About the Interactive Atlas

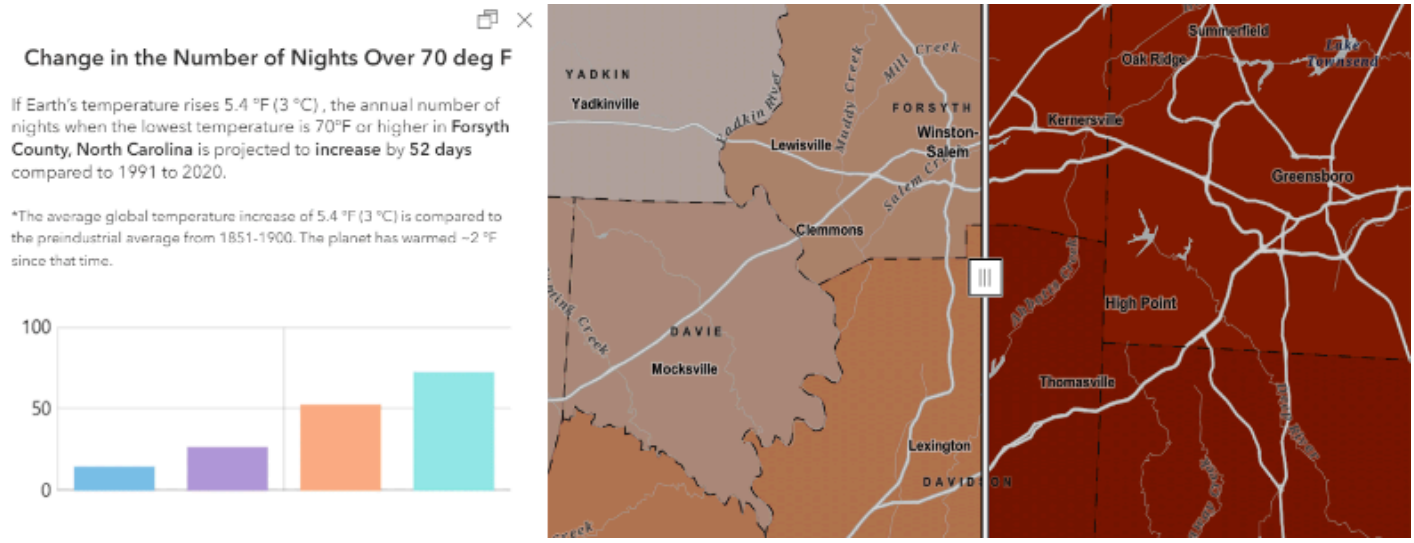
Details and methods for processing the projection data found in the NCA Interactive Atlas

Purpose of the NCA Interactive Atlas

The NCA Interactive Atlas provides digital access to downscaled climate projections maps used in the Fifth U.S. National Climate Assessment (NCA5). The Atlas is an extension of NCA5, offering

Translate

The NCA Interactive Atlas also includes features to help users interpret and compare maps. Click an area of interest on any map to see a plain-language summary of what the map is showing, or select the swipe feature to compare projected conditions at various levels of global warming.



Pop-ups show plain-language summaries, and the swipe feature allows users to compare maps.

Global Warming Levels

The Atlas shows regional climate conditions projected to occur if Earth's long-term average temperature reaches specific levels of warming. These Global Warming Levels (GWLs) correspond to global average temperature increases of 1.5, 2, 3, and 4 degrees Celsius above pre-industrial

individual climate models reach that level. The projections were then averaged with the 9 previous years and the 10 subsequent years to represent the climatic state for that period. Using a 20-year average avoids focusing on a shorter period that may be warmer or cooler than the two-decade average. Global warming levels were calculated using model projections under the very high scenario, SSP5-8.5 (Front Matter). This scenario was chosen because all model projections reach all of the GWLs of interest, other scenarios do not include all four GWLS.

Map Layers in the Atlas

The data processing methods used to produce maps that appear in the NCA5 report were also used to produce maps for the NCA Interactive Atlas. For details, see Appendix 1 and Appendix 3. You can view the following maps in the Atlas, or access the GIS-ready data for each map in the Climate Data section.

Name of Map	Description of the variable	Variable Field Name
Change in Average Annual Temperature	Average temperature over the entire year	Temperature average
Change in Mean Summer Temperature	Average daily temperature during June, July, & August	Temp mean summer

Change in Temperature on the Hottest Day of the Year	Highest daily temperature of the year	Temp max 1 day
Change in the Lowest Average Temperature of Summer	Average minimum temperature during June, July, August	Temp min summer
Change in the Number of Days Over 95°F	Days per year with an afternoon high temperature of at least 95°F	Temp Days 95 F
Change in the Number of Days Over 100°F	Days per year with an afternoon high temperature of at least 100°F	Temp Days 100 F
Change in the Number of Days Over 105°F	Days per year with an afternoon high temperature of at least 105°F	Temp Days 105 F
Change in the Number of Warm Nights	Days per year when the overnight low is 70°F or warmer	Temp Days Min 70 F
Change in the Number of Days with Freezing	Days per year when the lowest temperature dips below freezing	Temp Days Min 32 F
Change in the Number of Days below 0°F	Days per year when the lowest temperature drops well below freezing	Temp Days Min 0 F
Change in Annual Precipitation	Cumulative total precipitation over a full year	Precip Annual
Change in Extreme Precipitation Amounts	Total precipitation that arrives on days in the top 1% of historical precipitation totals	Precip Above 99th pctl

