOP POAL (Port Alsworth)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	22	-7		-17	-17	-20	5	26	33	44	39	27	-20
Max.	44	38		38	34	30	40	47	51	54	55	52	55
Mean	32.2	19.9		12.4	8.5	5.5	26.6	37.1	43.5	48.2	47.1	40.8	29.3
# days <32 F	18	24		24	25	31	18	8	0	0	0	2	150
% valid obs	100	100	0	100	100	100	100	100	100	100	97	97	91
Maximum air temperature (F)													
Min	35	12		5	1	15	31	49	53	56	55	52	1
Max	55	45		45	43	49	56	72	74	75	71	64	75
Mean	46.3	32.7		27.8	26.6	35.8	45.9	53.6	61.7	65.1	62.8	57.0	47.4
# days <32 F	0	10		16	19	11	1	0	0	0	0	0	57
% valid obs	100	100	0	97	100	100	100	100	100	100	97	97	91
Mean air temperature (F)													
Observed	39.4	26.3		20.5	17.6	20.7	36.3	47.9	52.7	56.6	55.0	49.1	38.5
% valid obs	100	100	0	97	100	100	100	100	100	100	97	97	91
POR mean ¹	34.4	23.8	16.7	14.0	17.1	22.5	34.0	44.8	53.2	57.2	55.2	47.4	35.0
1981-2010	34.5	23.8	19.4	15.5	18.6	24.3	35.2	43.0	54.3	57.9	55.5	47.4	36.1
Precipitation													
Total	1.50	2.75		0.59	1.40	0.12	0.97	0.07	2.93	2.57	3.02	1.00	16.93
% valid obs	26	50	0	26	100	100	100	100	100	100	97	100	75
POR mean ¹	1.63	1.41	1.10	0.82	0.68	0.72	0.56	0.53	1.10	1.56	2.38	2.38	14.89
1981-2010	1.50	1.46	0.91	0.81	0.82	0.66	0.49	0.41	0.74	1.33	1.89	2.21	13.23
Snow depth (in)													
Average	0	4		3	4	4	0	0	0	0	0	0	
% valid obs	7	83	0	100	100	100	100	100	100	100	97	100	
POR mean ¹	0	3	6	6	5	5	2	0	0	0	0	0	
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

¹Period of record used: 07/01/1960 to 11/30/2010



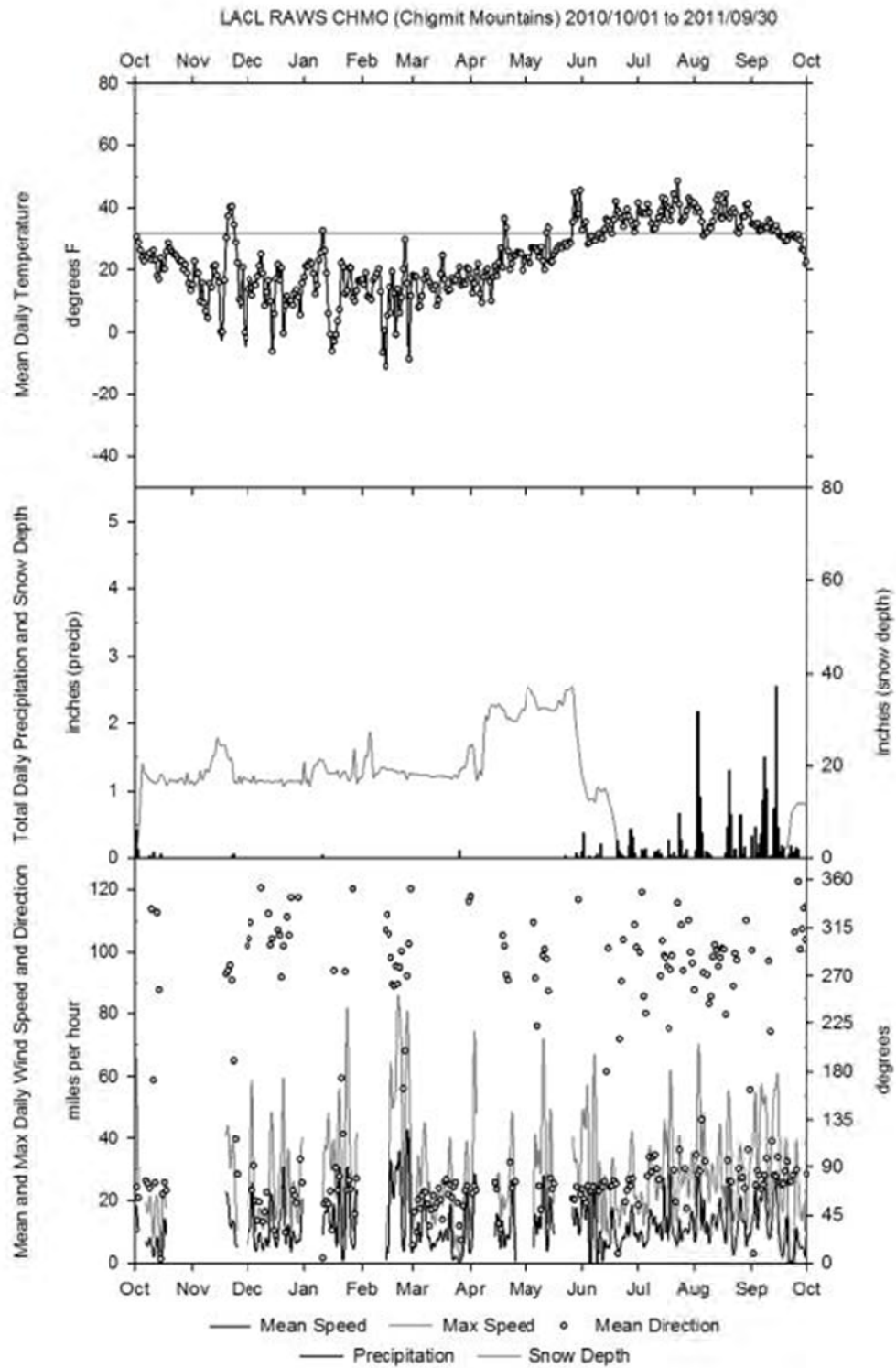
2011 Hydrologic Year - LACL COOP TELA (Telaquana Lake)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	15	-10	-35	-24	-34	-28	-10	20	31	39	35	21	-35
Max.	39	35	20	39	38	26	37	47	49	52	52	49	52
Mean	26.0	11.6	-12.7	5.2	-5.8	-3.0	18.1	33.2	42.5	45.4	43.0	38.2	20.3
# days <32 F	27	28	31	27	27	31	22	13	1	0	0	4	211
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	28	-3	-18	-10	-15	6	22	42	46	50	48	39	-18
Max	50	43	34	45	43	39	51	74	69	73	67	61	74
Mean	39.4	23.1	1.4	21.2	18.0	24.4	39.6	53.7	58.3	60.0	56.6	53.4	37.5
# days <32 F	5	25	29	21	20	23	3	0	0	0	0	0	126
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	32.7	17.4	-5.7	13.2	6.1	10.7	28.9	43.5	50.4	52.7	49.8	45.8	28.9
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1981-2010													
Precipitation													
Total ²	0.69	5.46	0.33	0.58	2.16	0.00	0.74	0.18	3.27	5.51	3.78	0.32	23.02
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

²Total precipitation (rain and snow) reported for 2011 hydrologic year.



