



Climate Monitoring in the Southwest Alaska Network

Annual Report for the 2010 Hydrologic Year

Natural Resource Technical Report NPS/SWAN/NRTR—2011/463



ON THE COVER

Remote Automated Weather Station on the Harding Icefield, Kenai Fjords National Park.
Photograph by: Chuck Lindsay

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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.

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Abstract

The Southwest Alaska Inventory and Monitoring Network 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 nine weather stations in three network parks, weather observations are obtained from an additional 24 stations across the region of interest. This report, the second in an annual series, summarizes weather observations from the recent hydrologic year and provides a regional and historical climate context.

The Southwest Alaska Network region was warmer and slightly drier than normal during the 2010 hydrologic year (October 2009 through September 2010). Compared to the climatological normal (the prevailing set of weather conditions calculated over a 30-year period, currently 1971-2000), annual mean temperatures for six long-term weather stations were 0.0 to +5.1 °F above normal. Total annual precipitation was 75% to 97% of normal. In general, precipitation across the Alaska Peninsula and southern Kenai Peninsula was closer to normal than precipitation across the northern Aleutian Range, southern Alaska Range, and the northern Kenai Peninsula. Late spring and mid-summer were unseasonably cool and wet across the region. Warmer than normal conditions during the 2010 hydrologic year represent a change from regional climatic conditions during the previous four hydrologic years, which were colder than normal. Drier than normal conditions are consistent with regional climatic conditions during the previous four hydrologic years.

All nine weather stations operated by the Southwest Alaska Network were maintained during the 2010 hydrologic year. Kenai Fjords National Park continued planning for the installation of a snowpack telemetry station near Exit Glacier and purchased a remote automated weather station for future installation in Aialik Bay. Representatives from the National Oceanic and Atmospheric Administration conducted site evaluations in Katmai National Park and Preserve in order to evaluate the possible installation of a Climate Reference Network Station.

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The author thanks the dedicated park staff and volunteers who faithfully document weather and snowpack observations throughout the year. The author also thanks Leon Alsworth, Yuzhun Evanoff, Allen Gilliland, Vera Gilliland, Warren Hill, Mark Kansteiner, Fritz Klasner, Claudette Moore, Angela Olson, Michael Shephard, and Mike Tetreau for their support and assistance with weather station installation and maintenance. The author credits Fritz Klasner for his many constructive suggestions, Nat Wilson for his work developing the data processing routines, and Bruce Giffen for his dedication and efforts toward developing the climate monitoring program in Southwest Alaska Network parks. Careful reviews by Russell Frith and Michael Shephard significantly improved earlier versions of this report.

The rainy weather in southwest Alaska during the summer of 2010 had a number of tragic consequences. Chiefly among them was poor flying weather – on August 21 three employees of Katmai National Park and Preserve and a local pilot were lost on a flight between Shelikof Strait and King Salmon. *Requiescat in pace.*

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
HPRCC	High Plains Regional Climate Center
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
PDO	Pacific Decadal Oscillation
PRISM	Parameter-Elevation Regressions on Slopes Model
RAWS	Remote Automated Weather Station
SNOTEL	Snowpack Telemetry
SST	Sea Surface Temperature
SWAN	Southwest Alaska Network
USFS	United States Forest Service
WBAN	Weather Bureau Army Navy
WRCC	Western Regional Climate Center

Introduction

This report is the second 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: Aniakchak National Monument and Preserve (ANIA), Alagnak Wild River (ALAG), 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 and 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 (Figure 2). The climate of the park units on the Alaska Peninsula (ALAG, ANIA, and KATM) is transitional between polar (tundra climate) and maritime (maritime subarctic). 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. 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. Interior regions of SWAN park units, like the Miller Creek drainage in Lake Clark National Park and Preserve, are protected from maritime influence by large mountain ranges. The boreal climate here is characterized by a large annual range in temperature and a small annual range in precipitation.

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 1971-2000. 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 and period of record values for a specific weather station may differ significantly.

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. 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). The ENSO affects the strength and positioning of the jet stream and the PDO affects North Pacific sea level pressure and sea surface temperature. Although not completely understood, both climatic oscillations are recognized to have important climatic consequences to coastal Alaska, including the SWAN. ENSO events (El Niño and La Niña) are recognized to influence temperatures by $\pm 2-4$ °F at a large spatial scale (Simpson et al. 2002, Papineau 2005). The PDO is correlated with winter temperature anomalies across Alaska; however, it has a stronger, more local influence on precipitation that primarily affects coastal areas. 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. Alaska has warmed substantially 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 climate stations in the SWAN region show a significant increase in both mean winter temperatures and mean annual temperatures for 1949-2008 (Alaska Climate Research Center, 2009). Mean winter temperatures at King Salmon have increased by 8.1 °F and mean annual temperatures have increased by 3.8 °F. Mean winter temperatures at Homer have increased by 6.3 °F and mean annual temperatures have increased by 4.0 °F. While it is important to note that these temperature trends span the 1976-1977 Pacific Climate Shift (Hartman and Wendler 2005), the observed warming trend is supported by independent observations of the resulting change in 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.uaaf.edu/accap/>)
- Alaska Climate Research Center (<http://climate.gi.alaska.edu/>)
- Alaska Ocean Observing System (<http://www.aos.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 climate stations in the SWAN region have long-term reliable records. A complete inventory of land-based weather and climate monitoring stations in the SWAN was completed by Davey and others (2007). Climate conditions have been monitored at just a few locations near SWAN park units since the late 1930s and 1940s (one station record extends to 1908). Thirty three stations operated by six different climate monitoring programs 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. In addition to operating and maintaining nine of these weather stations, the SWAN monitoring strategy is to obtain annual weather observations from agency archives, convert those observations to daily and monthly summaries in both U.S. customary and metric units using customized routines, and store data on the SWAN server for ease of access and use.

Data Acquisition, Quality Control, and Data Processing

Six different climate monitoring programs (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 (Giffen et al. *in review*). In short, Remote Automated Weather Station (RAWS) data are obtained from the Western Regional Climate Center (WRCC). Data for 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 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 National Data Buoy Center (NDBC). Data from ancillary stations (e.g. ranger stations, field data loggers) are neither monitored by the SWAN nor 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 employ domain checks, which follow MesoWest, or more conservative, specifications (Giffen 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.

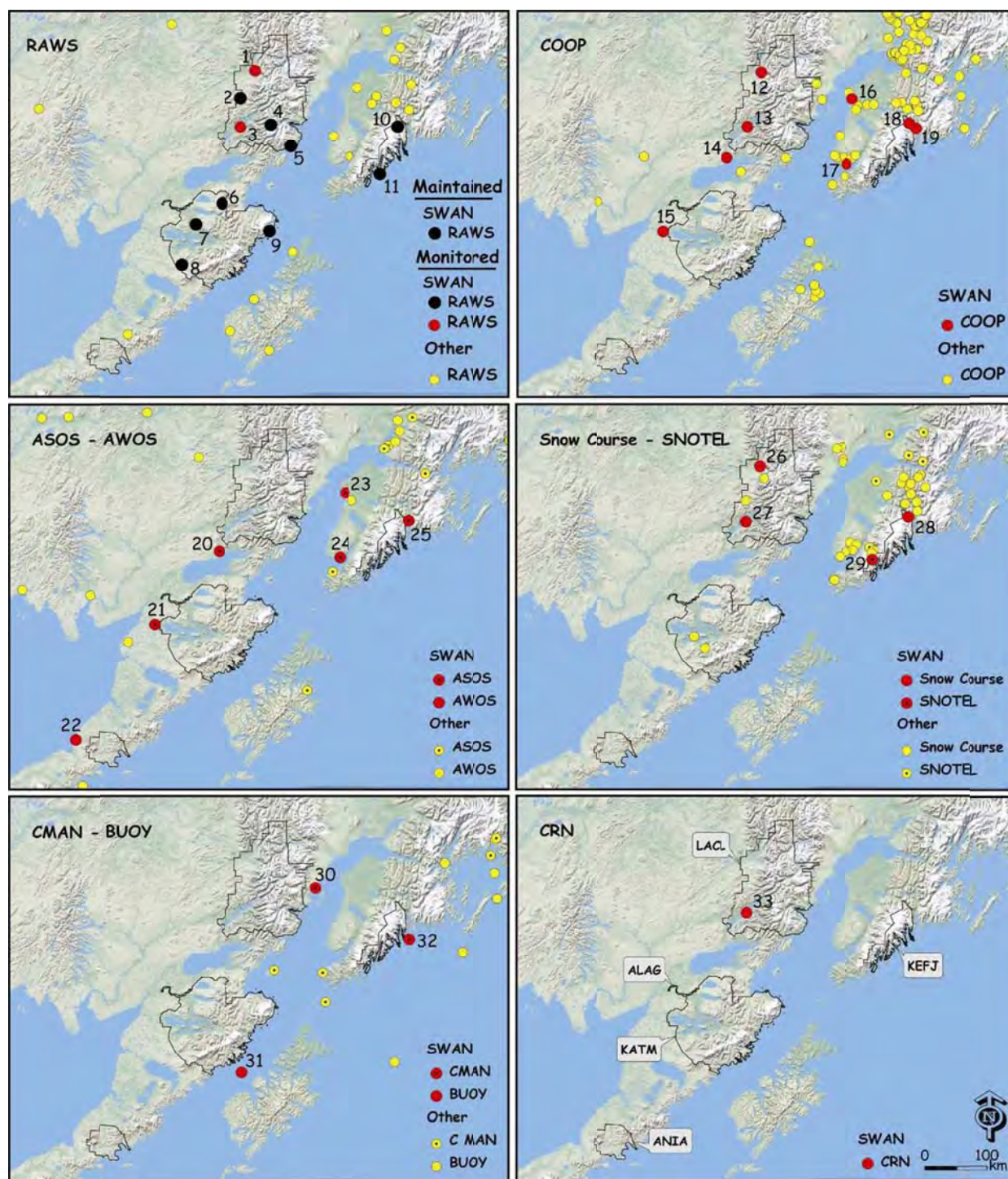


Figure 2. Locations of climate stations in the six climate-monitoring programs in the SWAN region. Climate stations operated and maintained by the SWAN are shown in black. Additional stations that are monitored by the SWAN are shown in both black and red. See Table 1 for definitions of the climate-monitoring program acronyms. The numbers are used to identify each station in Table 2. Refer to the introduction for definitions of park-unit acronyms.

Table 1. Climate monitoring programs used for monitoring climate in the SWAN. Numbers in parentheses indicate the numbers of stations located within park boundaries – numbers outside of parentheses indicate stations located outside, but nearby, park boundaries.

Climate monitoring program (Acronym in bold)	Responsible agency	Program synopsis	No. stns. monitored
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.	0 (11)
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.	6 (2)
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.	6 (0)
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.	1 (3)
CMAN (Coastal-Marine Automated Network); Moored BOUY (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.	3 (0)
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.	0 (1)

Table 2. Weather stations monitored by the SWAN. Station names are those used by the climate monitoring network, but the acronyms are unique to this report. Map numbers refer to locations in Figure 2. The ID number is from the climate monitoring network (e.g. NESDIS ID, COOP Station No., WBAN ID, NRCS ID, NDBC No.). The station start is the earliest date listed for that ID number in the NCDC Multi-network Metadata System. Older climate data may be available from a station with the same name, but with a different ID number, and most likely reflect observations from a different type of weather station that may (or may not) have been located in the same location.

Station name	Acronym	Station type	Map no.	ID no.	Lat. N	Lon. W	Elev ft.	Station start
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
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
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		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

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. 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. GOES telemetry); however, these data are stored on-site, are retrieved during subsequent summer months, and climate databases are updated with the complete record. Additionally, 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.

Summary Reports and Graphs

Summary reports 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 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 (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 1971-2000 period and period of record (POR) 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 the six weather stations with the longest, most complete records located near three SWAN parks that represent the major climate regimes in the network. 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 warmer than average during the 2010 hydrologic year. Compared to the climatological normal (the prevailing set of weather conditions calculated over a 30-year period, currently 1971-2000), annual mean temperatures for long-term weather stations in the SWAN region were 0.0 to +5.1 °F above normal (Table 3). The hydrologic year began with a warmer than average fall (with the notable exception of November) across the region (Figure 3). High temperature records were broken on three days in King Salmon during early October. Several new low temperature records were set in mid-November. It was a warm winter, especially during the months of December, January, and February. Several locations were anomalously warm in February - Kenai was 12.8 °F above average, Port Alsworth was 9.7 °F above average, and Iliamna was 8.5 °F above average. March brought cooler than normal conditions to the SWAN region. King Salmon was 7.9 °F below average, Iliamna was 3.8 °F below average, and Seward was 1.1 °F below average in March. Temperatures were above average across the northern and eastern parts of the region in April and May (Figure 3). June, July, and August were unseasonably cool – Port Alsworth was 4.6 °F below average, Iliamna was 4.2 °F below average, and King Salmon was 4.0 °F below average in July. Clear skies and warm temperatures generally dominated the SWAN region throughout the month of September and several daily high temperature records were set.

Precipitation

Most of the SWAN region was drier than average during the 2010 hydrologic year. Compared to the climatological normal, total annual precipitation at long term weather stations in the SWAN region was 75% to 97% of normal (Table 4). In general, precipitation across the Alaska Peninsula and southern Kenai Peninsula was closer to average than precipitation across the northern Aleutian Range, southern Alaska Range, and the northern Kenai Peninsula. Late spring and mid-summer were wetter than normal across the region. October was characterized by drier than normal conditions, especially in Homer and Kenai where precipitation was 61% and 62% of normal conditions, respectively. Varying amounts of precipitation occurred in November. Although King Salmon only received 63% of normal precipitation, 18 inches fell as snow. High pressure aloft west of the Alaska mainland persisted for the first three weeks of January, which resulted in drier than normal conditions. Precipitation in January was as low as 9% to 16% of normal on the Kenai Peninsula. February was characterized by close to normal precipitation and abundant snowfall across the Kenai Peninsula, but the Alaska Peninsula remained drier than normal. Frequent onshore flow during March and April brought above normal precipitation to nearly the entire region. Very heavy snow fell over much of the Kenai Peninsula in early March. May and June were drier than normal, but the deep winter snowpack persisted longer than normal. In King Salmon the ground was snow free on May 25. July and early August were characterized by anomalously wet conditions. Precipitation for the month of July ranged from 153% (King Salmon) to 300% (Iliamna) of normal. September's clear skies brought dry conditions to the region with significantly below (28%-81%) normal precipitation.

Table 3. Average daily temperatures during hydrologic year 2010 (Oct. 1, 2009 to Sep. 30, 2010) and departures from 1971-2000 averages for select SWAN region stations.

Station name	Station ID	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Homer Airport	503665	42.3 (4.5)	27.2 (-2.2)	29.1 (3.3)	26.6 (3.2)	31.4 (6.5)	27.6 (-1.8)	35.8 (-0.6)	43.1 (-0.6)	48.8 (-1.2)	52.1 (-2.0)	52.4 (-1.4)	47.1 (-0.8)	38.7 (0.6)
Iliamna Airport	503905	41.2 (6.6)	18.2 (-6.7)	25.0 (5.9)	17.7 (1.3)	24.9 (8.5)	19.0 (-3.8)	30.9 (-1.4)	43.6 (0.5)	50.7 (-0.2)	51.6 (-4.2)	53.5 (-1.0)	49.2 (1.6)	35.5 (0.6)
Kenai Airport	504546	44.4 (10.1)	21.4 (-0.4)	22.8 (6.5)	20.7 (7.3)	29.4 (12.8)	27.5 (4.0)	38.2 (3.6)	48.1 (3.7)	53.9 (3.1)	56.6 (1.6)	57.1 (3.1)	51.3 (4.4)	39.4 (5.1)
King Salmon Airport	504766	38.8 (5.5)	17.3 (-5.9)	24.0 (6.8)	15.4 (0.0)	22.7 (7.1)	15.6 (-7.9)	30.9 (-2.2)	43.6 (0.1)	50.4 (-0.5)	51.7 (-4.0)	53.1 (-1.7)	49.2 (1.6)	34.5 (0.0)
Port Alsworth	507570	41.7 (7.2)	18.5 (-5.4)	25.7 (8.1)	15.7 (1.0)	25.8 (9.7)	21.5 (-2.4)	34.9 (0.0)	47.7 (1.9)	-- (--)	53.7 (-4.6)	54.6 (-1.6)	51.3 (3.4)	-- (--)
Seward	508371	43.3 (3.5)	27.5 (-4.1)	28.2 (0.1)	28.7 (2.5)	31.4 (4.2)	30.9 (-1.1)	37.5 (-1.1)	46.3 (0.5)	50.6 (-1.5)	52.5 (-3.9)	-- (--)	51.8 (2.2)	40.3 (0.0)

Temperatures are given in degrees Fahrenheit. Departures from 1971-2000 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 2010 (Oct. 1, 2009 to Sep. 30, 2010) and percentage versus 1971-2000 averages for select SWAN region stations.

Station name	Station ID	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Annual
Homer Airport	503665	1.70 (61)	3.41 (119)	2.83 (94)	0.24 (9)	1.88 (92)	2.62 (144)	2.26 (187)	0.31 (29)	0.81 (84)	3.47 (239)	2.12 (93)	1.39 (41)	23.04 (91)
Iliamna Airport	503905	2.80 (90)	2.48 (110)	0.42 (25)	0.14 (11)	0.41 (42)	0.30 (29)	1.69 (174)	1.33 (105)	0.79 (51)	7.13 (300)	4.74 (111)	2.22 (51)	24.43 (97)
Kenai Airport	504546	1.65 (62)	0.74 (44)	1.34 (92)	0.17 (16)	0.84 (92)	0.36 (44)	1.01 (158)	0.34 (36)	2.06 (189)	3.52 (201)	2.01 (77)	1.44 (44)	15.49 (82)
King Salmon Airport	504766	1.70 (81)	0.97 (63)	0.35 (25)	0.50 (49)	0.46 (64)	0.41 (52)	1.09 (116)	0.69 (51)	1.15 (68)	3.30 (153)	4.42 (153)	1.01 (36)	16.05 (83)
Port Alsworth	507570	0.95 (69)	-- (--)	0.10 (9)	0.26 (33)	0.14 (24)	0.72 (111)	0.78 (163)	0.09 (19)	-- (--)	3.69 (264)	3.20 (155)	1.70 (81)	-- (--)
Seward	508371	7.85 (80)	7.53 (105)	5.53 (71)	1.02 (14)	-- (--)	3.79 (92)	5.34 (113)	1.96 (41)	1.87 (81)	4.72 (211)	4.03 (73)	2.86 (28)	52.96 (75)

Percentages of monthly average precipitation versus 1971-2000 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.

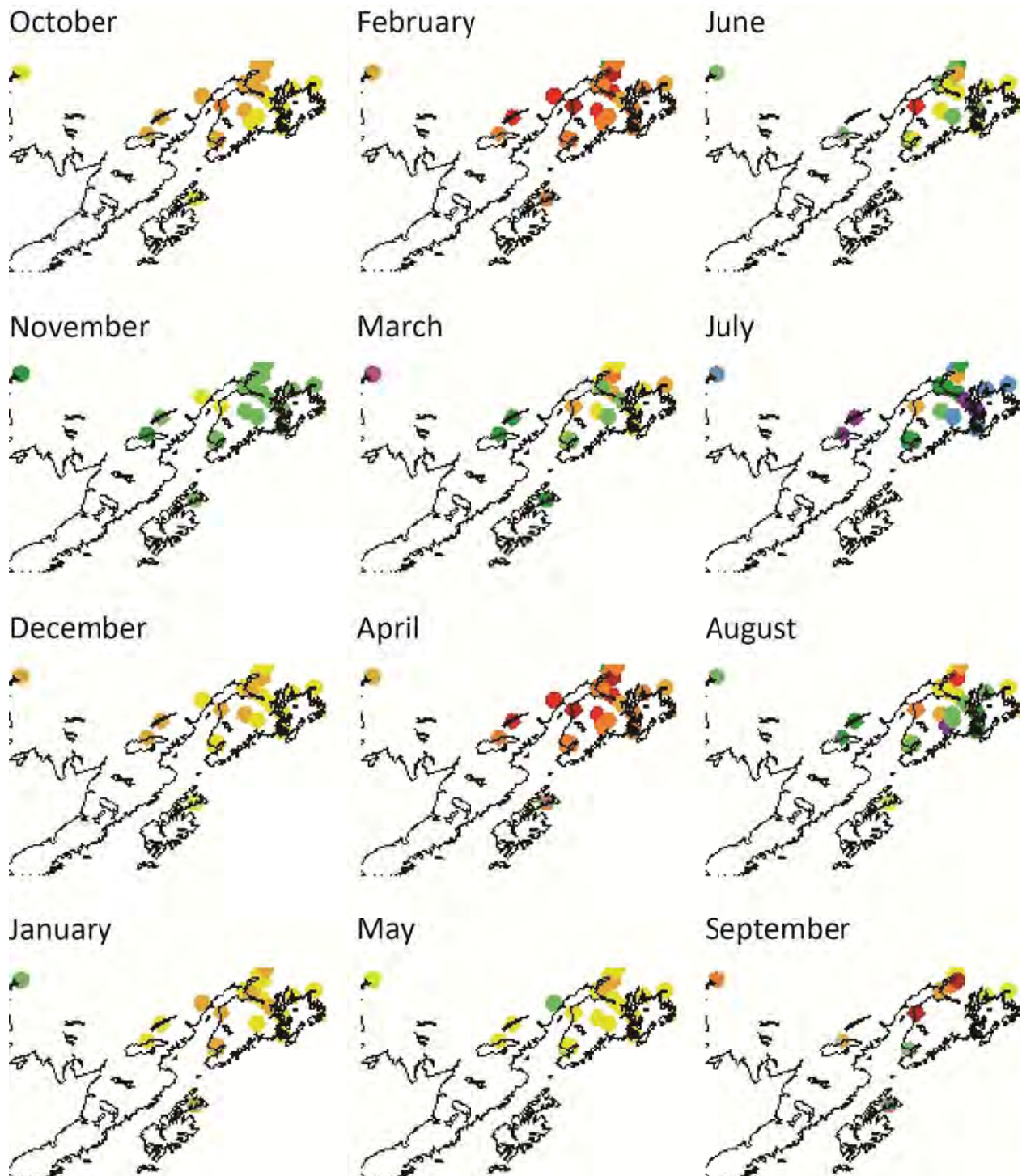


Figure 3. Mean monthly departures from 1971-2000 averages for select COOP stations in southwest Alaska during the 2010 hydrologic year. Figures are from the High Plains Regional Climate Center. Yellow, orange, and red colors represent increasingly warmer than average conditions. Green, blue, and purple colors represent increasingly cooler than average conditions. Dots represent individual COOP stations.

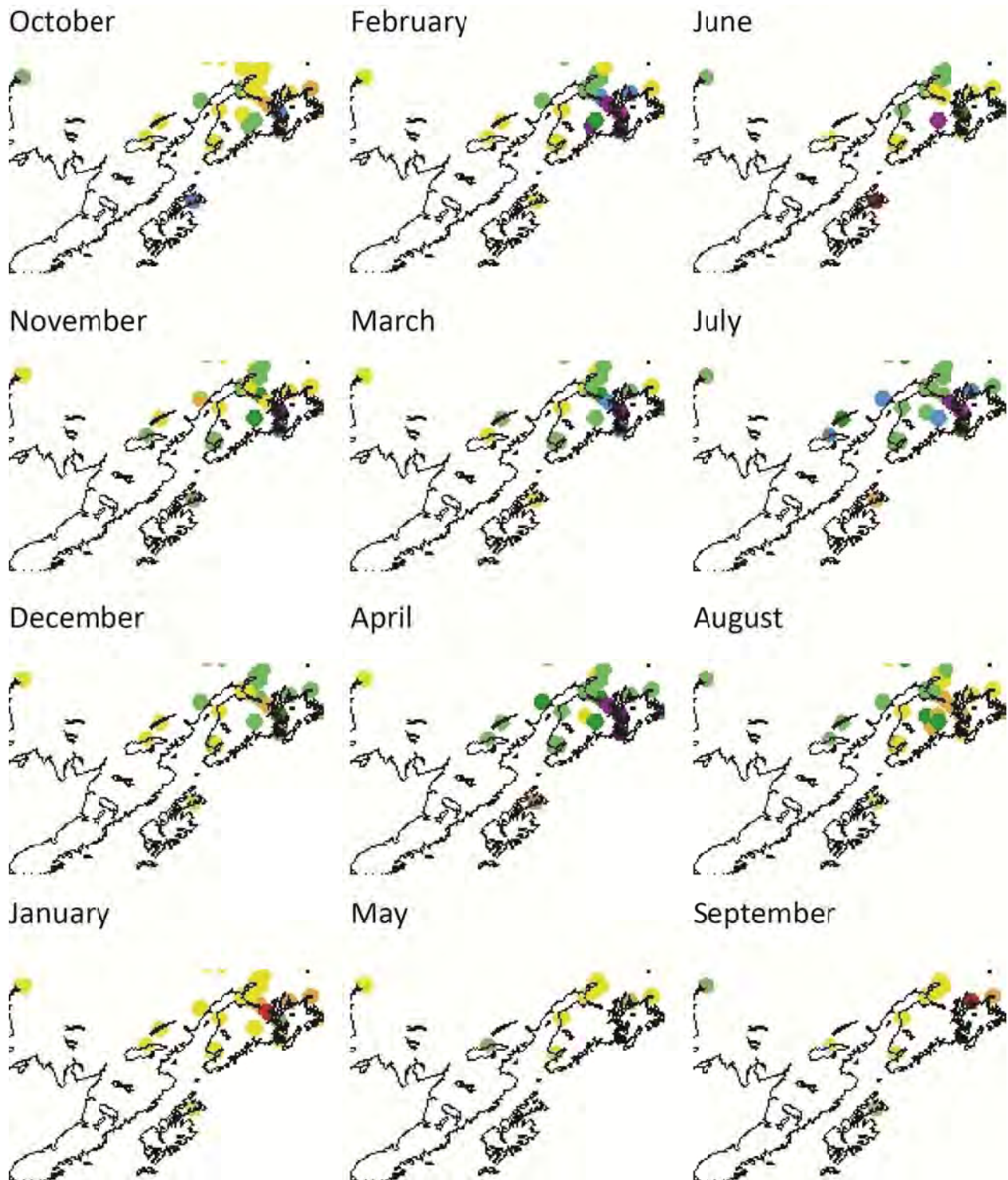


Figure 4. Total monthly precipitation percentages of 1971-2000 averages for select COOP stations in southwest Alaska during the 2010 hydrologic year. Figures are from the High Plains Regional Climate Center. Yellow, orange, and red colors represent increasingly drier than average conditions. Green, blue, and purple colors represent increasingly wetter than average conditions. Dots represent individual COOP stations.

Location of Summary Reports and Graphs for Individual Stations

Summary reports and graphs for consistently measured climate variables from all weather stations monitored by the SWAN (Figure 2 and 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 monthly 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 makes them impractical to operate at more than a few key locations. Undercatch (the difference between the actual amount of snow 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 4) 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 was 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.

Discussion

Summary of 2010 Hydrologic Year

Temperature

Mean annual temperatures were at or above average across most of the SWAN region during the 2010 hydrologic year. Winter months (except for November and March) were warmer than average and summer months (except for May and September) were cooler than average. February and April were anomalously warm and July was anomalously cool. Stations with maritime influence (e.g. Homer, King Salmon, and Seward) had mean annual temperatures that were equal to or close to the long-term average. In contrast, stations with a more continental, boreal climate (e.g. Kenai) had mean annual temperatures that were significantly warmer than the long-term average. Temperature summaries for long-term stations are presented relative to climate maps derived from the Parameter-Elevation Regressions on Slopes Model (PRISM 2010) in Figure 5. The PRISM model uses point climate station data (climatological normals) and a digital elevation model to generate gridded interpolations of temperature and precipitation. Climate maps derived from PRISM data provide a useful spatial reference for the interpretation of patterns of variability in climate data.

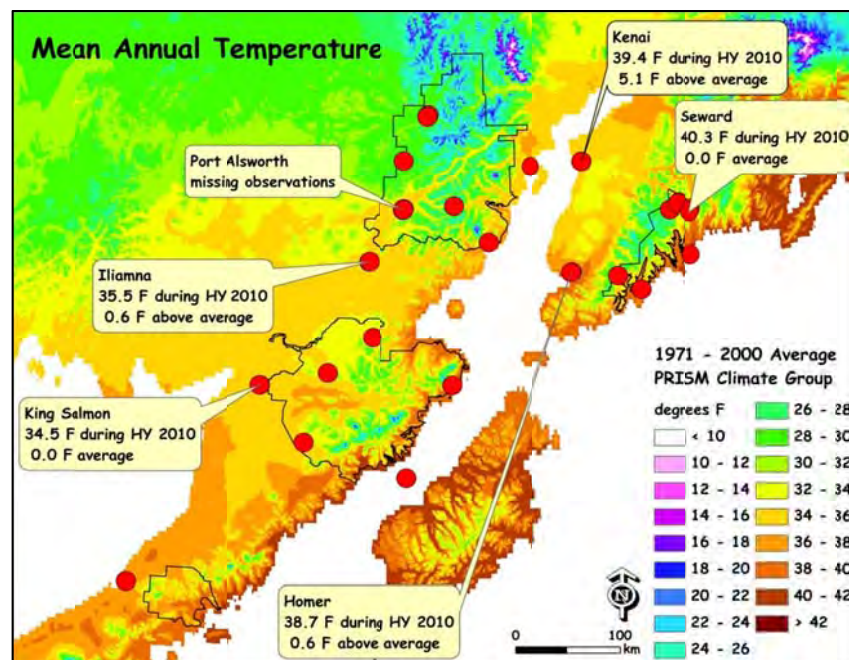


Figure 5. Mean annual temperatures (2010 hydrologic year) for long-term stations in the SWAN region relative to spatially interpolated mean annual temperatures for the climatological normal (1971-2000) generated by the PRISM.

Precipitation

Total annual precipitation at all long-term stations was at or slightly below the climatological normal. There was a no clear pattern in the spatial distribution of precipitation; however, precipitation across the Alaska Peninsula and southern Kenai Peninsula was closer to average than precipitation across the northern Aleutian Range, southern Alaska Range, and the northern Kenai Peninsula. Spring (April) and the middle of summer (July and August) yielded significantly above average precipitation at most long-term stations. Precipitation summaries for long-term stations are presented relative to climate maps derived from the PRISM in Figure 6.

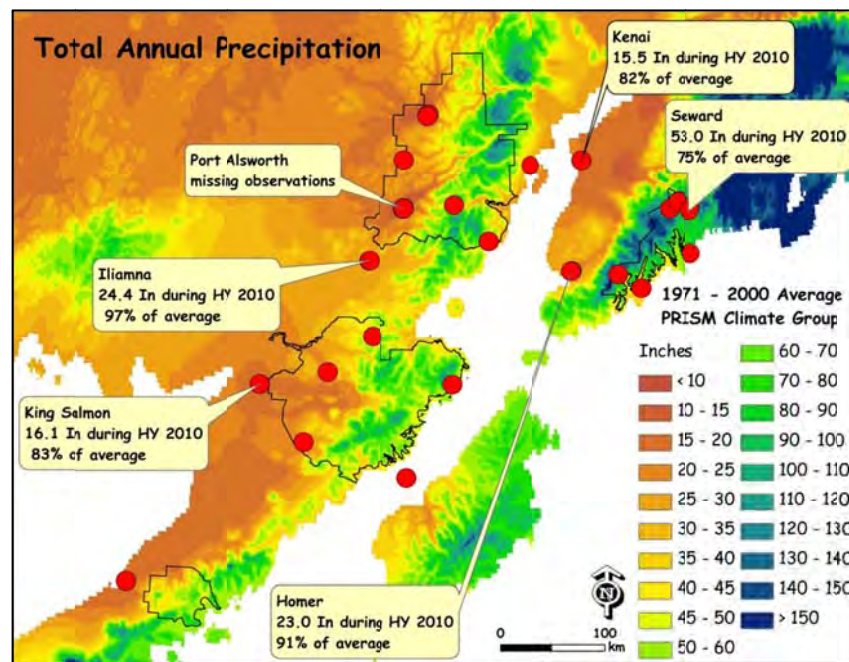


Figure 6. Total annual precipitation (2010 hydrologic year) for long-term stations in the SWAN region relative to spatially interpolated mean annual precipitation for the climatological normal (1971-2000) generated by the PRISM.

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. The approximately 50-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 normals, but this period may be too short for discerning long-term changes in climate regimes. Although the climate data for the long-term stations discussed above has been subjected to a suite of quality assurance checks (NCDC, 2010), 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.

