Opportunities For Partnership and Collaboration with the Alaska Climate Science Center

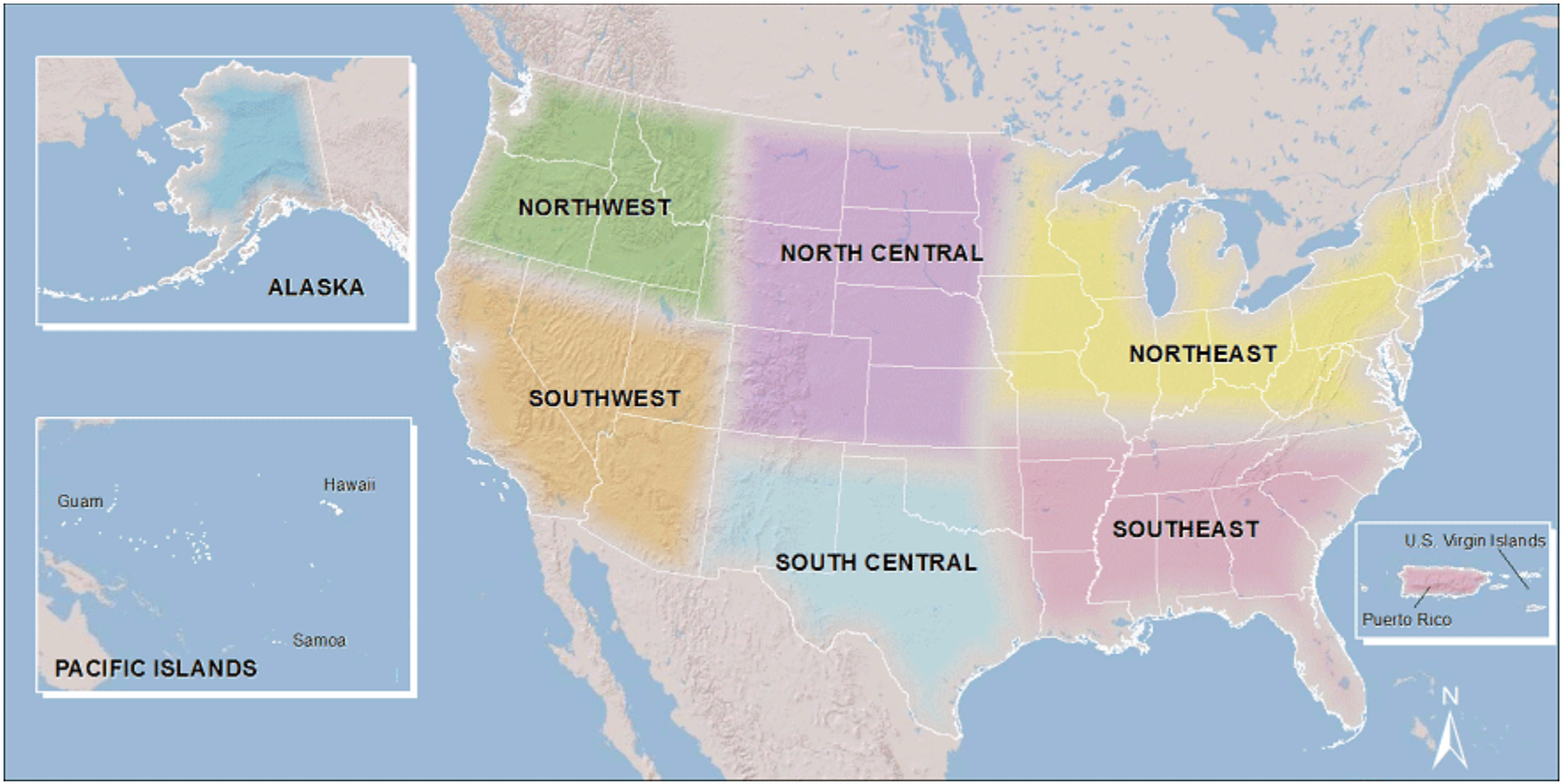
Department of the Interior
US Geological Survey
University of Alaska Fairbanks

AK CSC
Alaska Climate Science Center

USGS
science for a changing world

AK CSC

Alaska Climate Science Center



The AK CSC

- Climate change impacts on ecosystems
  -Habitats, resources and services
- Address DOI management issues, but also recognize broader connections
- Ultimate goal = “actionable science”

USGS
science for a changing world


USGS
science for a changing world

from ICEFIELD to OCEAN

Coastal Alaska and British Columbia glaciers are melting faster than almost any other glaciers on Earth. Glaciers are central to many natural processes and economic activities in this region. Changes in coastal icefields and glaciers can have a ripple effect down through the watershed all the way to the ocean.

How do glaciers impact Alaska's coastal ecosystems, and what do glacier changes mean for the future of this ecologically and economically valuable system?

RAIN OR SNOW?

As temperatures warm in this temperate climate, more precipitation is falling as rain instead of snow. This is already affecting the economically valuable yellow-cedar trees. Over longer time scales, this shift could lead to further declines in glacier mass.