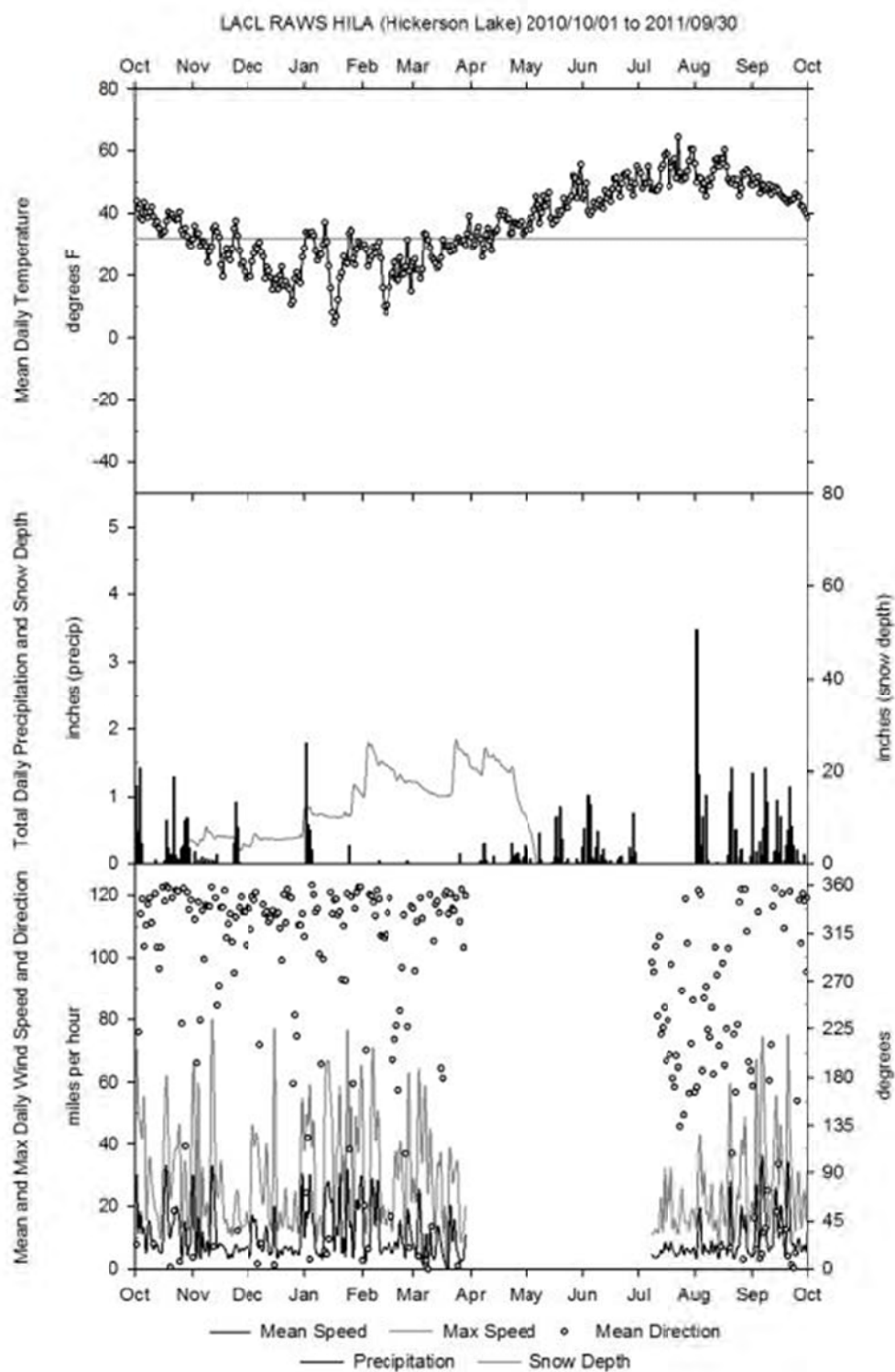
2011 Hydrologic Year - LACL RAWs CHMO (Chigmit Mountains)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	9.3	-9.0	-13.7	-11.0	-25.4	0.7	-5.8	13.8	26.1	31.5	26.8	17.6	-25.4
Max.	27.7	37.6	19.0	28.4	22.8	18.9	24.4	33.5	38.7	42.3	41.9	33.8	42.3
Mean	19.5	12.6	7.0	10.4	3.3	10.8	15.5	24.4	31.3	35.7	34.4	29.2	19.6
# days <32 F	31	28	31	31	28	31	30	27	19	1	7	23	287
% valid obs	100	100	100	100	100	100	100	100	100	100	100	90	99
Maximum air temperature (F)													
Min	16.0	5.7	5.4	0.9	2.3	12.7	13.5	24.8	31.1	34.9	33.1	25.2	0.9
Max	43.0	43.2	30.6	38.5	36.1	38.8	54.1	54.9	49.6	55.8	52.3	44.2	55.8
Mean	27.6	22.3	18.1	18.8	18.1	24.6	28.2	34.6	39.1	44.6	41.5	34.7	29.4
# days <32 F	25	25	31	29	27	26	22	16	3	0	0	5	209
% valid obs	100	100	100	100	100	100	100	100	100	100	100	90	99
Mean air temperature (F)													
Observed	22.7	17.1	12.9	14.7	11.0	15.7	20.9	23.7	34.3	39.2	37.3	31.4	23.8
% valid obs	100	100	100	100	100	100	100	100	100	100	100	91	99
POR mean													
1981-2010													
Precipitation													
Total ²	0.71	0.09		0.04	0.00	0.11	0.00	0.21	2.17	2.25	7.74	9.36	22.68
% valid obs	6	15	0	3	2	2	10	31	80	100	96	61	34
POR mean													
1981-2010													
Snow depth (in)													
Average	16.2	19.6	16.8	18.7	19.7	18.5	28.8	32.3	7.3	0.0	0.0	4.1	
% valid obs	97	98	97	92	89	100	97	90	92	100	100	90	
POR mean													
Wind (mph, degrees)													
Mean speed	7.1	12.0	10.9	13.9	19.9	8.2	13.3	14.5	9.8	11.8	13.7	11.8	
% valid obs	39	23	95	59	55	100	43	53	100	100	100	91	
Max speed	65.8	43.0	59.1	81.9	84.3	43.6	73.4	63.2	60.4	60.2	63.8	59.1	84.3
Max direction	75	272	287	60	245	61	73	290	64	262	105	68	245
Solar radiation (kWh/m2)													
Total	39.5	9.6	7.2	8.5	28.4	90.7	135.9	161.2	175.4	183.0	123.3	66.8	1049.4
% valid obs	100	100	100	100	100	100	100	100	100	100	100	90	99

²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values.