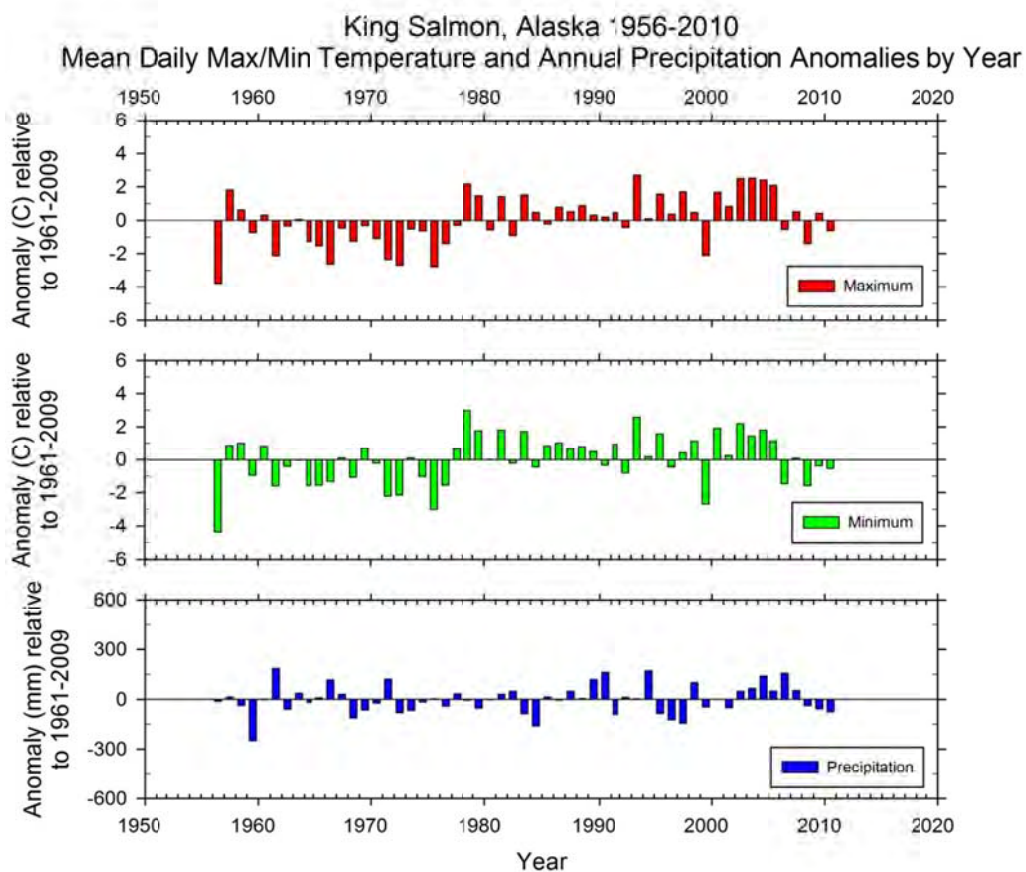


Figure 7. Maximum and minimum temperature and precipitation anomalies for King Salmon. Data are shown for the period of record, but only for years with >90% valid observations (i.e. with fewer than 37 missing days of observations). Anomalies are calculated using the mean for the valid period of record. Calendar years (January 1 to December 31) are shown.

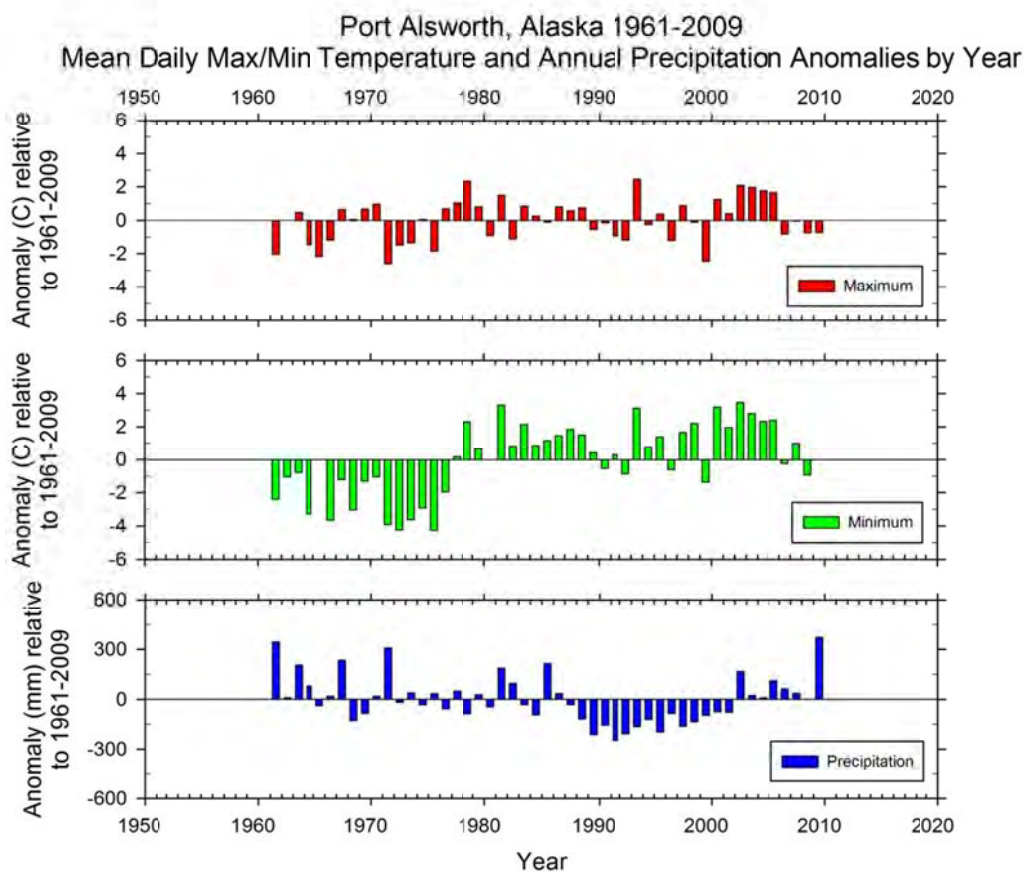


Figure 8. Maximum and minimum temperature and precipitation anomalies for Port Alsworth. Data are shown for the period of record, but only for years with >90% valid observations (i.e. with fewer than 37 missing days of observations). Anomalies are calculated using the mean for the valid period of record. Calendar years (January 1 to December 31) are shown.

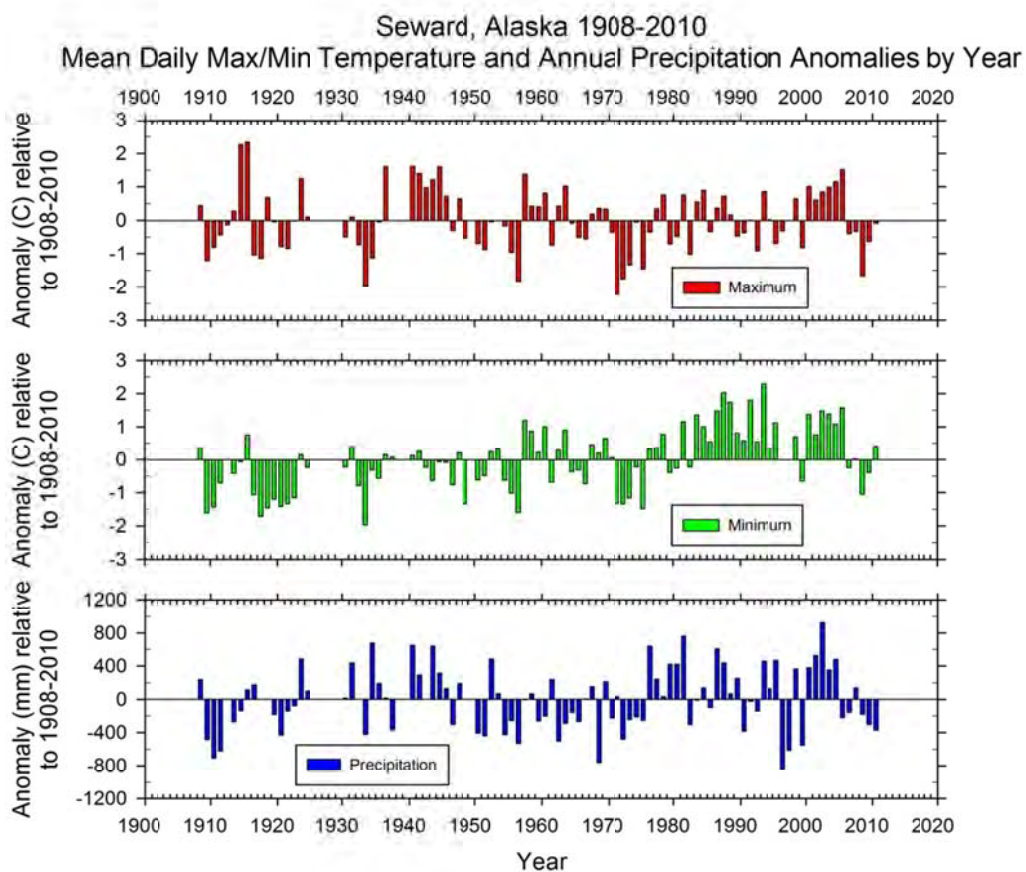


Figure 9. Maximum and minimum temperature and precipitation anomalies for Seward. Data are shown for the period of record, but only for years with >90% valid observations (i.e. with fewer than 37 missing days of observations). Anomalies are calculated using the mean for the valid period of record. Calendar years (January 1 to December 31) are shown.

Assessment

Average or slightly warmer than normal mean annual temperatures during the 2010 hydrologic year represent a small change from recent temperatures observed during the previous four years (2006-2009 hydrologic years). Mean annual temperatures for the 2006-2009 hydrologic years were below normal for all long-term stations except Kenai. The historical context for precipitation is less clear. Drier than normal total annual precipitation has generally been observed at Homer, Iliamna, and Kenai for at least the previous three years, and longer in Homer. Close to, or above normal, precipitation has been observed in King Salmon and Port Alsworth for the last four years. Seward is characterized by wide interannual variability in precipitation over the entire period of record.

PDO Conditions

The 2010 hydrologic year was characterized by neutral to slightly positive PDO conditions between October 2009 and June 2010, when negative PDO conditions developed (JISAO 2011). Negative PDO conditions also existed for much of the 2009 hydrologic year. These negative PDO conditions were 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 10). The position of the Aleutian Low and storm track is correlated with North Pacific SST anomalies; however, the impact of cooler SSTs alone for coastal areas may be significant as well. Differentiating between the effects of these two processes at an individual weather station is probably not possible.

An abrupt positive shift in mean annual temperature beginning during the 1977 hydrologic year is evident at five long-term stations (Kenai, King Salmon, Homer, Port Alsworth, and Seward) in the SWAN region. This shift is not noticeable at Iliamna, but is probably 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 (Figures 7 – 9). This reflects generally warmer winters beginning in the late 1970s. This climate shift has been well correlated with the shift from the negative to positive phase of the PDO (e.g. Simpson et al. 2002; Hartman and Wendler, 2005).

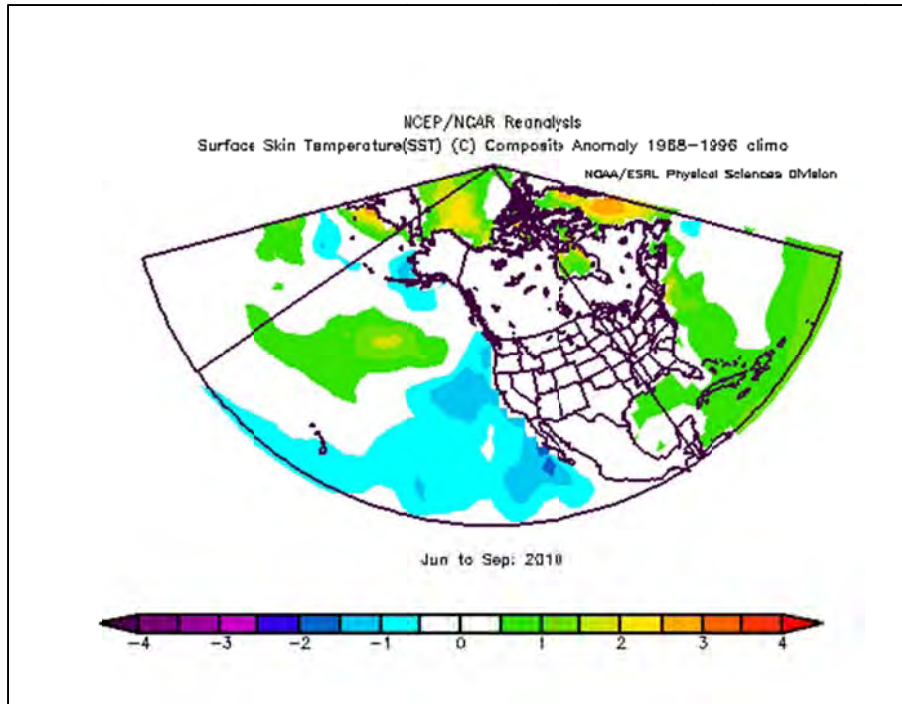


Figure 10. Sea surface temperature composite anomaly for the North Pacific area (June - September, 2010). Figure was generated using the NOAA Earth System Research Laboratory Physical Sciences Division daily mean composites plotting page using NCEP/NCAR reanalysis data. Climate means are based on 1968-1996.

ENSO Conditions

The 2010 hydrologic year was generally characterized by El Niño (ENSO positive) conditions. El Niño conditions developed in summer 2009 and persisted through spring 2010. Significant annual variability in temperature and precipitation at long-term stations in the SWAN region may be attributed to fluctuations in the ENSO. Although the average El Niño event results in a significant increase in winter temperatures across Alaska, the effect is highly variable both spatially (from one location to another) and temporally (from one El Niño event to another; Papineau n.d.). Temperature data from long-term stations in the SWAN region are weakly correlated to recent El Niño events (Table 5) with significantly warmer than average temperatures (compared to the climatological normal conditions) observed at all six stations during the 2003 and 2005 El Niño events. Temperature data from long-term stations in the SWAN region are also only weakly correlated to recent La Niña events with cooler than average temperatures (compared to the climatological normal conditions) observed at all six stations during the 1999 and 2000 La Niña events.

Table 5. El Niño and La Niña events (since 1950) of varying intensity listed by hydrologic year (NWS Climate Prediction Center, 2011).

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

Other Climate Forcings

The major weather feature in Alaska during summer is a low pressure trough over the Bering Sea. It is a weaker, summer version of the Aleutian Low, which dominates fall and winter circulation over the North Pacific Ocean. The cooler, and cloudier, than normal summer conditions observed during the 2010 hydrologic year may be attributed to an eastward shift in the low pressure trough into western Alaska and an associated weakening of the high pressure ridge that typically persists over western Canada during summer (Papineau 2010). The results of this shift are significant southwesterly flow that transports cooler air from the southern Bering Sea into southcentral Alaska, more active storm tracks in the Gulf of Alaska, and more frequent regional wind events.

Climatic Extremes and Significant Weather Events

Climatic extremes are listed in Table 6. Maximum temperatures recorded across the SWAN region range from 62 (Chigmit Mountains, LACL) to 80 °F (Stoney, LACL). Minimum temperatures recorded across the SWAN region range from -45 (Stoney, LACL) to 12 °F (Pilot Rock, KEFJ). The maximum (instantaneous) wind speed documented was West at 140 mph at Hickerson Lake, KEFJ. The number of frost days (a day on which the minimum air temperature falls below 32 °F) range from 39 (Pilot Rock, KEFJ) to 261 (Chigmit Mountains, LACL). The number of ice days (a day on which the maximum air temperature does not rise above 32 °F) range from 13 (Pilot Rock, KEFJ) to 207 (Chigmit Mountains, LACL).

Significant weather events that occurred at a large scale (i.e. across the SWAN region) during the 2010 hydrologic year included the following events. Pronounced cold snaps occurred in mid-November, mid-December, early February, and mid-March. Mid-winter thaw events occurred in late December to mid-January and in mid-February. Significant mid-winter rain events occurred in December and February. Noteworthy snowfall events occurred in November, March, and April. Unseasonally high rainfall occurred in July and August. Strong, regional wind events occurred in early October, early December, February (twice), early April, and early May.

Table 6. Climatic extremes and significant weather events during the 2010 hydrologic year at weather stations monitored by the SWAN.

Station name	Station type	Max temp	Min temp	Max wind speed	Max wind direction	Frost days	Ice days
Chigmit Mountains	RAWS	61.5	-35.1	104	78	261	207
Contact Creek	RAWS	70.3	-19.8	66	87	199	135
Coville	RAWS	66.0	-16.8	95	81	192	92
Drift River Terminal	CMAN	66.9	-0.6	57		138	67
Exit Glacier	SNCO						
Fourpeaked	RAWS	67.1	-3.5	96	71	145	48
Harding Icefield	RAWS	63.1	-15.9	109	116	251	198
Hickerson Lake	RAWS	71.4	-5.6	140	274	157	59
Homer Airport	COOP	68	-1			163	51
Homer Airport	ASOS	67	0			151	54
Iliamna Airport	COOP	73	-19			162	86
Iliamna Airport	ASOS	73	-17			159	88
Kenai Airport	COOP	78	-16			158	66
Kenai Airport	ASOS	77	-16			151	69
King Salmon Airport	COOP	73	-24			193	93
King Salmon Airport	ASOS	71	-24			187	97
McArthur Pass	RAWS	69.1	1.8	109	122	129	43
Nuka Glacier	SNTE	66.9	-18.6			185	70
Pfaff Mine	RAWS	67.3	-21.5	112	103	209	108
Pilot Rock	CMAN	64.2	12.2	64		39	13
Port Alsworth	COOP	--	-30			--	--
Port Alsworth	SNCO						
Port Alsworth	RAWS	78	-31	42	88	202	82
Port Alsworth 1 SW	CRN	75.7	--			--	--
Port Heiden	AWOS	71	-3			169	94
Seward	COOP	75	1			138	42
Seward Airport	ASOS	74	2			134	50
Seward 8NW	COOP	--	--			--	--
Shelikof Strait	BUOY	--	--			--	--
Snipe Lake	RAWS	68.7	-29.4	85	126	207	113
Stoney	RAWS	80	-45	36	52	251	105
Telaquana Lake	COOP	73	-31			207	114
Telaquana Lake	SNCO						

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.

Status of Climate Monitoring in Network Parks

The SWAN maintained all nine weather stations that it operates during the 2010 hydrologic year. Two stations (Chigmit Mountains and Harding Icefield) were accessed by ski plane and maintained in April. The other stations were accessed by fixed-wing aircraft, boat, and foot (with the exception of McArthur Pass, which was accessed twice by helicopter). Three maintenance visits were made to the McArthur Pass station, which experienced considerable damage from icing and wind during spring 2010. A summary of all maintenance work at SWAN operated and maintained weather stations is presented in Table 7.

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. Based on recommendations from the NRCS, SWAN will try using a Judd sonic snow depth sensor on high elevation and coastal weather stations in 2011. 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 observations made during the 2008 hydrologic year). A summary of all known issues affecting the performance and data quality of weather stations maintained and operated by the SWAN is provided in Table 8.

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

Station	Date	Maintenance
Chigmit Mountains	04/08/2010	Scheduled maintenance. Replaced AT/RH, WD, and WS sensors. Replaced WS cable.
Contact Creek	06/17/2010	Scheduled maintenance. Replaced AT/RH, WD, and WS sensors.
Contact Creek	09/14/2010	Installed time-lapse camera tied into weather station batteries and solar panel.
Coville	06/15/2010	Scheduled maintenance. Replaced AT/RH, WD, and WS sensors.
Coville	09/15/2010	Installed time-lapse camera tied into weather station batteries and solar panel.
Fourpeaked	06/18/2010	Scheduled maintenance. Replaced AT/RH, WD, WS sensors, and RG-TB. Tri-leg tower frame broken at weld – field repaired.
Harding Icefield	04/24/2010	Scheduled maintenance. Replaced AT/RH, WD, WS, SR, SD sensors, and RG-TB. Replaced GOES antenna. Serviced all-season precipitation gauge.
Hickerson Lake	06/21/2010	Scheduled maintenance. Considerable bear damage to station. Replaced AT/RH, WD, WS sensors, and RG-TB. Replaced solar panel and GPS antenna cable.
McArthur Pass	11/18/2009	Unscheduled maintenance. Replaced WS sensor and WS cable.
McArthur Pass	05/29/2010	Scheduled maintenance. Considerable ice and wind damage to station. Replaced AT/RH, WS, and WD sensors. Removed SD sensor (no replacement available).
McArthur Pass	08/17/2010	Unscheduled maintenance. Replaced SD sensor and cable.
Pfaff Mine	06/16/2010	Scheduled maintenance. Replaced AT/RH, WD, and WS sensors.
Snipe Lake	04/09/2010	Unscheduled maintenance, also performed scheduled maintenance. Considerable bear damage to station. Replaced AT/RH and WS sensors. Removed ST sensor (no replacement). Replaced solar panel. Station had not charged since 07/2009 because of severed solar panel cable.
Snipe Lake	08/11/2010	Installed time-lapse camera tied into weather station batteries and solar panel.

Table 8. Issues affecting performance and data quality of RAWs operated and maintained by the SWAN. Acronyms are as follows: air temperature (AT), relative humidity (RH), wind speed (WS), wind direction (WD), snow depth (SD), and solar radiation (SR).

Station	Date begin	Date end	Issue
Chigmit Mountains	10/01/2009	10/02/2009	WS sensor not working (iced-up)
Chigmit Mountains	10/07/2009	10/08/2009	WS sensor not working (iced-up)
Chigmit Mountains	10/23/2009	11/08/2009	WS sensor not working (iced-up)
Chigmit Mountains	11/23/2009	12/04/2009	WS sensor not working (iced-up)
Chigmit Mountains	12/22/2009	01/10/2010	WS sensor not working (iced-up)
Chigmit Mountains	01/13/2010	01/22/2010	WS sensor not working (iced-up)
Chigmit Mountains	01/29/2010	04/02/2010	WS sensor not working (iced-up)
Chigmit Mountains	04/05/2010	04/07/2010	WS sensor not working (iced-up)
Chigmit Mountains	04/22/2010	04/24/2010	WS sensor not working (iced-up)
Chigmit Mountains	04/26/2010	05/04/2010	WS sensor not working (iced-up)
Chigmit Mountains	05/12/2010	05/18/2010	WS sensor not working (iced-up)
Chigmit Mountains	10/01/2009	09/30/2010	Some artificial spikes in SD data
Chigmit Mountains	06/01/2010	09/30/2010	SD tare drifts to 0.0 to 0.5 in
Chigmit Mountains	10/01/2009	09/30/2010	Only liquid (e.g. rain) precipitation recorded
Contact Creek	10/01/2009	09/30/2009	Only liquid (e.g. rain) precipitation recorded
Contact Creek	10/01/2009	09/30/2009	Some artificial spikes in SD data
Contact Creek	08/28/2010	09/30/2010	RH sensor not working
Coville	10/01/2010	09/30/2010	Some artificial spikes in SD data
Coville	10/01/2009	09/30/2009	Only liquid (e.g. rain) precipitation recorded
Fourpeaked	01/14/2010	06/18/2010	RH sensor not working
Fourpeaked	10/01/2009	06/18/2010	RG sensor not working
Fourpeaked	07/05/2010	09/03/2010	RG no data (not passing through WFMI)
Fourpeaked	10/01/2009	09/30/2009	Only liquid (e.g. rain) precipitation recorded
Fourpeaked	10/01/2009	09/30/2010	Some artificial spikes in SD data
Harding Icefield	10/25/2009	11/02/2009	WS sensor intermittently not working (iced-up)
Harding Icefield	11/05/2009	11/06/2009	WS sensor not working (iced-up)
Harding Icefield	11/07/2009	11/09/2009	WS sensor not working (iced-up)
Harding Icefield	12/14/2009	12/19/2009	WS sensor not working (iced-up)
Harding Icefield	01/14/2010	01/30/2010	WS sensor not working (iced-up)
Harding Icefield	04/11/2010	04/24/2010	WS sensor not working (iced-up)
Harding Icefield	10/15/2009	12/08/2009	SR sensor not working
Harding Icefield	04/24/2010	04/24/2010	SR sensor changed, data drift prior
Harding Icefield	02/09/2010	02/23/2010	SR sensor not working
Harding Icefield	10/01/2009	09/30/2010	SD sensor intermittently fogged and not working
Hickerson Lake	10/01/2009	09/30/2010	Only liquid (e.g. rain) precipitation recorded
Hickerson Lake	10/01/2010	09/30/2010	Some artificial spikes in SD data
Hickerson Lake	05/12/2010	06/21/2010	RG not working
Hickerson Lake	12/10/2009	12/15/2009	WD/WS sensor not working (iced-up)
Hickerson Lake	03/10/2009	03/11/2009	WD/WS sensor not working (iced-up)
McArthur Pass	10/01/2009	09/30/2010	SD sensor not working
McArthur Pass	03/14/2010	03/18/2010	AT sensor not working
McArthur Pass	04/17/2010	05/29/2011	AT sensor not working (physically missing)
McArthur Pass	03/18/2010	05/29/2010	RH sensor not working
McArthur Pass	10/01/2009	09/30/2010	Only liquid (e.g. rain) precipitation recorded
Pfaff Mine	10/01/2009	09/30/2010	Only liquid (e.g. rain) precipitation recorded
Pfaff Mine	10/01/2009	09/30/2010	Some artificial spikes in SD data
Pfaff Mine	10/01/2009	06/03/2010	RH sensor not working

Table 8 continued. Issues affecting performance and data quality of RAWS operated and maintained by the SWAN. Acronyms are as follows: air temperature (AT), relative humidity (RH), wind speed (WS), wind direction (WD), snow depth (SD), and solar radiation (SR).

Station	Date begin	Date end	Issue
Snipe Lake	10/01/2009	09/30/2010	Only liquid (e.g. rain) precipitation recorded
Snipe Lake	10/01/2009	09/30/2010	Some artificial spikes in SD data
Snipe Lake	04/09/2010	09/30/2010	SD tare artificially high, adjusted (subtracted 1.3 in)

The SWAN benefits greatly from, and in turn, supports park-based weather and climate monitoring efforts. Two additional RAWS were purchased with park funds and are planned for installation at Merrill Pass in LACL and at Pedersen Lagoon in KEFJ during 2011. With assistance from the NRCS, KEFJ plans to install a SNOTEL station at Exit Glacier during 2011. This automated station will provide continuous weather observations throughout the year, including times when observations are not currently made at the existing COOP station because of staffing or access issues. A new SNOTEL site would provide continuous and accurate precipitation observations including winter-time snowfall, snow depth, and snow water equivalent. Representatives from NOAA visited existing RAWS locations in KATM to conduct site assessments for possible station replacement with a CRN station in the future. 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.

Conclusion

The Southwest Alaska Network region was warmer and slightly drier than normal during the 2010 hydrologic year (October 2009 through September 2010). Compared to the climatological normal (the prevailing set of weather conditions calculated over a 30-year period, currently 1971-2000), annual mean temperatures for six long-term weather stations were 0.0 to +5.1 °F above normal. Total annual precipitation was 75% to 97% of normal. In general, precipitation across the Alaska Peninsula and southern Kenai Peninsula was closer to normal than precipitation across the northern Aleutian Range, southern Alaska Range, and the northern Kenai Peninsula. Late spring and mid-summer were unseasonably cool and wet across the region. Warmer than normal conditions during the 2010 hydrologic year represent a change from regional climatic conditions during the previous four hydrologic years, which were colder than normal. Drier than normal conditions are consistent with regional climatic conditions during the previous four hydrologic years.

Literature Cited

- Alaska Climate Research Center. 2009. Temperature change in Alaska: Total change in mean seasonal and annual temperature °F, 1949-2008. Available at <http://climate.gi.alaska.edu/ClimTrends/Change/TempChange.html> (accessed 16 November 2009).
- Bennett, A.J., W.L. Thompson, and D.C. Mortenson. 2006. Vital signs monitoring plan, Southwest Alaska Network. National Park Service, Anchorage, Alaska.
- Davey, C.A., K.T. Redmond, and D.B. Simeral. 2007. Weather and climate inventory, National Park Service, Southwest Alaska Network. Natural Resource Technical Report NPS/SWAN/NRTR-2007/045. National Park Service, Fort Collins, Colorado.
- Giffen, B.A, C.R. Lindsay, and N.J. Wilson. *In review*. Methods for monitoring climate in southwest Alaska network parks: volume 1 – narrative, appendices, and standard operating procedures, version 1.0. Natural Resources Report NPS/SWAN/NRR – 2011/XXX. National Park Service, Fort Collins, Colorado.
- Hartman, B., and G. Wendler. 2005. The significance of the 1976 Pacific climate shift in the climatology of Alaska. *Journal of Climate* 18:4824-4839.
- Joint Institute for the Study of the Atmosphere and Ocean (JISAO), 2011. Monthly standardized values for the PDO index. Available at <http://jisao.washington.edu/pdo/PDO.latest> (accessed 30, May 2011).
- National Climatic Data Center, 2010. Global Historical Climatology Network – Daily: Methods – quality control. Available at <http://www.ncdc.noaa.gov/oa/climate/ghcn-daily/> (accessed 30 May 2011).
- National Weather Service (NWS) Climate Prediction Center, 2011. Previous ENSO events 1951-present. Available at http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/ensostuff/ensoyears.shtml (accessed 30 May 2011).
- Papineau, J. 2005. Winter temperature variability across Alaska during El Niño events. Alaska Region Research Notes RN-05-0002. National Weather Service, Anchorage, Alaska.
- Papineau, J. 2010. The agony and the ecstasy of southcentral summers. Available from http://pafc.arh.noaa.gov/papers/southcentral_summers.pdf (accessed 30 May 2011).
- Papineau, J., no date. Understanding Alaska's climate variation. Available from <http://pafc.arh.noaa.gov/climvar/climate-paper.html> (accessed 14 May 2010).
- PRISM Climate Group, Oregon State University and Alaska Region Inventory and Monitoring Program, National Park Service, 2010. Gridded temperature and precipitation data for Alaska for the 1971-2000 climatological normal. Available from <http://science.nature.nps.gov/nrdata/> (accessed and manipulated 4 April, 2010).

Redmond, K.T., D.B. Simeral, and G.D. McCurdy. 2005. Climate monitoring for southwest Alaska national parks: Network design and site selection. Western Regional Climate Center, Reno, Nevada.

Scenarios Network for Alaska Planning. 2008. Climate change summary reports: Aniakchak National Monument and Preserve, Katmai National Park and Preserve, Kenai Fjords National Park and Preserve, and Lake Clark National Park and Preserve. Available from <http://www.snap.uaf.edu/downloads/climate-change-summary-reports> (accessed 15 November 2009).

Simpson, J.J., G.L. Hufford, M.D. Fleming, J.S. Berg, and J. Ashton. 2002. Long-term climate patterns in Alaskan surface temperature and precipitation and their biological consequences. *IEEE Transactions on Geoscience and Remote Sensing* 40:1164-1184.

Weller, G. P. Anderson, and B. Wang, eds. 1999. Preparing for a changing climate: The potential consequences of climate change and variability in Alaska. Alaska Regional Assessment Group Report, U.S. Global Change Research Program. Fairbanks, Alaska.