MELTING AWAY

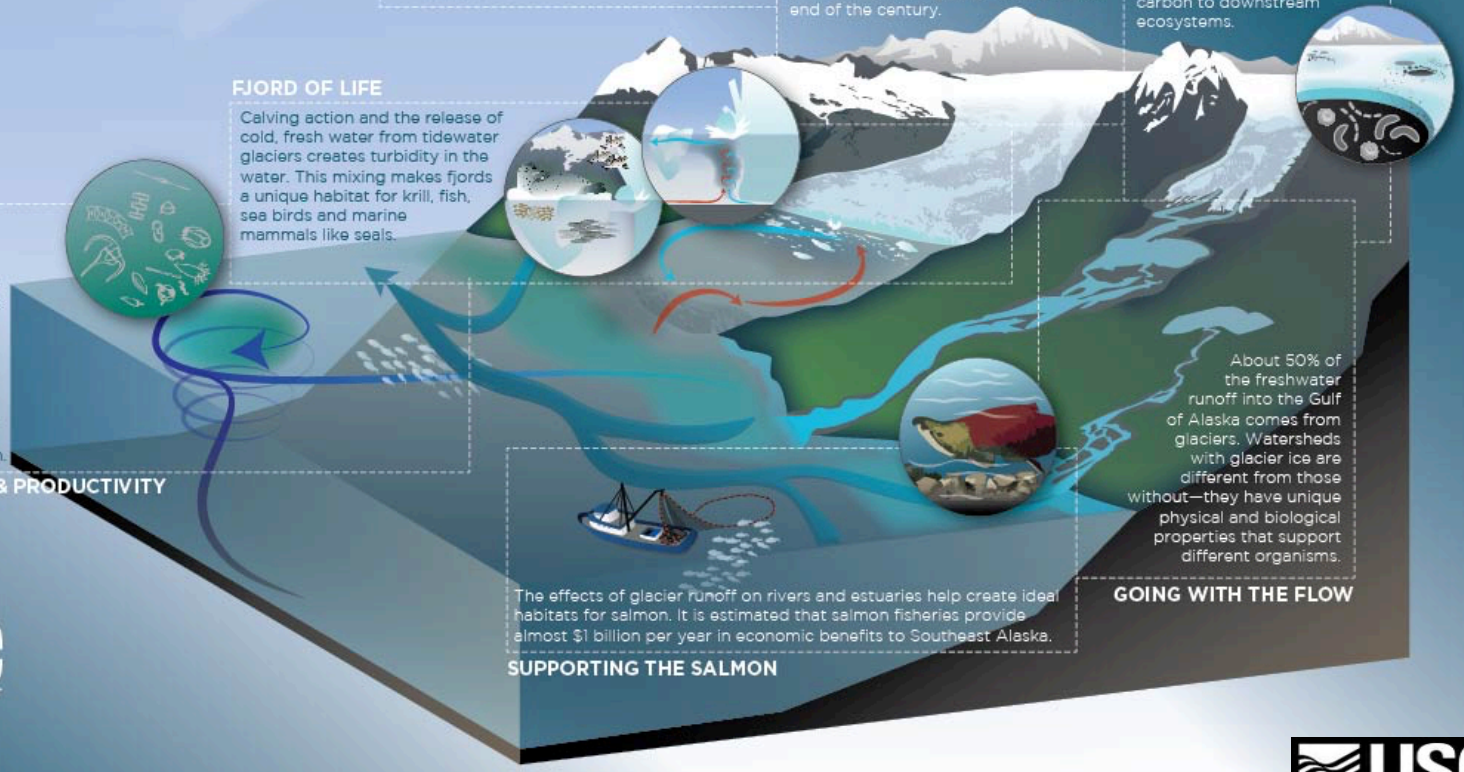
Rates of glacier loss are projected to increase in the region, with a 26–36 % reduction of total glacier volume by the end of the century.

LIFE ON ICE

On the surface, within, and underneath—glaciers are full of life. The glacier surface collects organic matter and is home to diverse microbial communities. Runoff from glaciers provides bioavailable carbon to downstream ecosystems.

FJORD OF LIFE

Calving action and the release of cold, fresh water from tidewater glaciers creates turbidity in the water. This mixing makes fjords a unique habitat for krill, fish, sea birds and marine mammals like seals.



Freshwater runoff from glaciers helps drive the Alaska Coastal Current. This current carries heat, nutrients, and organisms towards the Arctic. Glacier runoff also adds rock derived elements such as phosphorus and iron to marine ecosystems, which fuels phytoplankton growth at the bottom of the food chain.

DRIVING CURRENTS & PRODUCTIVITY

About 50% of the freshwater runoff into the Gulf of Alaska comes from glaciers. Watersheds with glacier ice are different from those without—they have unique physical and biological properties that support different organisms.

GOING WITH THE FLOW

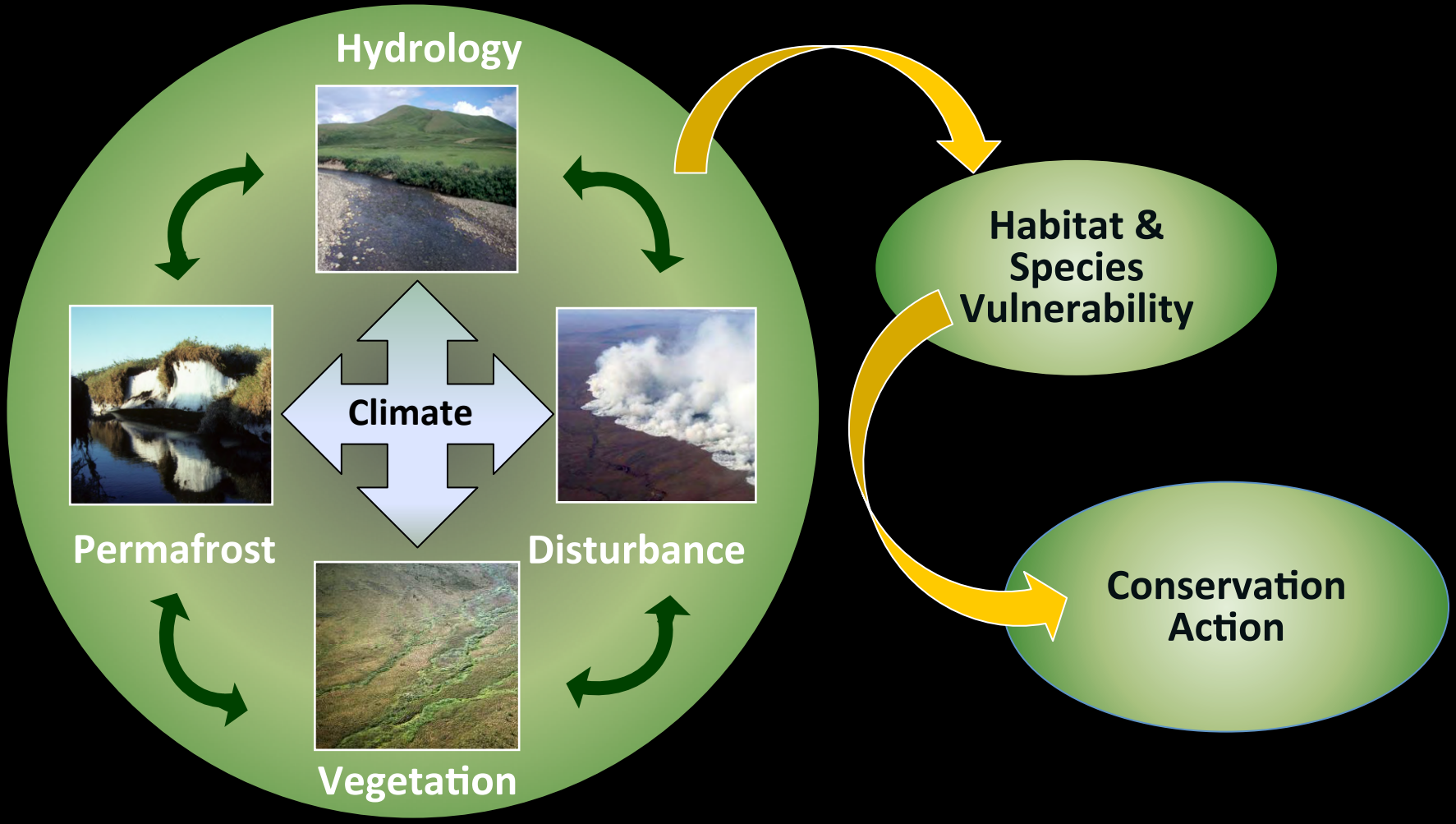
The effects of glacier runoff on rivers and estuaries help create ideal habitats for salmon. It is estimated that salmon fisheries provide almost $1 billion per year in economic benefits to Southeast Alaska.

