

CIA CAS InFocus Seminar

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Goals of the Actuaries' Climate Index (ACI) and the Actuaries' Climate Risk Index (ACRI)

- Create indices that reflect an actuarial perspective; are objective; and are easy to understand without being overly simplistic
- Create one index that measures changes in climate extremes; and a second index that relates those climate extremes to economic and human losses
- Use the indices to inform the insurance industry and the general public on the impact of climate change, and the importance of climate change to insurers
- Promote the actuarial profession, by contributing constructively to the climate change debate

Research sponsors:

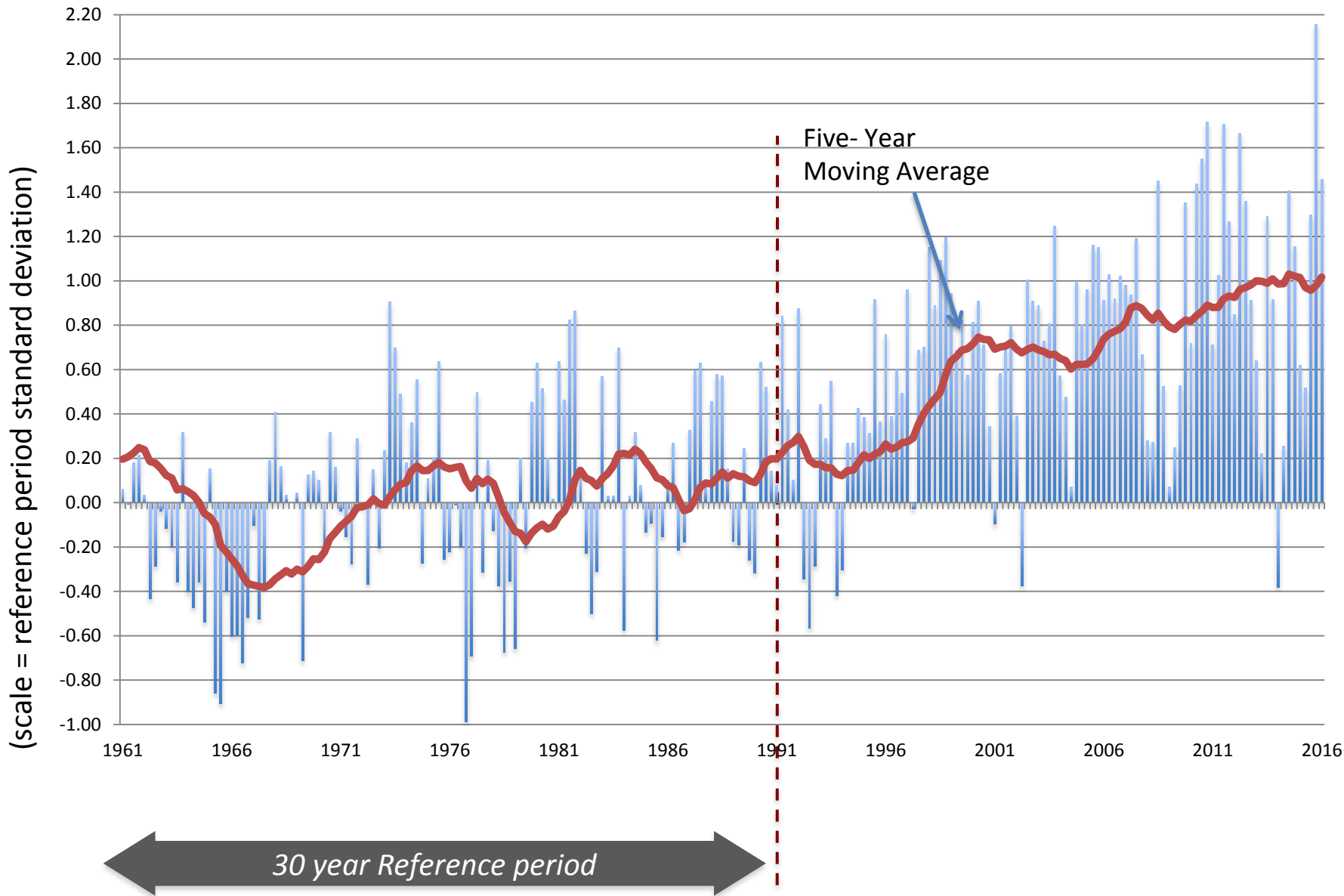


The Actuaries' Climate Index (ACI)