Appendices

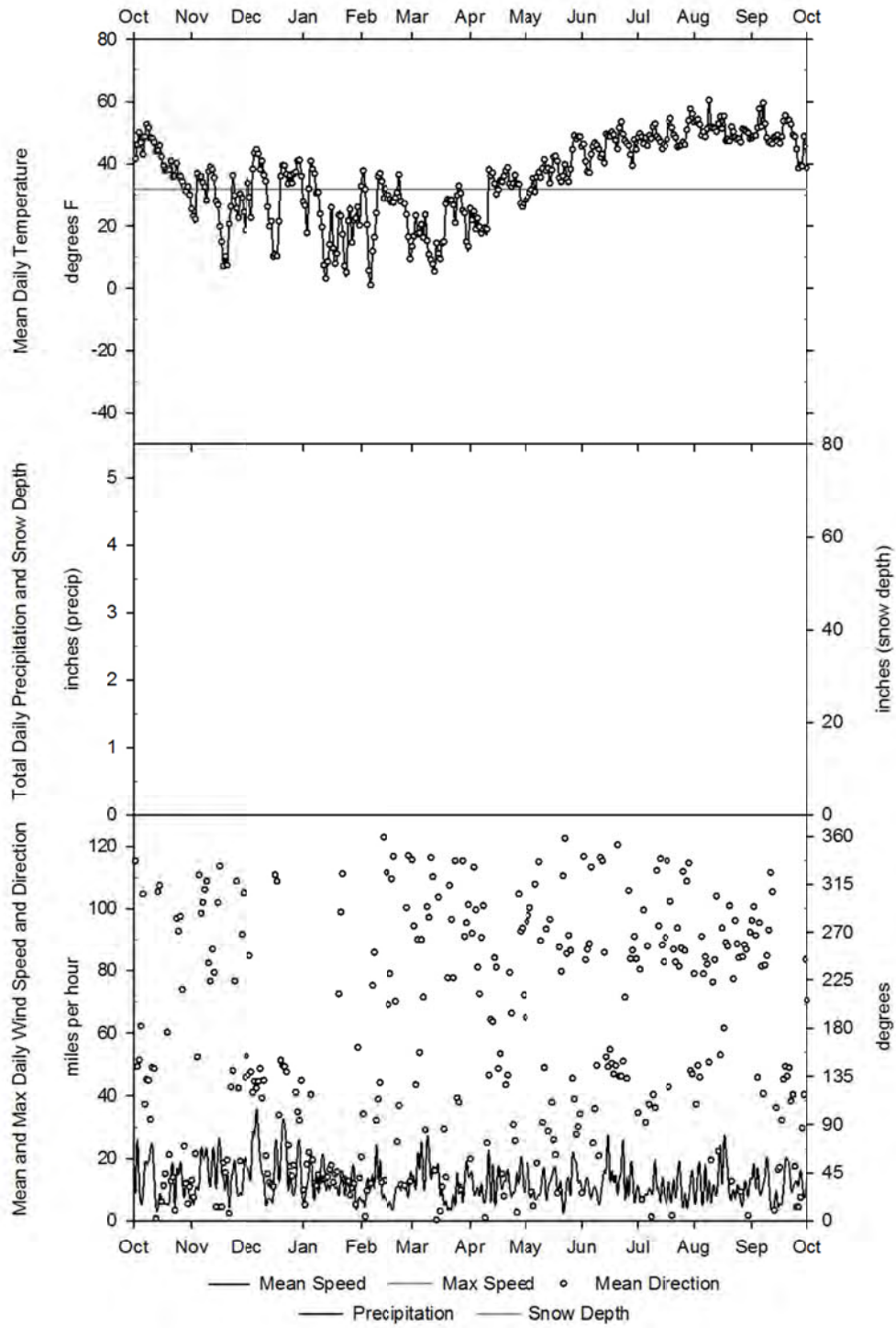
Summary tables and graphs for the most consistently measured climate variables from all weather stations monitored by the SWAN are included in the appendices and are organized by park, climate monitoring program, and station name. Daily measures are used for generating graphs (with the exception of NRCS 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 1971-2000 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.

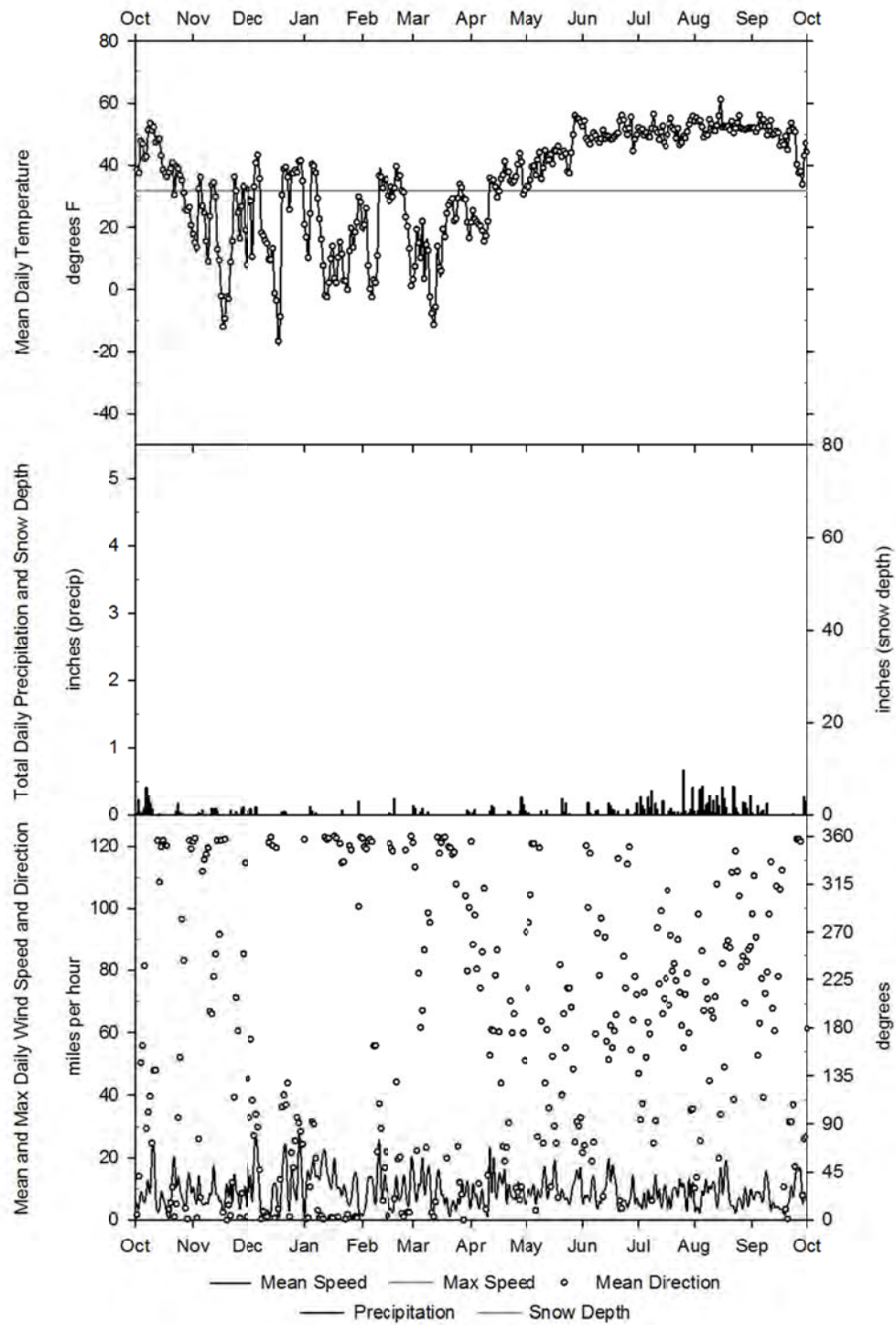
2010 Hydrologic Year - ANIA AWOS POHE (Port Heiden)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	19	3	7	-2	-3	1	3	24	35	37	40	28	-3
Max.	50	37	43	39	36	27	36	45	46	52	53	52	53
Mean	35.8	21.5	28.5	15.8	20.5	13.1	23.4	33.8	39.7	45.4	46.6	43.1	30.7
# days <32 F	7	21	15	29	25	31	27	11	0	0	0	3	169
% valid obs	96	94	88	99	92	99	97	99	95	99	96	98	96
Maximum air temperature (F)													
Min	30	10	14	7	5	9	20	30	39	45	48	43	5
Max	59	44	46	43	42	39	45	55	63	64	70	71	71
Mean	45.4	31.9	36.9	25.7	28.1	25.5	34.8	43.6	51.8	54.1	55.6	54.3	40.7
# days <32 F	1	12	5	24	18	22	11	1	0	0	0	0	94
% valid obs	96	94	88	99	92	99	97	99	95	99	96	98	96
Mean air temperature (F)													
Observed	40.8	27.0	32.3	21.0	25.0	19.5	29.5	33.3	45.7	49.3	50.8	48.9	35.8
% valid obs	96	94	88	99	92	99	97	99	95	99	96	98	96
POR mean													
1971-2000													
Precipitation													
Total													
% valid obs													
POR mean													
1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	11.9	14.9	17.3	11.9	10.3	12.9	12.0	12.0	12.5	9.7	11.9	11.6	
% valid obs	100	95	99	99	94	99	99	99	99	99	98	99	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

ANIA AWOS POHE (Port Heiden) 2009/10/01 to 2010/09/30



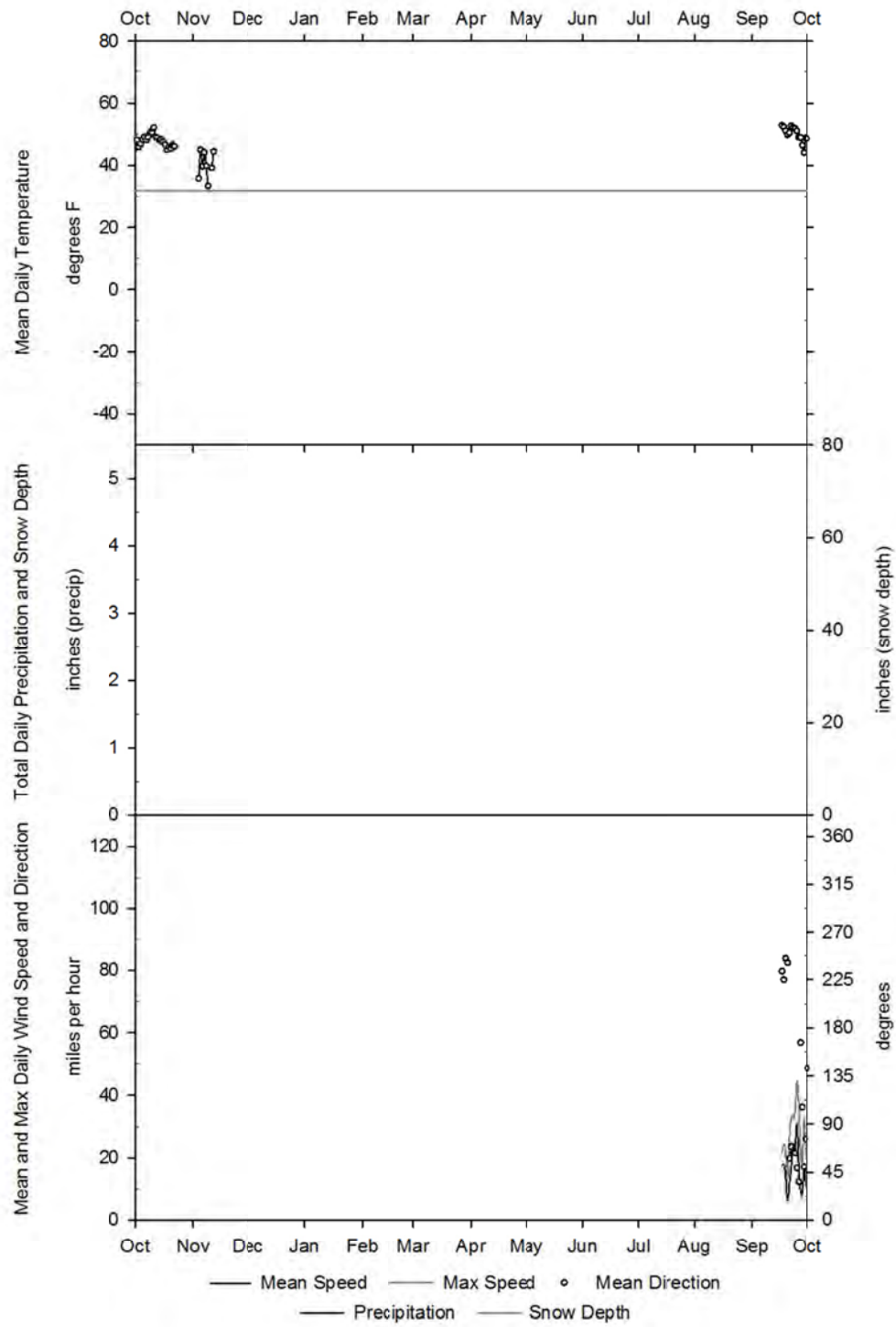
2010 Hydrologic Year - KATM ASOS KISA (King Salmon Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	3	-19	-24	-11	-14	-22	1	22	33	39	38	19	-24
Max.	48	34	40	38	34	25	36	49	48	52	57	53	57
Mean	32.3	8.9	17.7	9.6	16.0	5.5	23.3	34.1	41.3	46.0	47.1	40.5	26.9
# days <32 F	10	28	20	28	26	31	26	13	0	0	0	5	187
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	24	-1	-8	2	0	-2	23	38	49	49	52	45	-8
Max	58	42	46	42	44	42	53	70	71	66	69	69	71
Mean	45.3	25.6	30.2	21.3	29.3	25.7	38.3	52.5	58.5	56.8	58.9	57.4	41.7
# days <32 F	4	18	14	23	12	18	8	0	0	0	0	0	97
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	39.0	18.1	24.2	15.4	22.7	16.4	31.2	43.3	50.2	51.0	52.7	48.5	34.5
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1971-2000													
Precipitation													
Total	1.70	0.92	0.35	0.50	0.45	0.41	1.09	0.68	1.15	3.30	4.41	1.00	15.96
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	8.9	8.4	10.7	12.1	10.2	8.6	9.4	10.1	8.7	8.0	8.2	7.9	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

KATM ASOS KISA (King Salmon Airport) 2009/10/01 to 2010/09/30



2010 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.	43.7	33.4										42.8	33.4
Max.	50.9	45.0										52.5	52.5
Mean	46.9	40.1										48.5	46.2
# days <32 F	0	0										0	0
% valid obs	56	2	0	0	0	0	0	0	0	0	0	45	9
Maximum air temperature (F)													
Min	46.0	33.4										46.4	33.4
Max	54.7	45.0										53.6	54.7
Mean	49.3	40.3										51.5	48.4
# days <32 F	0	0										0	0
% valid obs	56	2	0	0	0	0	0	0	0	0	0	45	9
Mean air temperature (F)													
Observed	47.9	40.2										50.0	47.2
% valid obs	56	2										45	9
POR mean													
1971-2000													
Precipitation													
Total													
% valid obs													
POR mean													
1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed												15.8	
% valid obs	0	0	0	0	0	0	0	0	0	0	0	45	
Max speed													
Max direction													
Solar radiation (KWh/m2)													
Total													
% valid obs													

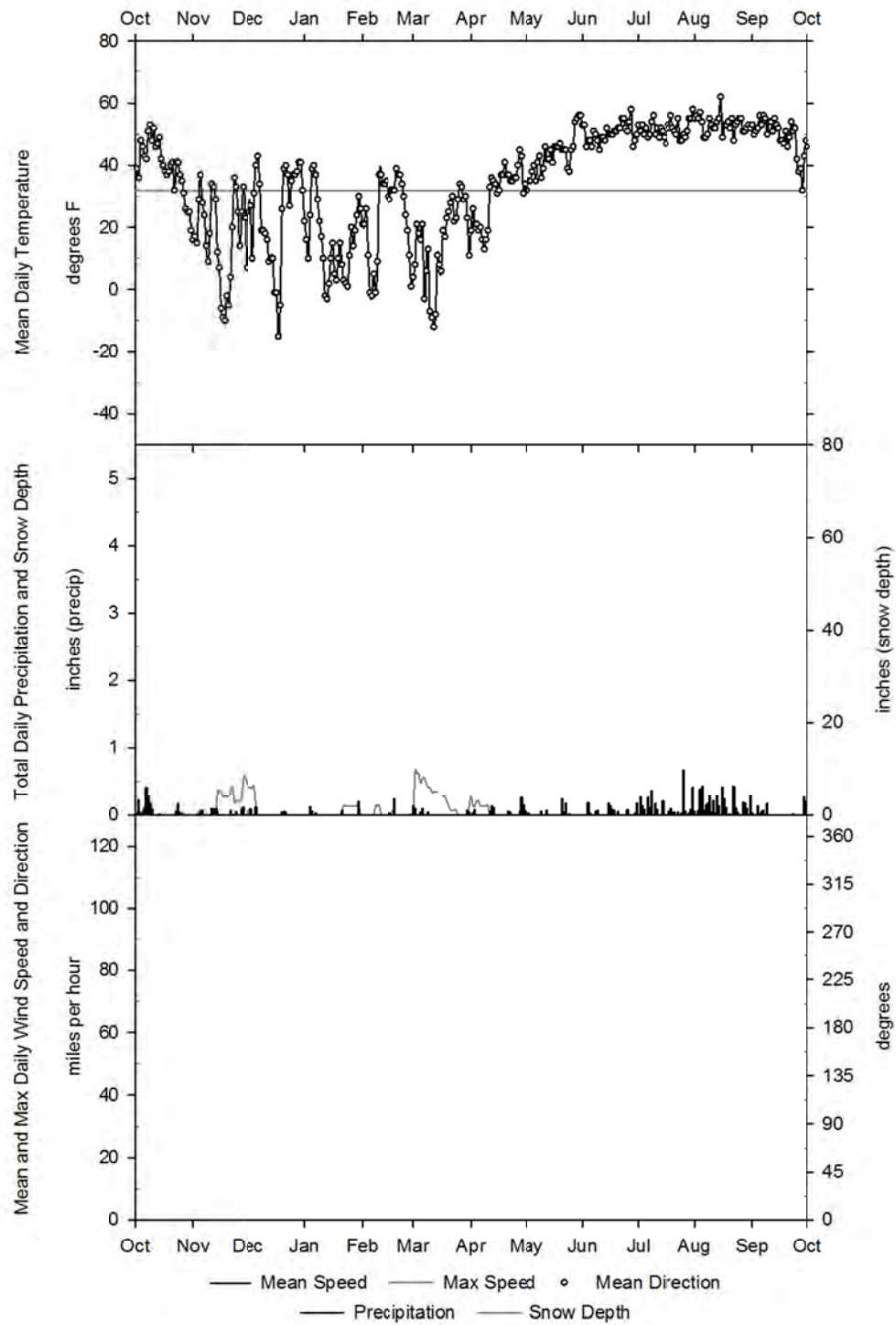
KATM BUOY SHST (Shelikof Strait) 2009/10/01 to 2010/09/30



2010 Hydrologic Year - KATM COOP KISA (King Salmon)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	7	-21	-24	-11	-17	-24	0	22	31	37	37	17	-24
Max.	48	33	40	38	34	25	36	49	47	51	57	53	57
Mean	31.7	7.9	17.1	9.3	15.5	4.8	22.9	33.6	40.9	45.7	46.7	40.0	26.4
# days <32 F	12	28	22	28	26	31	26	14	1	0	0	5	193
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	24	-1	-7	2	1	-1	23	39	50	50	52	46	-7
Max	58	43	46	42	45	43	54	70	73	67	70	70	73
Mean	45.9	26.3	30.6	21.5	29.9	26.2	38.8	53.4	59.5	57.5	59.5	58.3	42.4
# days <32 F	3	17	13	23	11	18	8	0	0	0	0	0	93
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	38.8	17.3	24.0	15.4	22.7	15.6	30.9	43.6	50.4	51.7	53.1	49.2	34.5
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	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
1971-2000	33.3	23.2	17.2	15.4	15.6	23.5	33.1	43.5	50.9	55.7	54.8	47.6	34.5
Precipitation													
Total	1.70	0.97	0.35	0.50	0.46	0.41	1.09	0.69	1.15	3.30	4.42	1.01	16.05
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
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
1971-2000	2.10	1.54	1.39	1.03	0.72	0.79	0.94	1.35	1.70	2.15	2.89	2.81	19.41
Snow depth (in)													
Average	0	3	1	1	0	4	1	0	0	0	0	0	
% valid obs	100	100	100	100	100	94	100	100	100	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

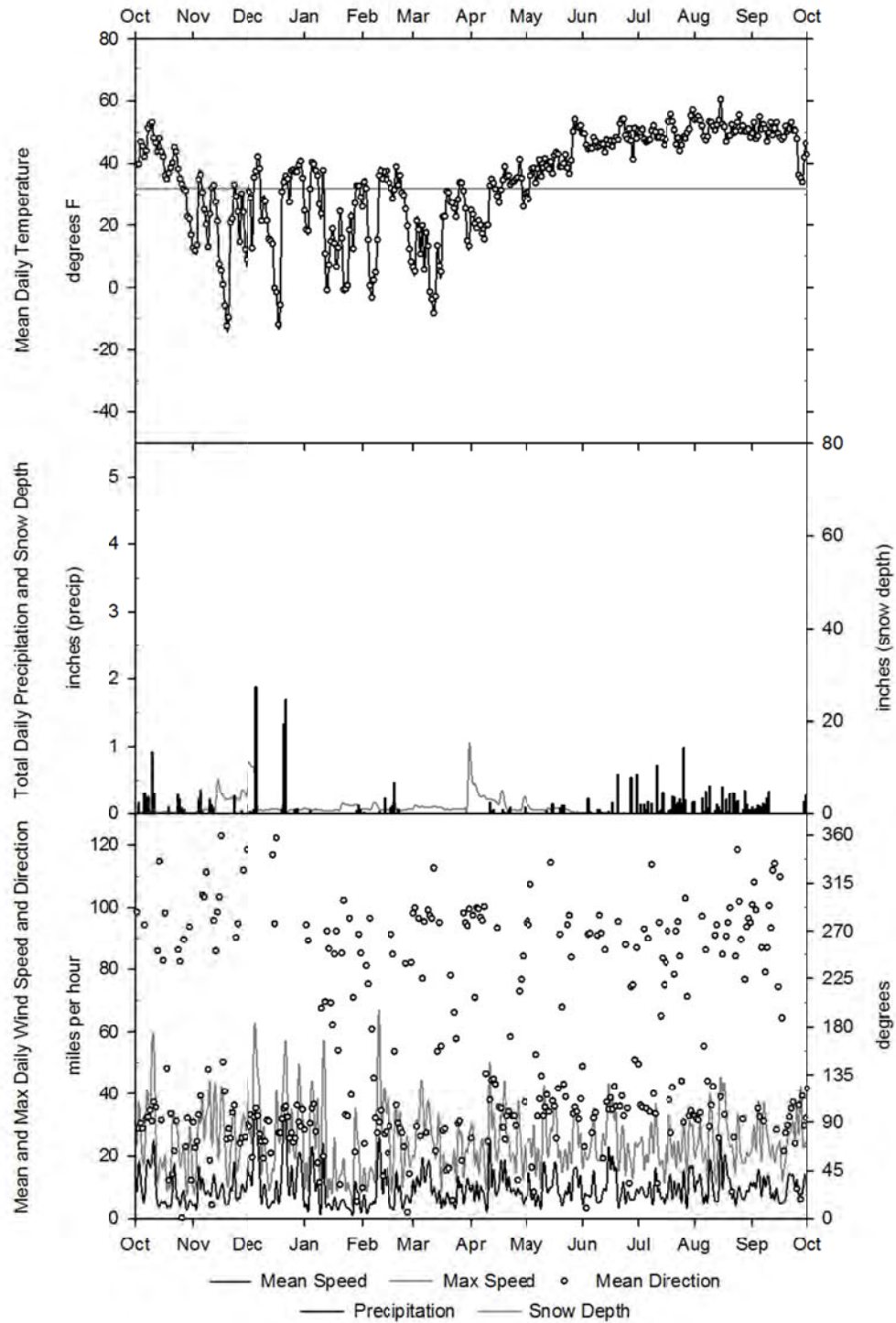
KATM COOP KISA (King Salmon Airport) 2009/10/01 to 2010/09/30



2010 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.	4.3	-19.8	-19.3	-8.3	-12.1	-18.6	-0.6	18.9	27.1	31.1	36.7	16.0	-19.8
Max.	49.8	32.7	39.0	37.6	33.4	26.4	33.6	47.7	46.0	50.5	57.9	51.8	57.9
Mean	32.7	9.5	19.0	12.6	17.0	6.2	21.6	32.3	38.6	43.5	45.2	39.1	26.5
# days <32 F	12	29	22	29	25	31	27	16	3	1	0	4	199
% valid obs	100	98	98	97	100	100	100	100	100	100	100	100	99
Maximum air temperature (F)													
Min	25.7	-4.7	-4.9	4.5	2.7	-1.3	21.9	33.1	46.6	47.3	49.6	46.9	-4.9
Max	57.9	40.3	45.0	42.6	44.2	43.5	50.4	63.5	68.7	68.5	68.5	70.3	70.3
Mean	46.0	26.0	32.8	29.4	31.6	27.8	37.3	49.8	56.6	56.8	58.5	57.7	42.6
# days <32 F	6	25	17	24	16	29	16	2	0	0	0	0	135
% valid obs	100	98	98	97	100	100	100	100	100	100	100	100	99
Mean air temperature (F)													
Observed	38.9	19.0	26.4	20.8	24.5	17.3	29.3	41.0	47.6	49.8	51.5	48.2	34.6
% valid obs	100	98	98	98	100	100	100	100	100	100	100	100	100
POR mean													
1971-2000													
Precipitation													
Total ²	2.76	1.46	5.19	0.28	1.02	0.00	0.59	0.57	2.35	4.57	3.73	2.31	24.83
% valid obs	85	22	55	28	48	22	56	91	99	100	100	96	67
POR mean													
1971-2000													
Snow depth (in)													
Average	0.2	2.9	2.3	1.1	1.1	2.0	2.8	0.9	0.1	0.1	0.1		
% valid obs	73	97	97	98	100	100	100	91	18	1	1	0	
POR mean													
Wind (mph, degrees)													
Mean speed	100.0	98.1	98.0	96.9	98.5	100.0	99.6	99.7	99.0	100.0	99.9	100.0	
% valid obs	100	98	98	97	99	100	100	100	99	100	100	100	
Max speed	56.2	45.4	58.6	55.5	65.5	42.3	50.1	39.4	43.2	36.5	45.4	42.3	65.5
Max direction	104	99	109	64	87	79	123	130	112	126	129	17	87
Solar radiation (KWh/m2)													
Total	39.5	20.0	13.4	15.7	32.0	94.0	130.2	142.2	141.9	96.2	82.2	83.3	890.5
% valid obs	100	99	99	98	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.

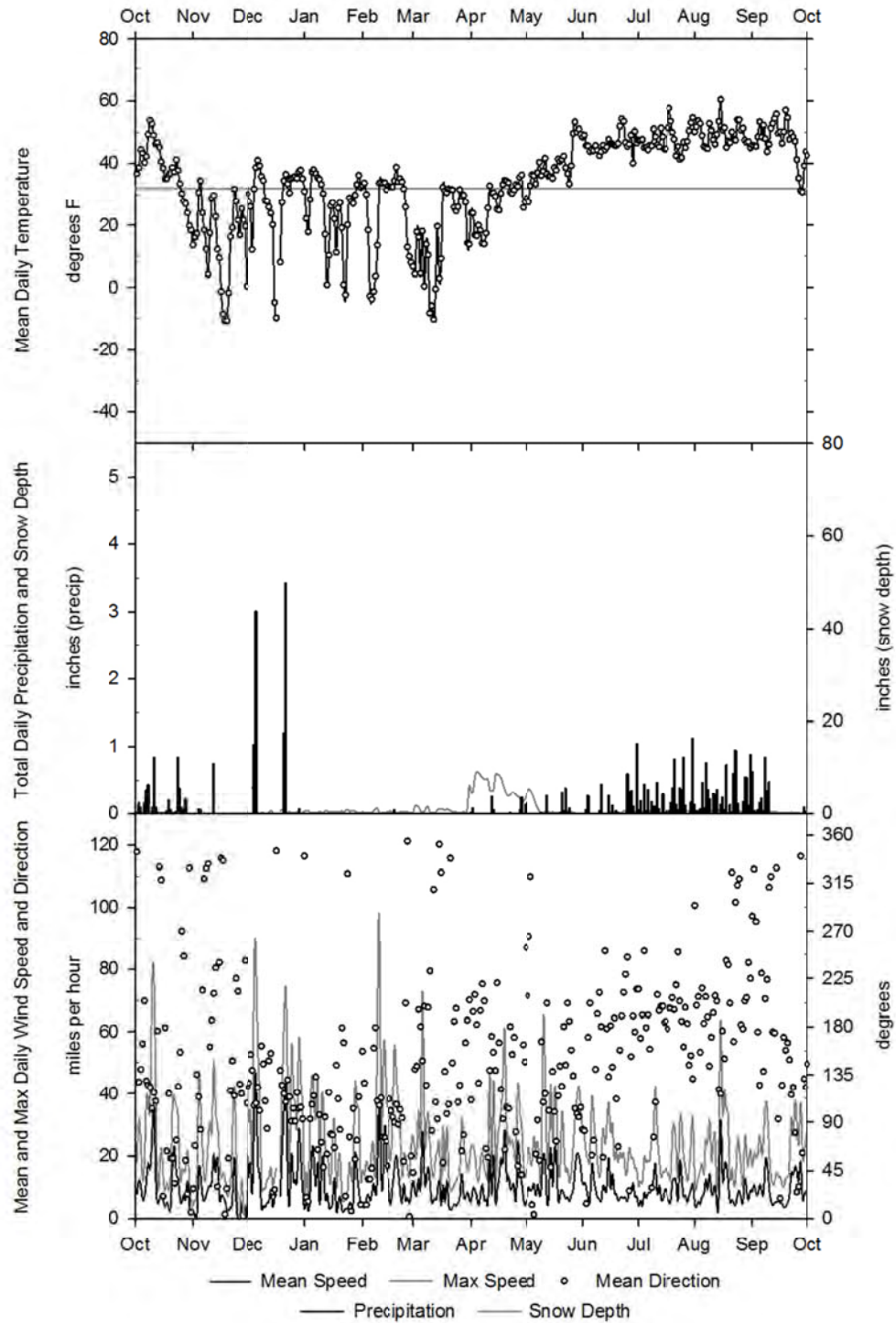
KATM RAWS COCR (Contact Creek) 2009/10/01 to 2010/09/30



2010 Hydrologic Year - KATM RAWs COVI (Coville)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	11.7	-15.0	-16.8	-7.6	-9.0	-16.6	6.8	22.3	32.0	36.1	41.0	19.8	-16.8
Max.	49.8	30.2	37.2	36.0	31.3	27.0	31.6	46.4	44.8	51.3	57.2	50.0	57.2
Mean	33.2	10.2	22.9	18.2	17.8	9.3	21.8	33.3	39.4	43.1	45.1	41.1	28.1
# days <32 F	10	30	20	27	28	31	30	12	0	0	0	4	192
% valid obs	97	75	94	100	100	100	98	100	100	100	100	100	97
Maximum air temperature (F)													
Min	16.0	-6.2	-2.0	7.3	-0.4	-3.5	17.1	31.3	44.8	44.4	46.8	40.5	-6.2
Max	58.3	39.0	45.3	40.3	41.9	41.4	46.4	61.3	64.8	64.2	65.1	66.0	66.0
Mean	42.3	20.8	33.0	31.0	29.1	26.1	33.6	45.3	54.6	53.4	55.1	54.3	40.1
# days <32 F	5	23	11	13	11	18	10	1	0	0	0	0	92
% valid obs	97	75	94	100	100	100	98	100	100	100	100	100	97
Mean air temperature (F)													
Observed	37.7	15.9	28.9	24.7	23.5	17.0	27.2	39.4	46.4	47.7	49.3	47.0	34.2
% valid obs	97	75	94	100	100	100	98	100	100	100	100	100	97
POR mean													
1971-2000													
Precipitation													
Total ²	4.23	0.92	8.75	0.02	0.07	0.02	1.00	1.17	3.46	7.04	8.82	2.44	37.94
% valid obs	79	12	53	39	50	18	40	91	100	100	100	96	65
POR mean													
1971-2000													
Snow depth (in)													
Average			0.9	0.4	0.4	1.2	5.8	1.5	0.3	0.3	0.4	0.3	
% valid obs	0	0	46	80	69	76	98	63	45	78	98	89	
POR mean													
Wind (mph, degrees)													
Mean speed	10.4	9.3	14.9	8.3	11.9	8.8	11.4	11.6	8.9	8.9	9.3	9.4	
% valid obs	97	75	94	100	100	100	98	100	100	100	100	100	
Max speed	78.3	50.8	85.2	45.9	94.9	72.9	60.4	63.3	38.9	42.3	63.8	37.6	94.9
Max direction	89	101	113	84	81	141	138	112	156	181	198	143	81
Solar radiation (KWh/m2)													
Total	33.9	11.7	8.2	12.6	28.8	79.5	112.7	146.6	133.5	93.4	74.1	76.1	811.3
% valid obs	97	76	94	100	100	100	98	100	100	100	100	100	97

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.

