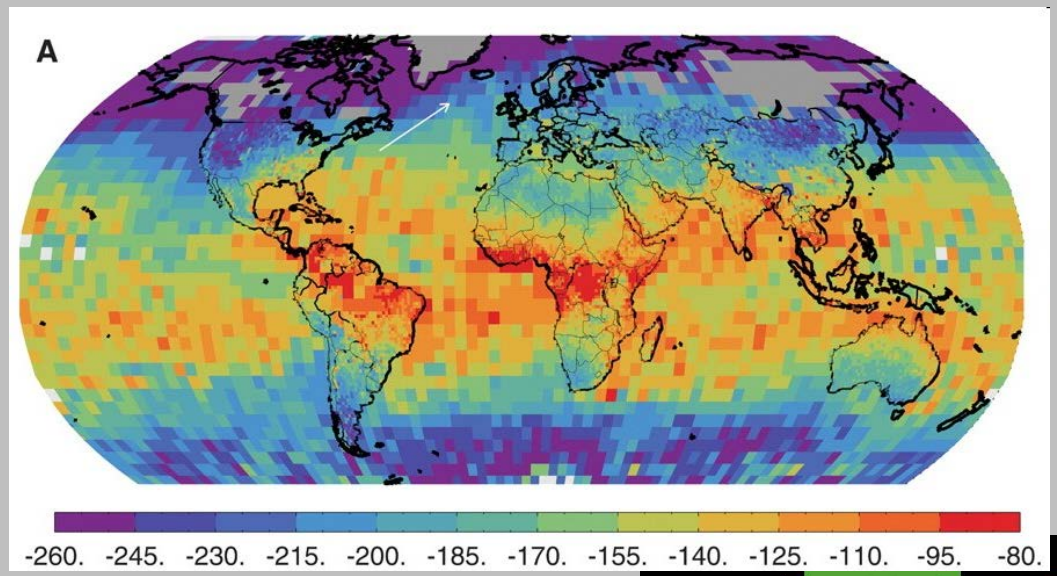
Climate Scenarios, Tools, and Modeling

Scenarios Network
FOR ALASKA & ARCTIC PLANNING

AK CSC
Alaska Climate Science Center

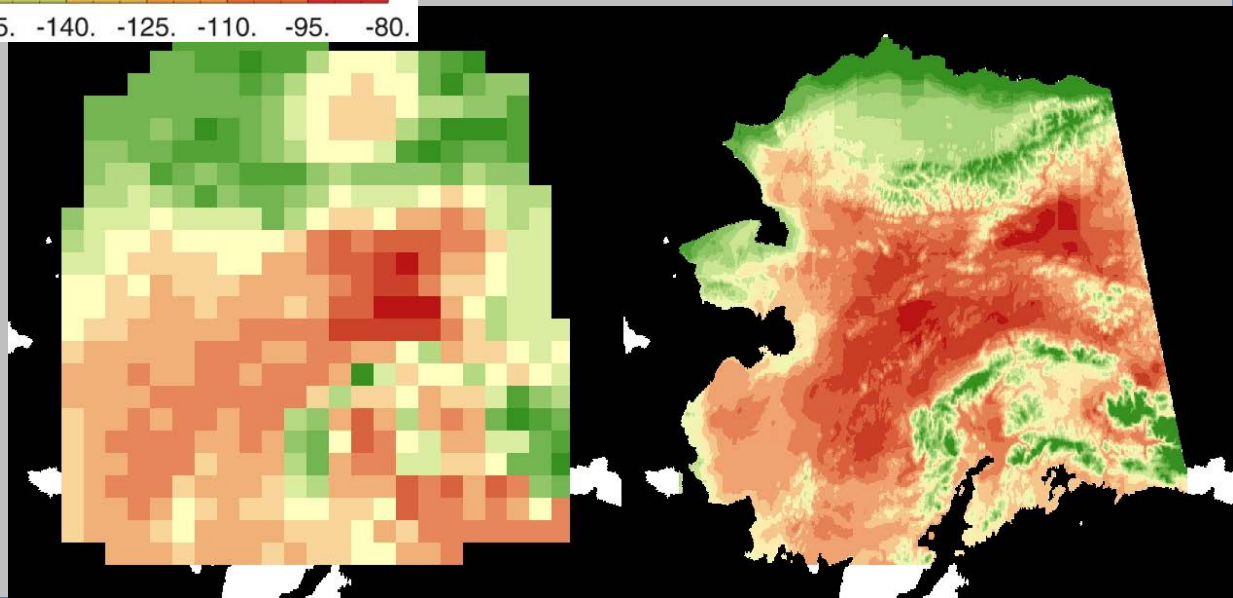
SNAP: Scenarios Network for Alaska and Arctic Planning (www.snap.uaf.edu)

GCM output (ECHAM5) *Figure 1A from Frankenberg et al., Science, Sept. 11, 2009*



Current SNAP projections are based on CMIP3 models, and statistically downscaled using PRISM gridded data. CMIP5 models available soon.

CRU data and SNAP outputs after PRISM downscaling 0.5 x 0.5 degrees to 2 x 2 km



- **Temperature**
- **Precipitation**
- **Potential Evapotranspiration**
- **Snow-day Fraction**
- **Every month of every year from 1900 to 2100**
- **3 emission scenarios**
- **771m and 2km resolution**

Projected Monthly Temperature and Precipitation – 2 km CMIP3/AR4

Projected (2001-2100: B1, A1B, and A2 scenarios) monthly temperature and precipitation from 5 AR4 GCMs that perform best across Alaska and the Arctic, downscaled to 2 km via the delta method. A 5-Model Average is also included.