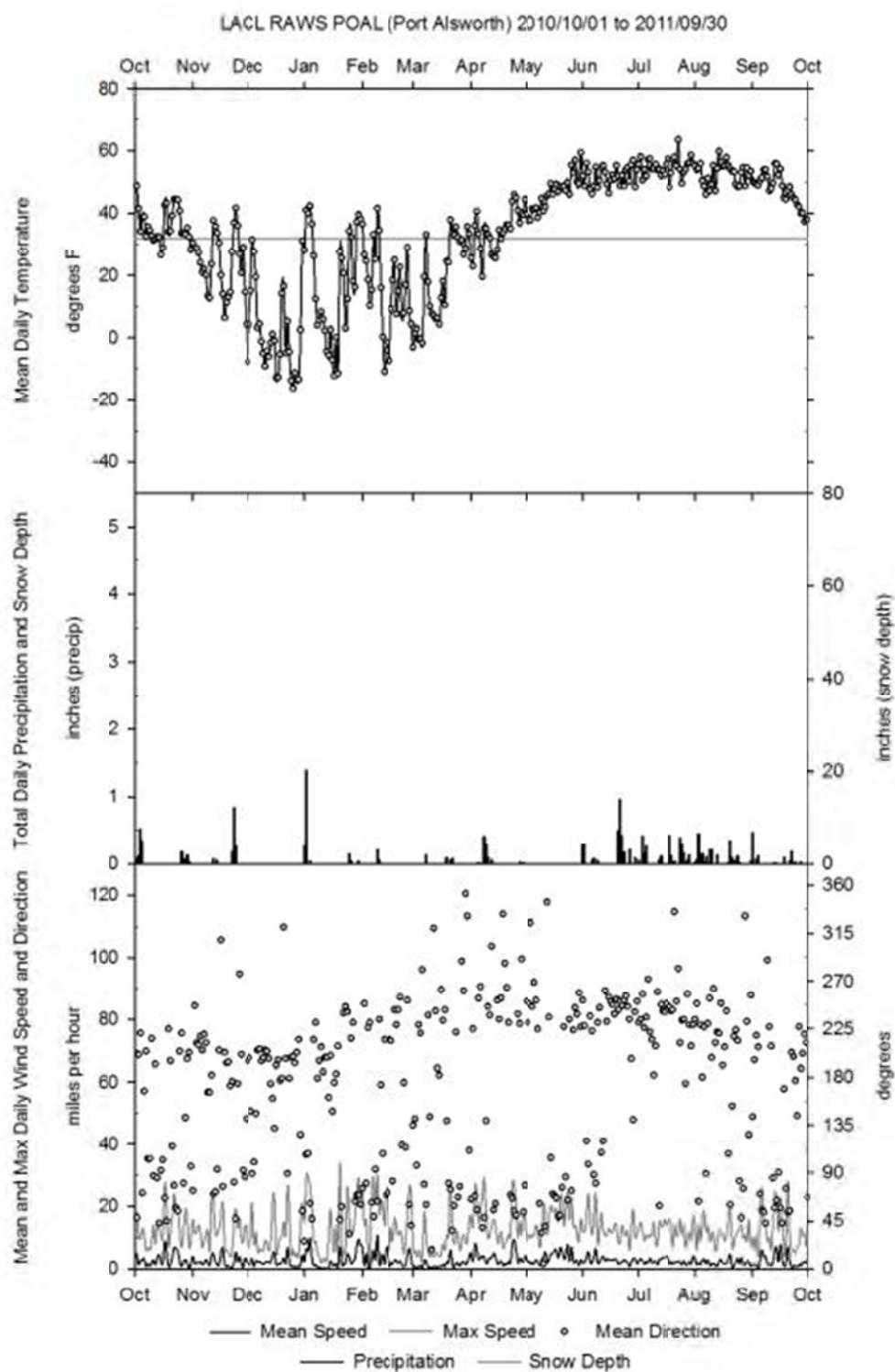
2011 Hydrologic Year - LACL RAWS HILA (Hickerson Lake)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	26.8	13.3	5.4	1.4	2.3	13.1	18.1	29.8	34.9	43.5	41.4	33.4	1.4
Max.	40.3	34.5	28.0	32.0	28.2	34.0	34.7	47.3	48.2	53.4	52.9	46.9	53.4
Mean	33.6	24.5	15.7	21.2	16.4	23.5	29.3	37.3	42.0	47.1	47.2	42.3	31.8
# days <32 F	10	27	31	29	28	30	20	2	0	0	0	0	177
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	32.4	25.2	16.2	8.6	16.3	23.5	34.7	33.7	41.7	50.2	48.4	43.2	8.6
Max	51.3	40.5	35.4	43.7	37.2	52.7	52.7	65.5	65.8	72.1	68.7	60.6	72.1
Mean	42.2	33.8	25.4	29.8	28.0	35.1	41.9	49.3	54.0	60.7	57.4	51.2	42.5
# days <32 F	0	10	28	15	21	6	0	0	0	0	0	0	80
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	37.3	28.6	20.7	25.5	22.0	28.3	34.5	42.7	47.0	53.4	51.7	45.9	36.6
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1981-2010	100	100	100	100	100	100	100	100	100	99.6	100	100	100
Precipitation													
Total ²	8.22	2.47	0.00	3.36	0.11	0.19	1.94	3.15	5.34	0.00	11.83	8.74	45.35
% valid obs	92	42	4	34	8	35	82	100	100	100	100	99	67
POR mean													
1981-2010													
Snow depth (in)													
Average	0.7	5.3	5.7	11.8	20.5	18.3	19.3	1.1	0.0	0.0	0.0	0.0	
% valid obs	97	95	100	99	100	100	99	100	98	98	100	99	
POR mean													
Wind (mph, degrees)													
Mean speed	13.3	8.9	8.9	16.0	10.4	7.9				5.8	8.6	13.6	
% valid obs	100	100	100	100	100	89	0	0	0	79	100	100	
Max speed	70.0	74.0	77.2	76.5	67.3	62.9				32.4	59.7	74.5	77.2
Max direction	5	1	3	357	1	352				231	351	353	3
Solar radiation (kWh/m2)													
Total	35.1	14.0	6.9	8.9	31.7	84.3	111.0	136.4	127.7	159.3	111.0	64.7	891.6
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100

²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values.