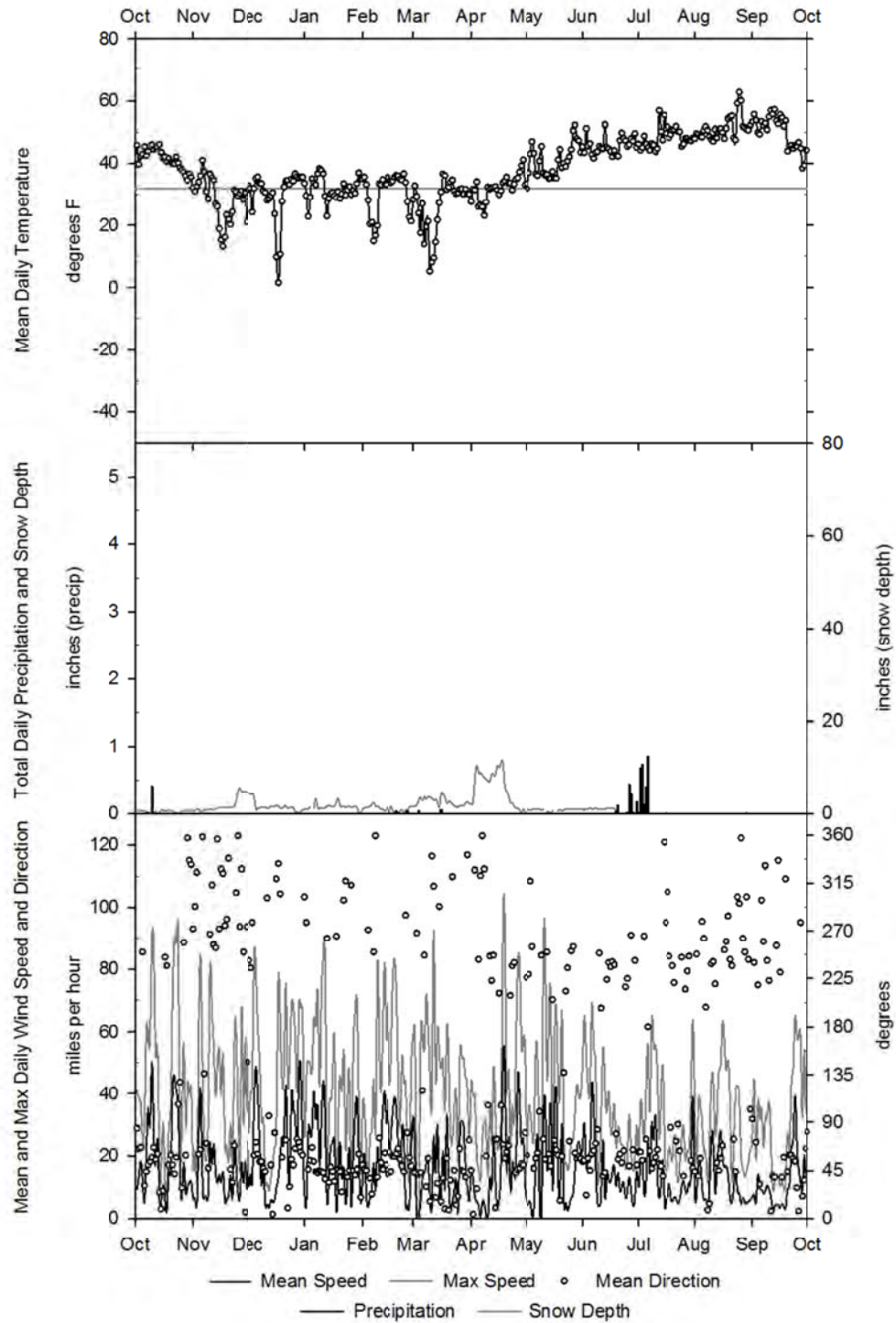
KATM RAWS COVI (Coville Lake) 2009/10/01 to 2010/09/30



2010 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	7.9	-3.5	20.8	10.6	0.0	16.9	29.7	38.5	42.4	45.1	35.6	-3.5
Max.	45.5	36.0	35.2	36.0	33.8	32.4	37.9	45.5	46.0	48.9	57.6	53.8	57.6
Mean	39.0	23.9	26.5	28.6	26.8	21.9	28.7	38.8	42.2	45.0	48.1	45.8	34.5
# days <32 F	1	27	21	24	19	29	23	1	0	0	0	0	145
% valid obs	99	99	97	100	98	94	96	100	100	100	100	100	98
Maximum air temperature (F)													
Min	36.7	18.1	6.1	25.3	19.8	12.6	28.4	36.5	43.5	45.1	48.7	42.8	6.1
Max	52.5	45.5	40.3	43.0	39.4	42.6	44.1	59.0	59.2	66.6	67.1	64.2	67.1
Mean	44.3	32.6	32.9	34.7	33.6	31.3	37.0	45.5	50.6	52.5	55.7	54.4	42.1
# days <32 F	0	15	8	6	8	9	2	0	0	0	0	0	48
% valid obs	99	99	97	100	98	94	96	100	100	100	100	100	98
Mean air temperature (F)													
Observed	41.2	28.2	29.9	31.6	30.0	26.1	32.3	40.8	45.7	48.2	51.4	49.7	38.1
% valid obs	99	99	97	100	98	94	96	100	100	100	100	100	98
POR mean 1971-2000													
Precipitation													
Total ²	0.45	0.00	0.00	0.00	0.10	0.11			1.12	2.80		0.00	4.58
% valid obs	94	40	64	59	62	6	0	0	42	14	0	92	39
POR mean 1971-2000													
Snow depth (in)													
Average	0.4	2.0	1.6	1.4	1.2	2.6	6.3	0.9	0.6	0.0	0.0	0.0	
% valid obs	97	97	83	89	70	92	78	73	96	82	79	75	
POR mean													
Wind (mph, degrees)													
Mean speed	18.6	14.2	21.9	21.0	21.4	14.4	15.7	15.9	14.4	13.4	11.8	11.4	
% valid obs	99	99	97	100	98	94	96	100	100	100	100	100	
Max speed	90.8	84.3	83.4	84.1	83.4	92.6	95.5	89.0	69.1	63.8	63.3	64.7	95.5
Max direction	53	63	82	41	63	295	71	65	70	50	55	57	71
Solar radiation (KWh/m2)													
Total	31.5	17.4	6.7	10.9	22.2	69.3	100.0	131.3	128.1	99.2	96.5	87.2	800.3
% valid obs	99	99	97	100	98	94	96	100	100	100	100	100	98

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.

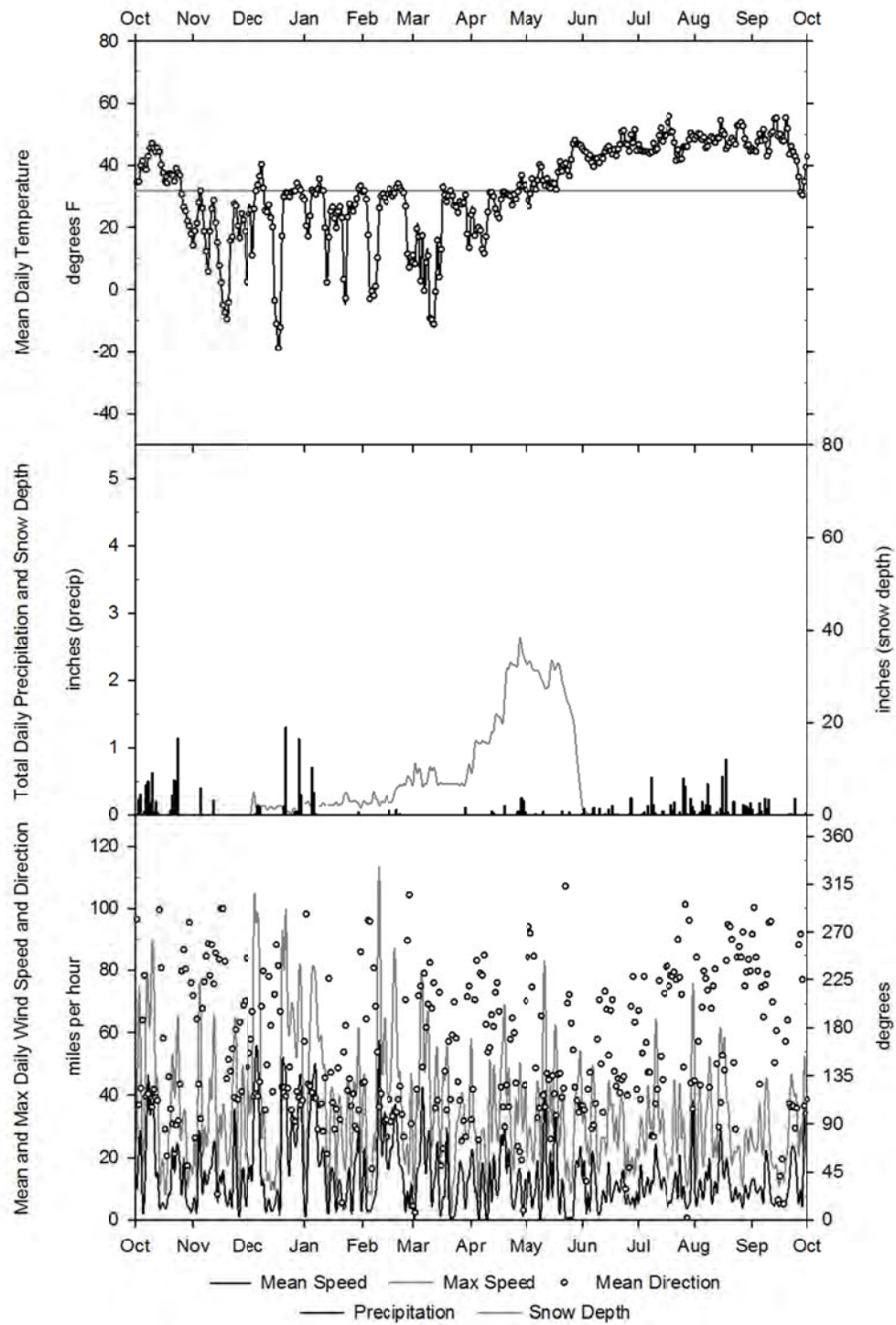
KATM RAWS FOUR (Fourpeaked) 2009/10/01 to 2010/09/30



2010 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.	12.2	-12.6	-21.5	-7.4	-9.8	-15.7	7.7	21.9	32.0	36.0	41.4	21.6	-21.5
Max.	45.1	28.9	33.3	32.5	31.6	27.5	31.8	43.0	45.1	47.1	49.5	48.0	49.5
Mean	32.3	9.7	18.9	18.6	17.0	9.4	21.1	32.0	38.8	42.2	44.3	40.2	27.1
# days <32 F	12	30	29	30	28	31	30	16	0	0	0	3	209
% valid obs	100	99	100	100	100	99	99	100	100	100	100	100	100
Maximum air temperature (F)													
Min	17.1	-6.3	-16.4	10.8	3.6	-6.9	16.7	33.1	42.8	44.4	47.1	37.0	-16.4
Max	50.4	36.7	47.7	40.8	39.0	47.3	53.2	62.8	63.7	67.3	61.7	67.3	67.3
Mean	39.4	21.1	28.6	29.5	26.8	25.7	35.5	47.2	52.0	53.4	54.4	52.2	38.9
# days <32 F	5	25	15	20	15	20	8	0	0	0	0	0	108
% valid obs	100	99	100	100	100	99	99	100	100	100	100	100	100
Mean air temperature (F)													
Observed	35.7	15.8	23.6	24.2	21.9	16.7	26.8	37.7	45.0	47.1	48.7	45.6	32.5
% valid obs	100	99	100	100	100	99	99	100	100	100	100	100	100
POR mean													
1971-2000													
Precipitation													
Total ²	5.19	0.62	3.27	1.13	0.20	0.11	0.86	0.24	0.86	2.91	3.63	1.23	20.24
% valid obs	76	7	34	28	34	12	39	90	100	99	100	97	60
POR mean													
1971-2000													
Snow depth (in)													
Average	0.0	0.0	1.6	2.8	4.5	7.8	24.0	25.8	0.1	0.0	0.0	0.0	
% valid obs	100	99	62	60	89	98	98	93	96	72	79	83	
POR mean													
Wind (mph, degrees)													
Mean speed	15.6	13.3	22.2	16.6	17.4	13.8	12.2	12.2	9.1	12.0	11.3	11.7	
% valid obs	100	99	100	100	100	99	99	100	100	100	100	100	
Max speed	87.0	69.4	100.9	81.2	112.3	77.0	68.0	73.3	46.1	75.2	61.1	51.5	112.3
Max direction	93	90	123	115	103	132	77	106	102	103	100	104	103
Solar radiation (kWh/m2)													
Total	31.5	13.3	8.1	13.1	30.9	84.4	128.5	163.4	162.7	110.9	86.5	77.0	930.3
% valid obs	100	99	100	100	100	99	99	100	100	100	100	100	100

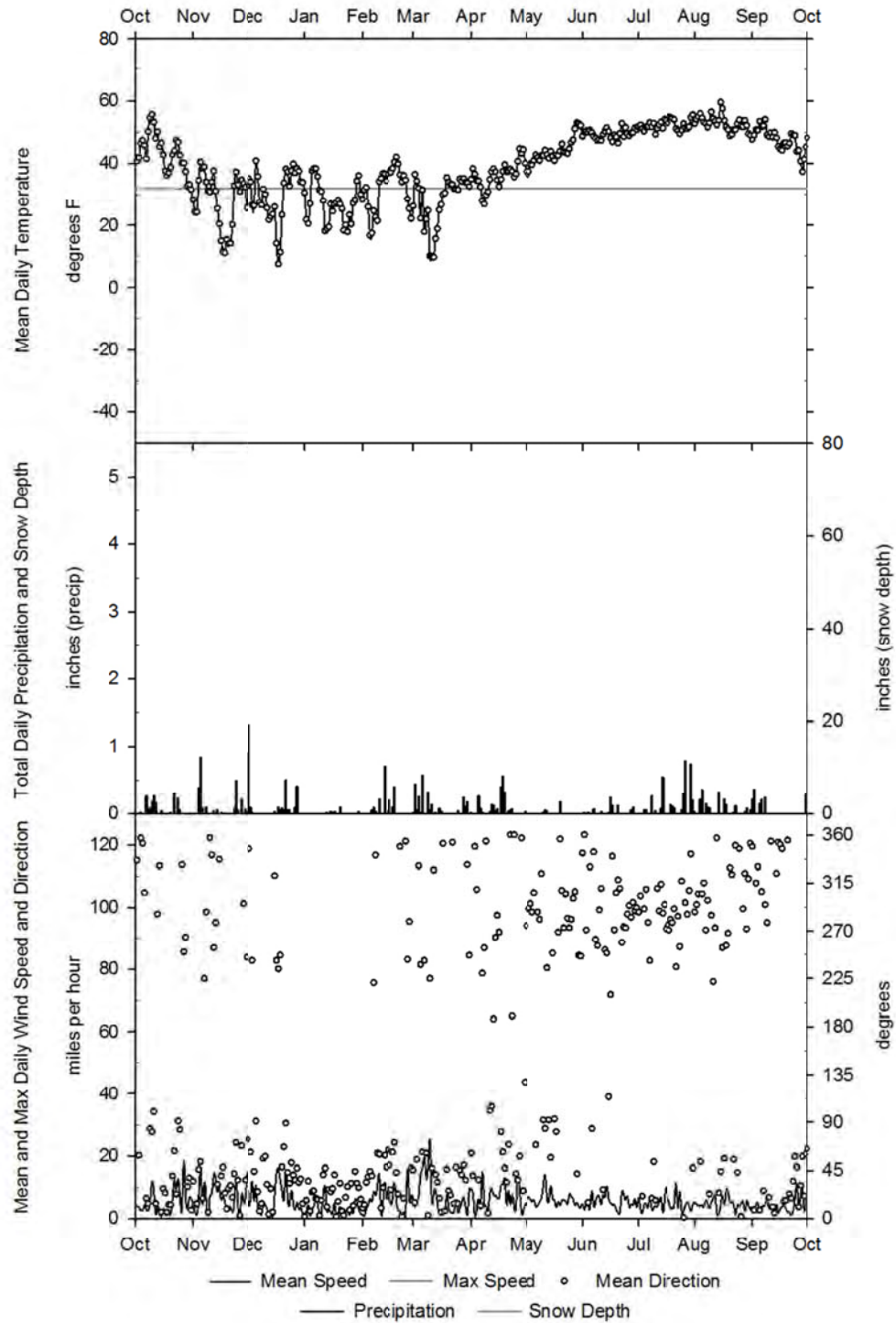
²Station is only capable of measuring liquid precipitation. Precipitation reported when maximum air temperature is below 31.1 °F is not considered valid and these data are not used for summarizing purposes. The water equivalent of solid precipitation (e.g. snowfall) is not measured and this is reflected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

KATM RAWS PFMI (Pfaff Mine) 2009/10/01 to 2010/09/30



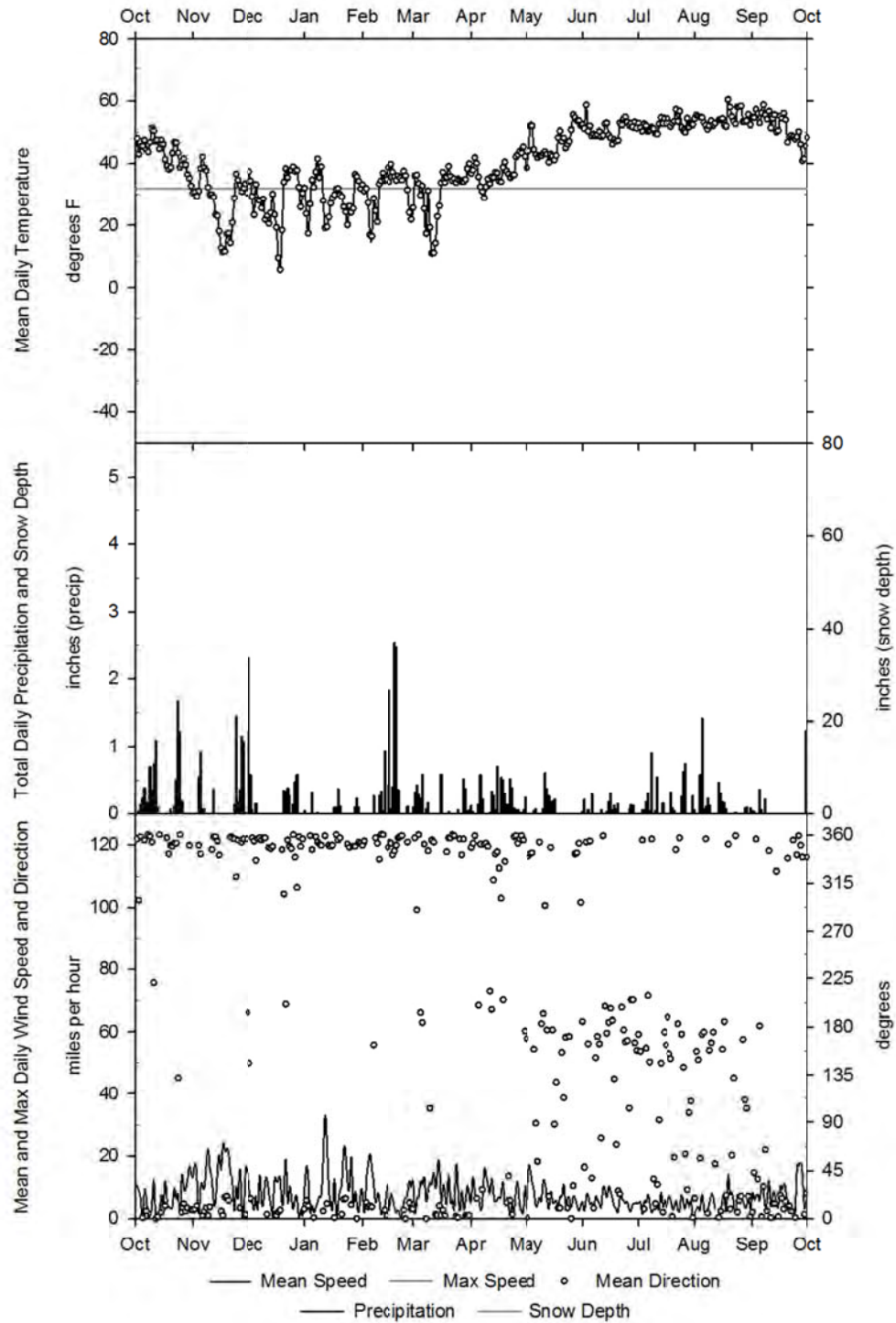
2010 Hydrologic Year - KEFJ ASOS HOAI (Homer Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	22	4	2	12	9	0	19	28	38	39	38	28	0
Max.	51	37	37	35	38	32	38	46	47	52	54	49	54
Mean	37.1	21.9	24.4	21.6	26.8	22.2	30.9	33.6	43.7	47.4	47.1	40.7	33.4
# days <32 F	10	24	22	28	17	30	13	5	0	0	0	2	151
% valid obs	100	100	100	100	100	100	100	100	99	100	100	100	100
Maximum air temperature (F)													
Min	33	15	10	22	20	15	30	40	49	53	52	46	10
Max	59	44	45	42	46	41	51	67	60	62	67	63	67
Mean	47.8	32.7	34.1	31.9	36.0	33.3	40.9	50.0	54.0	56.5	57.8	53.8	44.1
# days <32 F	0	10	9	16	8	9	2	0	0	0	0	0	54
% valid obs	100	100	100	100	100	100	100	100	99	100	100	100	100
Mean air temperature (F)													
Observed	42.7	27.9	29.7	26.9	31.6	27.9	36.3	43.9	49.5	52.2	52.7	47.4	39.1
% valid obs	100	100	100	100	100	100	100	100	99	100	100	100	100
POR mean													
1971-2000													
Precipitation													
Total	1.70	3.40	2.89	0.23	1.88	2.61	2.25	0.31	0.81	3.47	2.12	1.39	23.06
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	5.3	7.0	6.0	3.1	6.3	7.2	6.6	6.1	5.4	4.8	4.7	4.3	
% valid obs	100	100	100	100	100	100	100	100	99	99	100	100	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

KEFJ ASOS HOAI (Homer Airport) 2009/10/01 to 2010/09/30



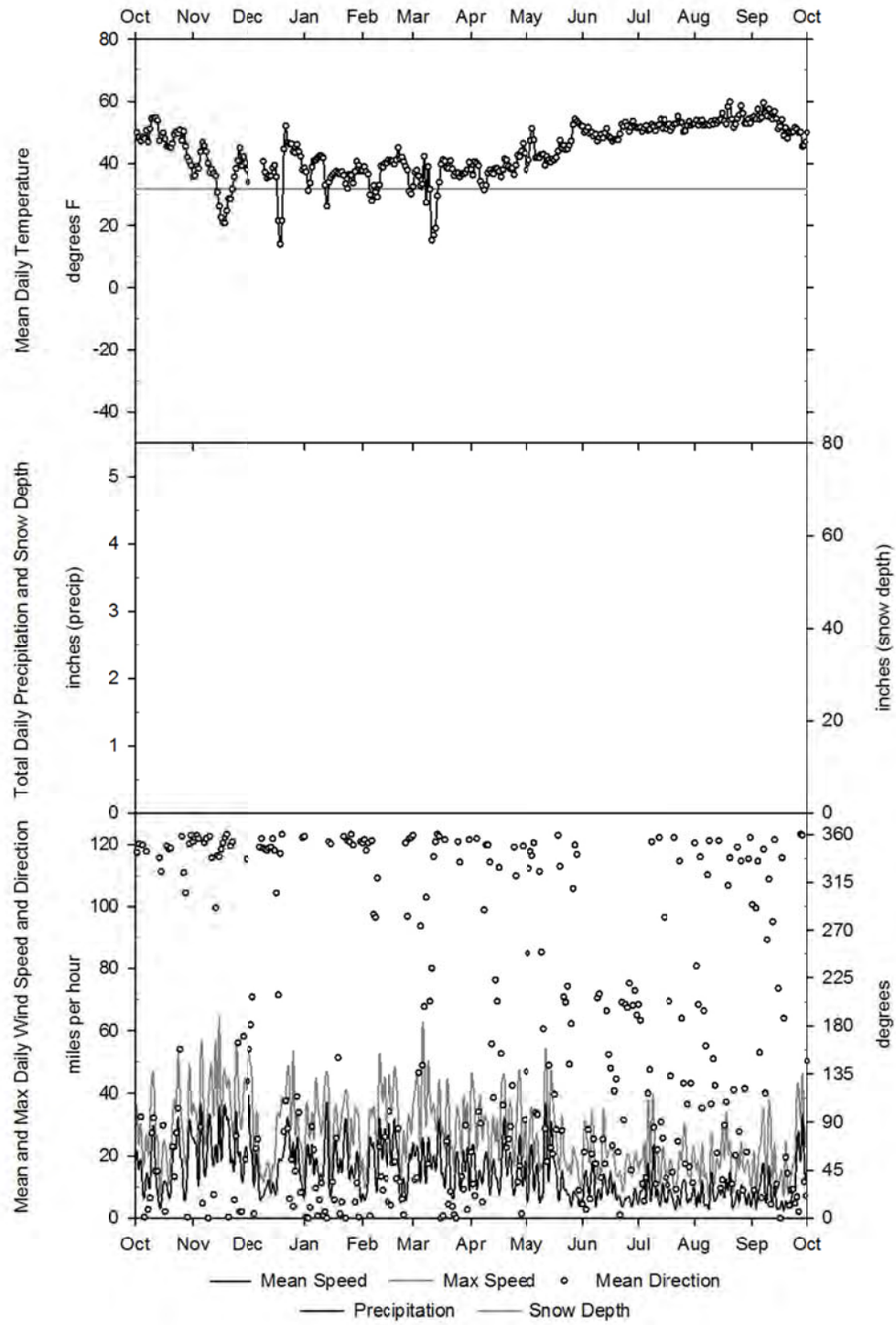
2010 Hydrologic Year - KEFJ ASOS SEAL (Seward Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	28	10	2	15	14	5	21	31	38	40	44	30	2
Max.	48	37	35	34	36	36	41	47	50	51	53	52	53
Mean	38.9	23.7	23.5	25.1	26.5	25.5	32.2	39.1	45.6	48.1	49.4	44.4	35.2
# days <32 F	3	24	23	26	20	23	11	2	0	0	0	2	134
% valid obs	100	100	100	100	100	100	99	100	100	100	92	100	99
Maximum air temperature (F)													
Min	34	13	8	20	20	15	33	44	49	52	54	47	8
Max	56	46	44	46	45	48	51	66	72	67	74	72	74
Mean	47.3	31.7	32.9	33.0	36.1	36.3	42.7	53.0	55.6	56.5	59.5	59.2	45.3
# days <32 F	0	10	12	13	7	8	0	0	0	0	0	0	50
% valid obs	100	100	100	100	100	100	99	100	100	100	92	100	99
Mean air temperature (F)													
Observed	42.9	27.7	28.4	29.1	31.2	30.7	37.3	43.6	50.9	52.4	54.2	51.4	40.2
% valid obs	100	100	100	100	100	100	99	100	100	100	92	100	99
POR mean 1971-2000													
Precipitation													
Total	7.84	7.54	5.68	1.45	10.11	3.86	5.34	1.96	1.86	4.71	4.03	2.87	57.25
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean 1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	7.0	13.1	7.6	10.2	7.4	8.9	7.4	7.0	5.6	4.4	5.2	7.8	
% valid obs	100	100	100	100	100	100	100	100	100	100	92	100	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

KEFJ ASOS SEAI (Seward Airport) 2009/10/01 to 2010/09/30



2010 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.	33.6	18.9	12.2	23.9	25.5	13.8	29.7	35.1	46.0	48.2	50.2	42.1	12.2
Max.	53.4	43.9	49.1	39.7	43.2	39.6	43.2	50.5	51.3	52.2	55.9	56.8	56.8
Mean	45.7	32.7	35.8	34.1	34.4	31.1	35.8	43.2	48.3	50.3	52.2	49.7	41.3
# days <32 F	0	9	3	7	9	10	1	0	0	0	0	0	39
% valid obs	100	99	72	99	100	100	100	100	100	100	100	100	97
Maximum air temperature (F)													
Min	38.3	22.8	17.1	30.9	29.8	17.8	33.6	42.3	48.0	51.3	54.0	47.8	17.1
Max	57.2	51.4	58.5	46.2	47.8	51.1	48.6	59.4	61.5	62.4	64.2	62.4	64.2
Mean	51.0	39.4	42.2	39.9	40.0	39.6	41.7	43.5	52.8	55.2	56.7	55.7	47.1
# days <32 F	0	6	2	1	1	3	0	0	0	0	0	0	13
% valid obs	100	99	72	99	100	100	100	100	100	100	100	100	97
Mean air temperature (F)													
Observed	47.9	35.7	38.6	36.9	37.1	34.9	38.5	45.4	50.0	52.1	54.0	52.4	43.8
% valid obs	100	99	72	99	100	100	100	100	100	100	100	100	97
POR mean 1971-2000													
Precipitation													
Total													
% valid obs													
POR mean 1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	15.9	23.1	16.5	17.7	18.5	17.4	15.7	12.3	8.7	8.5	7.4	10.9	
% valid obs	100	100	100	99	100	100	100	100	100	100	100	100	
Max speed	52.8	64.4	53.7	46.8	51.5	60.8	46.8	51.0	34.2	37.6	34.2	46.3	64.4
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

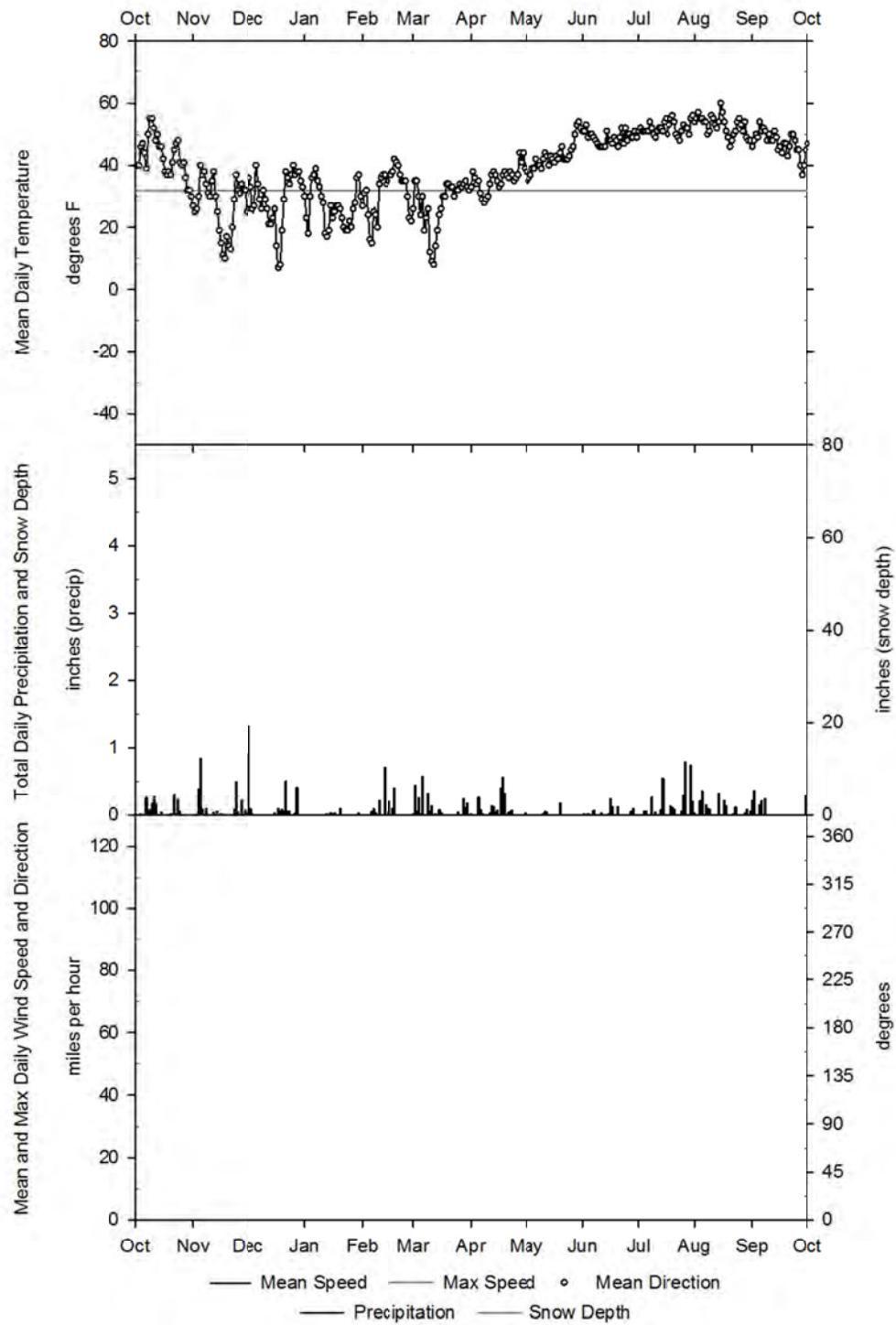
KEFJ CMAN PIRO (Pilot Rock) 2009/10/01 to 2010/09/30