SUPPORTING THE SALMON

AK CSC
Alaska Climate Science Center
csc.alaska.edu

USGS
science for a changing world

Integrated Ecosystem Model

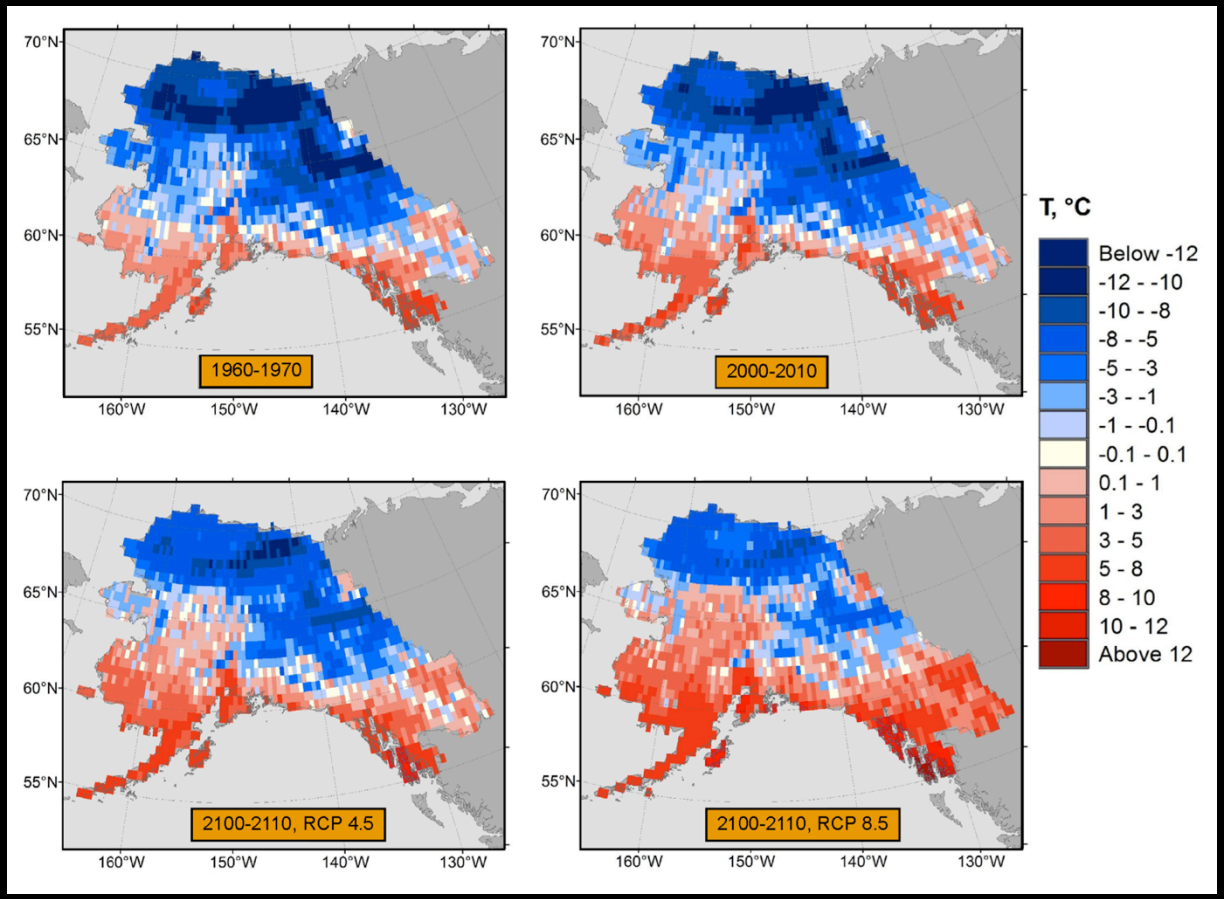


ALF TEM GIPL

Example Outputs

Producing model simulations driven by CMIP5 models

- GIPL 2.0 - simulated ground temperature at 1 m depth

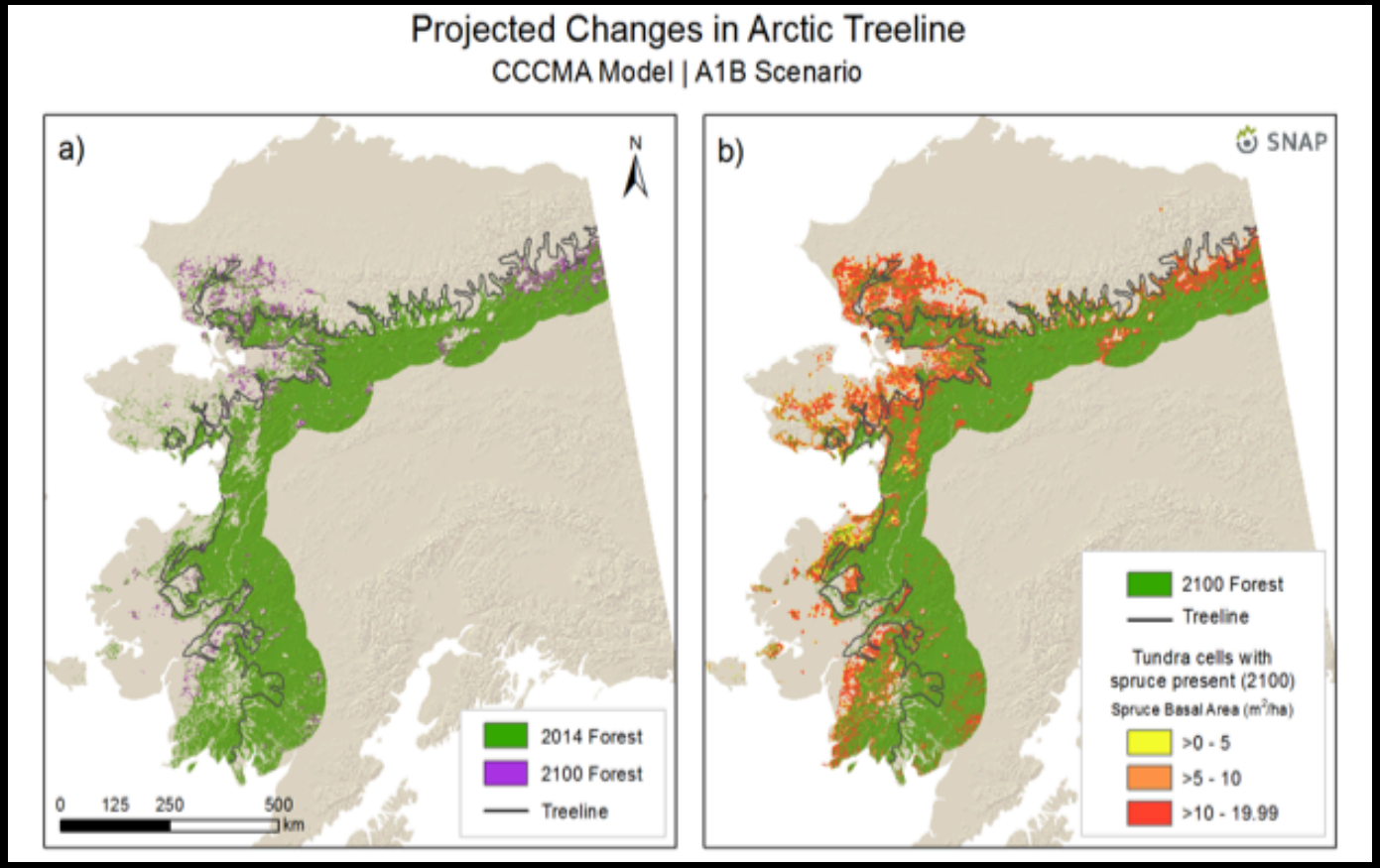


Nickolsky et al., In prep

ALF TEM GIPL

Example Outputs

- Forecasting tundra fire and treeline dynamics

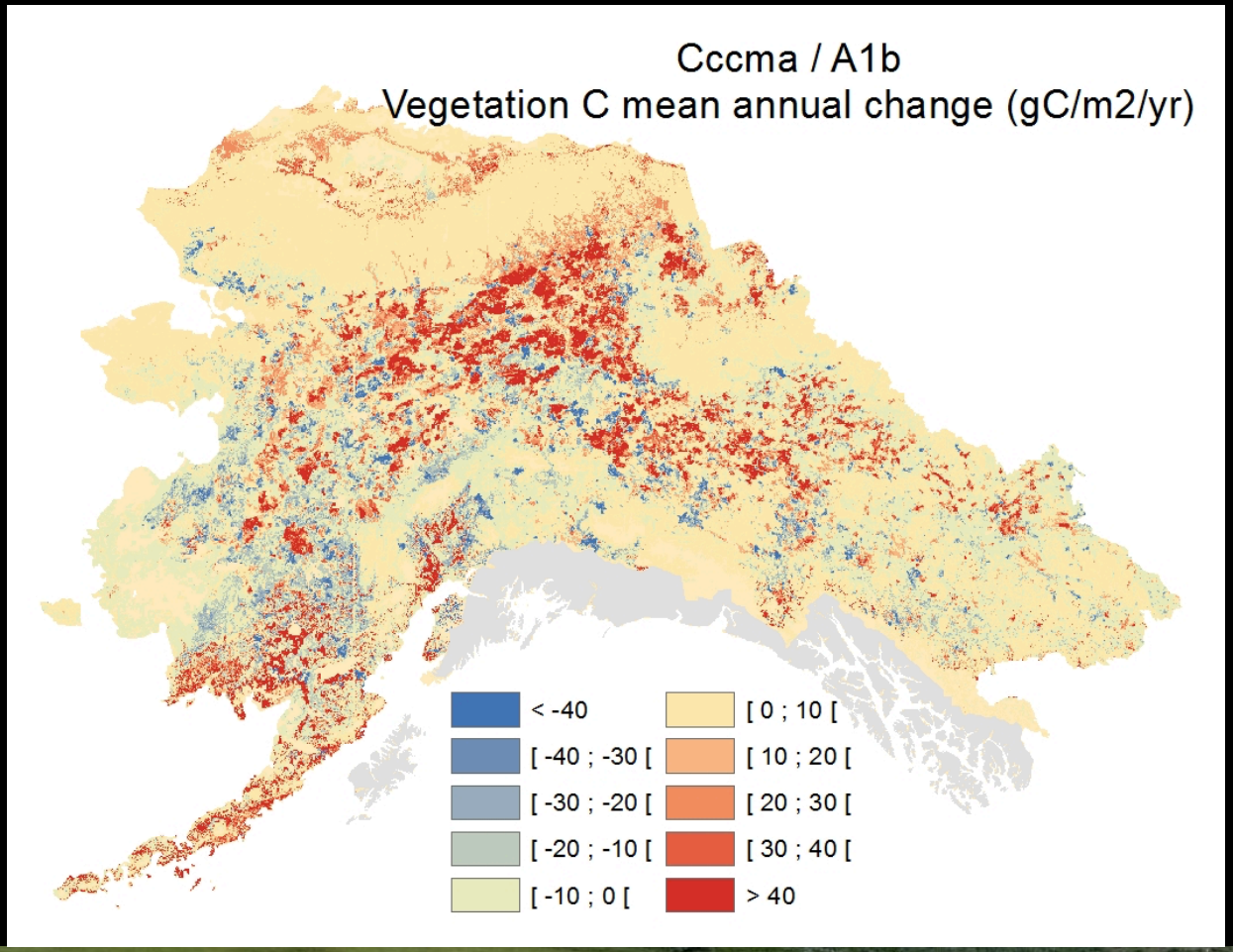


Breen et al., In prep

ALF TEM GIPL

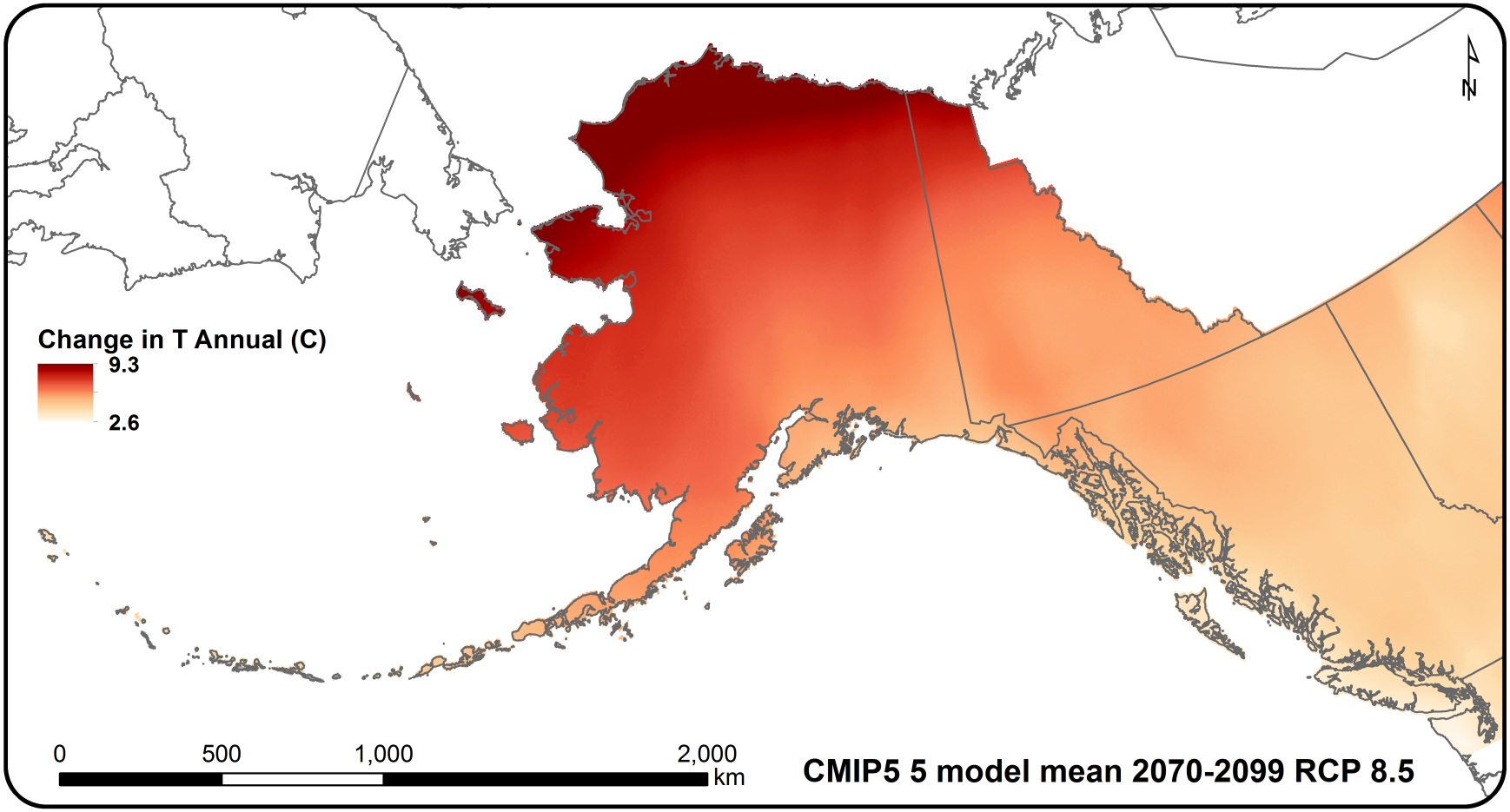
Example Outputs

- Forecasting vegetation and carbon change



ALF TEM GIPL