2011 Hydrologic Year - LACL RAWS POAL (Port Alsworth)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	16.0	-13.0	-26.0	-21.0	-20.0	-21.0	1.0	23.0	29.0	36.0	33.0	19.0	-26.0
Max.	42.0	40.0	27.0	39.0	39.0	28.0	41.0	47.0	48.0	51.0	54.0	51.0	54.0
Mean	28.2	14.7	-6.1	8.3	2.5	3.3	23.0	33.3	40.3	44.9	43.8	37.9	22.9
# days <32 F	21	26	31	25	27	31	22	11	3	0	0	7	204
% valid obs	100	100	100	100	100	100	100	100	100	100	99	100	100
Maximum air temperature (F)													
Min	34.0	1.0	-10.0	-2.0	1.0	20.0	31.0	49.0	54.0	53.0	50.0	49.0	-10.0
Max	56.0	45.0	36.0	46.0	44.0	50.0	56.0	73.0	74.0	79.0	70.0	65.0	79.0
Mean	44.5	29.9	9.6	25.7	24.4	36.9	45.9	53.3	62.2	65.0	62.1	57.3	43.6
# days <32 F	0	17	27	18	20	8	1	0	0	0	0	0	91
% valid obs	100	100	100	100	100	100	100	100	100	100	99	100	100
Mean air temperature (F)													
Observed	36.0	22.2	2.2	17.0	13.9	19.0	34.7	43.5	51.7	54.7	52.5	47.3	33.2
% valid obs	100	100	100	100	100	100	100	100	100	100	99	100	100
POR mean 1981-2010													
Precipitation													
Total ²	1.50	1.46	0.27	1.65	0.27	0.36	0.94	0.30	2.91	2.66	2.72	0.65	15.71
% valid obs	69	26	5	32	14	28	64	89	99	100	99	96	60
POR mean 1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	3.0	2.5	2.3	3.2	3.1	1.7	3.6	3.6	2.9	2.5	2.1	2.7	
% valid obs	99	100	100	100	100	100	100	100	100	100	99	100	
Max speed	27.0	23.0	26.0	34.0	30.0	28.0	29.0	24.0	24.0	16.0	20.0	28.0	34.0
Max direction	42	75	62	8	55	29	64	67	77	348	18	61	8
Solar radiation (kWh/m2)													
Total	44.6	9.1	1.4	6.5	29.1	109.9	132.3	169.8	153.8	142.3	93.4	71.0	963.2
% valid obs	99	100	100	100	100	100	100	100	100	100	99	100	100

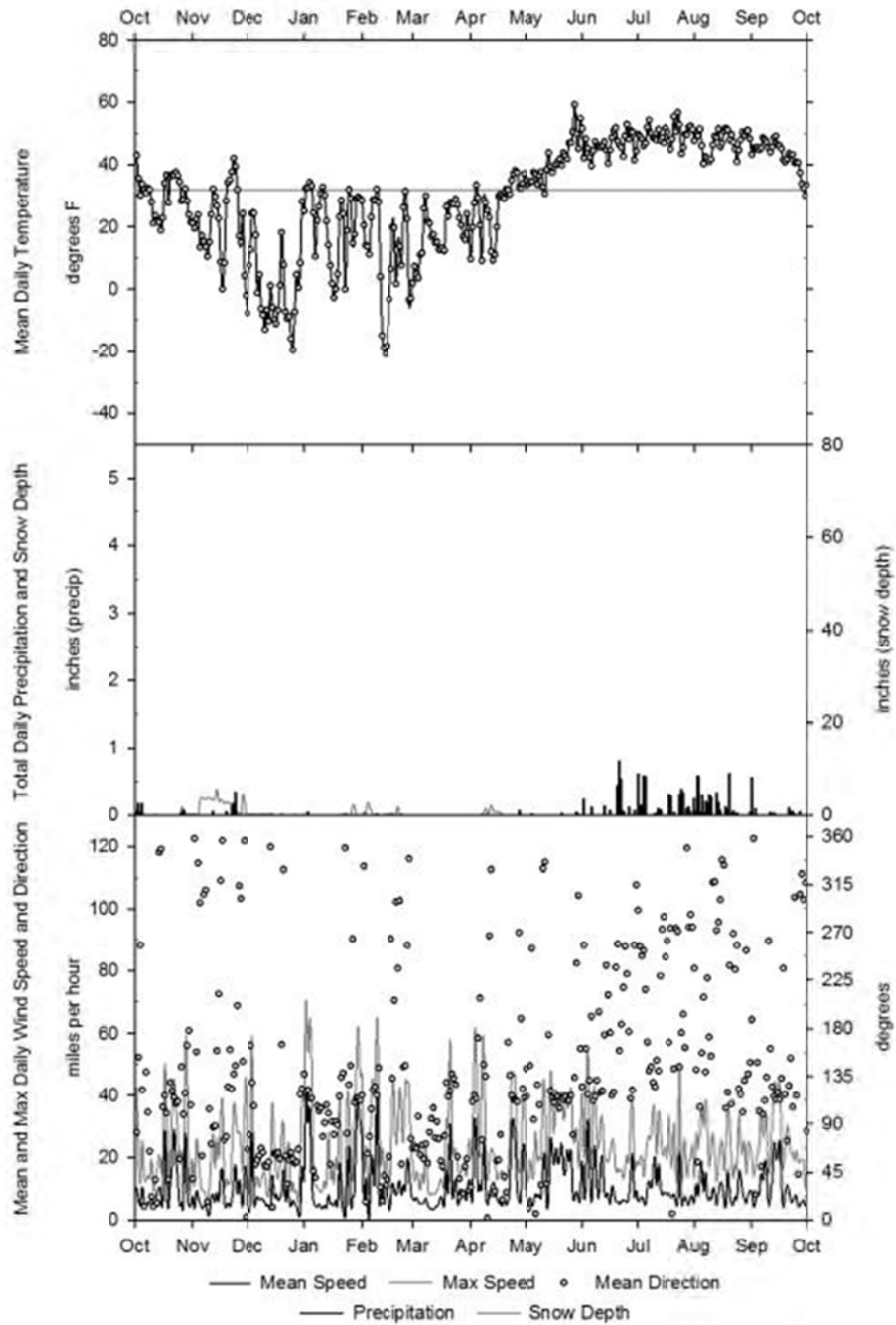
²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values.