focuses on the frequency of severe weather

- Example: “How often is the temperature in a given month at or above the 90th percentile?”
 - Other published data tend to focus on changes in the average over time, but it is the frequency of severe weather that matters to insurers
- ACI is a combination of six of these “frequency of severity” variables
 - High temperature
 - Low temperature
 - Heavy precipitation
 - Lengthy drought
 - High wind
 - Coastal sea level
- ❖ The 90th percentile is based on the 1961-1990 base reference period

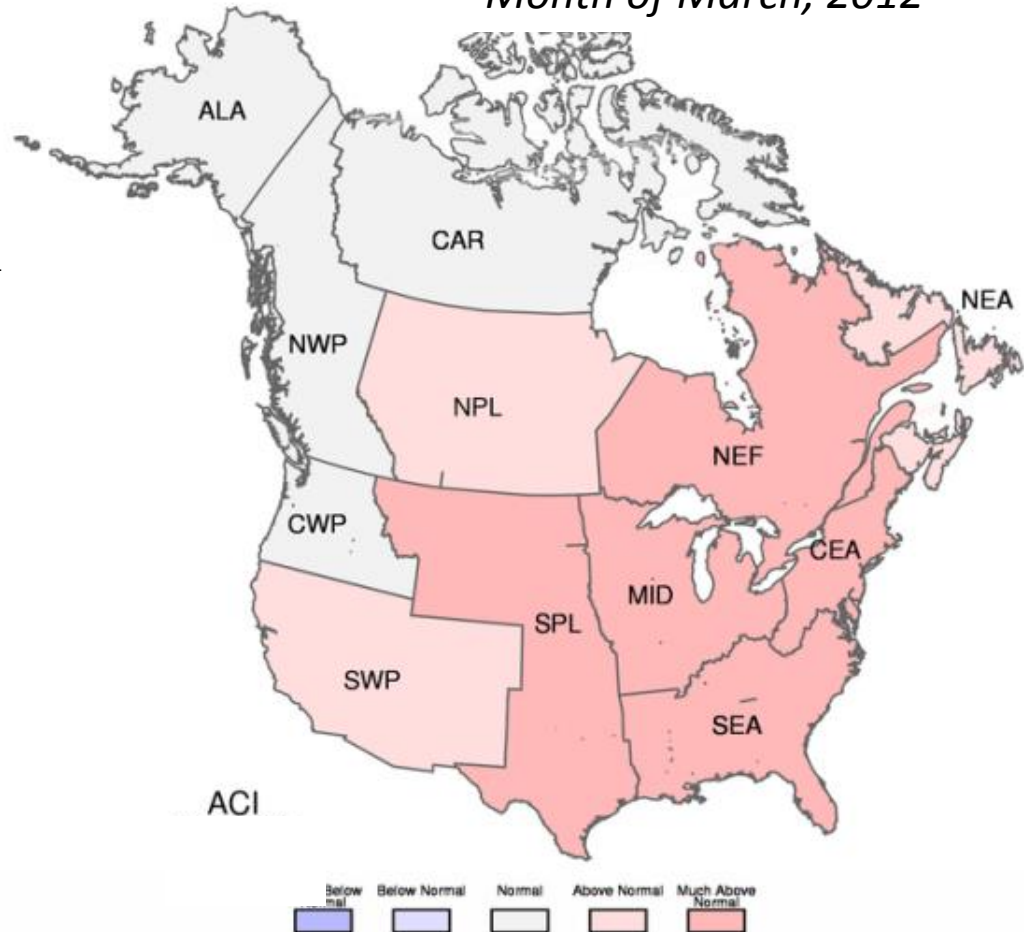
Actuaries Climate Index for USC



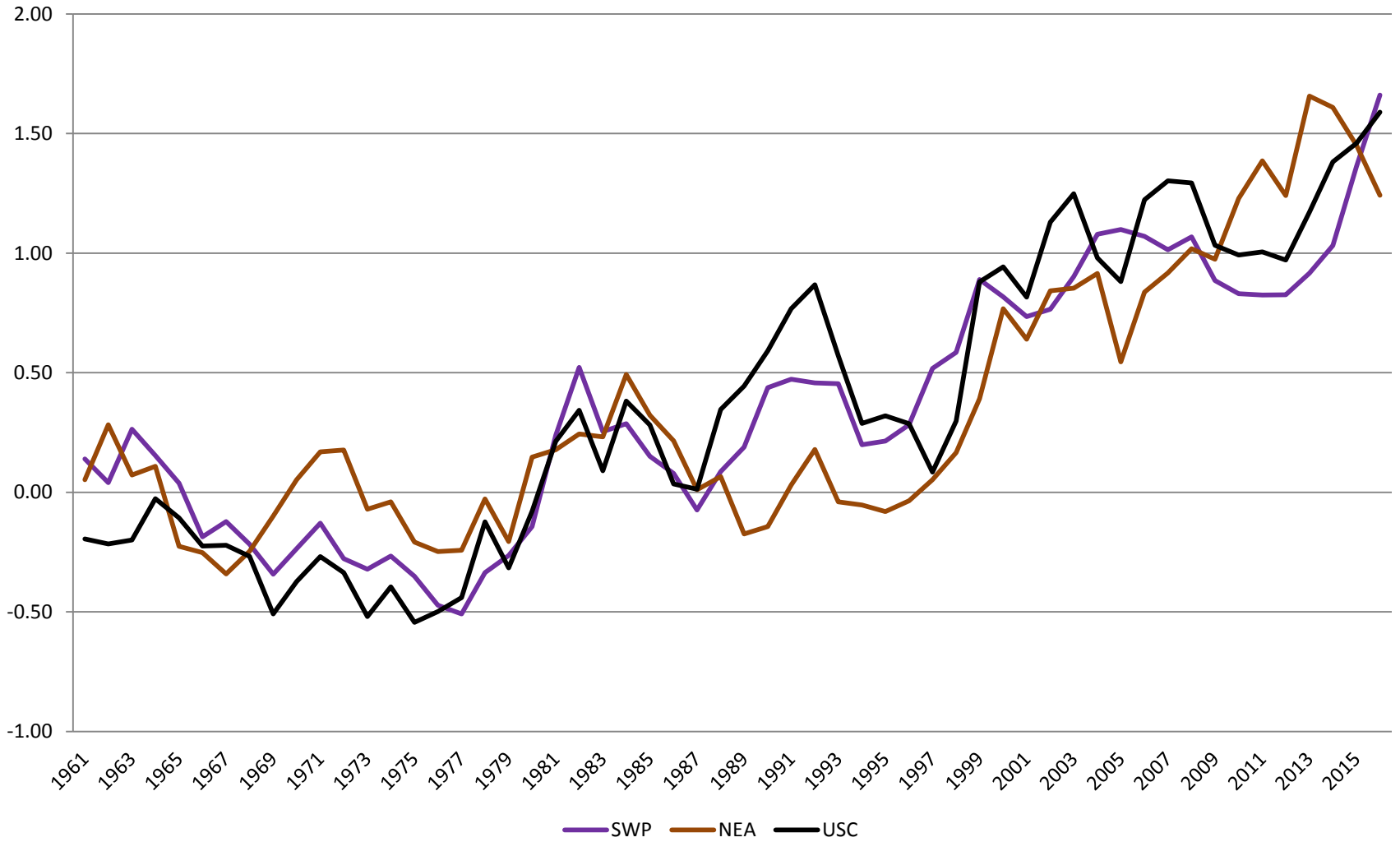
ACI data is constructed for geographic grids, then summarized to regions, countries, and in total