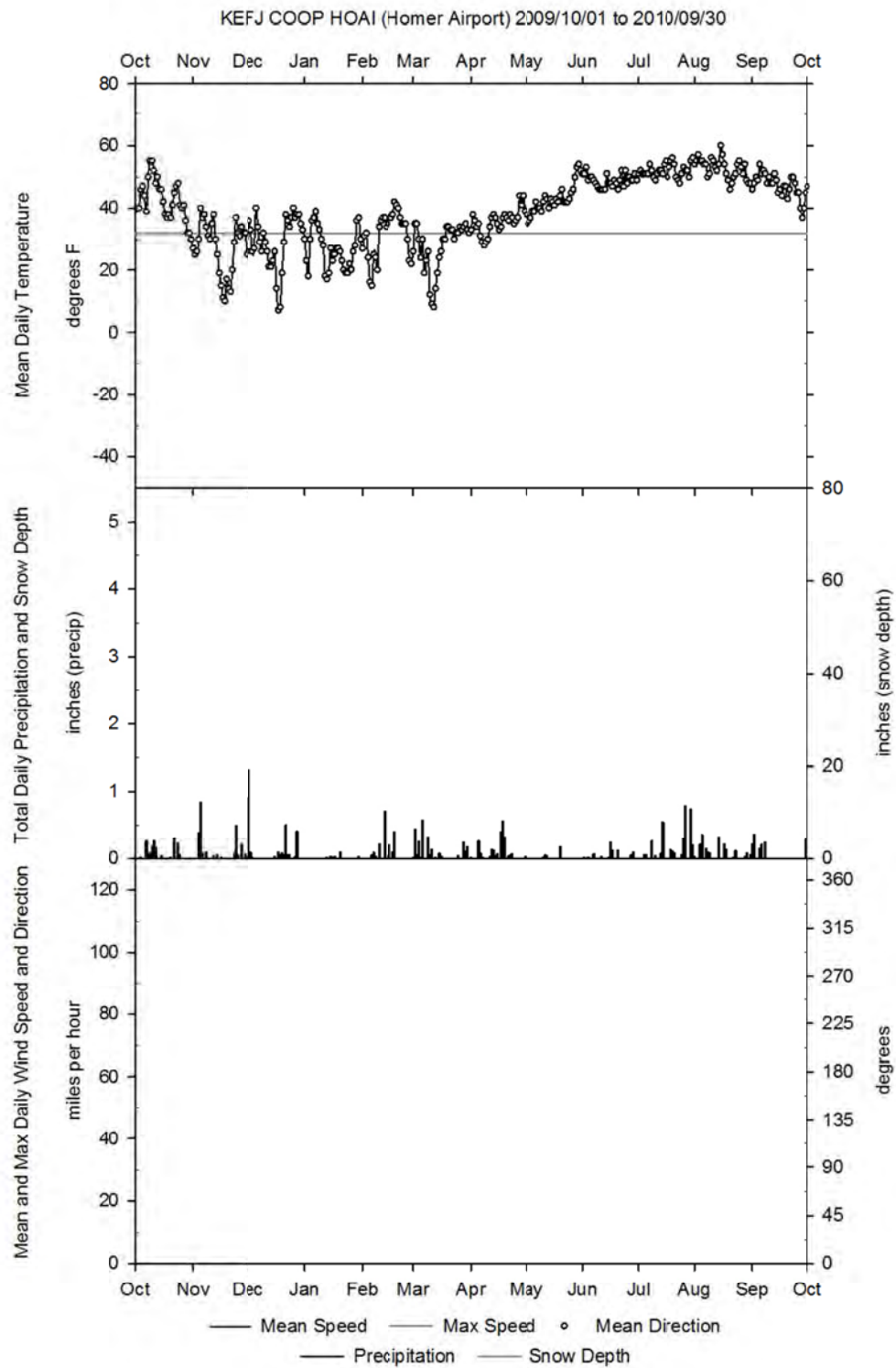
2010 Hydrologic Year - KEFJ COOP HOAI (Homer Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	20.0	3.0	0.0	10.0	8.0	-1.0	19.0	23.0	36.0	36.0	36.0	28.0	-1.0
Max.	51.0	37.0	36.0	35.0	37.0	31.0	37.0	43.0	47.0	51.0	53.0	48.0	53.0
Mean	36.3	21.0	23.4	20.5	26.1	21.2	30.0	35.7	42.8	46.5	46.3	39.8	32.5
# days <32 F	11	24	23	29	20	31	16	6	0	0	0	3	163
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	33.0	15.0	11.0	22.0	20.0	16.0	31.0	40.0	49.0	53.0	52.0	46.0	11.0
Max	59.0	44.0	45.0	43.0	46.0	42.0	51.0	67.0	61.0	63.0	68.0	63.0	68.0
Mean	48.4	33.2	34.7	32.6	36.5	33.8	41.5	50.6	54.8	57.4	58.4	54.4	44.8
# days <32 F	0	10	9	14	8	9	1	0	0	0	0	0	51
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	42.3	27.2	29.1	26.6	31.4	27.6	35.8	43.1	48.8	52.1	52.4	47.1	38.7
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
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
1971-2000	37.8	29.4	25.8	23.4	24.9	29.4	36.4	43.7	50.0	54.1	53.8	47.9	38.1
Precipitation													
Total	1.70	3.41	2.83	0.24	1.88	2.62	2.26	0.31	0.81	3.47	2.12	1.39	23.04
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean ¹	3.13	2.76	2.8	2.23	1.74	1.55	1.2	0.98	0.96	1.57	2.46	3.03	24.42
1971-2000	2.77	2.87	3	2.61	2.04	1.82	1.21	1.07	0.96	1.45	2.28	3.37	25.45
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

KEFJ COOP HOAI (Homer Airport) 2009/10/01 to 2010/09/30

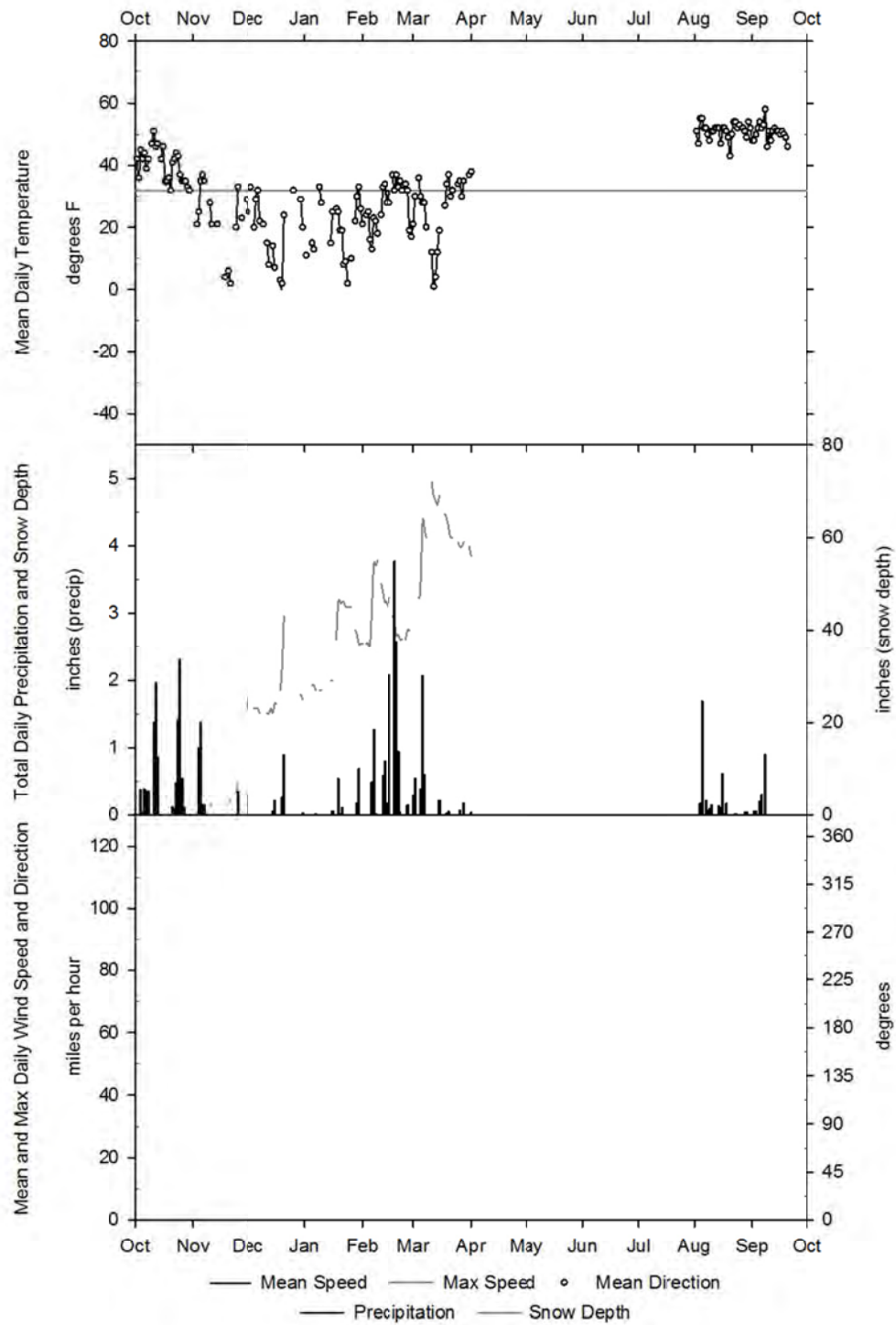


2010 Hydrologic Year - KEFJ COOP S8NW (Seward 8 NW)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	18	-13	-16	-9	2	-14					19	27	-16
Max.	46	32	26	28	31	31					50	49	50
Mean	32.0	13.3	7.4	8.2	18.5	15.5					39.6	34.6	22.7
# days <32 F	13	14	18	21	24	22					3	8	123
% valid obs	87	53	58	68	86	71	0	0	0	0	97	63	49
Maximum air temperature (F)													
Min	39	11	15	9	18	17					55	61	9
Max	56	41	40	43	47	46					71	73	73
Mean	47.9	32.3	31.1	30.7	35.6	38.1					62.6	66.6	44.6
# days <32 F	0	4	7	8	6	4					0	0	29
% valid obs	87	53	52	68	86	71	0	0	0	0	100	63	48
Mean air temperature (F)													
Observed	40.1	22.8	19.4	19.5	27.0	26.8					51.0	50.7	33.8
% valid obs	87	53	52	68	86	71	0	0	0	0	97	63	48
POR mean													
1971-2000													
Precipitation													
Total	10.52	3.30	1.47	1.62	13.38	4.20					3.64	1.50	39.63
% valid obs	94	53	52	61	79	55	0	0	0	0	100	100	49
POR mean													
1971-2000													
Snow depth (in)													
Average	0.0	6.0	25.0	37.0	44.0	60.0					0.0	0.0	
% valid obs	100	57	58	71	79	71	0	0	0	0	100	100	
POR mean													
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (KWh/m2)													
Total													
% valid obs													



2010 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.	18	-13	-16	-9	2	-14					19	27	-16
Max.	46	32	26	28	31	31					50	49	50
Mean	32.0	13.3	7.4	8.2	18.5	15.5					39.6	34.6	22.7
# days <32 F	13	14	18	21	24	22					3	8	123
% valid obs	87	53	58	68	86	71	0	0	0	0	97	63	49
Maximum air temperature (F)													
Min	39	11	15	9	18	17					55	61	9
Max	56	41	40	43	47	46					71	73	73
Mean	47.9	32.3	31.1	30.7	35.6	38.1					62.6	66.6	44.6
# days <32 F	0	4	7	8	6	4					0	0	29
% valid obs	87	53	52	68	86	71	0	0	0	0	100	63	48
Mean air temperature (F)													
Observed	40.1	22.8	19.4	19.5	27.0	26.8					51.0	50.7	33.8
% valid obs	87	53	52	68	86	71	0	0	0	0	97	63	48
POR mean													
1971-2000													
Precipitation													
Total	10.52	3.30	1.47	1.62	13.38	4.20					3.64	1.50	39.63
% valid obs	94	53	52	61	79	55	0	0	0	0	100	100	49
POR mean													
1971-2000													
Snow depth (in)													
Average	0.0	6.0	25.0	37.0	44.0	60.0					0.0	0.0	
% valid obs	100	57	58	71	79	71	0	0	0	0	100	100	
POR mean													
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (KWh/m2)													
Total													
% valid obs													

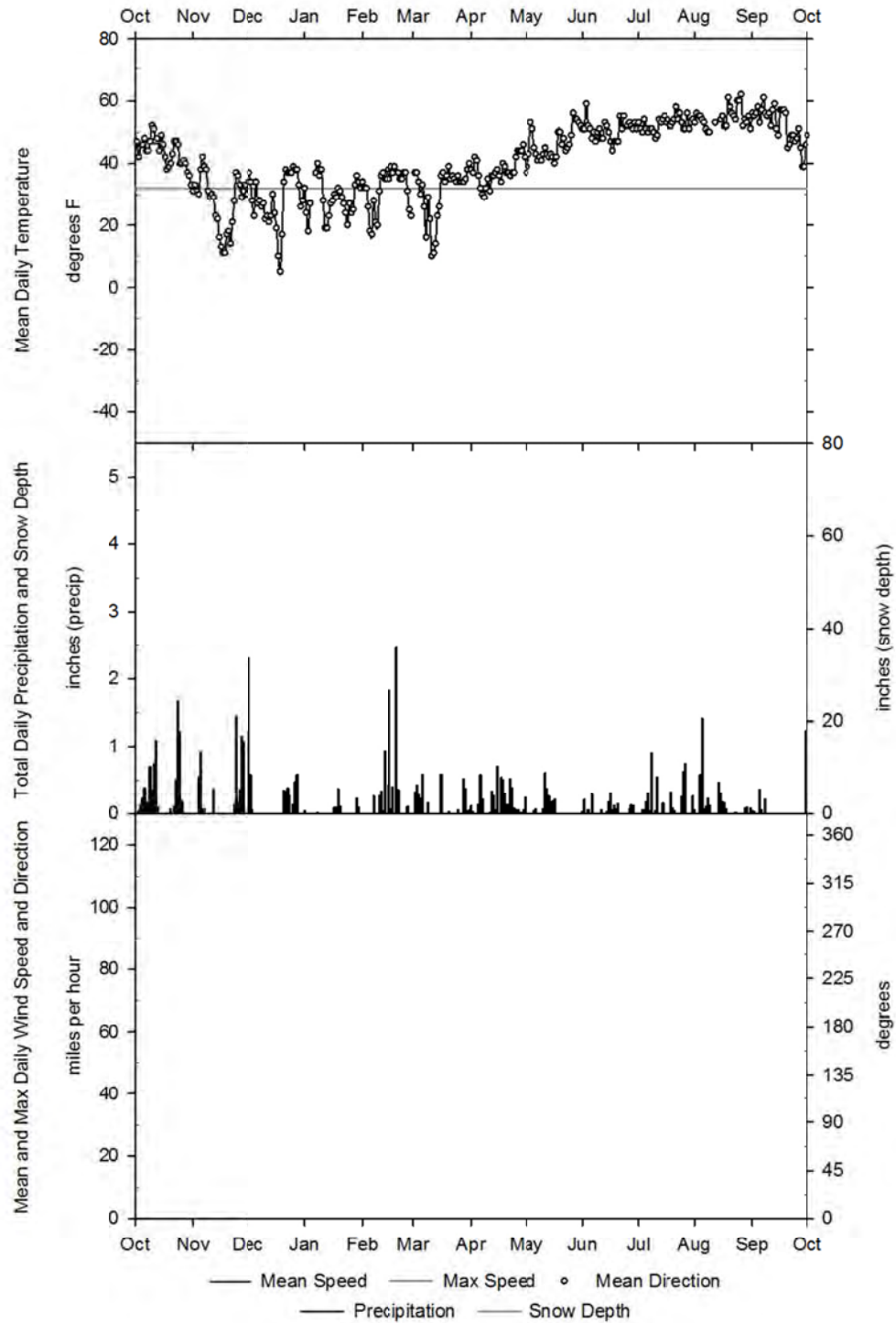
KEFJ COOP S8NW (Seward 8NW) 2009/10/01 to 2010/09/30



2010 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	9	1	15	13	4	21	30	38	39	44	30	1
Max.	47	37	34	33	35	36	41	46	50	51	53	52	53
Mean	38.6	23.1	22.9	24.2	26.2	24.9	31.7	33.6	45.2	47.7	48.7	43.9	34.6
# days <32 F	4	24	24	25	19	24	13	3	0	0	0	2	138
% valid obs	100	100	100	94	96	100	100	100	97	100	87	100	98
Maximum air temperature (F)													
Min	35	14	8	20	21	15	33	45	49	52	53	47	8
Max	57	47	44	47	46	48	52	66	73	67	75	73	75
Mean	47.9	32.1	33.3	33.2	36.7	37.0	43.2	53.8	56.1	57.2	60.6	60.0	45.9
# days <32 F	0	10	10	11	6	5	0	0	0	0	0	0	42
% valid obs	100	100	100	94	93	100	100	100	97	100	87	100	98
Mean air temperature (F)													
Observed	43.3	27.6	28.2	28.7	31.4	30.9	37.5	43.3	50.6	52.5	54.7	51.8	40.3
% valid obs	100	100	100	94	93	100	100	100	97	100	87	100	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
1971-2000	39.8	31.7	28.1	26.2	27.2	32	38.6	45.8	52.1	56.4	55.9	49.6	40.3
Precipitation													
Total	7.85	7.53	5.53	1.02	7.47	3.79	5.34	1.96	1.87	4.72	4.03	2.86	53.96
% valid obs	100	100	94	87	89	97	100	97	97	100	97	97	96
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
1971-2000	9.81	7.15	7.84	7.19	5.82	4.14	4.71	4.75	2.32	2.24	5.49	10.36	71.82
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

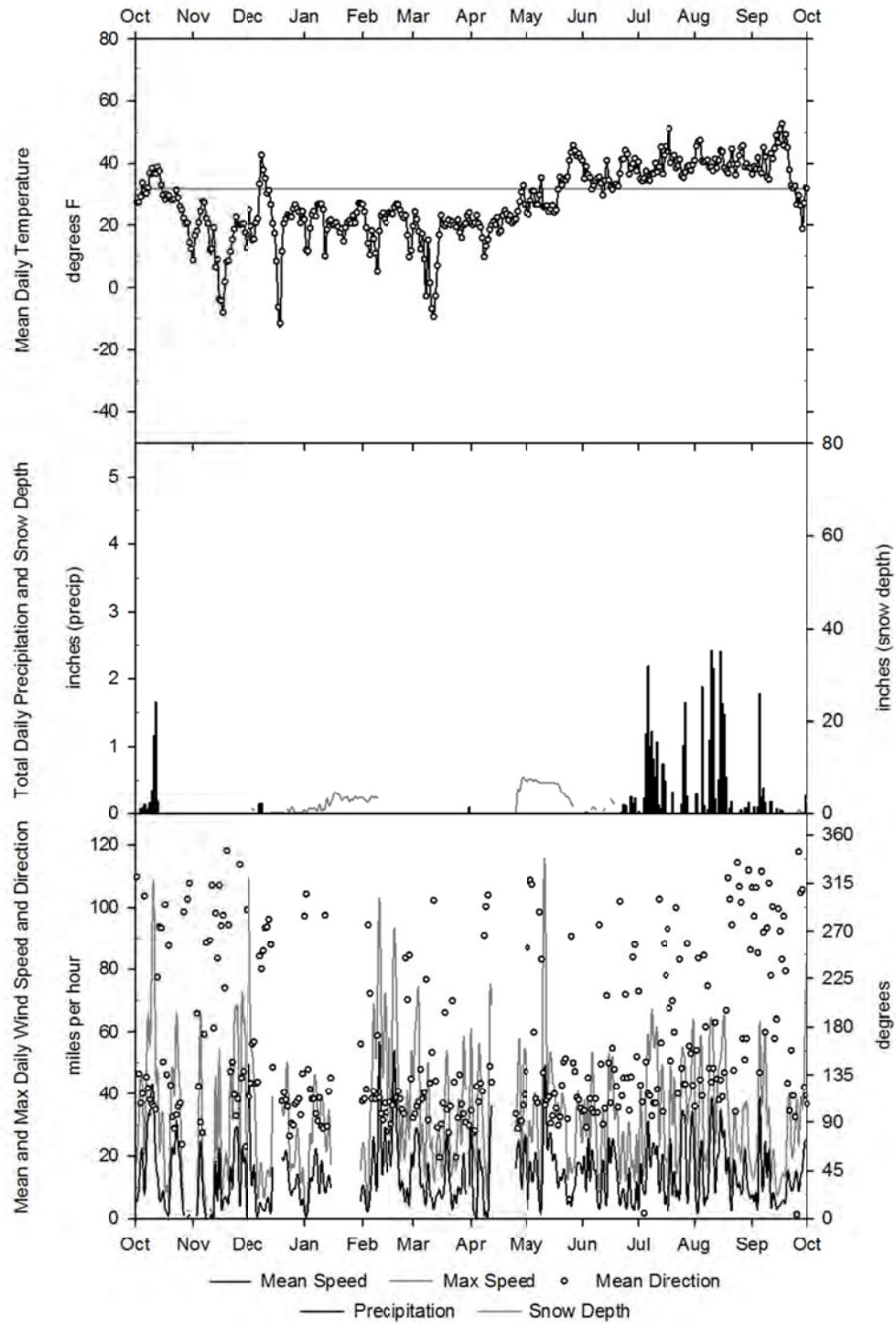
KEFJ COOP SEWA (Seward) 2009/10/01 to 2010/09/30



2010 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.	6.6	-10.3	-15.9	-1.1	0.9	-12.5	5.7	13.5	27.9	32.4	34.2	13.8	-15.9
Max.	36.3	25.7	39.0	25.3	24.4	22.6	29.3	40.5	37.6	42.4	42.8	46.4	46.4
Mean	25.8	10.6	17.5	17.6	16.0	10.5	17.8	27.8	32.8	35.5	37.3	34.2	23.7
# days <32 F	25	30	28	31	28	31	30	23	14	0	0	11	251
% valid obs	100	100	100	100	100	100	99	100	92	100	100	100	99
Maximum air temperature (F)													
Min	11.7	-5.4	-4.2	16.7	10.6	-3.8	16.9	25.1	31.6	36.3	38.1	27.1	-5.4
Max	45.5	29.7	45.5	31.8	29.7	33.6	37.4	59.5	55.2	57.9	54.9	63.1	63.1
Mean	31.9	18.7	25.5	24.3	23.4	20.4	26.5	39.1	43.0	44.2	45.5	43.5	32.2
# days <32 F	14	30	24	31	28	30	26	10	1	0	0	4	198
% valid obs	100	100	100	100	100	100	99	100	92	100	100	100	99
Mean air temperature (F)													
Observed	28.4	14.5	21.7	21.0	19.6	15.1	21.3	32.6	36.6	39.2	40.8	38.3	27.4
% valid obs	100	100	100	100	100	100	99	100	92	100	100	100	99
POR mean 1971-2000													
Precipitation													
Total ²	3.92		0.30	0.00		0.09	0.00	0.02	0.97	13.02	15.38	3.75	37.45
% valid obs	38	0	18	0	0	1	6	51	85	100	100	84	40
POR mean 1971-2000													
Snow depth (in)													
Average			0.5	2.5	3.2		6.4	6.0	1.5	0.1		0.9	
% valid obs	0	0	28	72	16	0	20	82	17	0	0	20	
POR mean													
Wind (mph, degrees)													
Mean speed	16.8	13.5	11.9	12.4	20.2	13.1	15.7	15.3	11.3	16.6	15.3	12.7	
% valid obs	76	75	77	46	91	84	48	100	91	100	100	99	
Max speed	105.6	84.8	105.6	44.3	103.1	70.5	70.0	109.2	52.6	66.9	64.4	83.0	109.2
Max direction	100	130	128	98	116	116	121	116	117	118	133	133	116
Solar radiation (KWh/m2)													
Total	22.9	0.0	35.2	24.2	28.4	150.2	135.8	207.4	193.7	170.0	133.8	99.7	1201.3
% valid obs	46	0	75	100	50	100	99	100	92	100	100	100	80

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.

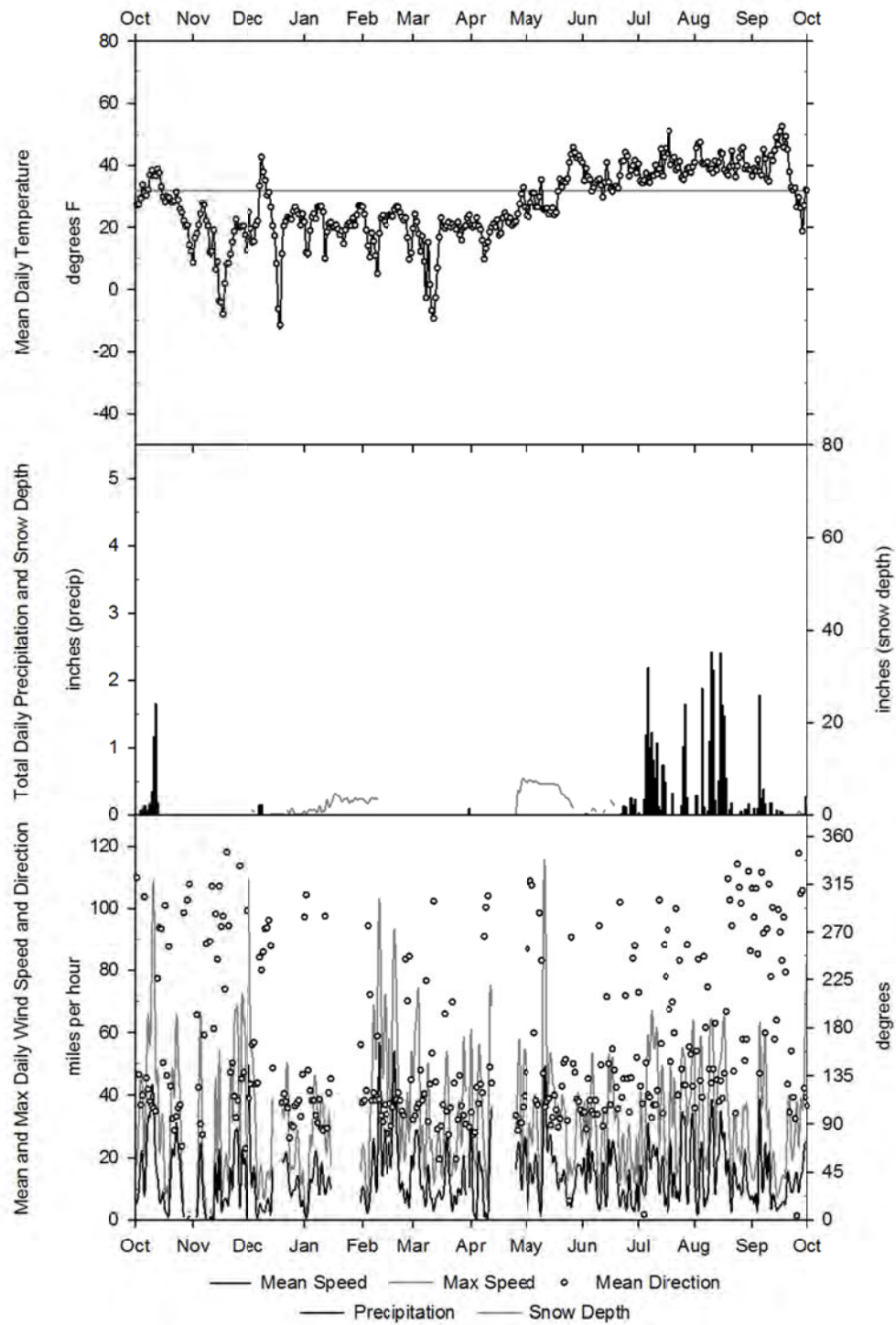
KEFJ RAWS HAIC (Harding Icefield) 2009/10/01 to 2010/09/30



2010 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.	26.2	11.1	2.1	19.2	16.3	1.8	17.4	44.4	38.3	41.9	43.7	37.0	1.8
Max.	45.7	37.8	34.5	35.4	35.4	36.3	34.5	43.8	46.0	48.6	55.8	55.2	55.8
Mean	38.7	25.7	27.0	30.1	28.8	23.0	27.3	45.3	41.4	44.7	47.7	46.0	35.2
# days <32 F	3	26	20	23	16	26	15	0	0	0	0	0	129
% valid obs	91	100	100	100	100	79	50	8	100	100	100	100	86
Maximum air temperature (F)													
Min	35.1	14.5	10.4	28.9	25.0	10.8	28.2	51.4	42.1	45.9	47.8	40.3	10.4
Max	51.8	43.0	51.1	43.3	41.9	42.8	53.8	55.0	60.3	62.8	69.1	67.3	69.1
Mean	43.8	32.4	32.8	35.0	34.9	32.9	38.5	53.0	49.3	51.5	54.4	54.9	42.3
# days <32 F	0	11	11	4	7	8	2	0	0	0	0	0	43
% valid obs	91	100	100	100	100	79	50	8	100	100	100	100	86
Mean air temperature (F)													
Observed	40.9	28.9	29.7	32.6	31.4	27.1	31.4	43.4	44.6	47.4	50.6	50.2	38.2
% valid obs	91	100	100	100	100	79	50	8	100	100	100	100	86
POR mean													
1971-2000													
Precipitation													
Total ²	24.03	5.36	6.73	5.26	7.09	1.31	0.89	0.70	10.83	15.33	12.48	5.22	95.29
% valid obs	95	47	60	72	62	34	27	8	100	99	100	100	67
POR mean													
1971-2000													
Snow depth (in)													
Average													
% valid obs	0	0	0	0	0	0	0	0	0	0	0	0	
POR mean													
Wind (mph, degrees)													
Mean speed	5.9	13.0	18.0	14.9	18.4	15.6	16.9	15.8	11.2	14.1	12.2	11.3	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
Max speed	101.6	102.7	89.5	72.3	94.4	89.0	109.2	93.7	68.7	77.2	73.6	58.6	109.2
Max direction	99	122	103	121	121	96	122	126	122	117	119	111	122
Solar radiation (kWh/m2)													
Total	33.5	14.6	6.2	9.3	17.4	28.4	68.7	87.7	111.6	89.5	85.8	90.5	643.2
% 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.