2011 Hydrologic Year - LACL RAWs SNLA (Snipe Lake)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	15.4	-10.3	-24.3	-9.6	-24.3	-3.6	-3.6	23.0	35.6	39.4	34.2	24.3	-24.3
Max.	37.2	38.5	22.3	32.0	29.7	25.9	34.3	43.6	46.4	47.8	47.8	45.9	48.6
Mean	25.4	14.4	-4.6	15.0	2.1	12.5	21.2	34.0	40.6	44.0	42.2	38.0	23.9
# days <32 F	26	28	31	30	28	31	26	12	0	0	0	4	216
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	21.4	-2.7	-12.5	5.5	-17.0	9.1	16.5	37.9	43.7	46.0	44.1	34.5	-17.0
Max	52.9	45.0	32.9	38.5	38.3	40.8	44.2	70.0	62.2	68.0	62.2	56.7	70.0
Mean	35.4	25.8	8.2	27.1	17.7	25.5	34.4	43.7	53.3	56.8	53.6	49.3	36.4
# days <32 F	9	21	30	20	22	27	9	0	0	0	0	0	138
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	29.9	20.0	1.2	21.3	10.2	18.3	27.6	41.2	46.3	49.6	47.1	42.8	29.7
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1981-2010													
Precipitation													
Total ²	0.52	0.77	0.00	0.05	0.03	0.00	0.10	0.12	3.27	3.89	4.11	0.48	13.34
% valid obs	49	23	1	25	9	5	45	91	100	100	100	96	54
POR mean													
1981-2010													
Snow depth (in)													
Average	0.2	2.3	0.1	0.2	0.4	0.0	0.3	0.0	0.0	0.0	0.0	0.0	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
POR mean													
Wind (mph, degrees)													
Mean speed	10.1	7.9	8.0	13.1	11.2	7.9	13.1	13.4	11.0	9.2	9.5	10.4	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
Max speed	53.0	42.3	59.3	70.5	64.7	57.9	57.9	43.5	55.7	49.7	38.3	44.7	70.5
Max direction	120	343	128	122	121	123	126	107	106	120	128	121	122
Solar radiation (kWh/m2)													
Total	35.8	12.4	4.8	8.9	27.9	88.8	133.2	159.1	134.0	123.3	87.9	67.3	883.8
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100

²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values.

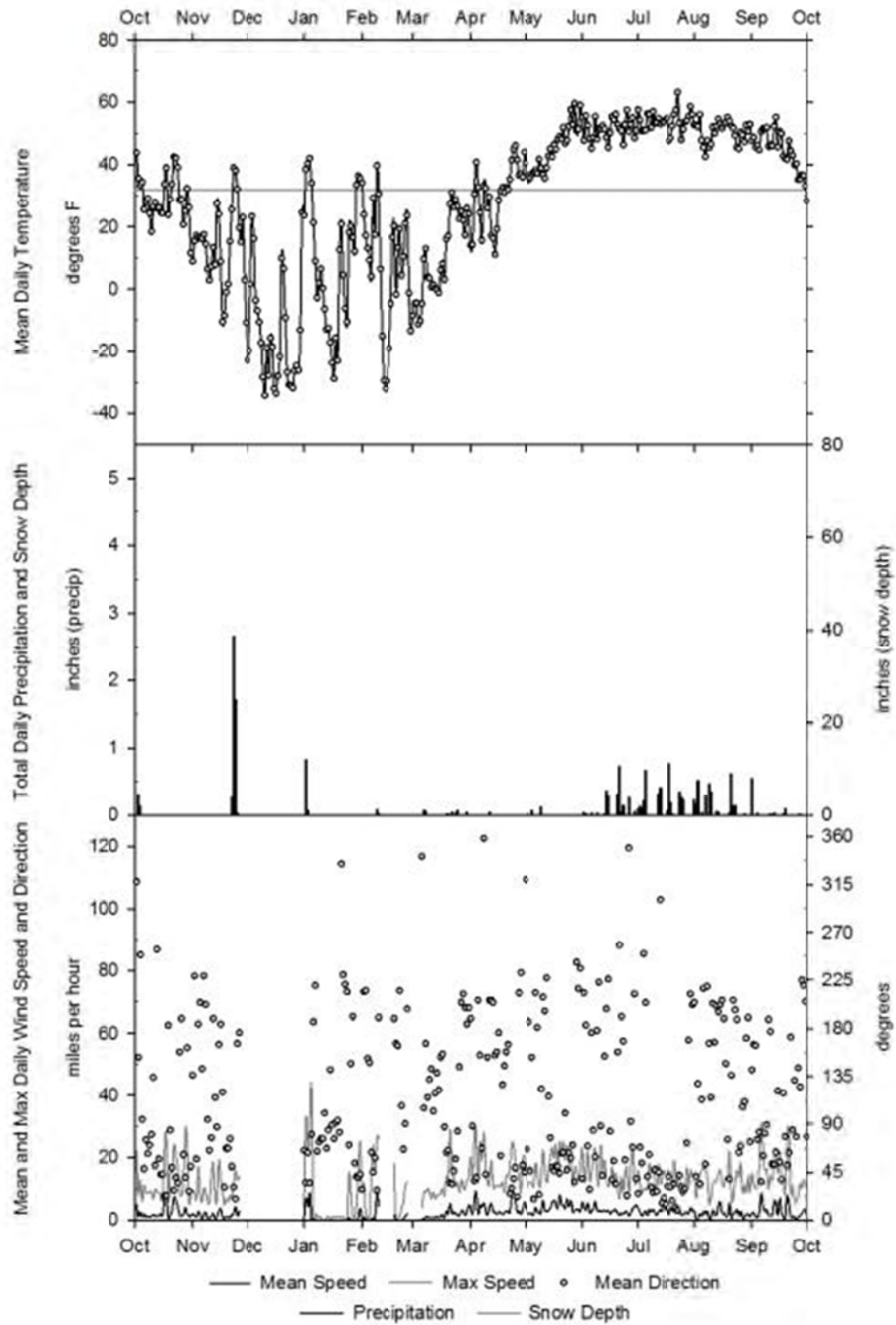
LACL RAWS SNLA (Snipe Lake) 2010/10/01 to 2011/09/30



2011 Hydrologic Year - LACL RAWs STON (Stoney)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	-8.0	-29.0	-42.0	-39.0	-45.0	-30.0	-15.0	12.0	22.0	28.0	27.0	4.0	-45.0
Max.	32.0	37.0	21.0	40.0	37.0	21.0	40.0	45.0	49.0	52.0	51.0	47.0	52.0
Mean	16.8	1.2	-23.5	-1.0	-9.9	-8.0	14.9	27.6	37.3	41.6	38.9	30.5	14.0
# days <32 F	29	28	31	28	27	31	25	22	7	4	9	16	257
% valid obs	100	100	100	100	99	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	25.0	-9.0	-22.0	-8.0	-10.0	15.0	27.0	43.0	50.0	54.0	51.0	42.0	-22.0
Max	56.0	41.0	31.0	45.0	45.0	49.0	56.0	81.0	74.0	80.0	77.0	67.0	81.0
Mean	41.2	23.0	-2.8	20.7	21.2	33.5	45.1	59.0	63.0	65.7	62.5	58.1	40.9
# days <32 F	5	22	31	21	19	15	3	0	0	0	0	0	116
% valid obs	100	100	100	100	99	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	28.7	12.3	-14.0	8.9	5.7	10.8	31.1	45.2	51.5	53.7	50.3	44.3	27.5
% valid obs	100	100	100	100	99	100	100	100	100	100	100	100	100
POR mean													
1981-2010													
Precipitation													
Total ²	0.45	4.65		0.90	0.10	0.36	0.10	0.22	2.45	3.97	3.51	0.24	16.95
% valid obs	41	12	0	24	11	15	56	82	97	99	96	88	52
POR mean													
1981-2010													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	2.6	1.7	0.3	0.9	1.2	1.9	3.9	4.0	3.2	2.9	2.2	2.8	
% valid obs	100	80	1	100	57	85	100	100	100	100	100	100	
Max speed	28.0	19.0	4.0	42.0	26.0	29.0	28.0	25.0	24.0	19.0	22.0	31.0	42.0
Max direction	108	221	313	74	41	34	18	348	188	45	344	41	74
Solar radiation (kWh/m2)													
Total	42.0	3.1	1.2	5.7	9.8	90.0	135.7	189.2	159.0	150.3	103.2	71.0	960.8
% valid obs	100	100	100	100	99	100	100	100	100	100	100	100	100

²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected in the percentage of valid observations that are reported as a measure of the reliability of cumulative values.