- ACI components are constructed in a uniform 2.5° grid across the USA and Canada
 - 275km by 275km at equator
- Grid components for each climate variable are summarized into indices for 12 natural regions, two countries and North America in total
- Summarized indices are unweighted averages of grid components
 - Climate change is equally important everywhere

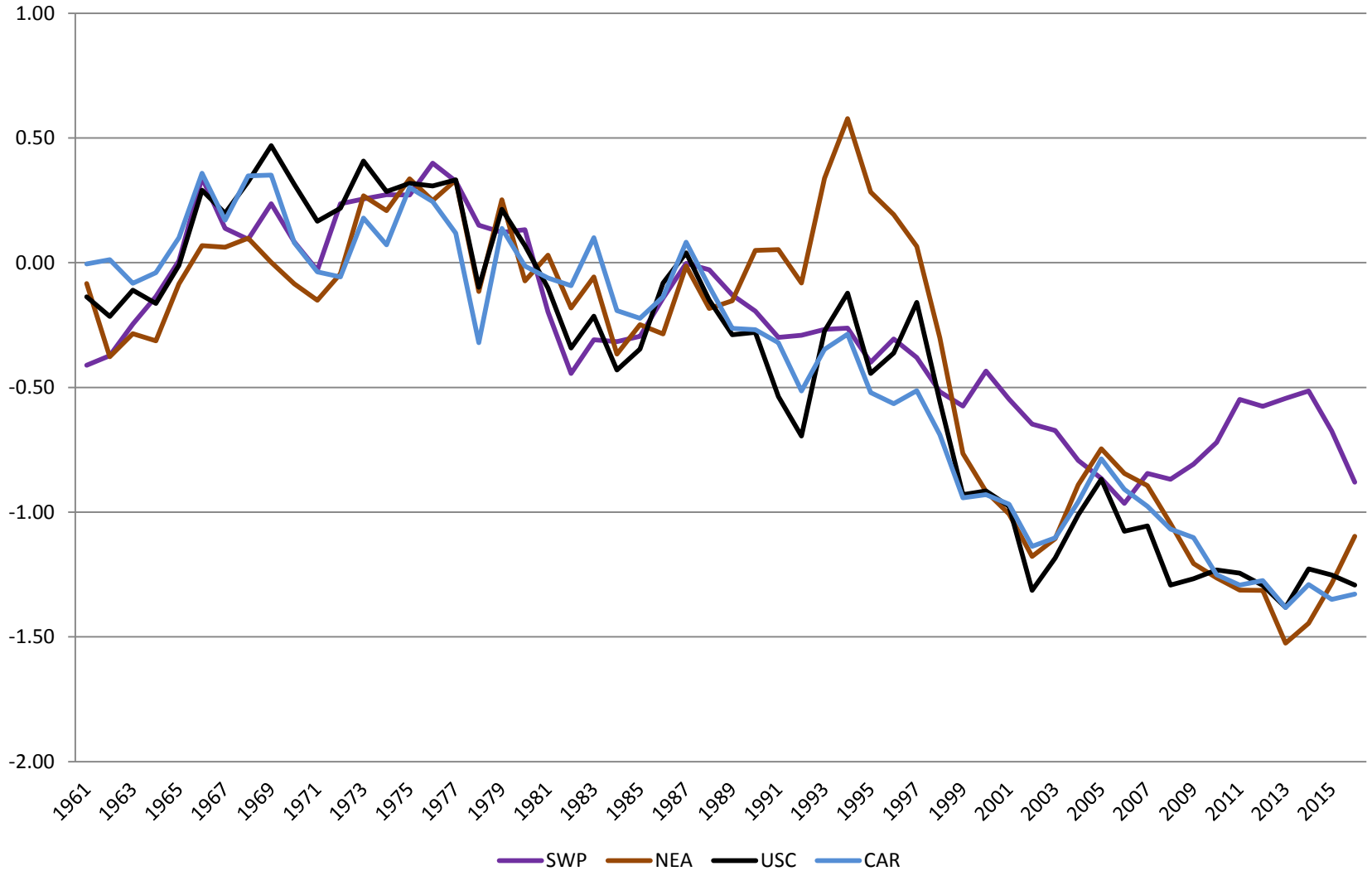
*Frequency of Extreme Temperatures
Month of March, 2012*