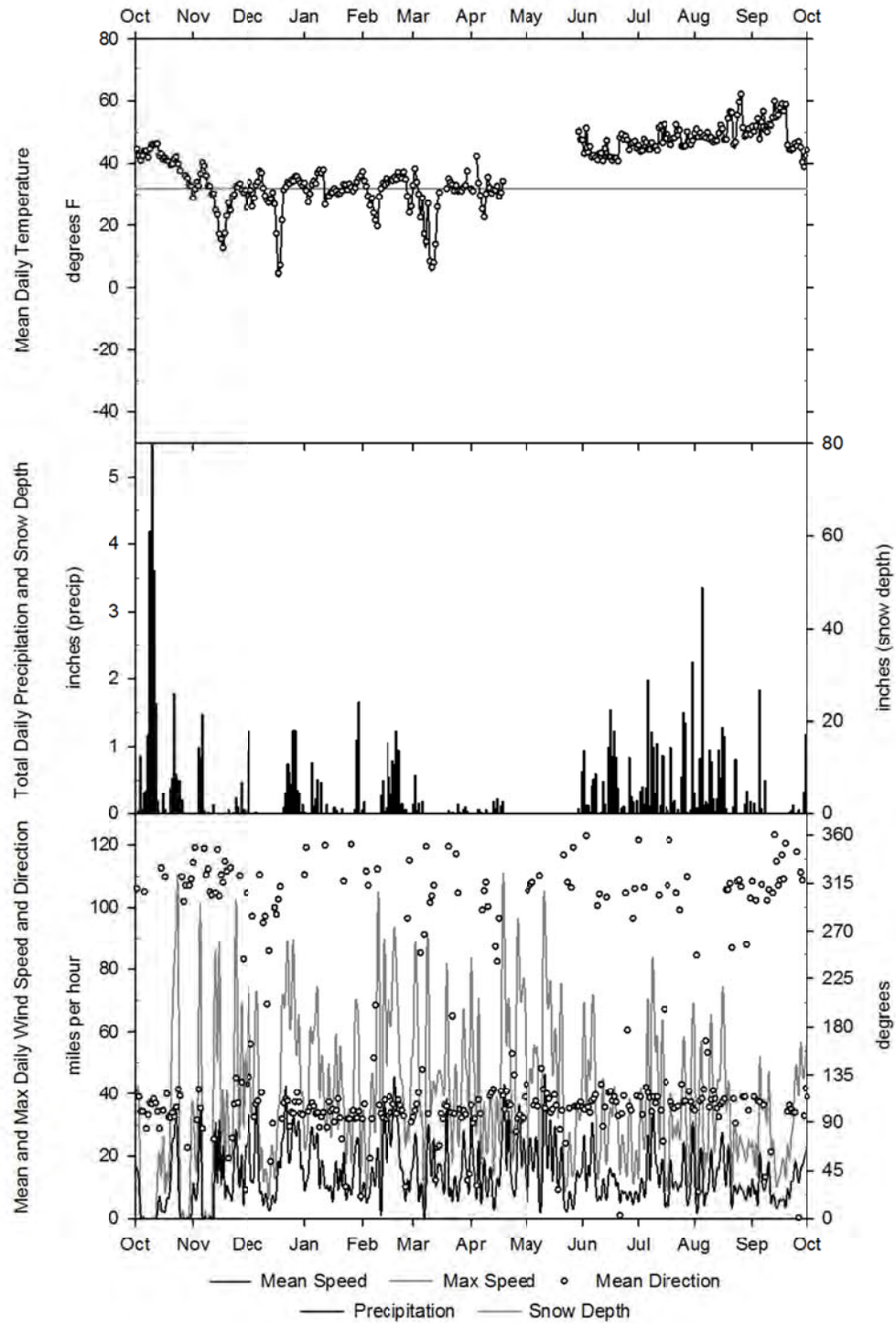
KEFJ RAWS HAIC (Harding Icefield) 2009/10/01 to 2010/09/30



2010 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.	26.2	11.1	2.1	19.2	16.3	1.8	17.4	44.4	38.3	41.9	43.7	37.0	1.8
Max.	45.7	37.8	34.5	35.4	35.4	36.3	34.5	43.8	46.0	48.6	55.8	55.2	55.8
Mean	38.7	25.7	27.0	30.1	28.8	23.0	27.3	45.3	41.4	44.7	47.7	46.0	35.2
# days <32 F	3	26	20	23	16	26	15	0	0	0	0	0	129
% valid obs	91	100	100	100	100	79	50	8	100	100	100	100	86
Maximum air temperature (F)													
Min	35.1	14.5	10.4	28.9	25.0	10.8	28.2	51.4	42.1	45.9	47.8	40.3	10.4
Max	51.8	43.0	51.1	43.3	41.9	42.8	53.8	55.0	60.3	62.8	69.1	67.3	69.1
Mean	43.8	32.4	32.8	35.0	34.9	32.9	38.5	53.0	49.3	51.5	54.4	54.9	42.3
# days <32 F	0	11	11	4	7	8	2	0	0	0	0	0	43
% valid obs	91	100	100	100	100	79	50	8	100	100	100	100	86
Mean air temperature (F)													
Observed	40.9	28.9	29.7	32.6	31.4	27.1	31.4	43.4	44.6	47.4	50.6	50.2	38.2
% valid obs	91	100	100	100	100	79	50	8	100	100	100	100	86
POR mean													
1971-2000													
Precipitation													
Total ²	24.03	5.36	6.73	5.26	7.09	1.31	0.89	0.70	10.83	15.33	12.48	5.22	95.29
% valid obs	95	47	60	72	62	34	27	8	100	99	100	100	67
POR mean													
1971-2000													
Snow depth (in)													
Average													
% valid obs	0	0	0	0	0	0	0	0	0	0	0	0	
POR mean													
Wind (mph, degrees)													
Mean speed	5.9	13.0	18.0	14.9	18.4	15.6	16.9	15.8	11.2	14.1	12.2	11.3	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
Max speed	101.6	102.7	89.5	72.3	94.4	89.0	109.2	93.7	68.7	77.2	73.6	58.6	109.2
Max direction	99	122	103	121	121	96	122	126	122	117	119	111	122
Solar radiation (kWh/m2)													
Total	33.5	14.6	6.2	9.3	17.4	28.4	68.7	87.7	111.6	89.5	85.8	90.5	643.2
% 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.

KEFJ RAWS MCPA (McArthur Pass) 2009/10/01 to 2010/09/30

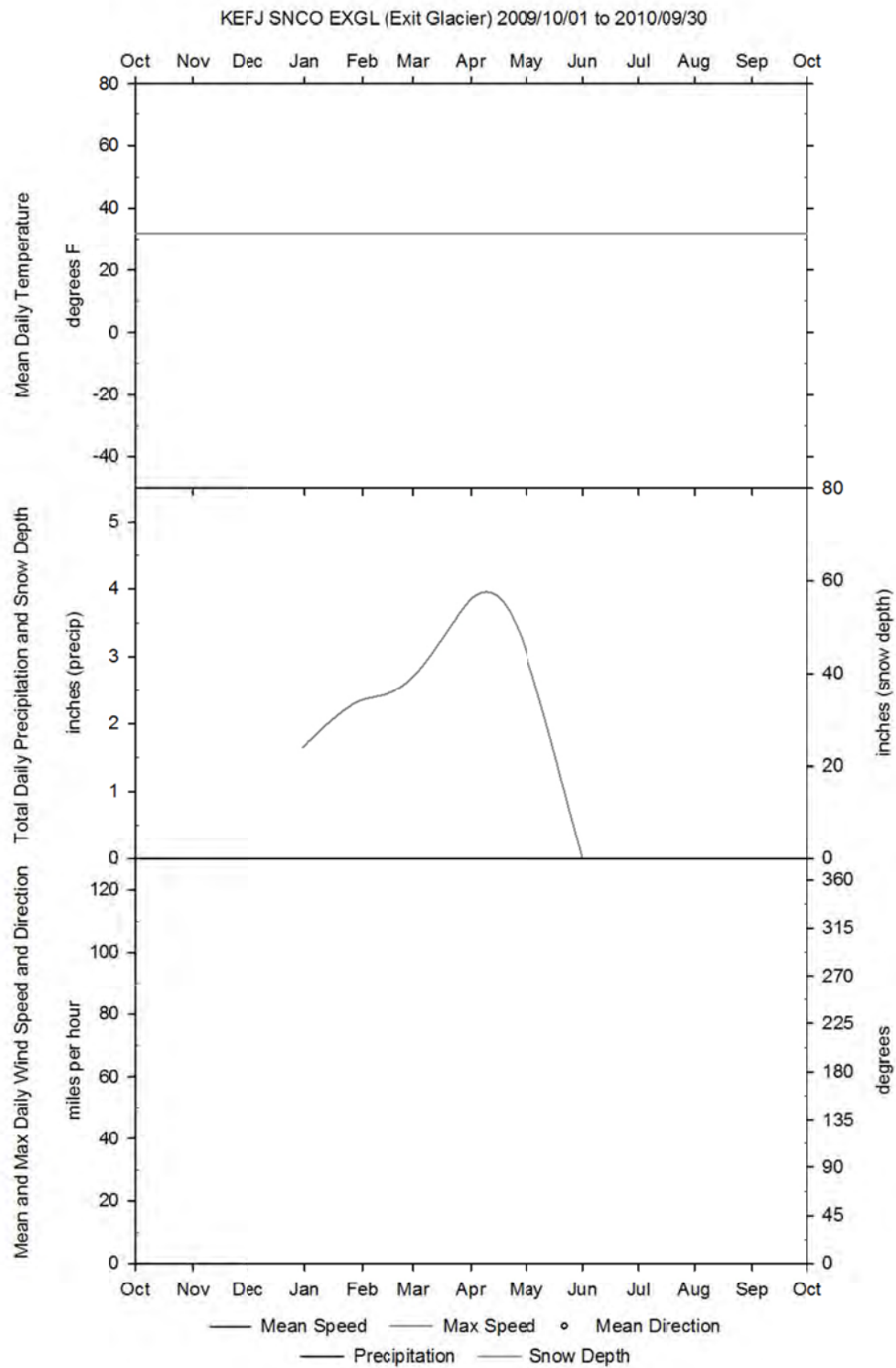


2010 Hydrologic Year - KEFJ SNCO (Exit Glacier)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.													
Max.													
Mean													
# days <32 F													
% valid obs													
Maximum air temperature (F)													
Min													
Max													
Mean													
# days <32 F													
% valid obs													
Mean air temperature (F)													
Observed													
% valid obs													
POR mean													
1971-2000													
Precipitation													
Total ³			8.10	10.20	12.90	20.20	17.90						
% valid obs			100	100	100	100	100	0					
POR mean ⁵			8.4	11.8	15.2	17.6	12.3						
1971-2000				9.7	13.7	15.9	13.3						
Snow depth (in)													
Average ⁴			24.0	34.0	39.0	56.0	48.0						
% valid obs			100	100	100	100	100	0					
POR mean ⁵			35	44	50	55	30						
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 beginning of the month.

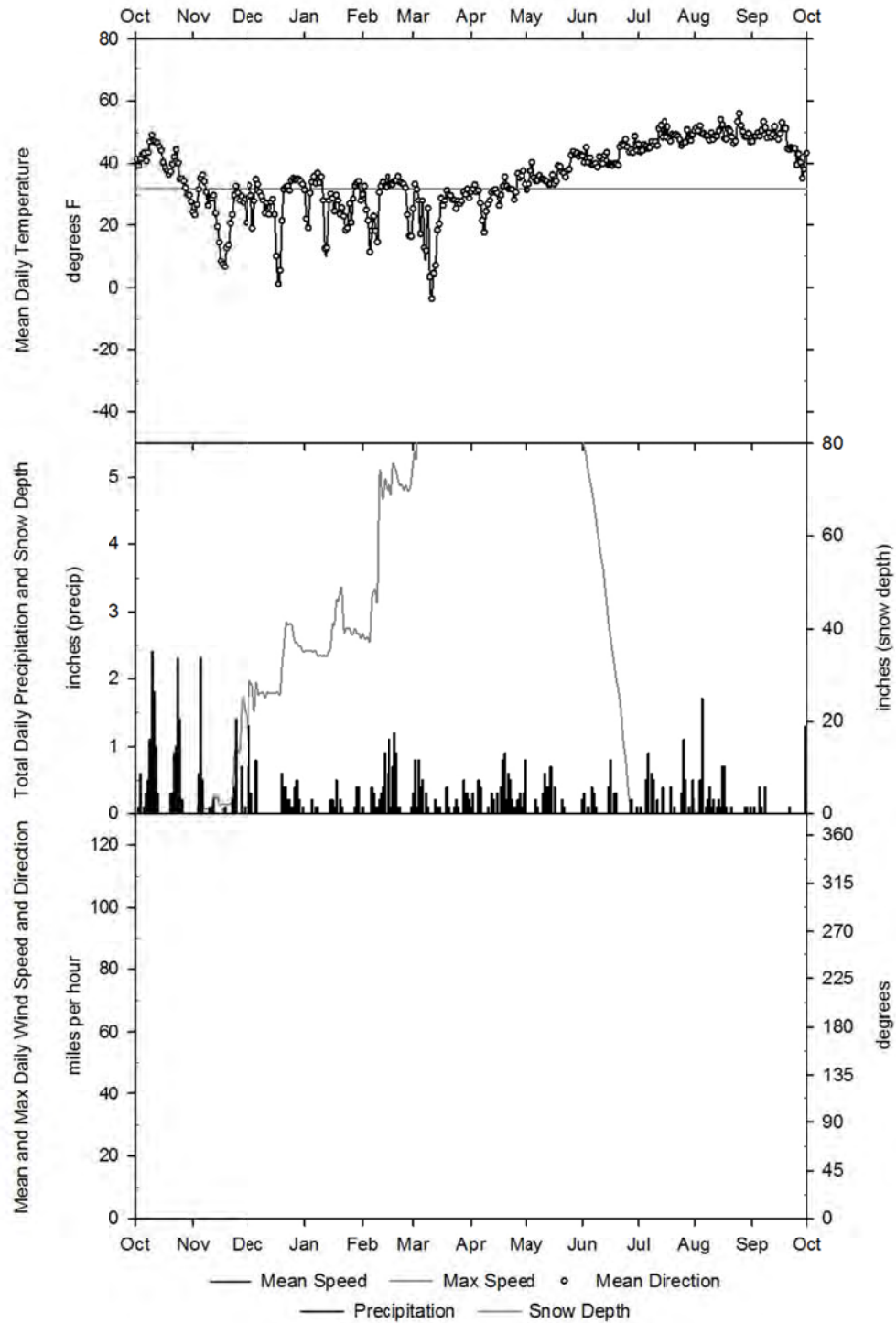
⁴Cummulative snow depth measured close to the beginning of the month.

⁵Values cited are from National Water and Climate Data Center (current Feb. 28, 2011)



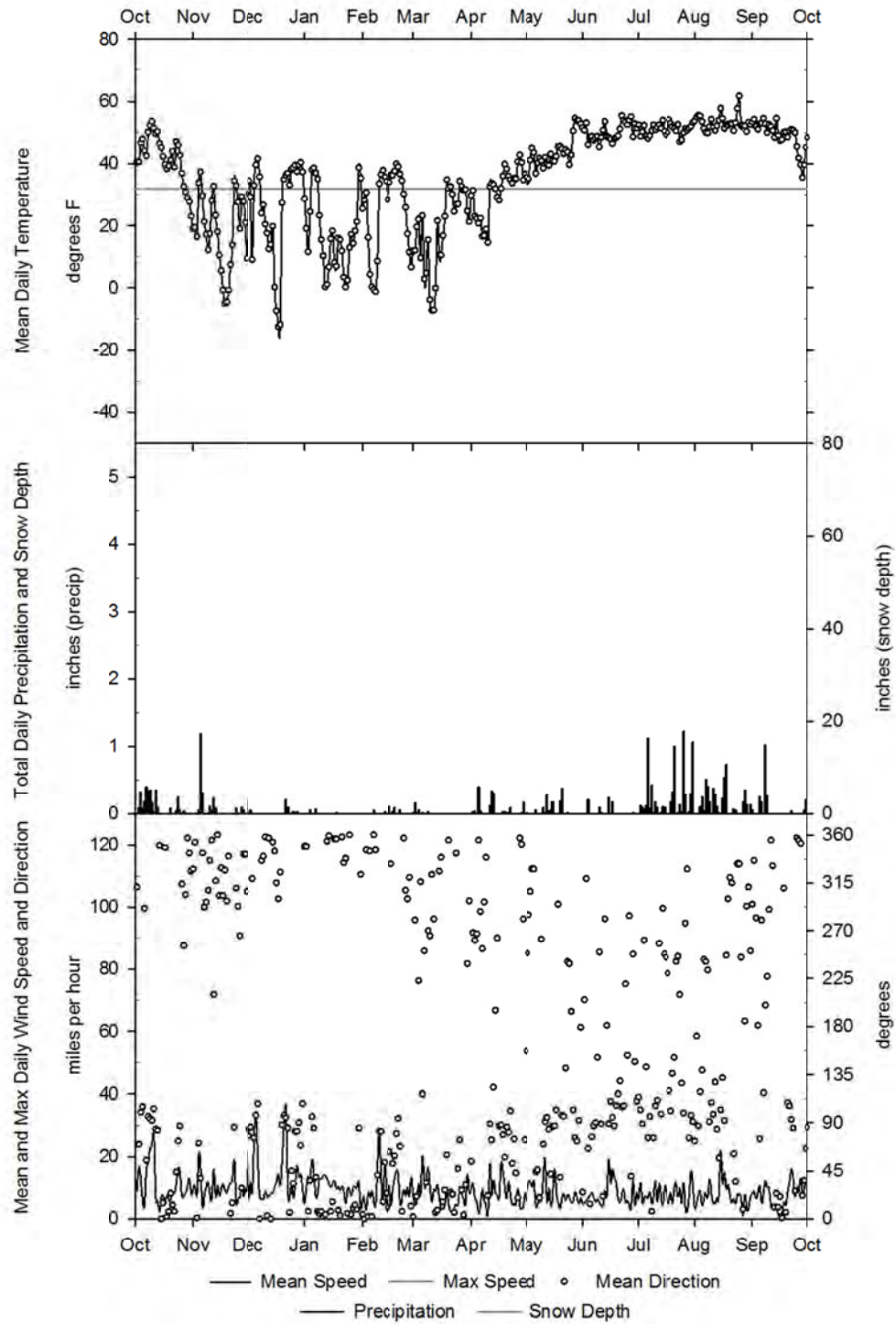
2010 Hydrologic Year - KEFJ SNTE NUGL (Nuka Glacier)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	19.6	-2.6	-3.3	7.2	-3.3	-18.6	2.5	24.3	34.7	37.0	34.3	22.5	-18.6
Max.	46.4	32.9	33.3	34.3	33.1	31.6	34.9	33.7	41.0	47.7	50.5	46.9	50.5
Mean	34.3	19.0	22.5	20.5	23.0	15.8	24.7	32.7	37.1	43.3	43.7	39.4	29.7
# days <32 F	14	27	24	27	22	31	26	11	0	0	0	3	185
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	27.3	8.8	5.4	16.5	16.3	9.7	25.2	35.2	41.4	46.9	49.6	40.5	5.4
Max	52.3	41.4	41.2	42.1	40.8	43.7	47.7	53.8	59.4	63.3	66.9	65.7	66.9
Mean	44.4	29.0	32.0	32.4	33.0	30.4	36.1	43.5	48.1	52.8	55.4	54.6	41.0
# days <32 F	2	17	11	14	8	14	4	0	0	0	0	0	70
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	39.5	24.5	27.7	27.3	27.9	23.5	30.6	37.3	42.4	47.8	49.7	46.8	35.5
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1971-2000													
Precipitation													
Total	14.60	7.40	5.60	2.70	7.90	5.60	7.50	3.60	3.20	6.20	5.30	2.40	72.00
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1971-2000													
Snow depth (in)													
Average	0	7	31	38	63	101	127	106	37	0	0	0	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
POR mean													
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (KWh/m2)													
Total													
% valid obs													

KEFJ SNTN NUGL (Nuka Glacier) 2009/10/01 to 2010/09/30



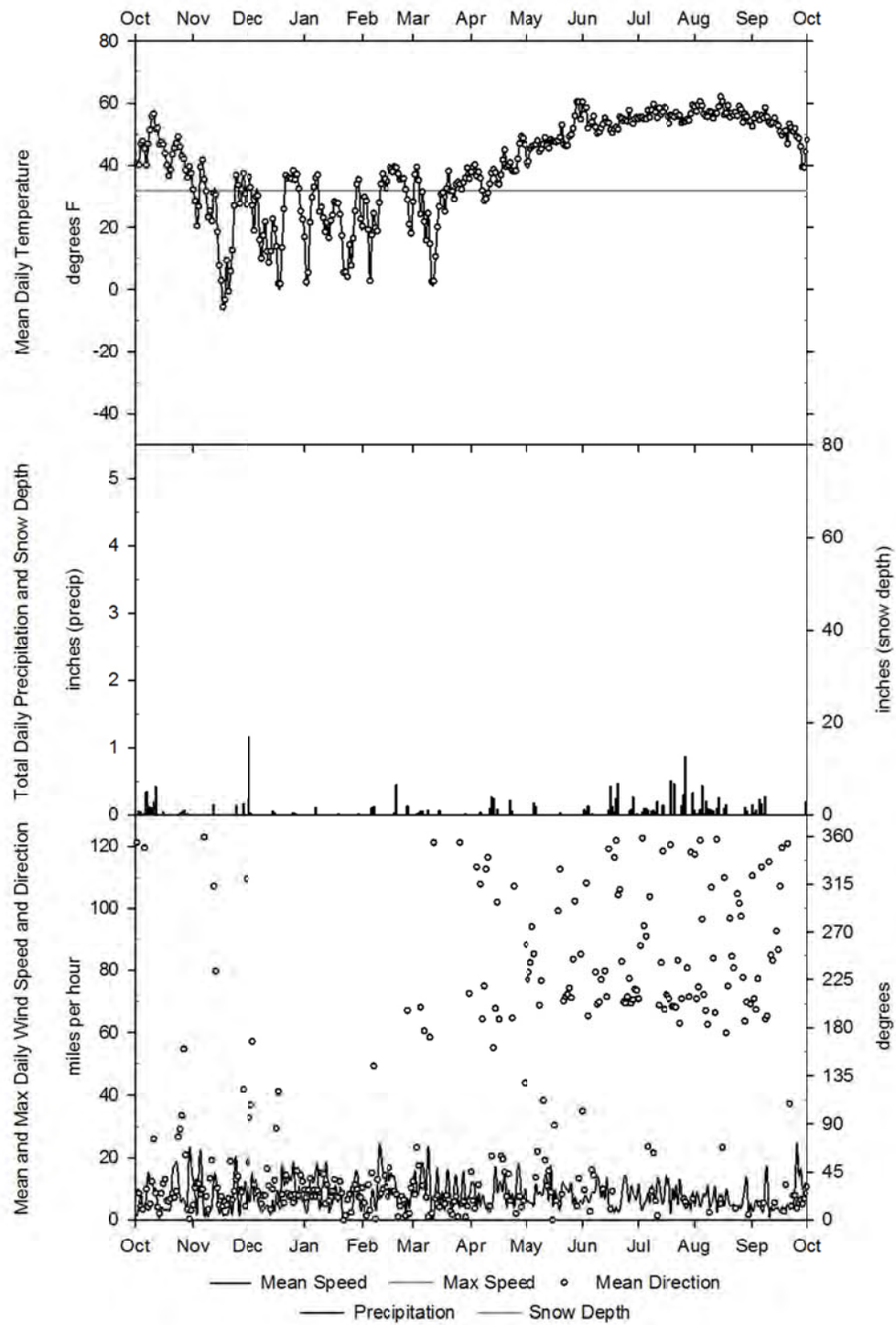
2010 Hydrologic Year - LACL ASOS ILAI (Iliamna Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	15	-10	-17	-4	-9	-17	-1	26	38	43	38	28	-17
Max.	52	35	39	37	37	31	36	48	49	52	56	52	56
Mean	37.1	12.3	20.2	13.0	19.6	10.7	24.6	33.0	43.9	47.1	48.1	42.7	29.7
# days <32 F	7	29	19	27	18	31	22	5	0	0	0	1	159
% valid obs	100	100	100	100	100	100	100	100	100	99	100	100	100
Maximum air temperature (F)													
Min	26	-2	-11	3	1	-1	23	39	48	50	52	43	-11
Max	55	41	44	41	44	41	51	65	66	63	73	67	73
Mean	45.8	24.3	29.8	22.2	29.7	27.2	36.5	50.4	57.0	55.4	58.4	55.7	41.1
# days <32 F	2	18	11	23	11	15	8	0	0	0	0	0	88
% valid obs	100	100	100	100	100	100	100	100	100	99	100	100	100
Mean air temperature (F)													
Observed	41.3	18.8	25.6	17.5	24.7	19.0	30.9	43.6	50.2	50.9	53.2	49.0	35.4
% valid obs	100	100	100	100	100	100	100	100	100	99	100	100	100
POR mean													
1971-2000													
Precipitation													
Total	2.79	2.48	0.42	0.14	0.40	0.29	1.68	1.33	0.79	7.13	4.73	2.21	24.39
% valid obs	100	100	100	100	100	100	100	100	100	99	100	100	100
POR mean													
1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	10.8	10.5	13.0	10.6	9.6	8.0	7.8	7.9	7.8	7.8	7.7	7.9	
% valid obs	100	100	100	100	100	100	100	100	100	99	100	100	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

LACL ASOS ILAI (Iliamna Airport) 2009/10/01 to 2010/09/30



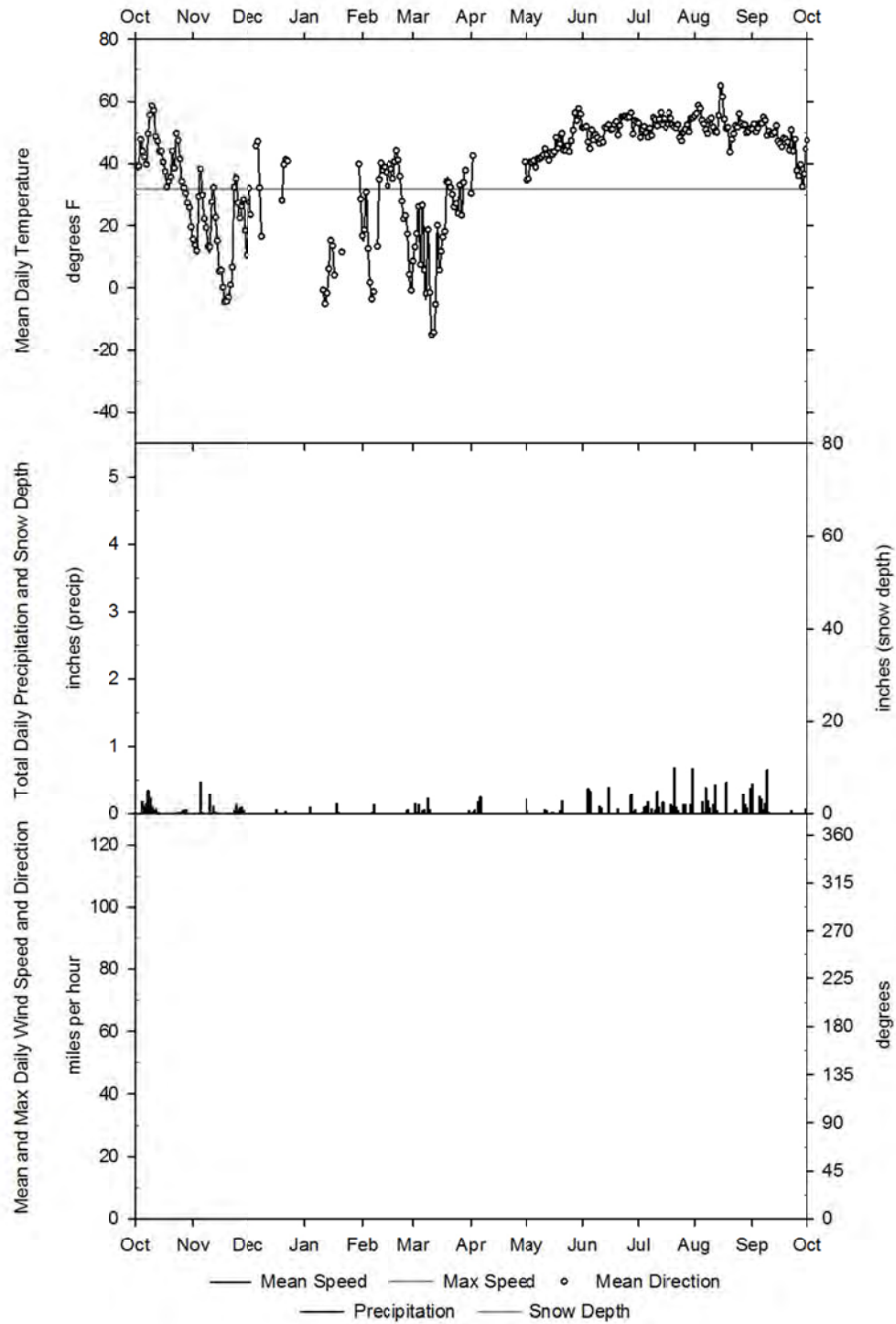
2010 Hydrologic Year - LACL ASOS KEAI (Kenai Airport)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	25	-16	-9	-10	-8	-15	17	28	36	39	39	25	-16
Max.	52	36	36	36	37	36	42	47	52	55	57	54	57
Mean	39.5	13.1	17.6	14.5	24.4	19.5	31.5	33.2	47.3	51.1	50.1	42.7	32.5
# days <32 F	6	26	25	29	20	27	14	2	0	0	0	2	151
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	36	11	5	11	16	16	34	47	54	55	57	46	5
Max	62	51	43	40	44	47	58	77	68	73	73	72	77
Mean	49.5	31.6	28.5	27.6	34.5	35.6	45.0	53.1	60.2	61.7	63.8	59.4	46.4
# days <32 F	0	12	17	22	8	10	0	0	0	0	0	0	69
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	44.4	23.0	23.4	21.3	29.7	28.2	38.7	43.9	53.8	56.3	57.0	51.4	39.7
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean 1971-2000													
Precipitation													
Total	1.65	0.73	1.33	0.17	0.84	0.35	1.01	0.34	2.06	3.51	2.00	1.44	15.43
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean 1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	8.6	7.2	8.2	8.1	9.5	9.9	8.4	8.1	8.0	7.6	6.4	7.3	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	98	
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total													
% valid obs													

LACL ASOS KEAI (Kenai Airport) 2009/10/01 to 2010/09/30



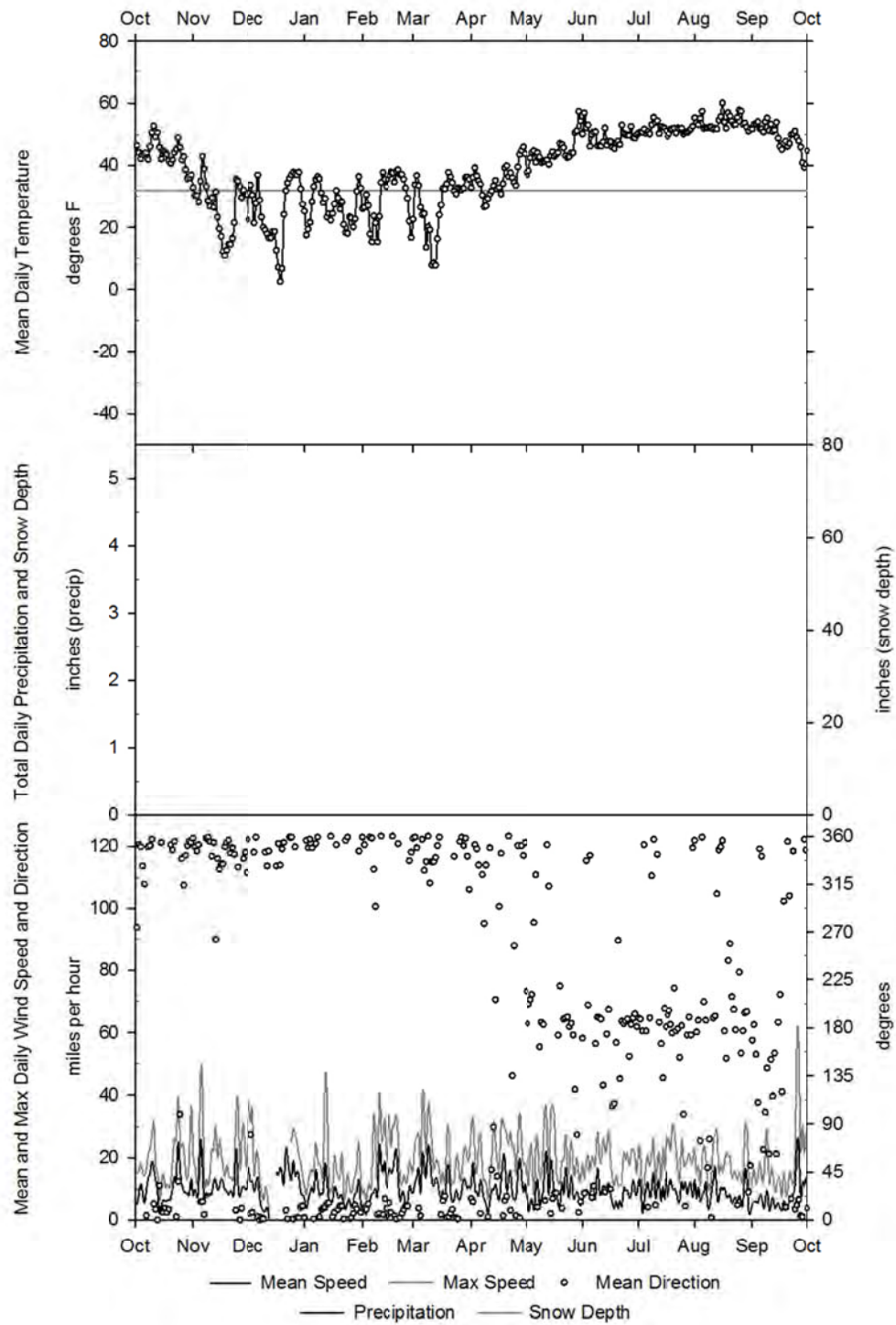
2010 Hydrologic Year - LACL CRNP1SW (Port Alsworth 1 SW)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	5.7	-14.6	13.5	-10.1	-14.3	-29.7	29.8	22.3	30.0	34.2	31.3	21.2	-29.7
Max.	51.4	34.9	44.4	38.3	37.8	33.4	38.5	39.9	49.5	51.6	56.7	50.0	56.7
Mean	32.4	7.9	29.0	7.1	16.3	5.1	34.1	31.4	39.5	45.0	44.7	36.4	28.3
# days <32 F	17	29	5	10	22	28	1	18	3	0	2	7	142
% valid obs	100	100	20	15	93	83	5	100	100	100	97	100	76
Maximum air temperature (F)													
Min	25.7	-1.5	22.6	-0.4	0.1	-0.2	38.8	41.9	52.0	51.4	52.2	44.1	-1.5
Max	64.2	43.2	51.1	42.3	52.9	44.4	50.5	75.7	72.0	73.2	72.3	70.2	75.7
Mean	46.6	24.1	39.2	15.9	32.9	30.2	45.1	57.1	62.4	60.0	61.6	58.7	47.0
# days <32 F	3	21	2	9	10	12	0	0	0	0	0	0	57
% valid obs	100	100	20	15	93	83	5	100	100	100	97	100	76
Mean air temperature (F)													
Observed	40.1	17.5	34.7	11.6	24.9	17.8	39.3	45.1	51.3	52.1	52.9	47.1	37.9
% valid obs	100	100	20	15	93	83	5	100	100	100	97	100	76
POR mean													
1971-2000													
Precipitation													
Total	1.43	1.34	0.11	0.26	0.24	0.74	0.70	0.39	1.74	3.24	3.28	1.46	14.93
% valid obs	100	100	100	83	100	100	19	100	100	100	96	100	92
POR mean													
1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed													
% valid obs													
Max speed													
Max direction													
Solar radiation (kWh/m2)													
Total	24.8	7.1	1.0	4.4	19.1	68.1	14.1	148.3	137.4	83.4	47.5	73.4	628.7
% valid obs	100	100	100	84	100	100	20	100	100	100	97	100	92