Baseline Reference Climate	1961-1990 PRISM
Spatial Resolution	2 km
Temporal Resolution	Monthly
Spatial Extent	Alaska and Western Canada (YT, BC, AB, SK, MB)

Temperature

Metadata: Projected Monthly Average Temperature 2 km AR4

	Scenario		
Model	**B1**	**A1B**	**A2**
5-model Average	2001-2100 (2.6 GB)	2001-2100 (2.6 GB)	2001-2100 (2.6 GB)
cccma_cgcm31	2001-2100 (2.6 GB)	2001-2100 (2.6 GB)	2001-2100 (2.6 GB)
gfdl_cm2_1	2001-2100 (2.6 GB)	2001-2100 (2.6 GB)	2001-2100 (2.6 GB)
miroc3_2_medres	2001-2100 (2.6 GB)	2001-2100 (2.6 GB)	2001-2100 (2.6 GB)
mpi_echam5	2001-2100 (2.6 GB)	2001-2100 (2.6 GB)	2001-2100 (2.6 GB)
ukmo_hadcm3	2001-2100 (2.7 GB)	2001-2100 (2.6 GB)	2001-2100 (2.7 GB)

Precipitation

Metadata: Projected Monthly Total Precipitation 2 km AR4

	Scenario		
Model	**B1**	**A1B**	**A2**
5-model Average	2001-2100 (2.3 GB)	2001-2100 (2.3 GB)	2001-2100 (2.3 GB)
cccma_cgcm31	2001-2100 (2.4 GB)	2001-2100 (2.3 GB)	2001-2100 (2.3 GB)
gfdl_cm2_1	2001-2100 (2.3 GB)	2001-2100 (2.3 GB)	2001-2100 (2.4 GB)
miroc3_2_medres	2001-2100 (2.3 GB)	2001-2100 (2.3 GB)	2001-2100 (2.3 GB)
mpi_echam5	2001-2100 (2.4 GB)	2001-2100 (2.4 GB)	2001-2100 (2.4 GB)
ukmo_hadcm3	2001-2100 (2.3 GB)	2001-2100 (2.3 GB)	2001-2100 (2.3 GB)

Projected Derived Temperature Products – 2 km CMIP3/AR4

Projected Derived Precipitation Products – 2 km CMIP3/AR4

2-km downscaled CRU 3.1 historical time series climate data for 32 AK cities

SNAP

Choose a dataset:

2-km downscaled CRU 3.1

Choose a city:

Big Delta
Cold Bay
Cordova
Elfin Cove
Fairbanks

Choose a variable:

Temperature

Year range:

1901 1950 2009

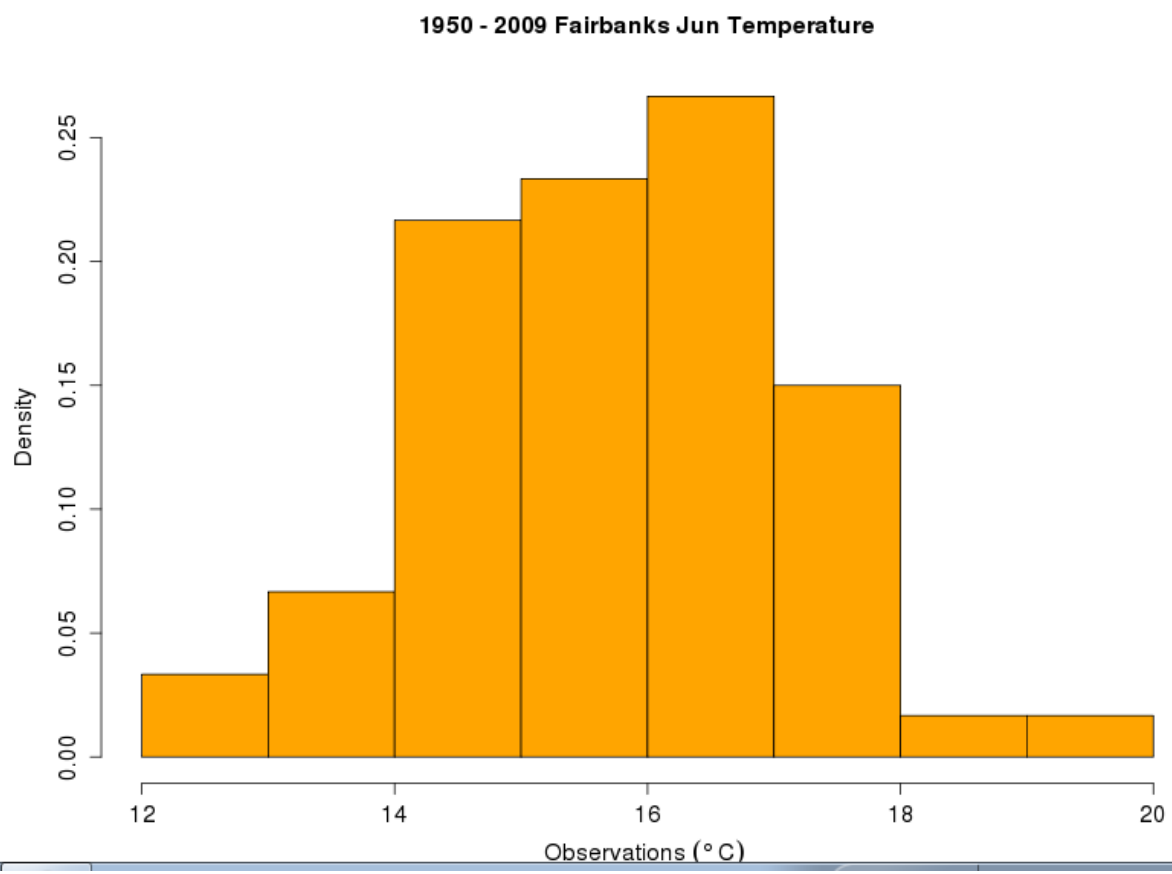
Choose a month:

Jun

- [ ] Vary number of histogram bins
- [ ] Show individual observations
- [ ] Overlay density curve
- [x] Load Google map

Download Sample

Distributions | Summary Statistics | Data | Regression | About



CMIP5 Quantile-mapped GCM Daily Data

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Time

1958 1981 2010 2100

Show months: All, Jan, Feb, Mar

Highlight months: None, Jan

Climate and Geography

Climate variable: temperature, WE wind, NS wind, Wind

Geographic location: Chukchi Sea, Point Lay, Wainwright, Barrow

Climate model: GFDL-CM3

RCP: RCP 6.0

Thresholds and Conditionals

Temp. threshold (C): -20, -16, -12, -8

Wind threshold (m/s): -10.8, -7.2, -3.6, 3.6

Days per month: Above threshold

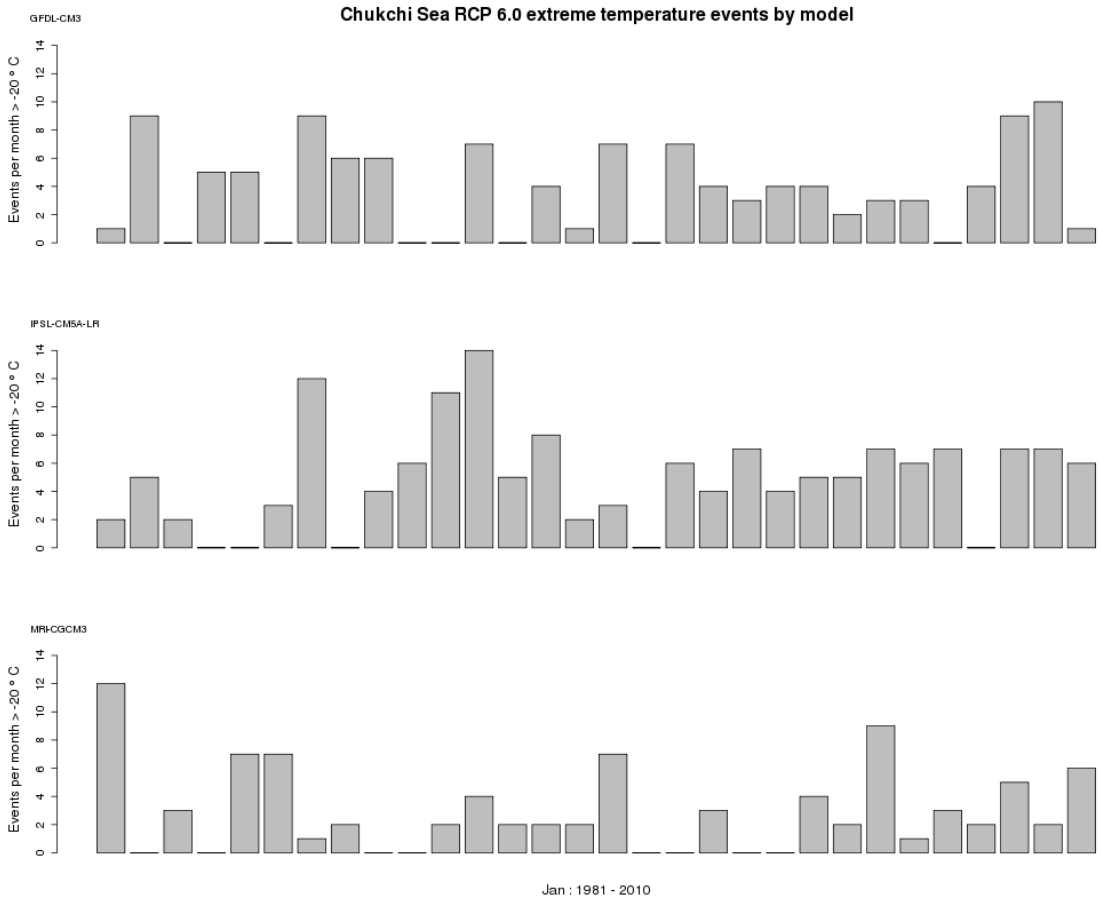
Conditional variable: Model

Positve values for directional wind components indicate West to East and South to North, like an X-Y graph.