LACL RAWS STON (Stoney) 2010/10/01 to 2011/09/30



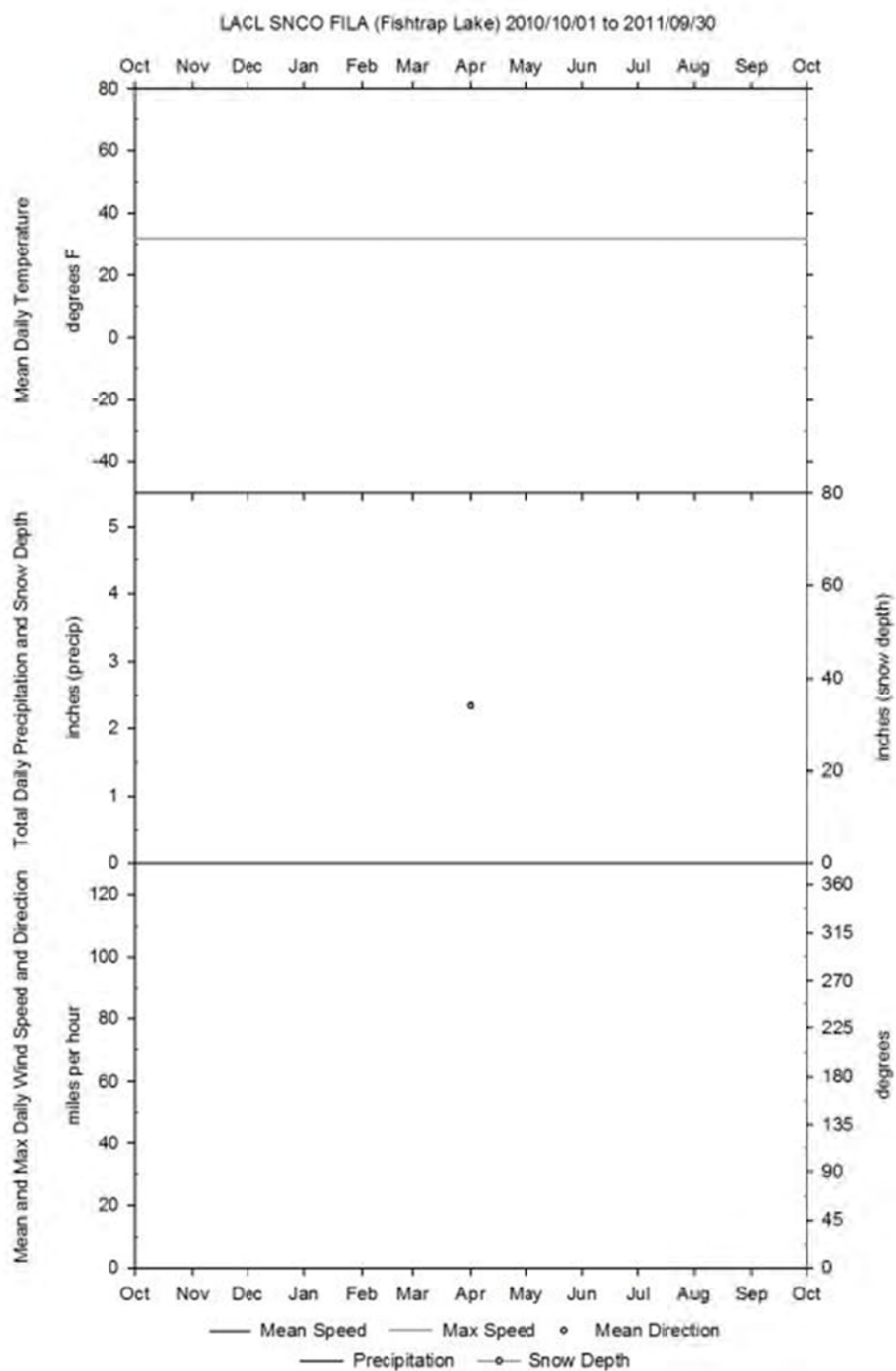
2011 Hydrologic Year - LACL SNC0 FILA (Fishtrap Lake)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.													
Max.													
Mean													
# days <32 F													
% valid obs													
Maximum air temperature (F)													
Min													
Max													
Mean													
# days <32 F													
% valid obs													
Mean air temperature (F)													
Observed													
% valid obs													
POR mean													
1971-2000													
Precipitation													
Total ³						8.4							
% valid obs			0	0	0	100	0						
POR mean													
1971-2000 ⁵			7.9	8.9	9.7	10.5							
Snow depth (in)													
Average ⁴						34							
% valid obs			0	0	0	100	0						
1971-2000 ⁵			35	38	40	40							
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

³Snow water equivalent measured close to the end of the month listed.

⁴Cummulative snow depth measured close to the end of the month listed.

⁵Values cited are from http://www.ambcs.org/pub/sc_sum_ak/SNOWCOURSE.HTM (current 11/30/2011).

⁵1981-2010 climatological normals for snow courses were not available at the time of publication.