Statistical Downscaling: Annual Temperature Change

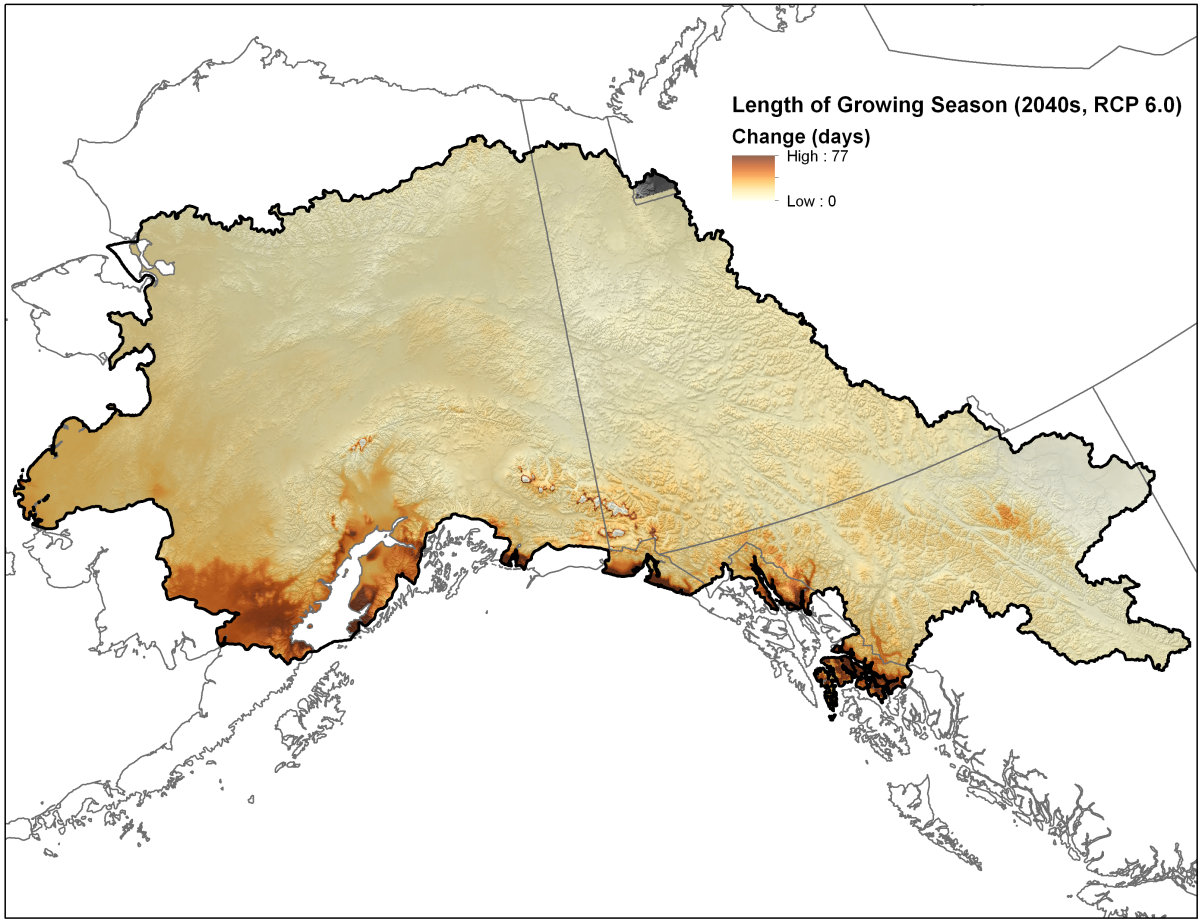


SNAP

Data: SNAP, https://www.snap.uaf.edu/

AK CSC
Alaska Climate Science Center

Change in growing season length

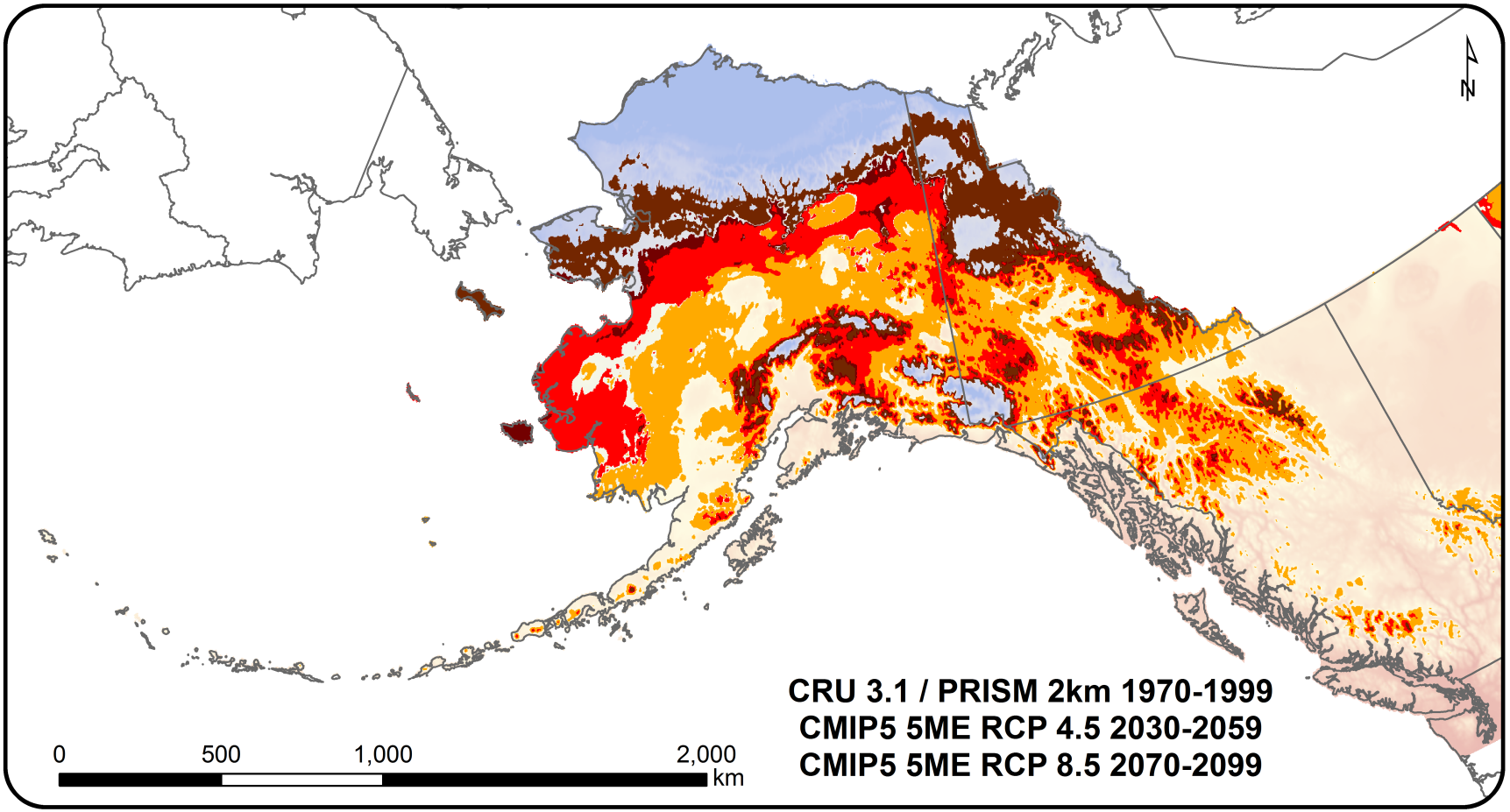


SNAP

Data: SNAP, https://www.snap.uaf.edu/

AK CSC
Alaska Climate Science Center

Annual average T between 0C and -2C: RCP 8.5 2080s

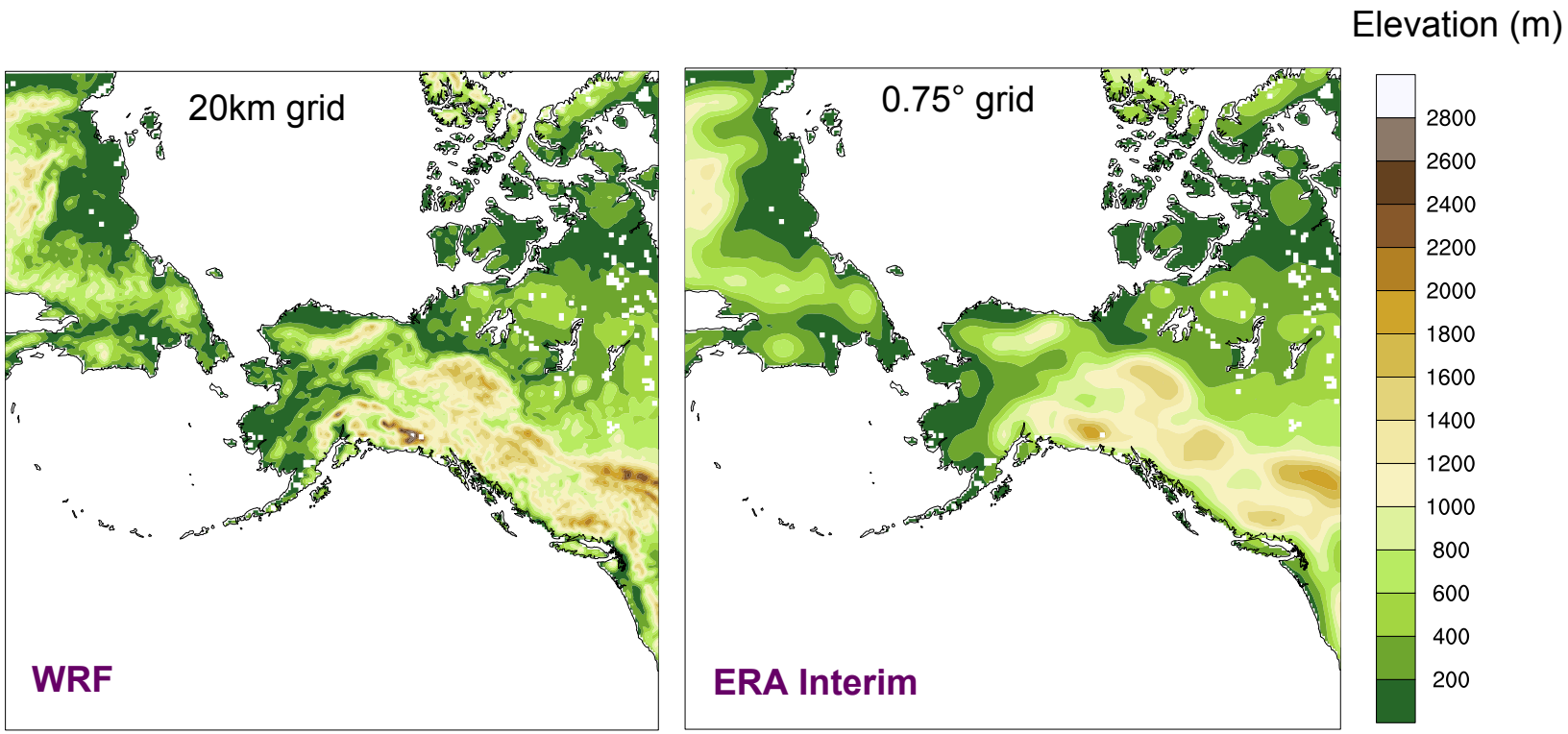


SNAP

Data: SNAP, https://www.snap.uaf.edu/

AK CSC
Alaska Climate Science Center

Regional Climate Model Domain



- Using the Weather Research and Forecasting Model (WRF)
- 20 km grid resolution
- 3 hourly time step