☐ Show location grid

Download Graphic

Conditional Barplots | About



Modeled Polar Sea Ice Coverage

SNAP

Choose model:

- ACCESS-1.0
- CESM1-CAM5
- CMCC-CM
- HADGEM2-AO

Year range: 1860 1979 2099

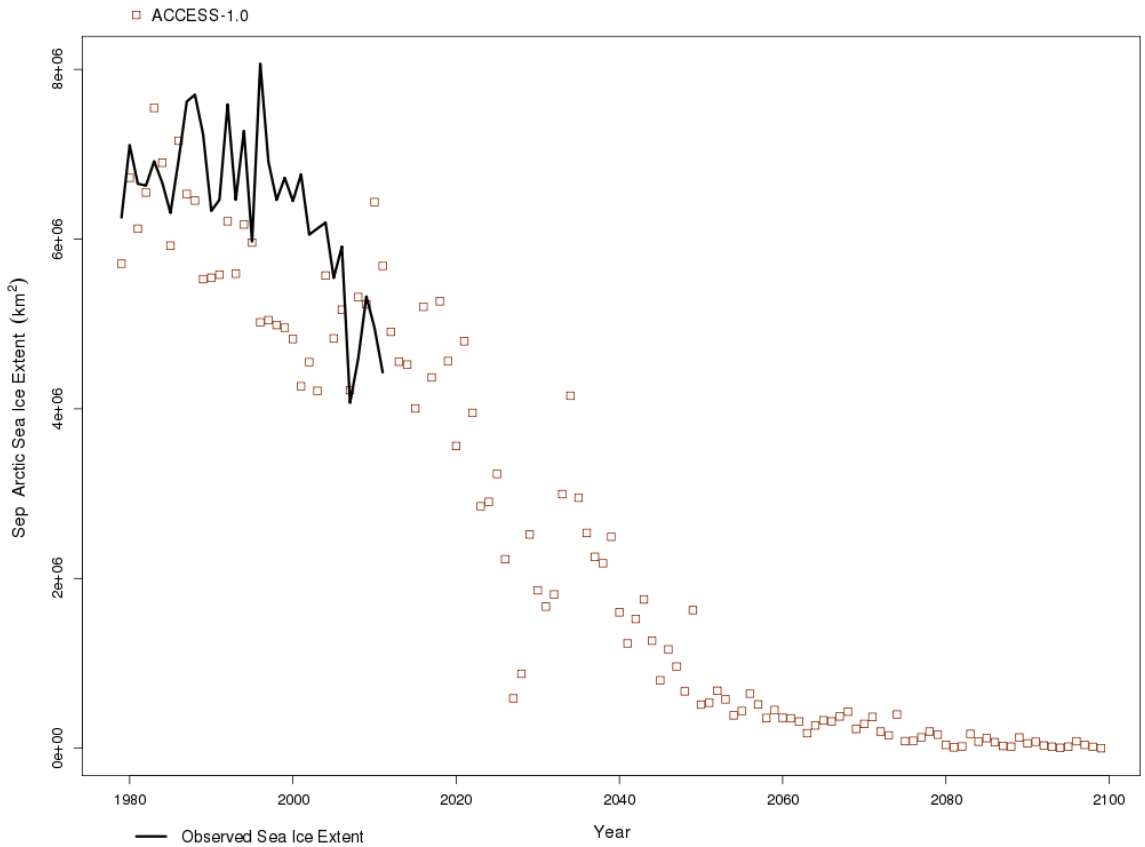
Seasonal period: Sep

- [x] Show sample points
- [ ] Show time series line(s)
- [ ] Linear trend
- [ ] Quadratic trend
- [ ] Locally weighted LOESS
- [ ] Full fixed (x,y) limits
- [x] Show Observations (1979 - 2011)

Download Graphic

Extent Totals | Concentration Map | About

Sea Ice Extent Totals



Modeled Polar Sea Ice Coverage

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Decade:

2030s

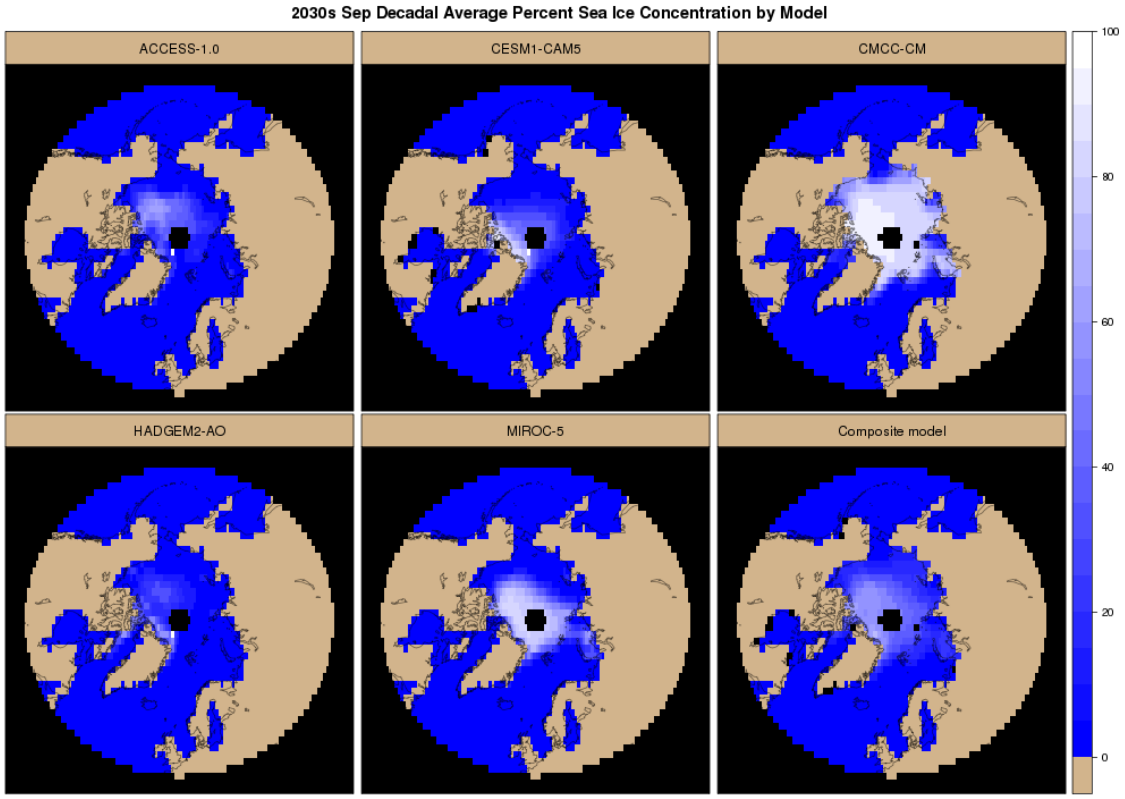
Month:

Sep

Download Graphic

Extent Totals | Concentration Map | About

Sea Ice Concentration

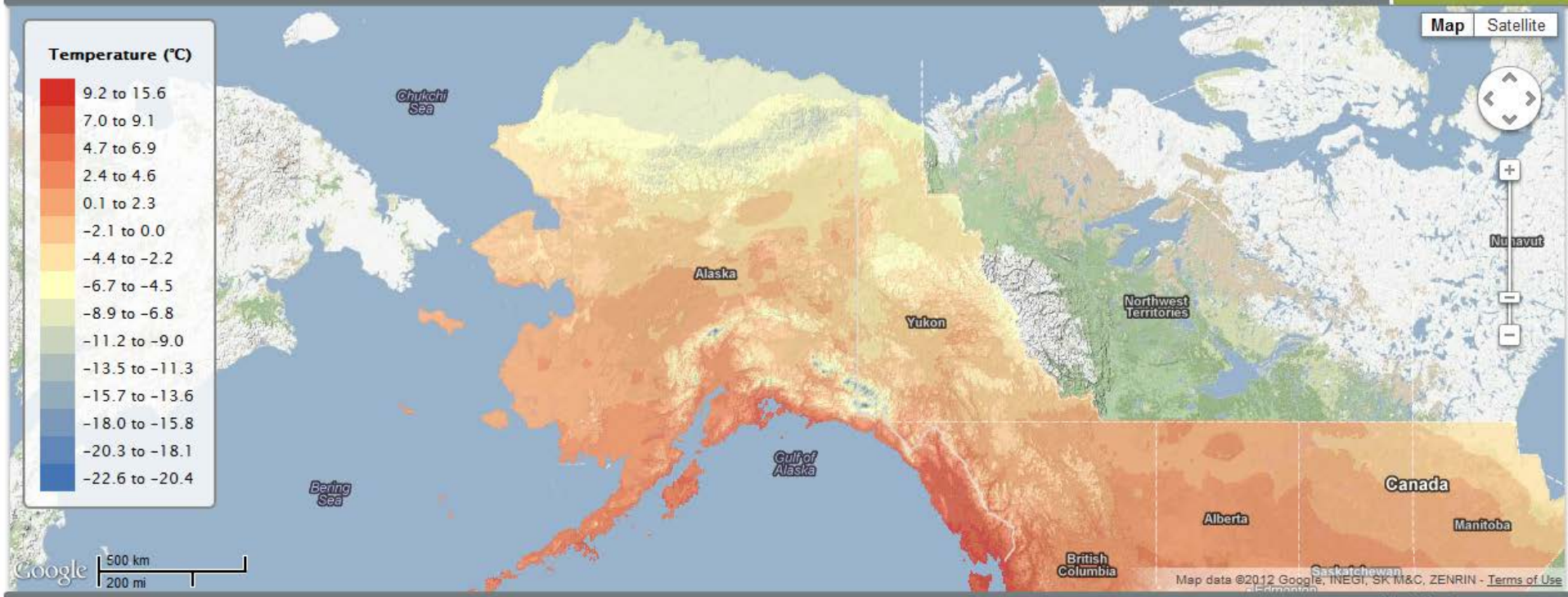


SNAP

currently viewing

Projected GCM Average Temperature | as 10-year averages | from 2050-2059 | assuming mid-range emissions (A1B) | from the 5-model average | at 2km resolution

Print Link share



Download Data View Metadata

UAF UNIVERSITY OF ALASKA FAIRBANKS

Community Charts: Fairbanks, Alaska

To load a chart, type your community's name:

Fairbanks, Alaska

Data Set

Temperature | Precipitation

Emissions Scenario

Low (B1) | Medium (A1B) | High (A2) | ?

Inter-Model Variability

Off | On | ?

SNAP has created charts for communities in the area shown above.