LACL CLRN POAL (Port Alsworth) 2(09/10/01 to 2010/09/30



2010 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.	26.1	7.3	-0.6	12.2	9.5	5.2	22.6	32.0	41.2	46.2	45.1	33.8	-0.6
Max.	51.3	40.8	36.7	34.0	34.7	34.0	41.4	51.8	50.0	53.6	55.9	52.5	55.9
Mean	40.6	22.3	21.9	22.7	25.9	23.5	32.0	40.3	46.3	49.5	50.8	45.2	35.1
# days <32 F	2	27	23	29	17	26	14	0	0	0	0	0	138
% valid obs	26	7	-1	12	10	5	23	32	41	46	45	34	99
Maximum air temperature (F)													
Min	40.1	15.3	6.1	22.1	18.3	11.5	30.0	39.7	47.1	50.9	52.7	43.3	6.1
Max	54.3	45.0	42.1	42.3	42.6	43.3	50.2	66.9	64.9	63.5	64.4	61.9	66.9
Mean	47.0	31.0	29.1	30.8	34.0	32.9	39.9	50.1	53.0	54.4	57.7	53.1	42.8
# days <32 F	0	12	16	16	10	11	2	0	0	0	0	0	67
% valid obs	100	100	93	100	100	100	100	100	100	100	100	100	99
Mean air temperature (F)													
Observed	43.5	26.4	26.0	26.6	29.8	27.8	35.6	44.4	49.2	51.6	53.8	49.0	38.8
% valid obs	100	100	93	100	100	100	100	100	100	100	100	100	99
POR mean													
1971-2000													
Precipitation													
Total													
% valid obs													
POR mean													
1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	10.3	11.2	11.9	8.2	11.3	12.0	10.7	9.4	8.9	9.7	8.1	7.9	
% valid obs	100	100	87	100	100	99	100	100	100	100	100	100	
Max speed	39.6	46.3	37.1	44.5	40.3	40.0	34.4	33.7	28.6	30.0	29.8	56.8	56.8
Max direction													
Solar radiation (KWh/m2)													
Total													
% valid obs													

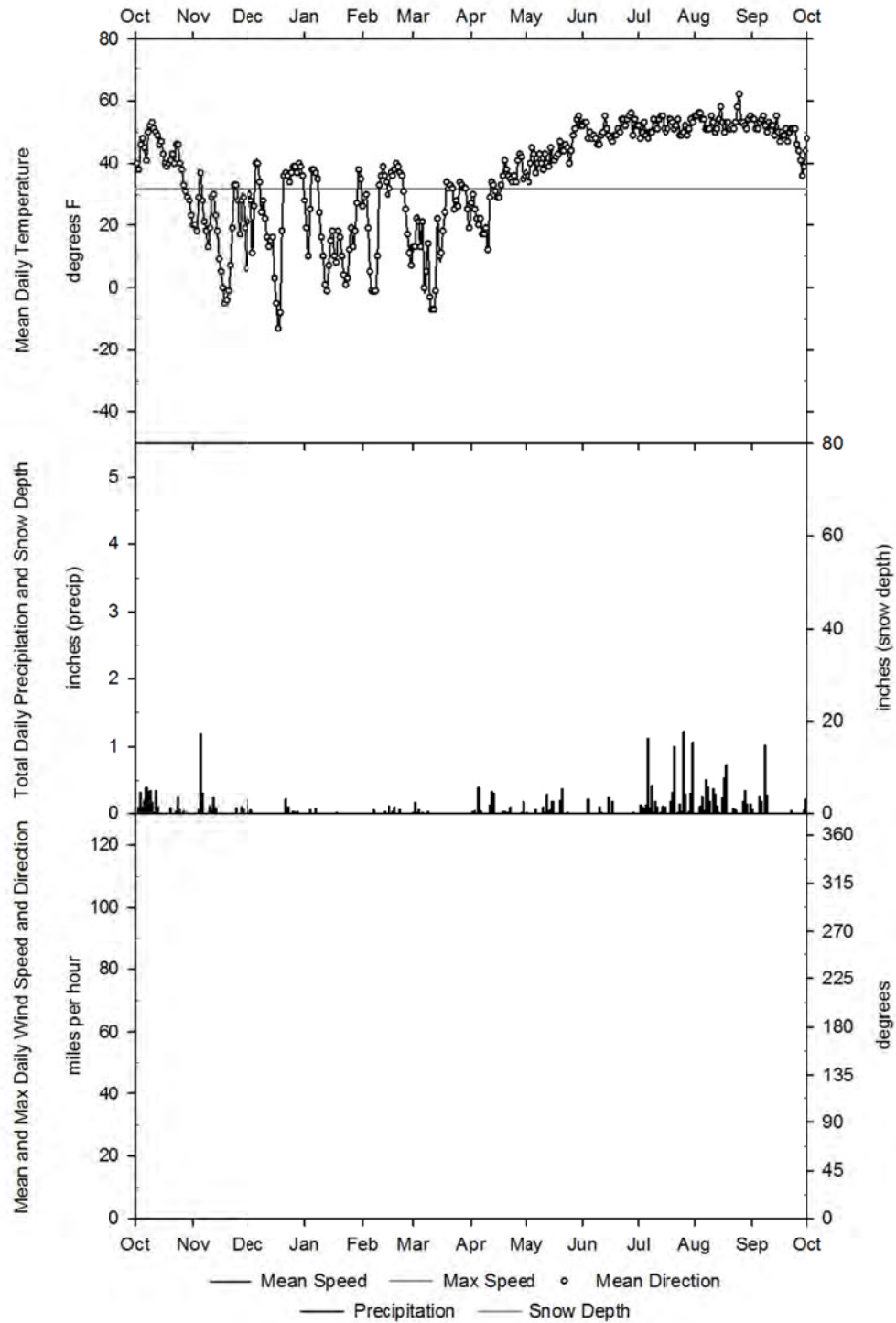
LACL CMAN DRRI (Drift River Terminal) 2009/10/01 to 2010/09/30



2010 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.	14	-10	-18	-6	-10	-19	-2	26	36	42	38	27	-19
Max.	51	34	38	37	36	30	35	48	48	52	56	51	56
Mean	36.4	11.8	19.6	12.6	19.3	10.1	24.1	35.5	43.4	47.0	47.9	42.0	29.2
# days <32 F	7	29	20	27	20	31	22	5	0	0	0	1	162
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	26	0	-11	4	2	-1	23	42	49	50	52	44	-11
Max	55.0	42.0	44.0	42.0	45.0	41.0	53.0	65.0	67.0	64.0	73.0	67.0	73
Mean	46.2	24.7	30.5	22.9	30.5	27.8	37.4	51.5	58.0	56.2	58.9	56.2	41.8
# days <32 F	2	18	11	23	11	14	7	0	0	0	0	0	86
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	41.2	18.2	25.0	17.7	24.9	19.0	30.9	43.6	50.7	51.6	53.5	49.2	35.5
% 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
1971-2000	34.6	24.9	19.1	16.4	16.4	22.8	32.3	43.1	50.9	55.8	54.5	47.6	34.9
Precipitation													
Total	2.80	2.48	0.42	0.14	0.41	0.30	1.69	1.33	0.79	7.13	4.74	2.22	24.43
% 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
1971-2000	3.10	2.25	1.66	1.33	0.98	1.03	0.97	1.27	1.54	2.36	4.26	4.32	25.09
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

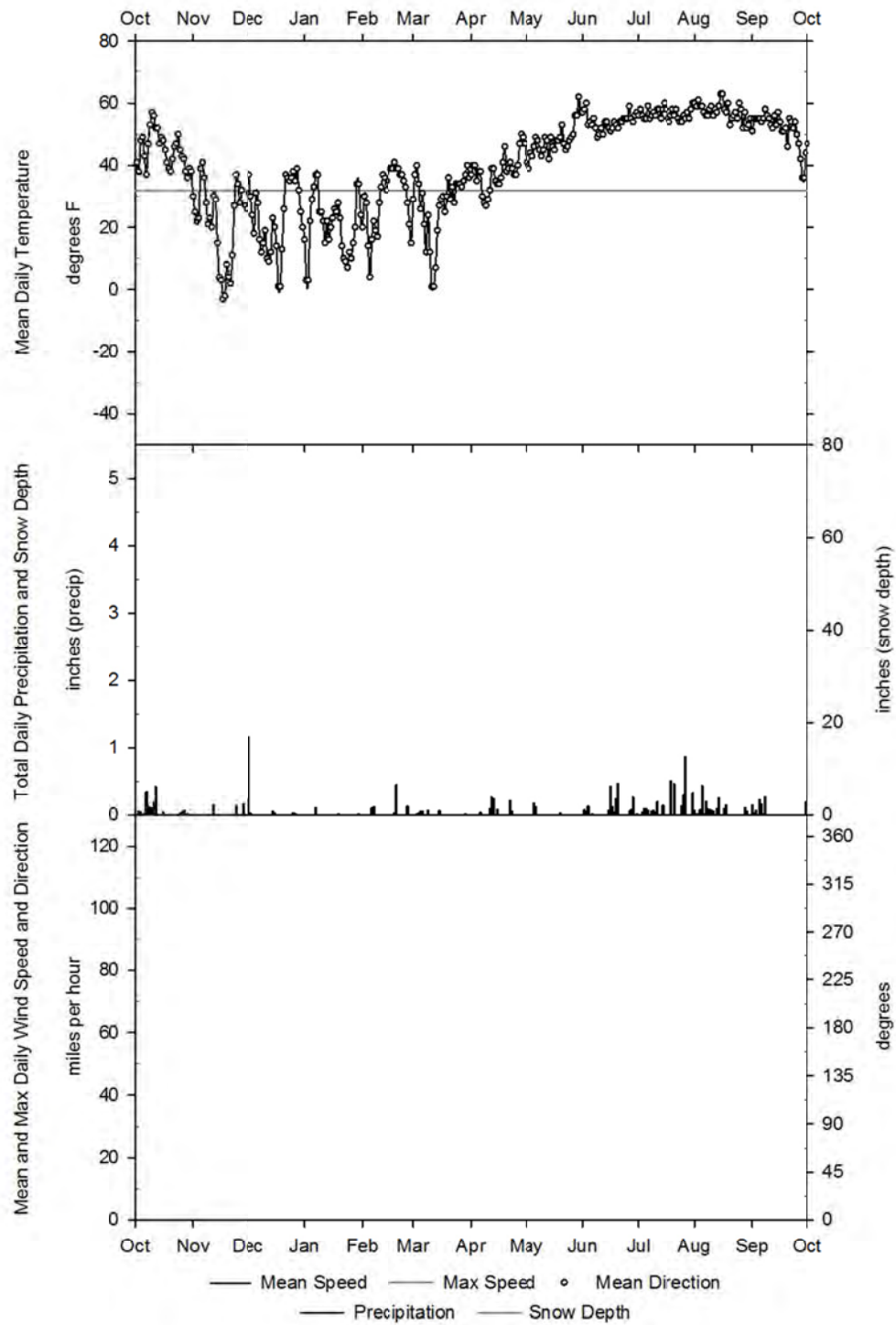
LACL COOP ILAI (Iliamna Airport) 2009/10/01 to 2010/09/30



2010 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.	23	-16	-10	-11	-9	-16	16	28	34	37	38	24	-16
Max.	51	34	36	35	37	35	41	46	52	55	57	54	57
Mean	38.9	11.8	16.7	13.4	23.5	18.4	30.8	37.3	46.7	50.5	49.5	42.1	31.7
# days <32 F	6	27	27	29	21	27	15	3	0	0	0	3	158
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	37	11	6	13	17	17	34	48	54	55	57	47	6
Max	62	48	44	40	44	48	60	78	69	76	73	72	78
Mean	49.9	31.4	28.8	27.9	35.1	36.4	45.6	59.0	61.0	62.6	64.5	60.3	47.0
# days <32 F	0	13	16	21	8	8	0	0	0	0	0	0	66
% valid obs	100	97	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	44.4	21.4	22.8	20.7	29.4	27.5	38.2	43.1	53.9	56.6	57.1	51.3	39.4
% valid obs	100	97	100	100	100	100	100	100	100	100	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
1971-2000	34.3	21.8	16.3	13.4	16.6	23.5	34.6	44.4	50.8	55.0	54.0	46.9	34.3
Precipitation													
Total	1.65	0.74	1.34	0.17	0.84	0.36	1.01	0.34	2.06	3.52	2.01	1.44	15.49
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
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
1971-2000	2.66	1.69	1.45	1.07	0.91	0.81	0.64	0.95	1.09	1.75	2.62	3.31	18.95
Snow depth (in)													
Average													
% valid obs													
POR mean ¹	1	3	8	12	13	12	3	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: 09/03/1949 to 12/31/2010

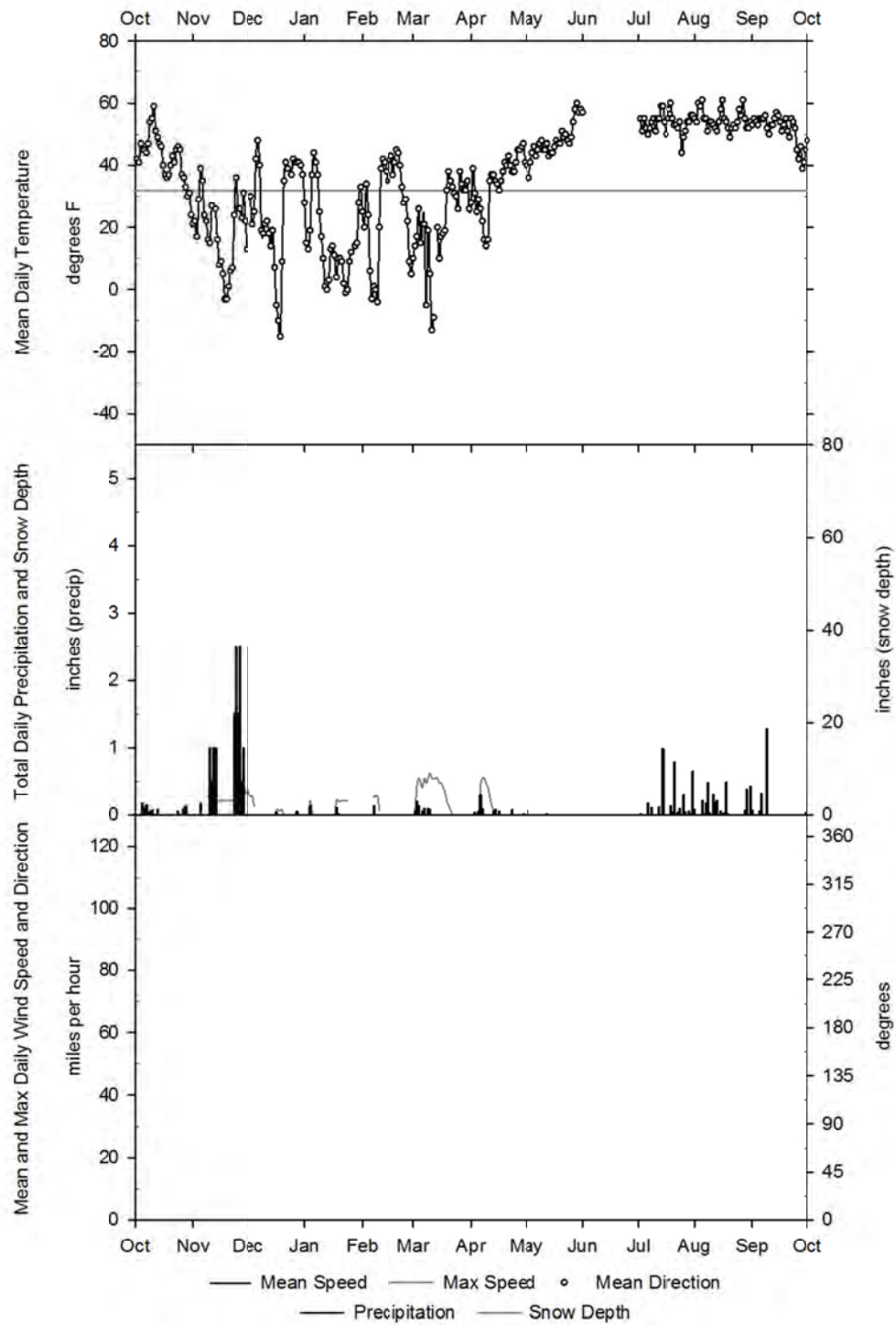
LACL COOP KEAI (Kenai Airport) 2009/10/01 to 2010/09/30



2010 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.	12	-10	-18	-10	-19	-30	-5	30		39	36	27	-30
Max.	55	37	45	42	40	32	39	47		51	56	52	56
Mean	35.7	11.9	20.1	8.7	18.4	9.1	26.9	33.0		46.8	46.5	41.0	27.8
# days <32 F	8	28	22	28	18	30	15	2		0	0	3	154
% valid obs	100	93	97	100	100	100	100	100	0	100	100	100	91
Maximum air temperature (F)													
Min	28	1	-12	5	3	3	29	41		49	54	48	-12
Max	63	41	51	45	51	48	57	73		72	73	74	74
Mean	47.5	25.8	31.6	22.1	33.3	32.8	42.9	57.1		60.6	62.5	61.3	43.6
# days <32 F	1	19	13	23	9	12	3	0		0	0	0	80
% valid obs	100	100	97	97	100	97	100	100	0	100	100	100	91
Mean air temperature (F)													
Observed	41.7	18.5	25.7	15.7	25.8	21.5	34.9	47.7		53.7	54.6	51.3	35.9
% valid obs	100	93	97	97	100	97	100	100	0	100	100	100	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
1971-2000	34.5	23.9	17.6	14.7	16.1	23.9	34.9	45.8	54.0	58.3	56.2	47.9	35.7
Precipitation													
Total	0.95		0.10	0.26	0.14	0.72	0.78	0.09		3.69	3.20	1.70	11.63
% valid obs	100	0	100	97	96	100	100	100	0	100	100	100	91
POR mean ¹	1.63	1.41	1.10	0.82	0.68	0.72	0.56	0.53	1.10	1.58	2.38	2.38	14.89
1971-2000	1.37	1.25	1.08	0.79	0.58	0.65	0.48	0.48	0.92	1.40	2.06	2.09	13.15
Snow depth (in)													
Average	0	3	1	1	1	4	1	0		0	0	0	
% valid obs	97	80	94	74	75	100	100	100	0	97	100	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

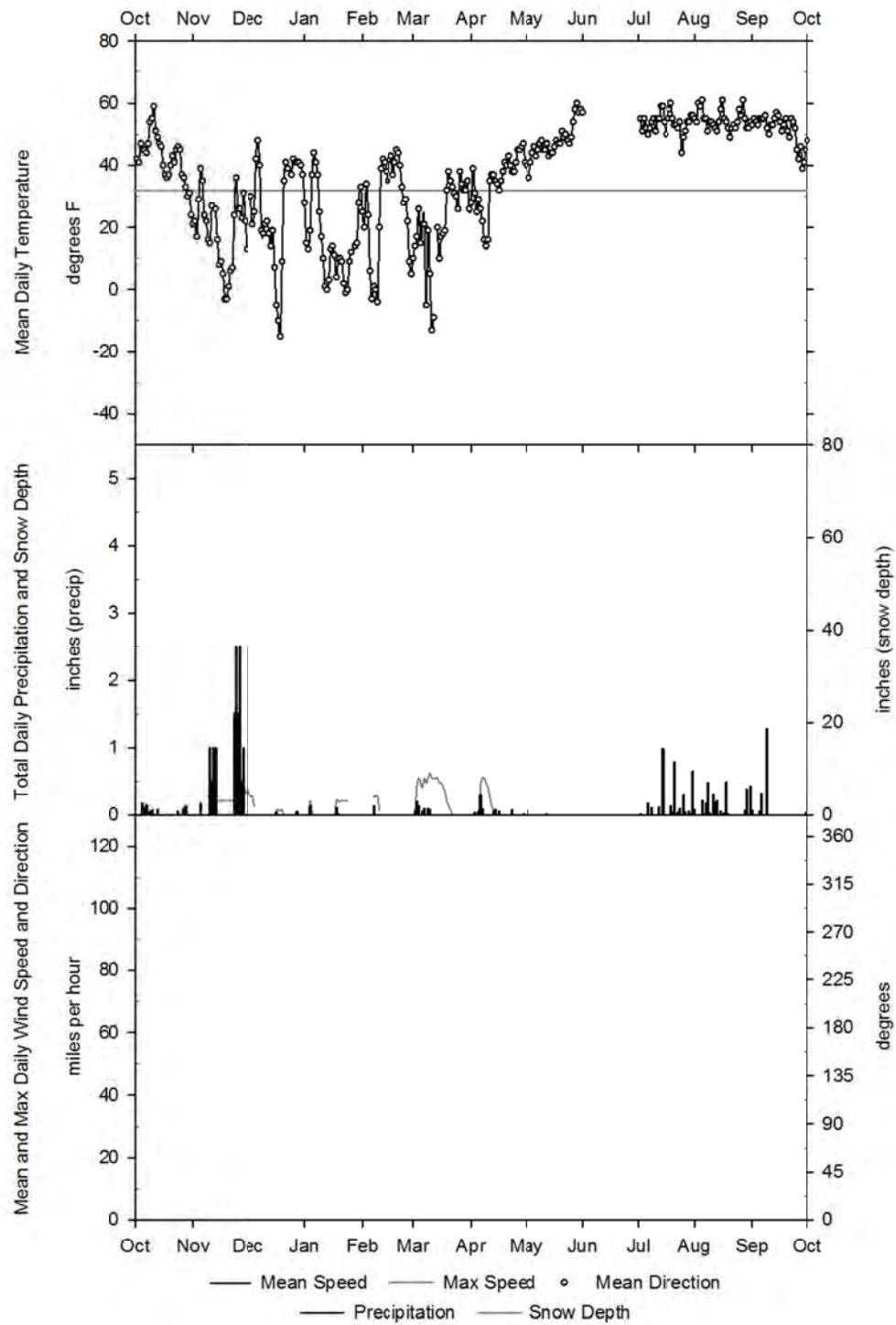
LACL COOP POAL (Port Alsworth) 2009/10/01 to 2010/09/30



2010 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.	5	-28	-31	-23	-23	-29	-6	26	32	38	37	15	-31
Max.	51	23	42	36	37	20	32	48	50	51	52	48	52
Mean	30.2	0.8	9.7	-2.9	9.6	-0.5	21.4	33.5	42.5	45.8	45.3	36.3	22.8
# days <32 F	18	28	26	30	24	31	28	16	0	0	0	6	207
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	17	-16	-19	-11	-11	-9	21	35	46	50	50	40	-19
Max	61	40	51	43	49	42	53	72	71	73	72	67	73
Mean	41.0	15.5	25.5	10.2	25.6	25.6	39.3	55.1	60.3	59.3	59.1	56.1	39.5
# days <32 F	7	23	18	26	15	19	6	0	0	0	0	0	114
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	35.9	8.5	17.8	3.6	17.7	12.7	30.6	44.6	51.7	52.9	52.5	46.4	31.3
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1971-2000													
Precipitation													
Total ²	1.46	3.19	0.07	0.07	0.42	0.43	0.75	0.13	3.07	5.37	5.27	1.42	21.64
% valid obs													
POR mean													
1971-2000													
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													

²Only liquid precipitation (e.g. rain) reported. Percentage of valid observations are not reported for this station. An 8-inch metal standard rain gauge was installed in May, 2010. Total precipitation (e.g. rain and snow) will be reported in the 2011 Hydrologic Year.

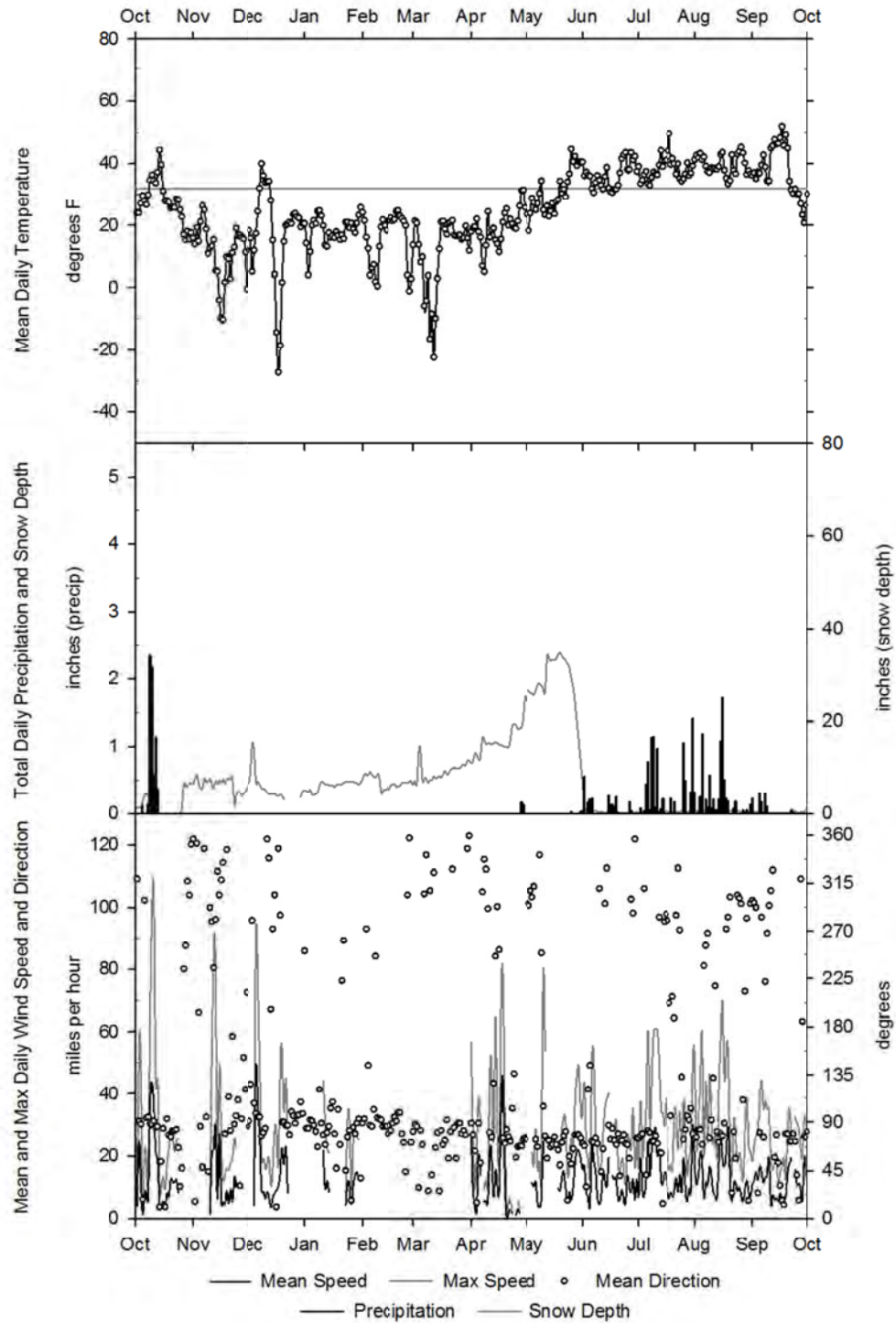
LACL COOP POAL (Port Alsworth) 2009/10/01 to 2010/09/30



2010 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	-20.2	-35.1	1.2	-8.5	-26.3	1.2	15.1	27.9	31.6	30.4	17.4	-35.1
Max.	39.2	23.5	36.9	22.6	22.5	18.0	30.4	39.0	40.5	44.2	41.4	46.0	46.0
Mean	24.9	5.1	12.7	15.5	11.3	5.0	15.5	26.5	32.6	35.2	36.5	33.6	21.3
# days <32 F	24	30	29	31	28	31	30	24	18	4	1	11	261
% valid obs	100	100	100	100	100	100	88	89	95	99	100	98	97
Maximum air temperature (F)													
Min	18.1	-6.7	-11.9	6.8	3.6	-14.4	10.8	20.8	31.6	34.2	35.6	24.6	-14.4
Max	48.0	29.7	42.6	29.7	28.6	30.6	41.9	61.0	61.5	56.8	52.7	59.2	61.5
Mean	30.3	15.7	21.7	21.4	19.7	17.1	25.4	36.4	41.8	42.1	43.3	42.2	29.8
# days <32 F	20	30	24	31	28	31	25	13	1	0	0	4	207
% valid obs	100	100	100	100	100	100	88	89	95	99	100	98	97
Mean air temperature (F)													
Observed	27.2	11.0	17.4	18.4	15.2	10.6	18.5	31.1	36.4	38.2	39.5	37.6	25.1
% valid obs	100	100	100	100	100	100	89	90	95	99	100	98	98
POR mean													
1971-2000													
Precipitation													
Total ²	6.87		0.00				0.30	0.12	2.31	9.09	7.44	1.14	27.27
% valid obs	24	0	20	0	0	0	4	42	84	99	99	75	38
POR mean													
1971-2000													
Snow depth (in)													
Average	4.5	6.2	5.9	6.1	6.9	9.2	16.2	27.3	0.5	0.4	0.4	0.4	
% valid obs	39	90	68	100	94	94	87	88	86	77	74	78	
POR mean													
Wind (mph, degrees)													
Mean speed	14.1	12.0	15.5	11.1		26.9	12.7	12.5	10.7	14.3	12.9	11.4	
% valid obs	64	48	57	33	0	2	56	62	91	99	100	91	
Max speed	104.0	85.9	91.9	44.3		56.6	77.2	73.7	50.8	60.9	69.4	44.3	104.0
Max direction	78	315	103	78		77	65	64	57	76	69	286	78
Solar radiation (KWh/m2)													
Total	27.9	14.1	6.2	9.3	14.8	77.7	106.3	157.5	129.9	128.0	101.1	92.8	865.7
% valid obs	100	100	100	100	100	100	88	89	95	99	100	98	97

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.