- Running ERA (historical) and GFDL and CCSM (future) under 4.5, 6.0 and 8.5 RPC

Suite of Daily Data Available from Dynamical Downscaling in Alaska

Variables Available	Level
TMAX: "Daily maximum 2m temperature"	s
TMIN: "Daily minimum 2m temperature"	s
ALBEDO: "Albedo"	s
CLDFRA: "Total cloud cover"	s
CLDFRA_HIGH: "High level cloud cover"	s
CLDFRA_LOW: "Low level cloud cover"	s
CLDFRA_MID: "Mid level cloud cover"	s
HFX: "Sensible heat flux"	s
LH: "Latent heat flux"	s
LWDNB: "Downward long wave flux"	s
LWDNBC: "Clear sky downward long wave flux"	s
LWUPB: "Upward long wave flux"	s
LWUPBC: "Clear sky upward long wave flux"	s
PSFC: "Surface pressure"	s
Q2: "Specific humidity at 2m height"	s
QBOT: "Specific humidity at lowest model level"	s
SEAICE: "Ice concentration (ice=1no ice=0)"	s
SLP: "Mean sea level pressure (ETA model)"	s
SNOW: "Snow water equivalent"	s
SNOWC: "Snow cover"	s
SNOWH: "Snow depth"	s
SWDNB: "Downward short wave flux"	s
SWDNBC: "Clear sky downward solar flux"	s
SWUPB: "Upward short wave flux"	s
SWUPBC: "Clear sky upward solar flux"	s
T2: "Temperature at 2m height"	s
TBOT: "Temperature at lowest model level"	s
TSK: "Surface skin temperature"	s
U10: "u-component of wind at 10m height"	s
UBOT: "u-component of wind at lowest model level"	s
V10: "v-component of wind at 10m height"	s
VBOT: "v-component of wind at lowest model level"	s
VEGFRA: "Vegetation fraction"	s
ACSNOW: "Water equivalent of accum. snow depth"	s
PCPT: "Total precipitation"	s
PCPC: "Accumulated total precipitation"	s
PCPNC: "Accumulated large-scale precipitation"	s
POTEVP: "Accumulated potential evaporation"	s
GHT: "Geopotential height"	atm levels
OMEGA: "Pressure vertical velocity"	atm levels
QVAPOR: "Specific humidity"	atm levels
SMOIS: "Volumetric soil moisture content"	soil levels
T: "Temperature"	atm levels
TSLB: "Soil temperature"	soil levels
U: "u-component of wind"	atm levels
V: "v-component of wind"	atm levels
SH2O: "Liquid volumetric soil moisture (non-frozen)"	soil levels