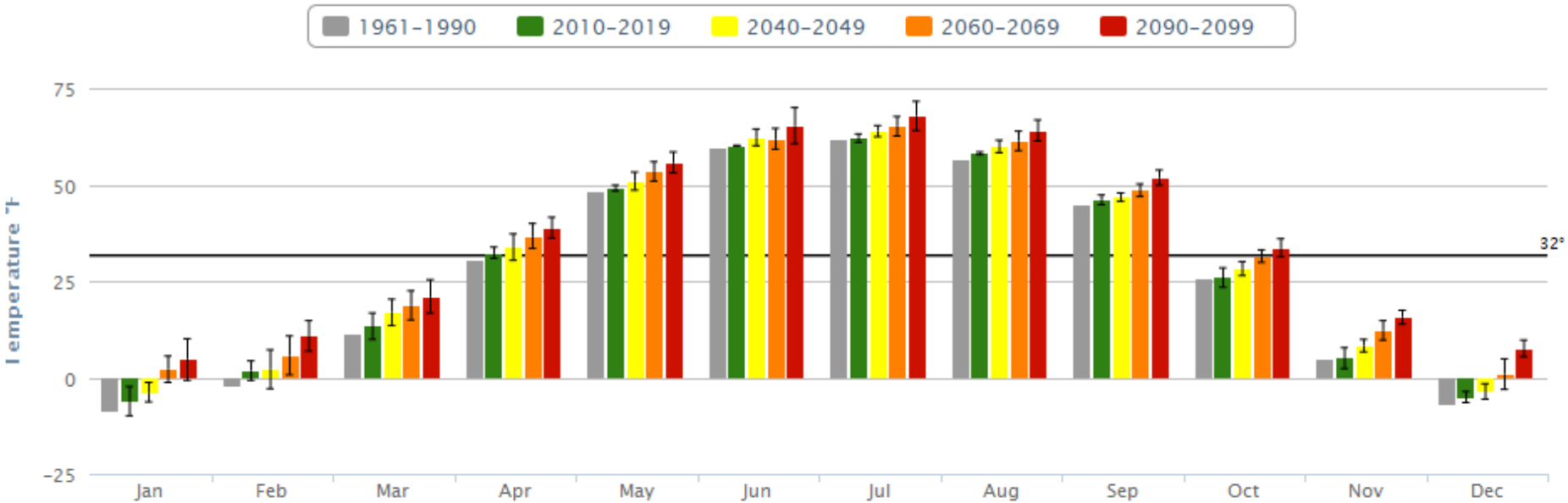
In cooperation with:

COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF ALASKA FAIRBANKS

Export

Average Monthly Temperature for Fairbanks, Alaska

Historical PRISM and 5-Model Projected Average, Mid-Range Emissions (A1B)



Due to variability among climate models and among years in a natural climate system, these graphs are useful for examining trends over time, rather than for precisely predicting monthly or yearly values. For more information on derivation, reliability, and variability among these projections, please visit www.snap.uaf.edu.