Change in Days with Extreme Precipitation	Days per year with precipitation in the top 1% of historical rainfall events	Precip Days 99 pctl
Change in Precipitation on the Wettest Day of the Year	Highest daily precipitation total of the year	Precip 1-day max
Change in the Wettest Day in 5 Years	Highest daily precipitation total over five years	Precip 5-year max

Downscaled Climate Projections

Projections in the Atlas are from global climate models that participated in Phase 6 of the Coupled Model Intercomparison Project (CMIP6). To make the CMIP6 projections more relevant at regional-to-local scales, results from global models were spatially downscaled using statistical methods documented by LOCA2 and STAR-ESDM.

Note that climate projections are not weather forecasts for specific dates in the future – rather, they describe potential climate conditions for future decades based on plausible scenarios of human actions.

Climate Projections for States and Territories Outside the Contiguous United States

The availability of downscaled climate projections for geographies outside of the contiguous United States (OCONUS) is limited. For locations in Alaska, Hawai'i, and Puerto Rico, the Atlas includes global data from CMIP6 and downscaled data from STAR-ESDM for selected weather

Which global climate models are included?

CMIP6 Model	Downscaling applied to the CONUS	Original resolution applied to OCONUS
ACCESS-CM2	X	X
ACCESS-ESM1-5	X	X
BCC-CSM2-MR	X	X
CAMS-CSM1-0		X
CESM2		X
CESM2-WACCM		X
CMCC-CM2-SR5		X
CMCC-ESM2		X
CNRM-CM6-1		X
CNRM-CM6-1-HR		X
CNRM-ESM2-1		X
CanESM5	X	
CanESM5-CanOE		X
EC-Earth3	X	

EC-Earth3-Veg		X
FGOALS-g3	X	
FGOALS-f3-L		X
GFDL-CM4		X
GFDL-ESM4	X	X
GISS-E2-1-G		X
INM-CM4-8	X	X
INM-CM5-0	X	X
IPSL-CM6A-LR	X	X
KACE-1-0-G		
MCM-UA-1-0		X
MIROC6	X	
MIROC-ES2L		X
MPI-ESM1-2-HR	X	
MPI-ESM1-2-LR	X	
MRI-ESM2-0	X	X
NESM3		X
NorESM2-LM	X	X
NorESM2-MM	X	X

Additional Information

Content will continue to be added to the NCA Interactive Atlas after its initial release. For information on additional data sources and methodology, please see NCA5 metadata on the Global Change Information System.

For questions, contact us.

Downscaled Dataset Selection & Validation

Early in the NCA5 development, USGCRP convened a group of federal climate experts (NASA, NOAA, USGS, DOD, DOE) to identify and recommend to NCA5 leadership appropriate downscaled products for use in NCA5 that derived from the latest international global modeling experiments. This document describes the general process that informed the selection of downscaled climate data that were made available to authors to inform their chapter analyses. The data is publicly available via the NCA5 Atlas.

As part of the NCA5 process, an independent validation was conducted of the two statistically downscaled climate data products used in the NCA5 report. The goal was to assess consistency among these products under a suite of metrics and diagnostics, and to inform the careful use of these data products in decision-making. In general, the two products were found to be largely consistent with each other. The minor differences between products are attributed to climate variability, downscaling methodology and observational uncertainty. The full report, Validation of

Credit & Acknowledgments

Development of the NCA Interactive Atlas was directed and overseen by the U.S. Global Change Research Program (USGCRP), the National Oceanic and Atmospheric Administration (NOAA), and the Cooperative Institute for Satellite Earth System Studies (CISESS NC). The Atlas is hosted by Esri, under contract to NOAA.

The NCA5 Director, Allison Crimmins, as well as an interagency team of federal climate model experts provided input to the Atlas design through the USGCRP. Federal agencies represented in the effort are DOE, EPA, NASA, DOC-NOAA, and DOI-USGS.

The downscaled climate projection data was processed for the Atlas through a collaborative effort supported by Esri and the National Climate Assessment Technical Support Unit (TSU) in NOAA's National Centers for Environmental Information (NCEI). The data processing team included Ken Kunkel, Linda Copley, Liqiang Sun, Xia Sun, Dan Pisut, Mark Gilbert, Keith Smith, Robbie Richards, and Sheridan Moore. Maps and the Interactive Atlas development was supported by Dan Pisut, Emily Meriam, Colin Turner, and LuAnn Dahlman.

Downscaled datasets were developed and provided by the following research groups:

Localized Constructed Analogs Version 2 (LOCA2)

- Pierce, D.W., D.R. Cayan, D.R. Feldman, and M.D. Risser, 2023: Future increases in North American extreme precipitation in CMIP6 downscaled with LOCA. Journal of Hydrometeorology, 24, 951–975. https://doi.org/10.1175/jhm-d-22-0194.1

Seasonal Trends and Analysis of Residuals, Empirical-Statistical Downscaling Model (STAR-ESDM)

- Hayhoe, K., A. Stoner, D.J. Wuebbles, and I. Scott-Fleming, 2023: STAR-ESDM: A generalizable approach to generating high-resolution climate projections through signal decomposition. ESS Open Archive.

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