Example: Capturing extreme events

2011 Bering Sea superstorm Nov 8-9, 2011

Alaska Dispatch News

NEWS POLITICS VOICES ARCTIC CULTURE SPORTS ADVENTURE MULTIMEDIA

Obituaries Anchorage Fairbanks Mat-Su Crime Aviation Business Energy Nation-World Science

President declares Bering Sea 'mega storm' disaster in Western Alaska

Alex DeMarban | December 22, 2011

Like 0 Tweet 0 g+1 0 Text Size

ay declared a major
communities pummeled by

ase of federal funds to help
n severe winter storms

on Attendance Areas are
ssistance under the Hazard
help repair damaged
ncy preparations, the

ov. Sean Parnell declared a
saster on Dec. 5, freeing
state resources and

Photo by Rosa Schmidt, KNOM Radio Mission

Snow, hurricane-force winds batter Alaska coast

Story Image (5) Print Font Size:

Recommend 0 Tweet 0 g+1 0 Pin it 0 Share 0

Previous Next

Posted: Wednesday, November 9, 2011 6:41 am | *Updated: 1:34 pm, Wed Jan 16, 2013.*

Associated Press |

Updated 12 a.m.

Snow, hurricane-force winds batter Alaska coast

Winds entered category 1 hurricane range (74-95mph)

http://www.adn.com/article/president-declares-bering-sea-mega-storm-disaster-western-alaska

www.newsminer.com

http://www.ncdc.noaa.gov/stormevents/eventdetails.jsp?id=350582

https://www.snap.uaf.edu/tools-and-data/all-analysis-tools

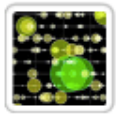
SNAP

ABOUT - EXPERTISE - METHODS - TOOLS + DATA - PROJECTS

All Analysis Tools

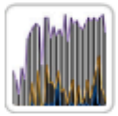
Community Charts

Explore temperature and precipitation histories and projections for thousands of communities across Alaska and Canada



Daily Precipitation

Analyze historical and projected daily precipitation amounts for communities across Alaska



Extreme Weather

Explore CMIP5 quantile-mapped daily data to analyze the frequency of extreme daily temperature and wind events from 1958 and projected through 2100

Historical Sea Ice Atlas

View historical sea ice data collected between 1850 and today on an interactive map of the seas off northern Alaska

Modeled Sea Ice Coverage

Explore and visualize various models of historical and projected arctic sea ice extent and concentration through 2099

Regional Climate Projections

Use our interactive map tool to browse and compare climate scenarios created from SNAP data.

Sea Ice and Wind

Examine projected interactions between monthly sea ice concentrations and extreme wind events

Download SNAP data

Download datasets for your own research.

How to cite SNAP products

When the publication medium allows it, please include the SNAP logo and a link back to our home page. For publications, please cite this way:

Scenarios Network for Alaska and Arctic Planning, University of Alaska. *[insert current year]. [insert specific webpage title].* Retrieved *[insert date]* from *[insert URL].*

Licensing, attribution and collaboration

Please contact us if you are interested in commercialization opportunities and/or collaborative R&D activities.

Modeled Historical and Projected Data

Historical Estimates and Projections of Sea Ice Concentration – 0.4 degrees CMIP5/AR5

Historical Daily Mean Quantile Mapped Temperatures – 2.5 degrees CMIP5/AR5

Projected Daily Mean Quantile Mapped Temperatures – 2.5 degrees CMIP5/AR5

Historical Daily Quantile Mapped Near Surface Wind Velocity – 2.5 degrees CMIP5/AR5

Projected Daily Quantile Mapped Near Surface Wind Velocity – 2.5 degrees CMIP5/AR5

Projected Monthly Temperature and Precipitation - 2km CMIP5/AR5

Projected Derived Temperature Products - 2km CMIP5/AR5

Projected Derived Precipitation Products - 2km CMIP5/AR5

Projected Monthly Temperature and Precipitation – 771m CMIP5/AR5

Projected Derived Temperature Products – 771m CMIP5/AR5

Projected Derived Precipitation Products – 771m CMIP5/AR5

Projected Monthly Temperature and Precipitation - 771m CMIP3/AR4

Projected Derived Temperature Products - 771m CMIP3/AR4

Projected Derived Precipitation Products - 771m CMIP3/AR4

Projected Monthly Temperature and Precipitation - 2 km CMIP3/AR4

Projected Derived Temperature Products - 2 km CMIP3/AR4

Projected Derived Precipitation Products - 2 km CMIP3/AR4

Projected Monthly Potential Evapotranspiration - 2km CMIP3/AR4

Projected Derived Potential Evapotranspiration - 2km CMIP3/AR4

Projected Decadal Averages Of Monthly Snow-day Fraction 771m CMIP3/AR4

Historically Observed Data

Historical Sea Ice Atlas: Observed Estimates of Sea Ice Concentration in Alaska Waters

Historical Monthly Temperature and Precipitation - 771m CRU TS 3.0

Historical Monthly Temperature and Precipitation - 771m CRU TS 3.1/3.1.01

Historical Derived Temperature Products - 771m CRU TS 3.0

Historical Derived Temperature Products - 771m CRU TS 3.1

Historical Derived Precipitation Products - 771m CRU TS 3.0

Historical Derived Precipitation Products - 771m CRU TS 3.1.01

Historical Monthly Temperature and Precipitation - 2 km CRU TS 3.0

Historical Monthly Temperature and Precipitation - 2 km CRU TS 3.1/3.1.01

Historical Derived Temperature Products - 2 km CRU TS 3.0

Historical Derived Temperature Products - 2 km CRU TS 3.1

Historical Derived Precipitation Products - 2 km CRU TS 3.0

Historical Derived Precipitation Products - 2 km CRU TS 3.1.01

Historical Monthly Potential Evapotranspiration - 2km CRUTS3.0

Historical Derived Potential Evapotranspiration - 2km CRUTS3.0

Historical Decadal Averages Of Monthly Snow-day Fraction 771m CRU TS 3.1

Leveraging AK CSC Research

- Datasets freely available via SNAP and other portals
- Limited capacity for support
- No capacity for development of custom products or “concierge services”
- Opportunity for “value added” development

USGS
science for a changing world

For more information:

http://www.doi.gov/csc/alaska/
http://csc.alaska.edu/
sgray@usgs.gov

AK CSC
Alaska Climate Science Center

USGS
science for a changing world