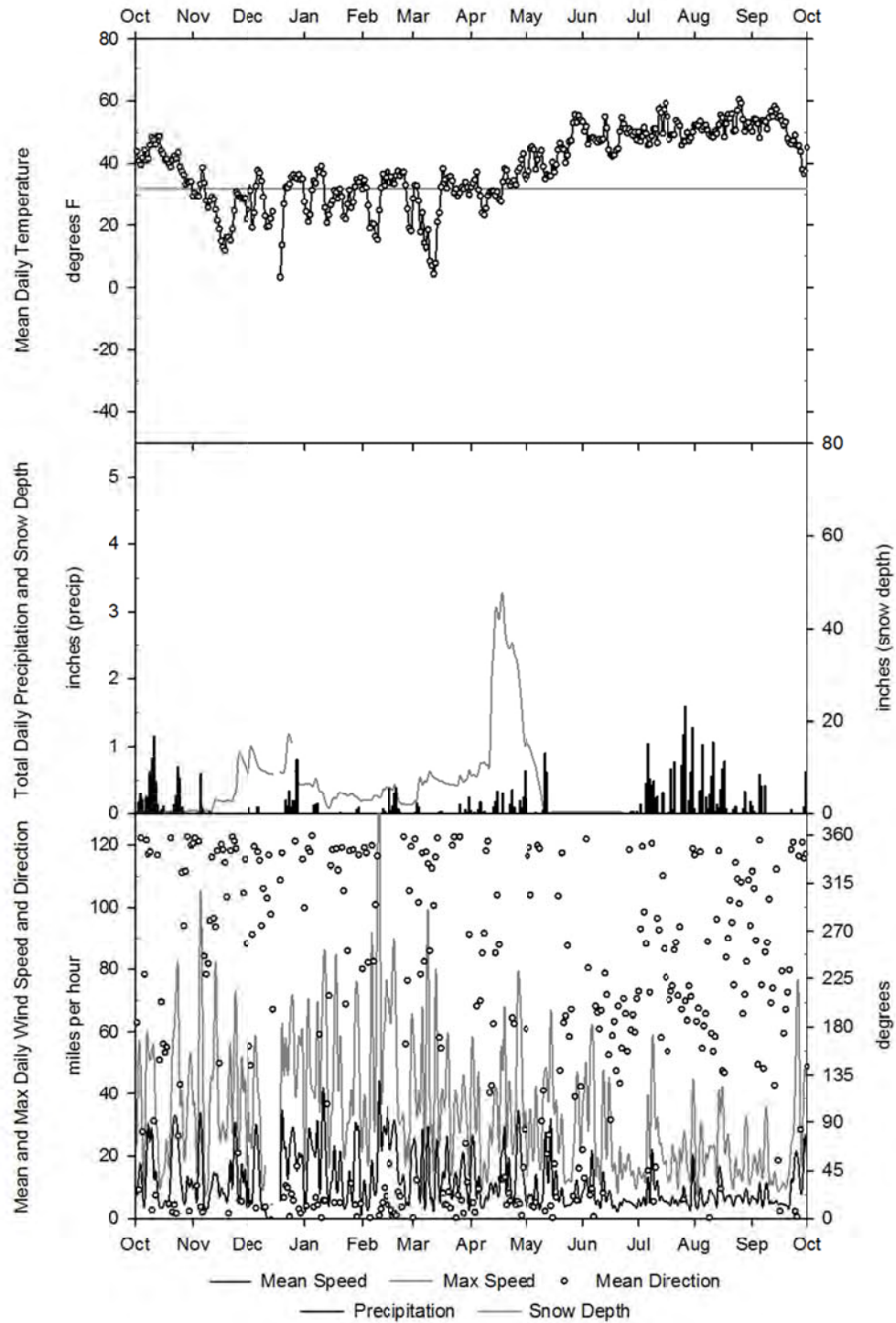
LACL RAWS CHMO (Chigmit Mountains) 2009/10/01 to 2010/09/30



2010 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.	26.4	7.7	-5.6	16.2	9.9	-2.4	17.4	23.2	39.2	42.1	44.8	34.0	-5.6
Max.	46.6	34.0	35.1	34.9	35.1	32.7	39.2	43.7	47.3	50.5	54.1	50.5	54.1
Mean	37.4	21.0	24.1	25.4	25.5	20.7	28.7	37.4	42.8	46.0	47.8	44.8	33.6
# days <32 F	6	29	24	26	18	29	23	2	0	0	0	0	157
% valid obs	100	100	85	100	100	100	99	100	100	100	100	100	99
Maximum air temperature (F)													
Min	32.5	17.4	7.0	23.4	19.8	14.2	29.5	37.2	43.9	48.4	49.8	39.6	7.0
Max	55.0	44.6	42.1	43.2	41.7	43.5	50.0	63.4	63.1	71.4	69.3	66.6	71.4
Mean	45.4	29.4	32.8	33.8	33.8	32.4	39.4	51.7	55.1	55.7	59.1	56.7	43.9
# days <32 F	0	17	13	10	8	10	1	0	0	0	0	0	59
% valid obs	100	100	85	100	100	100	99	100	100	100	100	100	99
Mean air temperature (F)													
Observed	41.0	25.0	29.1	29.6	29.5	26.2	33.0	43.7	48.4	50.4	52.4	50.0	38.4
% valid obs	100	100	85	100	100	100	99	100	100	100	100	100	99
POR mean 1971-2000													
Precipitation													
Total ²	6.30	0.72	1.99	0.58	1.42	0.81	3.18	159	0.11	11.04	6.61	2.47	36.82
% valid obs	96	20	51	47	58	48	69	38	31	100	100	100	63
POR mean 1971-2000													
Snow depth (in)													
Average	0.4	4.1	10.3	4.1	3.7	7.0	25.1	3.4	0.2	0.0	0.0	0.0	
% valid obs	94	99	77	80	99	100	96	99	100	95	99	97	
POR mean													
Wind (mph, degrees)													
Mean speed	13.9	12.8	14.5	16.7	18.3	13.8	13.0	9.4	7.0	7.6	7.1	9.5	
% valid obs	100	100	85	100	100	100	99	100	100	100	100	100	
Max speed	78.7	105.1	69.8	84.3	139.6	98.4	76.5	63.4	62.2	54.4	42.5	70.0	139.6
Max direction	17	82	21	28	274	7	44	15	3	352	359	45	274
Solar radiation (kWh/m2)													
Total	29.9	14.2	4.6	11.9	24.2	73.1	98.1	158.6	139.1	95.6	91.1	86.3	826.7
% valid obs	100	100	85	100	100	100	99	100	100	100	100	100	99

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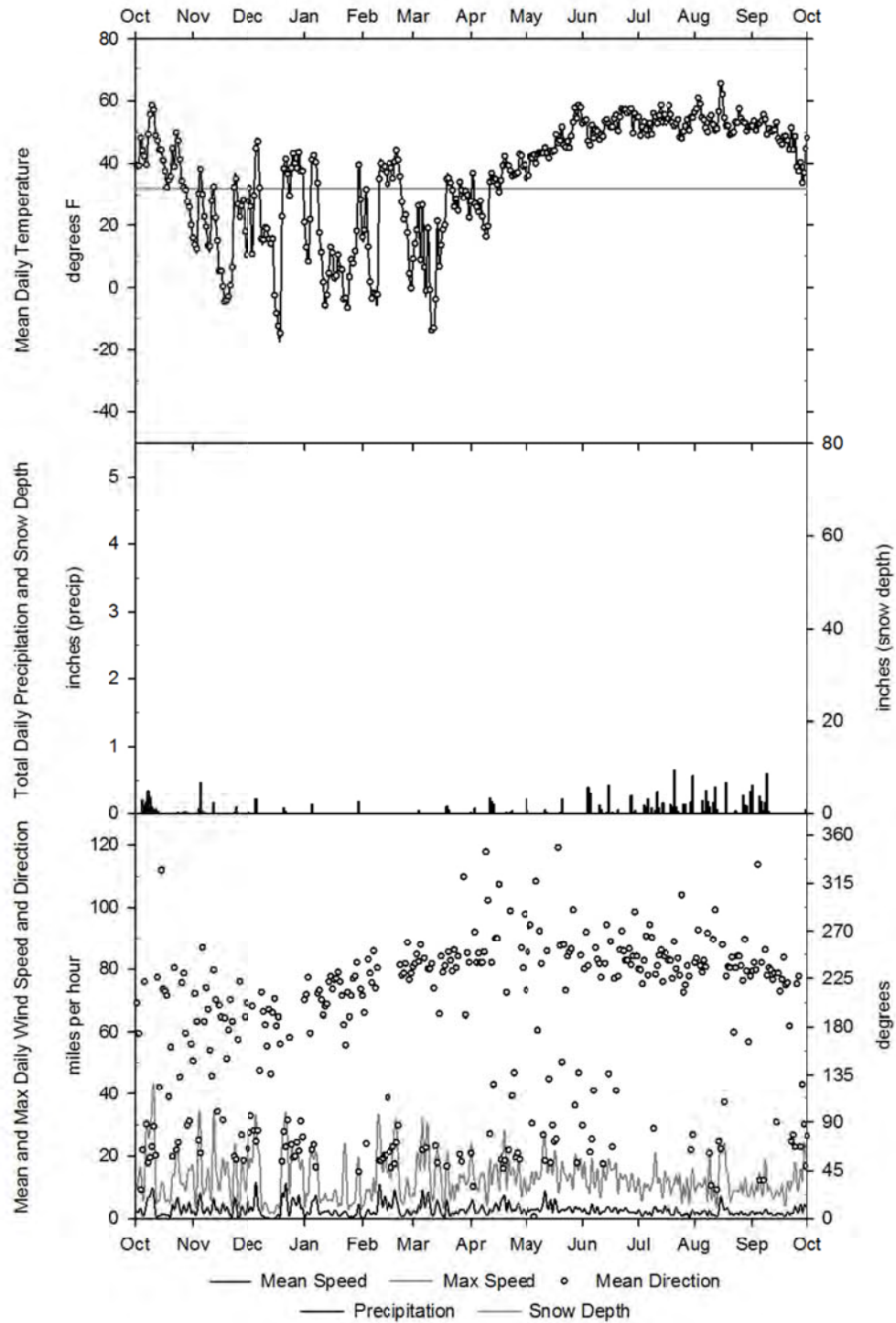
LACL RAWS HILA (Hickerson Lake) 2009/10/01 to 2010/09/30



2010 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.	6	-14	-20	-13	-21	-31	-7	22	30	34	31	21	-31
Max.	51	35	42	40	38	26	35	40	49	52	58	50	58
Mean	32.7	8.4	17.4	6.4	14.8	4.6	23.2	31.9	39.8	45.3	45.1	36.7	25.6
# days <32 F	17	29	25	27	21	31	24	16	3	0	2	7	202
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	28	0	-9	0	2	6	29	44	53	51	53	47	-9
Max	63	43	50	45	53	47	57	78	77	76	74	74	78
Mean	47.6	24.4	30.3	20.7	32.5	32.6	43.4	53.8	64.4	61.7	63.3	60.6	45.1
# days <32 F	1	20	13	23	11	12	2	0	0	0	0	0	82
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	40.3	17.5	24.7	12.9	23.5	18.9	33.4	43.3	52.7	53.0	53.9	47.7	35.5
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean 1971-2000													
Precipitation													
Total ²	1.39	0.87	0.38	0.31	0.02	0.22	0.92	0.35	1.74	3.15	3.24	1.36	13.95
% valid obs	77	18	43	17	45	25	63	90	99	100	100	93	64
POR mean 1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	3.2	3.2	3.4	2.1	3.5	3.3	3.3	3.4	2.6	2.0	2.1	2.1	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
Max speed	42	34	34	21	31	32	28	25	19	21	24	24	42
Max direction	88	217	125	84	122	19	24	29	129	72	121	28	88
Solar radiation (kWh/m2)													
Total	35.5	10.9	3.4	7.9	24.4	82.0	115.7	162.1	169.0	105.4	98.2	91.5	926.0
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100

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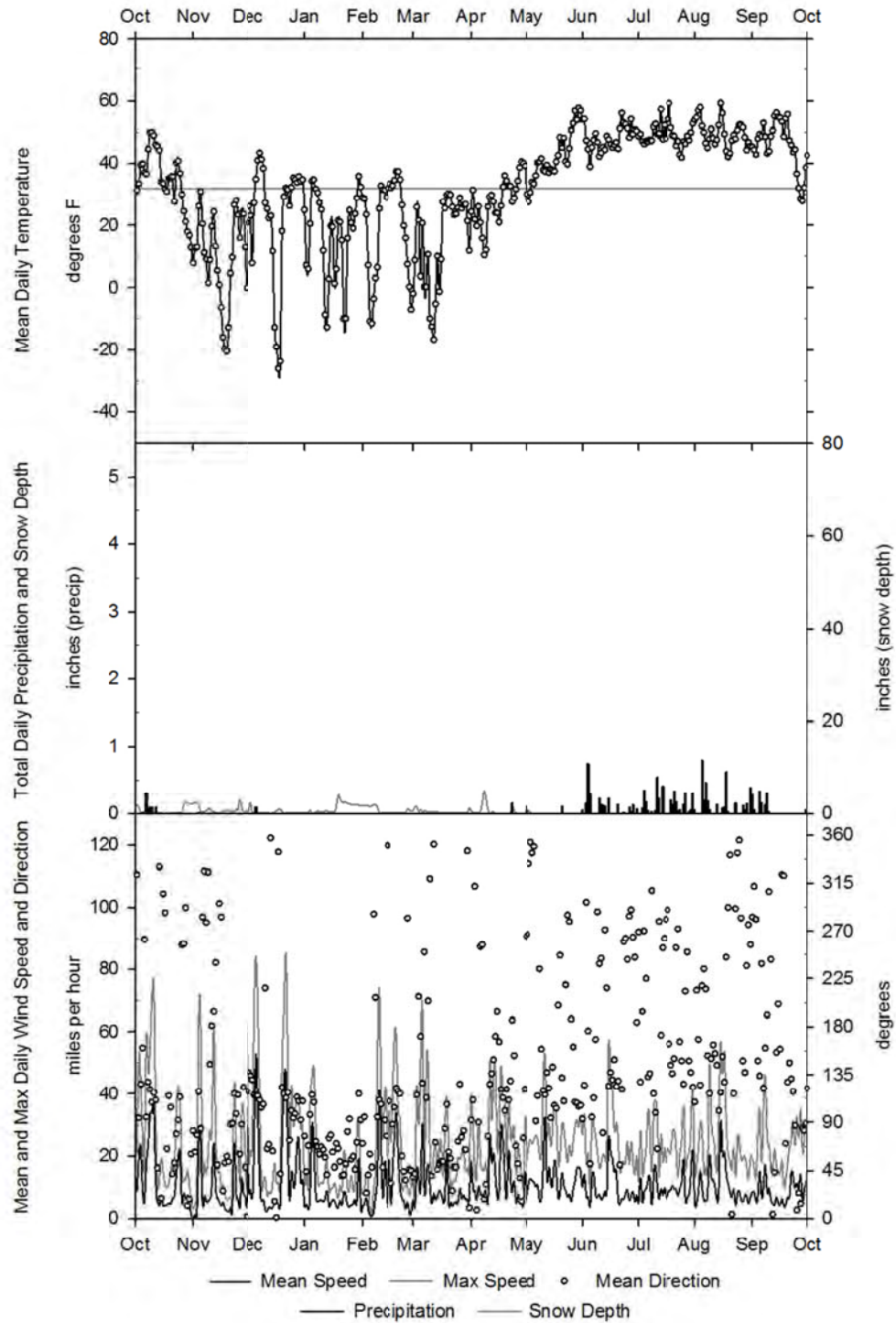
LACL RAWS POAL (Port Alsworth) 2009/10/01 to 2010/09/30



2010 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.	3.4	-23.8	-29.4	-17.9	-17.5	-22.4	5.0	24.3	33.1	38.8	36.5	17.1	-29.4
Max.	46.6	29.1	37.4	32.5	34.3	26.8	34.5	50.4	46.8	50.9	53.4	48.0	53.4
Mean	29.8	4.0	17.5	9.3	13.5	6.4	22.0	34.4	41.2	44.2	44.3	38.8	25.5
# days <32 F	20	30	24	30	26	31	28	12	0	0	0	6	207
% valid obs	100	100	100	100	100	100	99	100	100	100	100	100	100
Maximum air temperature (F)													
Min	16.9	-17.0	-24.2	-8.5	-4.7	-11.0	14.2	30.9	45.0	45.9	46.0	37.8	-24.2
Max	53.4	32.7	48.2	38.3	41.9	38.7	50.0	63.6	66.0	68.5	66.0	68.7	68.7
Mean	39.2	16.2	28.3	24.5	24.8	24.0	34.5	50.2	56.1	55.3	55.7	54.3	38.7
# days <32 F	6	26	13	22	16	17	11	2	0	0	0	0	113
% valid obs	100	100	100	100	100	100	99	100	100	100	100	100	100
Mean air temperature (F)													
Observed	34.1	10.3	23.0	16.9	18.8	15.2	28.1	42.2	47.9	49.2	49.3	45.7	31.8
% valid obs	100	100	100	100	100	100	99	100	100	100	100	100	100
POR mean 1971-2000													
Precipitation													
Total ²	0.73	0.02	0.12	0.02	0.00	0.02	0.27	0.21	2.55	3.73	3.86	1.10	12.62
% valid obs	71	3	45	19	38	14	40	89	100	100	100	93	59
POR mean 1971-2000													
Snow depth (in)													
Average	0.7	0.8	0.3	1.3	0.7	0.4	0.6	0.1	0.0	0.0	0.0	0.0	
% valid obs	64	100	88	100	97	96	99	100	100	100	100	100	
POR mean													
Wind (mph, degrees)													
Mean speed	11.7	9.1	14.7	7.3	10.8	9.4	11.7	12.0	9.6	10.1	10.4	8.8	
% valid obs	100	100	100	100	100	100	99	100	100	100	100	100	
Max speed	73.4	63.3	85.2	48.5	73.4	67.6	50.3	51.2	56.6	40.5	56.8	45.0	85.2
Max direction	113	122	126	122	110	109	122	111	129	113	123	125	126
Solar radiation (kWh/m2)													
Total	31.0	11.9	4.6	9.3	23.2	78.7	118.2	160.6	128.5	93.8	85.1	79.8	824.9
% valid obs	100	100	100	100	100	100	99	100	100	100	100	100	100

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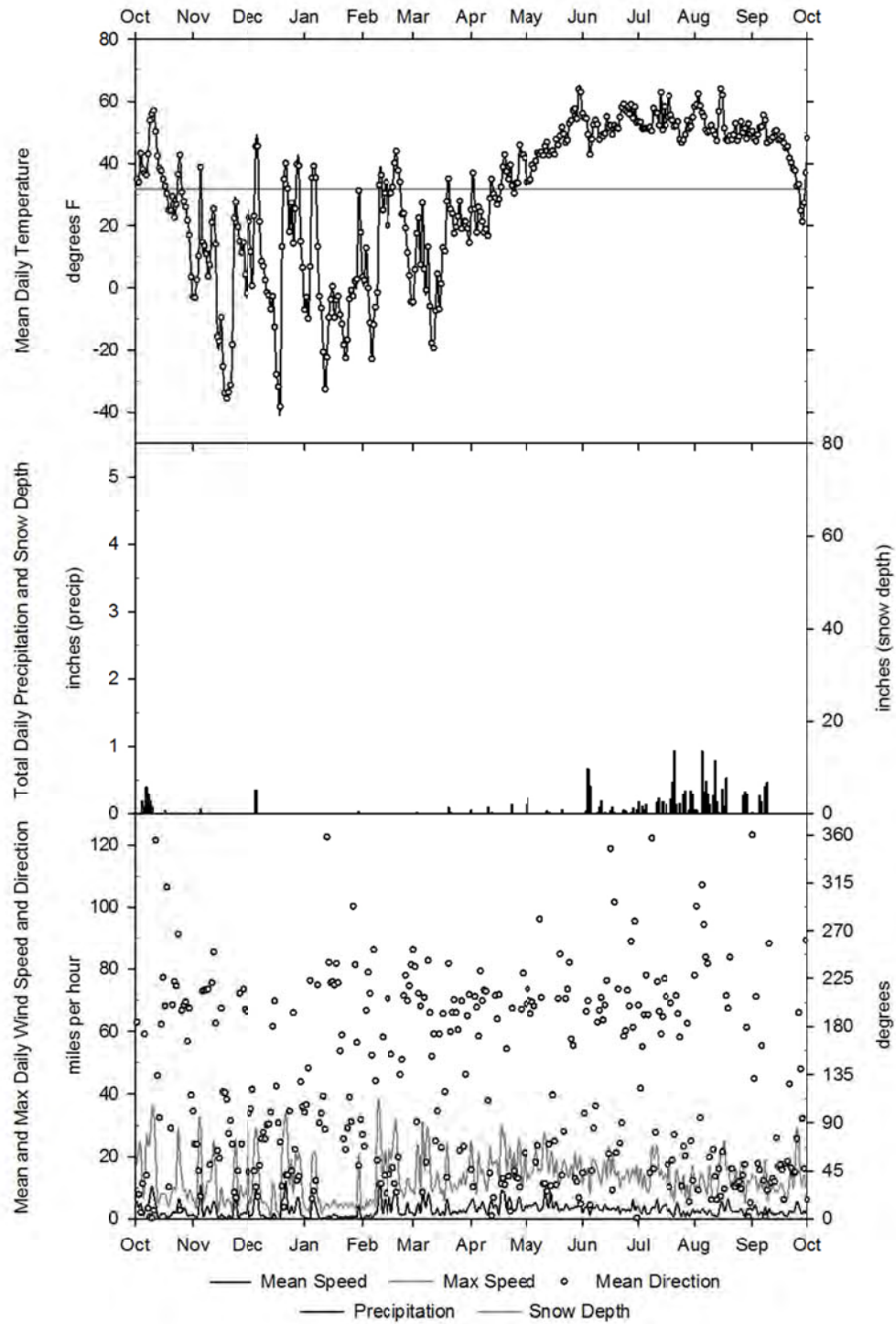
LACL RAWS SNLA (Snipe Lake) 2009/10/01 to 2010/09/30



2010 Hydrologic Year - LACL RAWs STON (Stoney)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.	-14	-44	-45	-41	-35	-40	-13	20	27	28	27	-4	-45
Max.	48	26	42	38	34	17	38	51	51	52	53	47	53
Mean	24.2	-11.3	0.7	-11.4	4.6	-6.7	18.3	30.6	38.6	43.6	42.0	27.1	16.8
# days <32 F	22	30	28	30	26	31	29	22	6	2	5	20	251
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Maximum air temperature (F)													
Min	19	-15	-26	-12	-9	-5	27	41	48	51	51	45	-26
Max	62	42	49	43	52	49	59	77	77	80	78	76	80
Mean	42.5	14.6	22.0	9.9	26.6	31.1	43.4	59.9	65.4	62.6	63.2	61.6	42.0
# days <32 F	7	24	19	26	14	13	2	0	0	0	0	0	105
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
Mean air temperature (F)													
Observed	33.3	2.5	11.7	-0.8	16.5	12.7	31.6	47.0	52.9	53.3	52.3	43.8	29.8
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	100
POR mean													
1971-2000													
Precipitation													
Total ²	1.32	0.07	0.35	0.03	0.00	0.18	0.46	0.36	2.06	4.29	5.38	1.32	15.82
% valid obs	58	8	25	11	31	20	55	85	97	99	97	75	55
POR mean													
1971-2000													
Snow depth (in)													
Average													
% valid obs													
POR mean													
Wind (mph, degrees)													
Mean speed	3.1	2.5	2.9	1.2	3.4	3.3	4.4	4.2	3.3	2.7	2.7	2.4	
% valid obs	100	100	100	100	100	100	100	100	100	100	100	100	
Max speed	35.0	32.0	34.0	21.0	36.0	31.0	29.0	27.0	23.0	23.0	25.0	29.0	36.0
Max direction	0	23	61	40	52	341	65	33	171	22	7	5	52
Solar radiation (kWh/m2)													
Total	30.5	4.9	3.9	6.6	23.4	86.4	123.4	163.7	163.8	112.3	108.1	103.7	951.3
% 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.

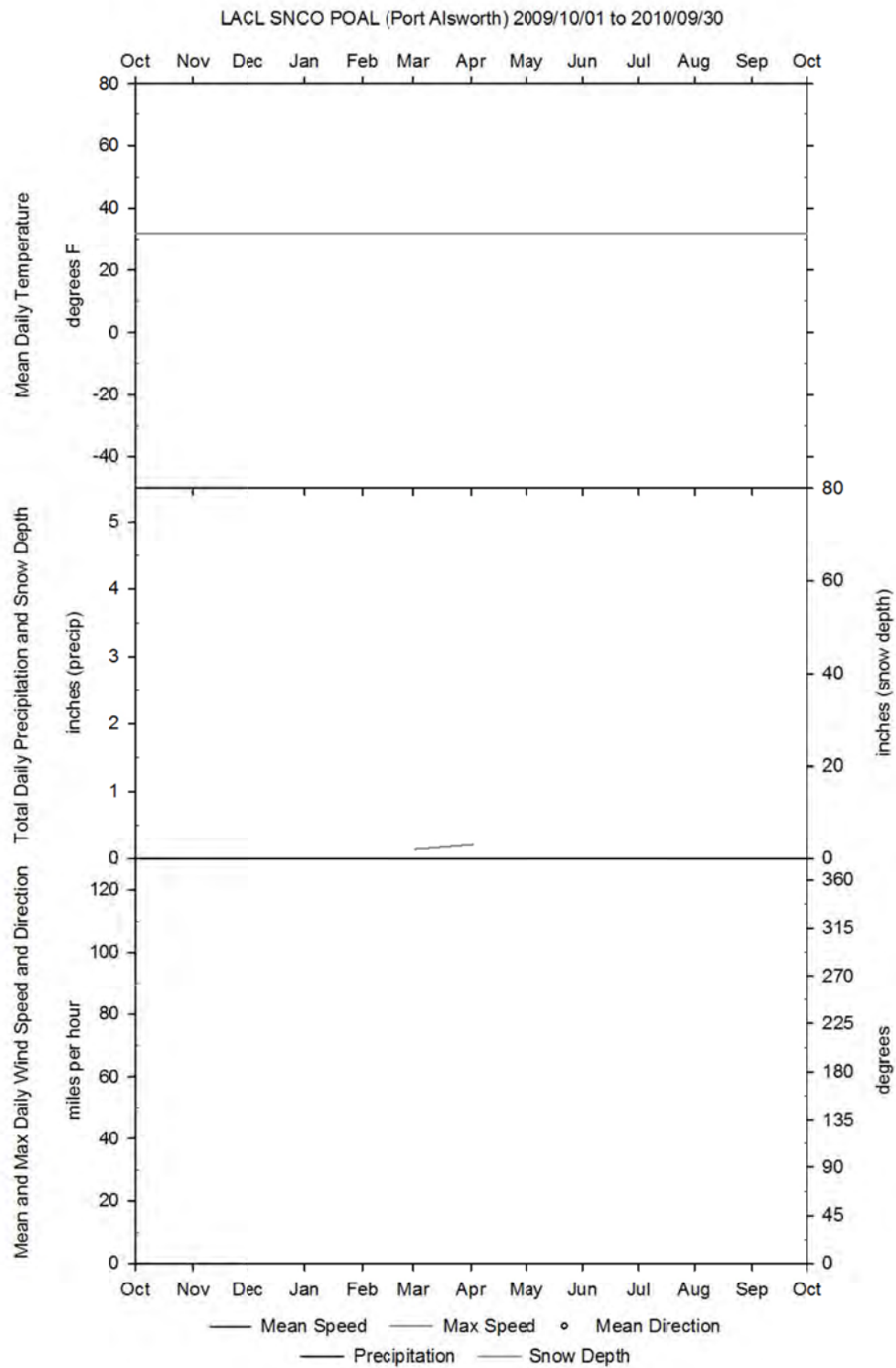
LACL RAWS STON (Stoney) 2009/10/01 to 2010/09/30



2010 Hydrologic Year - LACL SCN0 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					0.50	0.70							
% valid obs			0	0	100	100	0	0					
POR mean													
1971-2000				3.6	4.1	4.2	4.1	0.0					
Snow depth (in)													
Average ⁴					2	3							
% valid obs			0	0	100	100	0	0					
1971-2000				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 beginning of the month.

⁴Cumulative snow depth measured close to the beginning of the month.

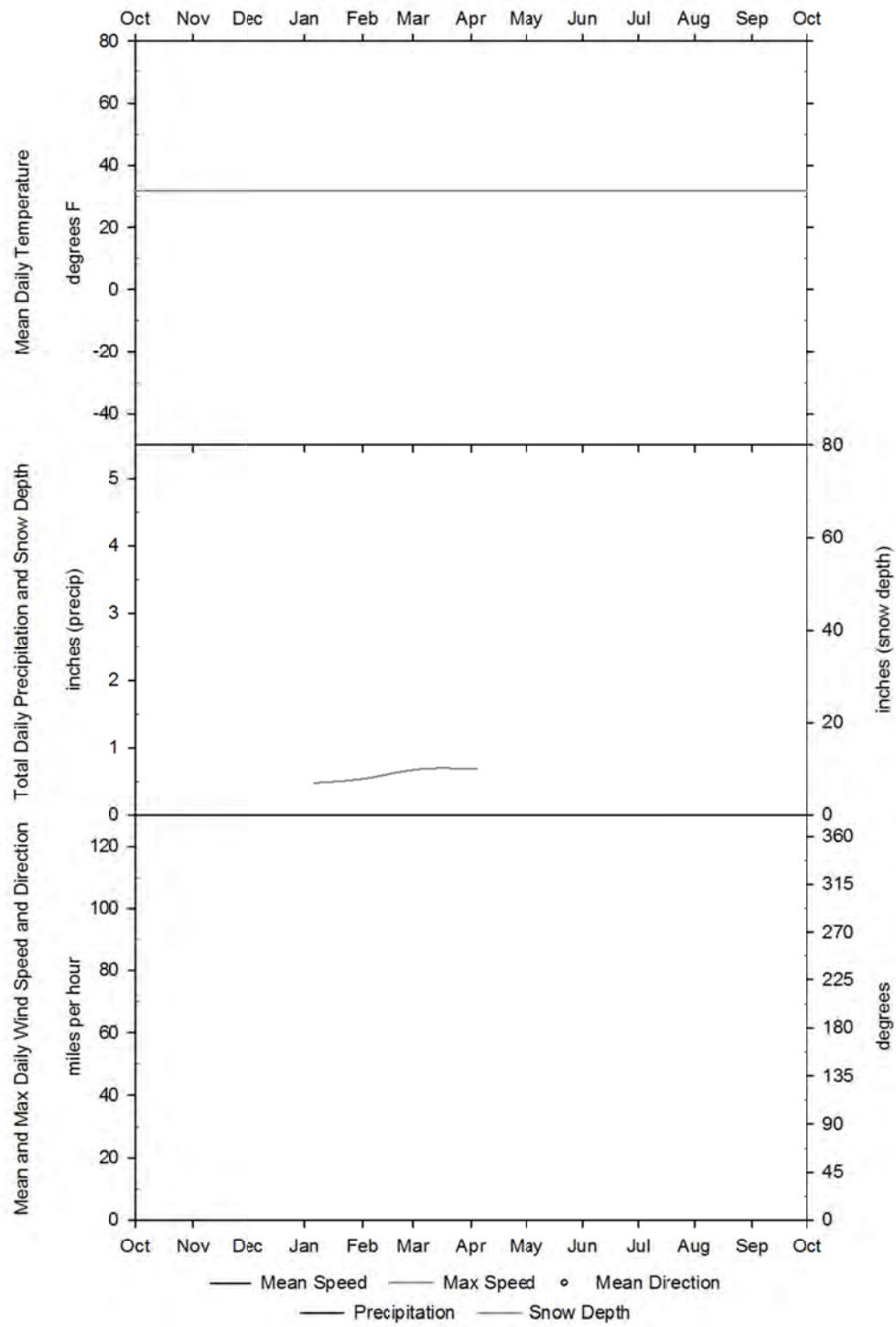


2010 Hydrologic Year - LACL SNC0 TELA (Telaquana Lake)													
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Year
Minimum air temperature (F)													
Min.													
Max.													
Mean													
# days <32 F													
% valid obs													
Maximum air temperature (F)													
Min													
Max													
Mean													
# days <32 F													
% valid obs													
Mean air temperature (F)													
Observed													
% valid obs													
POR mean													
1971-2000													
Precipitation													
Total ³			1.90	1.70	1.70	2.20							
% valid obs			100	100	100	100	0	0					
POR mean													
1971-2000				2.6	3.4	4.0	4.5						
Snow depth (in)													
Average ⁴			7.0	8.0	10.0	10.0							
% valid obs			100	100	100	100	0	0					
1971-2000				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 beginning of the month.

⁴Cumulative snow depth measured close to the beginning of the month.

LACL SNCO TELA (Telaquana Lake) 2009/10/01 to 2010/09/30



The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS 953/108003, June 2011

National Park Service
U.S. Department of the Interior



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