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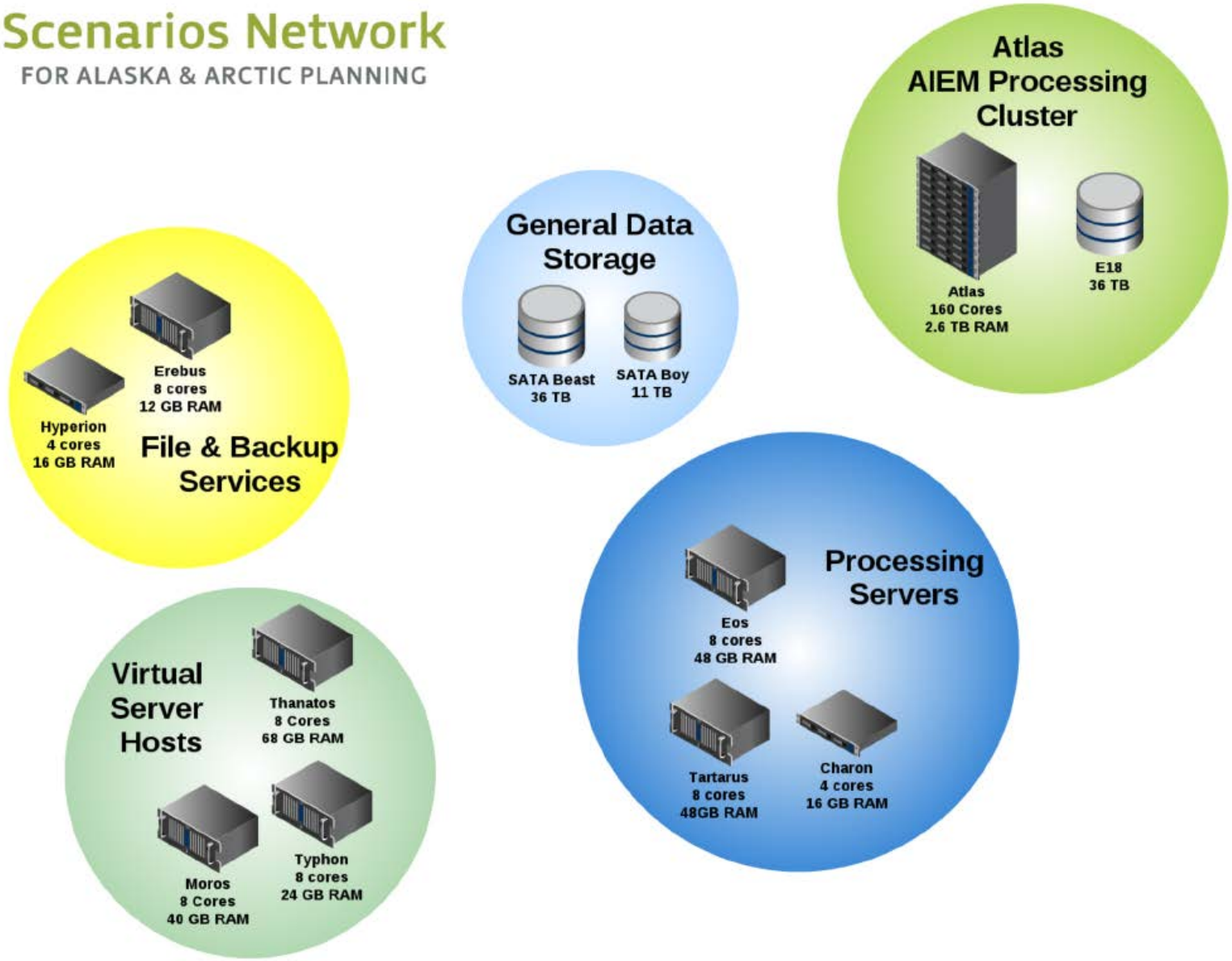
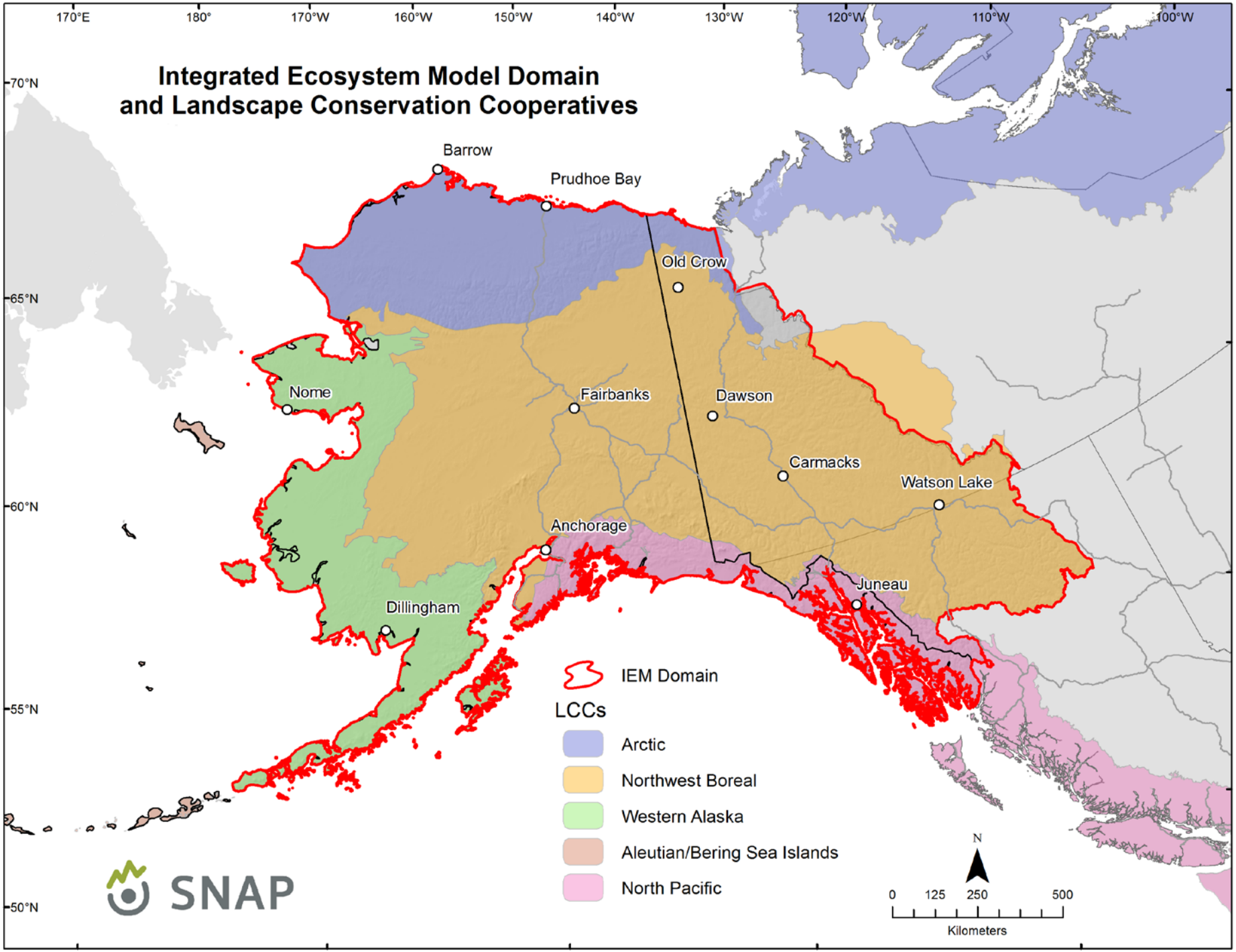
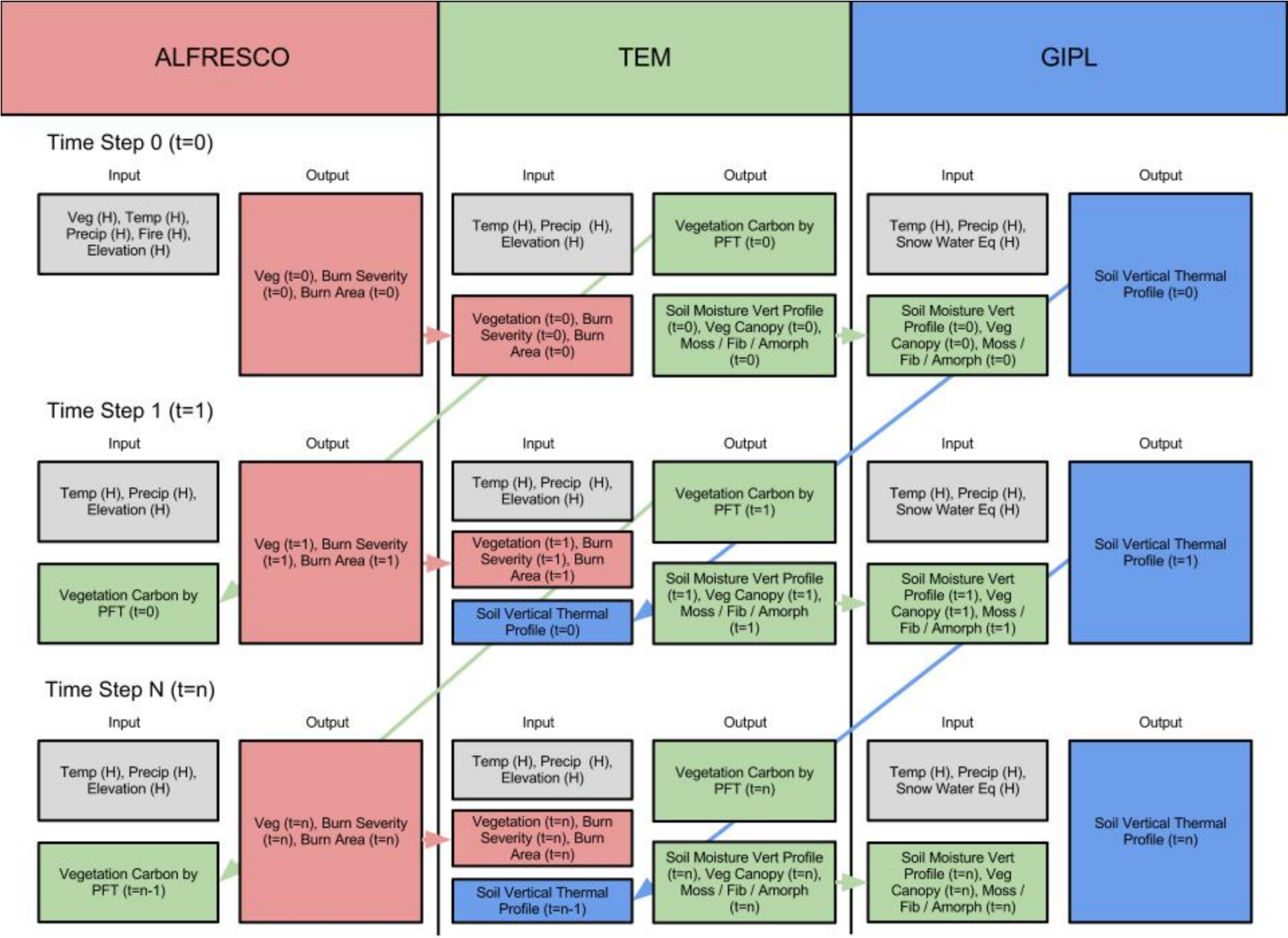