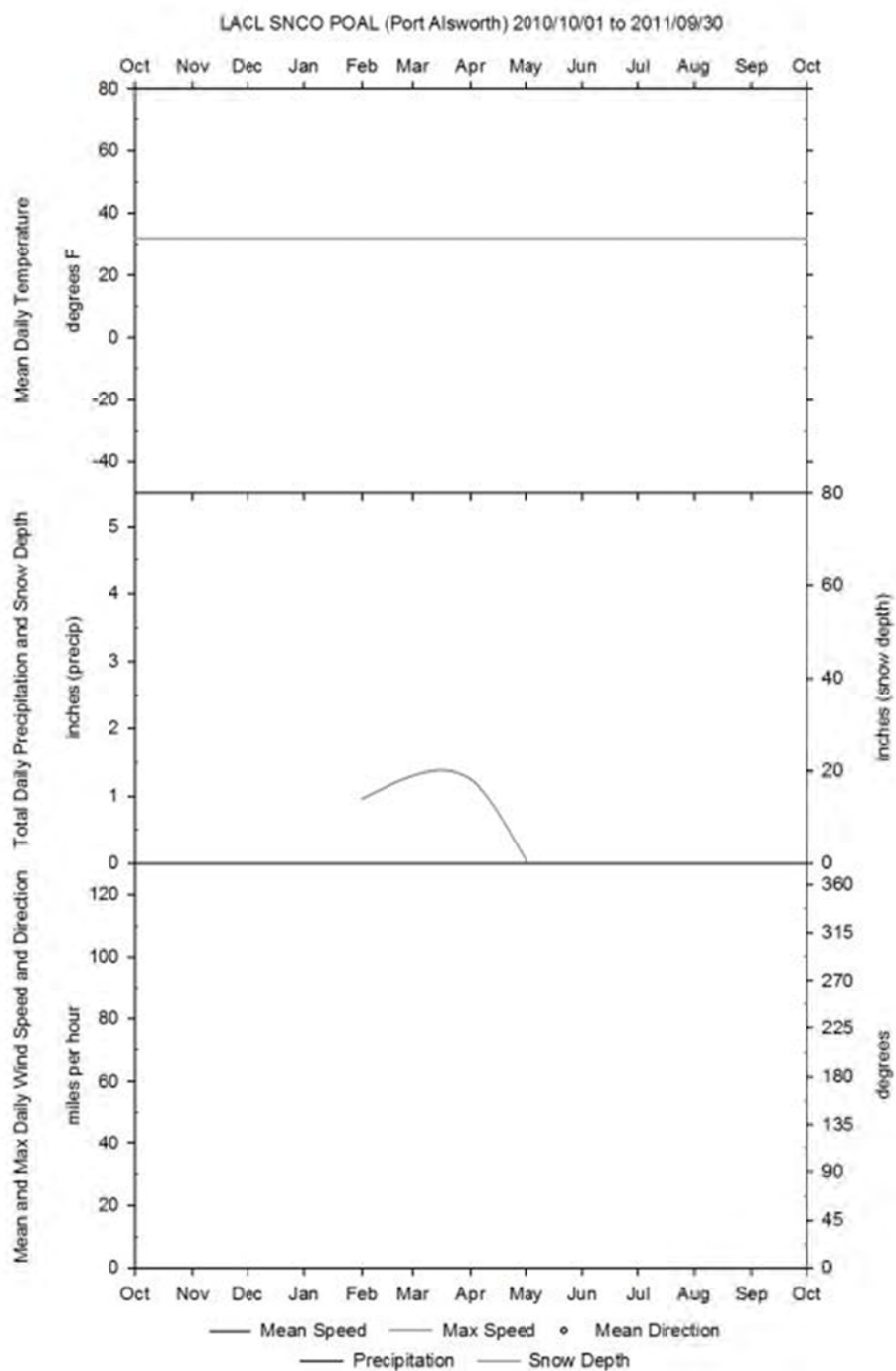
2011 Hydrologic Year - LACL SNC0 POAL (Port Alsworth)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.													
Max.													
Mean													
# days <32 F													
% valid obs													
Maximum air temperature (F)													
Min													
Max													
Mean													
# days <32 F													
% valid obs													
Mean air temperature (F)													
Observed													
% valid obs													
POR mean													
1971-2000													
Precipitation													
Total ³				3.0	3.5	4.2	0.0						
% valid obs			0	100	100	100	100						
POR mean													
1971-2000 ⁵			3.6	4.1	4.2	4.1	0.0						
Snow depth (in)													
Average ⁴				14	19	18	0						
% valid obs			0	100	100	100	100						
1971-2000 ⁵			15	17	15	12	0						
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

³Snow water equivalent measured close to the end of the month listed.

⁴Cummulative snow depth measured close to the end of the month listed.

⁵Values cited are from http://www.ambcs.org/pub/sc_sum_ak/SNOWCOURSE.HTM (current 11/30/2011).

⁵1981-2010 climatological normals for snow courses were not available at the time of publication.



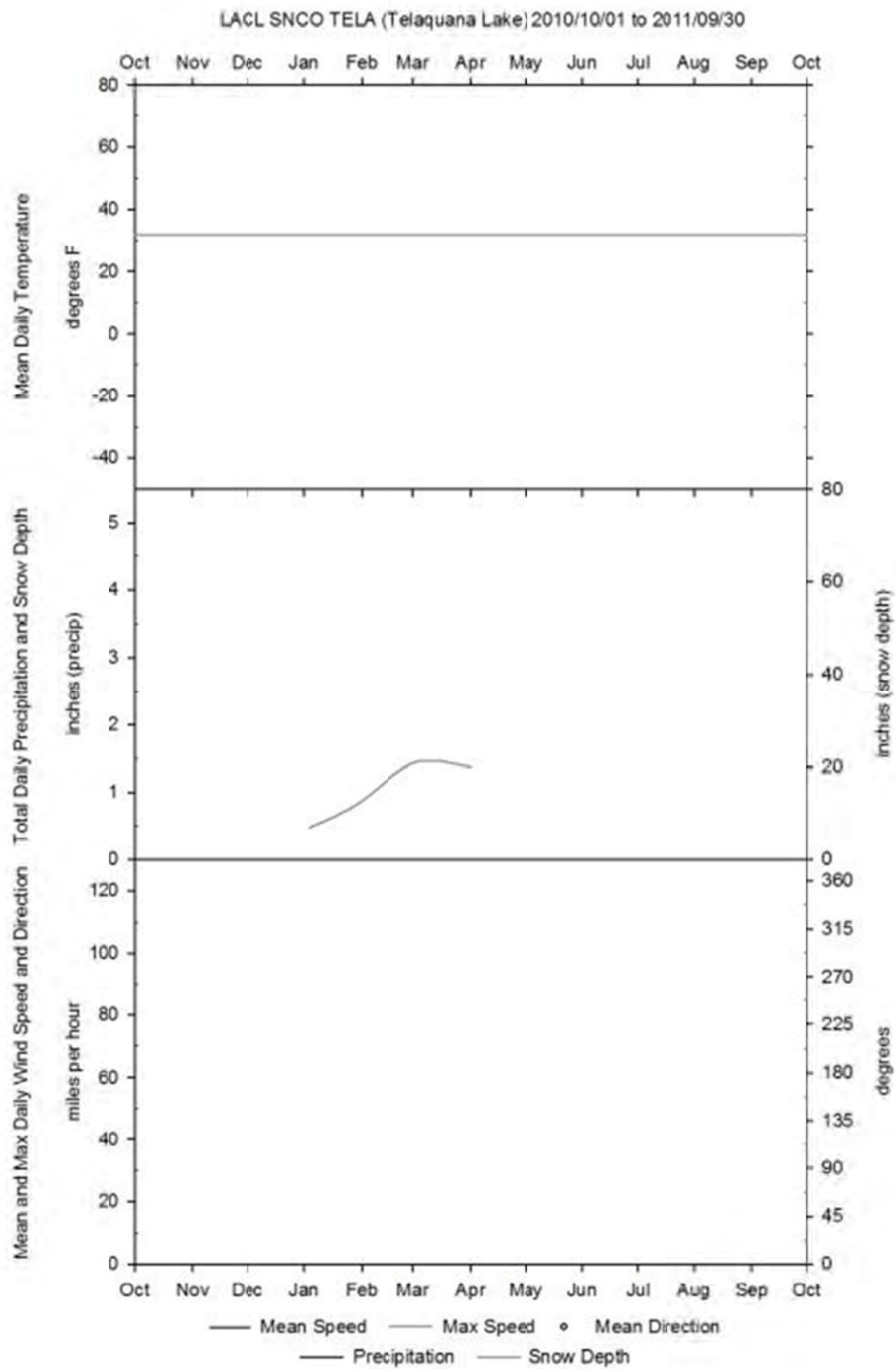
2011 Hydrologic Year - LACL SNC0 TELA (Telaquana Lake)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.													
Max.													
Mean													
# days <32 F													
% valid obs													
Maximum air temperature (F)													
Min													
Max													
Mean													
# days <32 F													
% valid obs													
Mean air temperature (F)													
Observed													
% valid obs													
POR mean													
1971-2000													
Precipitation													
Total ³			1.2	1.6	3.9	4.1							
% valid obs			100	100	100	100	0						
POR mean													
1971-2000 ⁵			2.6	3.4	4.0	4.5							
Snow depth (in)													
Average ⁴			7	13	21	20							
% valid obs			100	100	100	100	0						
1971-2000 ⁵			16	18	20	20							
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

³Snow water equivalent measured close to the end of the month listed.

⁴Cummulative snow depth measured close to the end of the month listed.

⁵Values cited are from http://www.ambcs.org/pub/sc_sum_ak/SNOWCOURSE.HTM (current 11/30/2011).

⁵1981-2010 climatological normals for snow courses were not available at the time of publication.



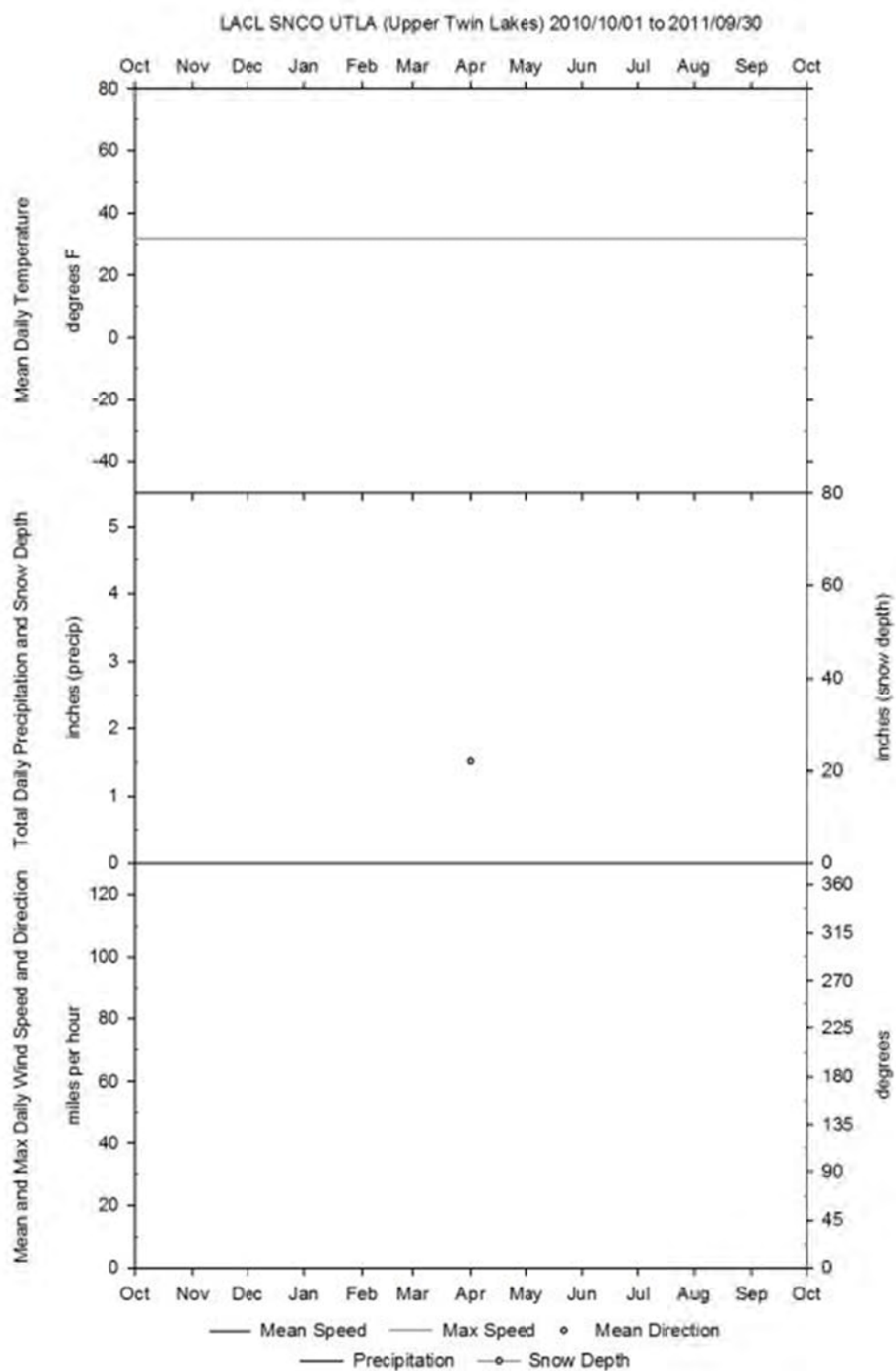
2011 Hydrologic Year - LACL SNCO UTLA (Upper Twin Lakes)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.													
Max.													
Mean													
# days <32 F													
% valid obs													
Maximum air temperature (F)													
Min													
Max													
Mean													
# days <32 F													
% valid obs													
Mean air temperature (F)													
Observed													
% valid obs													
POR mean													
1971-2000													
Precipitation													
Total ³					5.8	5.4							
% valid obs			0	0	100	100	0						
POR mean													
1971-2000 ⁵			5.1	6.1	7.0	7.2							
Snow depth (in)													
Average ⁴						22							
% valid obs			0	0	0	100	0						
1971-2000 ⁵			23	25	27	27							
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

³Snow water equivalent measured close to the end of the month listed.

⁴Cummulative snow depth measured close to the end of the month listed.

⁵Values cited are from http://www.ambcs.org/pub/sc_sum_ak/SNOWCOURSE.HTM (current 11/30/2011).

⁵1981-2010 climatological normals for snow courses were not available at the time of publication.



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National Park Service
U.S. Department of the Interior



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