Integrated Ecosystem Model Domain
and Landscape Conservation Cooperatives
170°E
180°
170°W
160°W
150°W
140°W
130°W
120°W
110°W
100°W
70°N
65°N
60°N
55°N
50°N
Barrow
Prudhoe Bay
Old Crow
Nome
Fairbanks
Dawson
Carmacks
Watson Lake
Anchorage
Juneau
Dillingham
IEM Domain
LCCs
Arctic
Northwest Boreal
Western Alaska
Aleutian/Bering Sea Islands
North Pacific
N
0
125
250
500
Kilometers
SNAP


ALFRESCO
TEM
GIPL
Time Step 0 (t=0)
Input
Output
Input
Output
Input
Output
Veg (H), Temp (H), Precip (H), Fire (H), Elevation (H)
Veg (t=0), Burn Severity (t=0), Burn Area (t=0)
Temp (H), Precip (H), Elevation (H)
Vegetation Carbon by PFT (t=0)
Vegetation (t=0), Burn Severity (t=0), Burn Area (t=0)
Soil Moisture Vert Profile (t=0), Veg Canopy (t=0), Moss / Fib / Amorph (t=0)
Temp (H), Precip (H), Snow Water Eq (H)
Soil Vertical Thermal Profile (t=0)
Soil Moisture Vert Profile (t=0), Veg Canopy (t=0), Moss / Fib / Amorph (t=0)
Time Step 1 (t=1)
Input
Output
Input
Output
Input
Output
Temp (H), Precip (H), Elevation (H)
Veg (t=1), Burn Severity (t=1), Burn Area (t=1)
Temp (H), Precip (H), Elevation (H)
Vegetation Carbon by PFT (t=1)
Temp (H), Precip (H), Snow Water Eq (H)
Vegetation Carbon by PFT (t=0)
Vegetation (t=1), Burn Severity (t=1), Burn Area (t=1)
Soil Vertical Thermal Profile (t=0)
Soil Moisture Vert Profile (t=1), Veg Canopy (t=1), Moss / Fib / Amorph (t=1)
Soil Vertical Thermal Profile (t=1)
Soil Moisture Vert Profile (t=1), Veg Canopy (t=1), Moss / Fib / Amorph (t=1)
Time Step N (t=n)
Input
Output
Input
Output
Input
Output
Temp (H), Precip (H), Elevation (H)
Veg (t=n), Burn Severity (t=n), Burn Area (t=n)
Temp (H), Precip (H), Elevation (H)
Vegetation Carbon by PFT (t=n)
Temp (H), Precip (H), Snow Water Eq (H)
Vegetation Carbon by PFT (t=n-1)
Vegetation (t=n), Burn Severity (t=n), Burn Area (t=n)
Soil Vertical Thermal Profile (t=n-1)
Soil Moisture Vert Profile (t=n), Veg Canopy (t=n), Moss / Fib / Amorph (t=n)
Soil Vertical Thermal Profile (t=n)
Soil Moisture Vert Profile (t=n), Veg Canopy (t=n), Moss / Fib / Amorph (t=n)