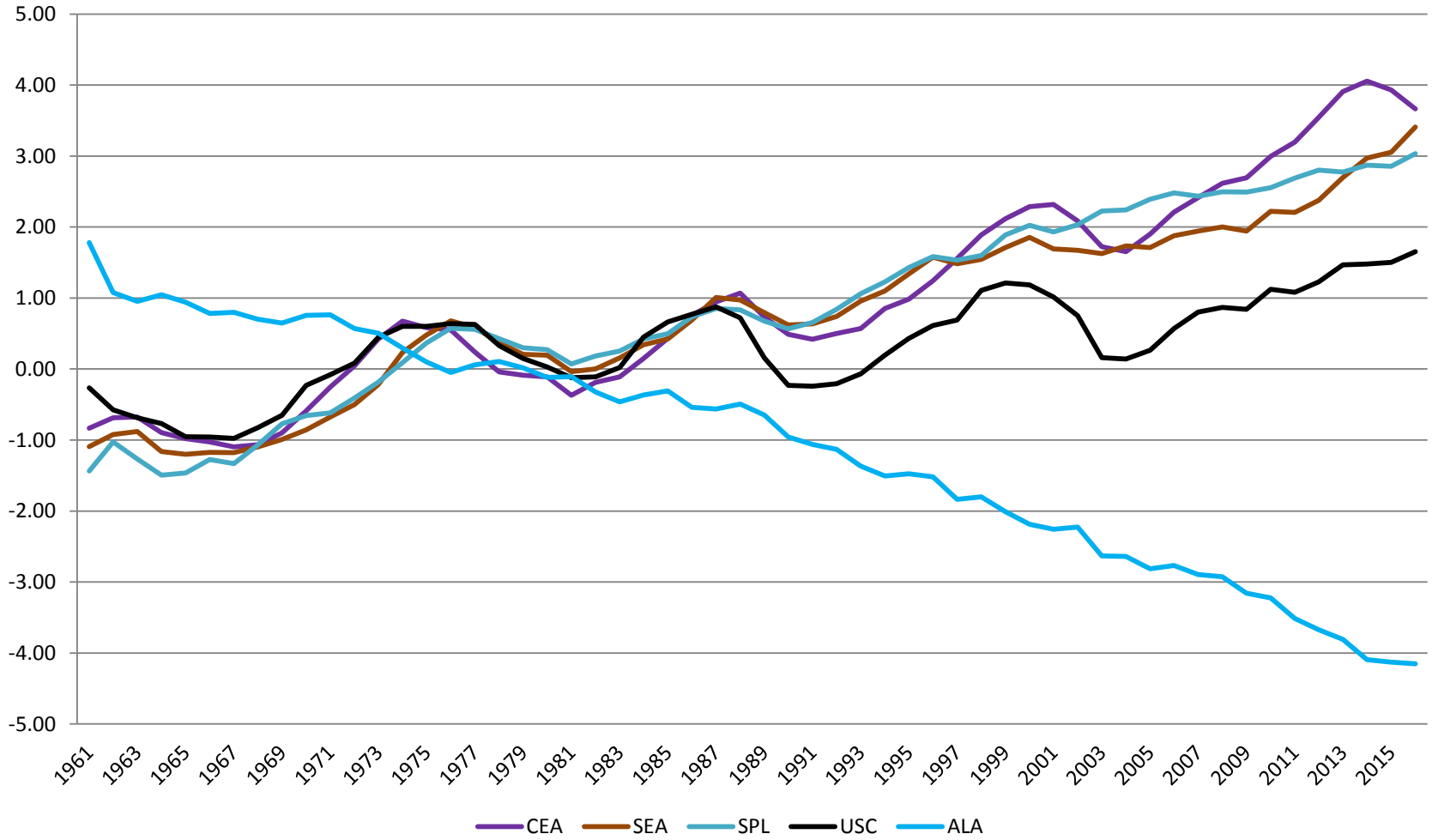
High Temperatures Index



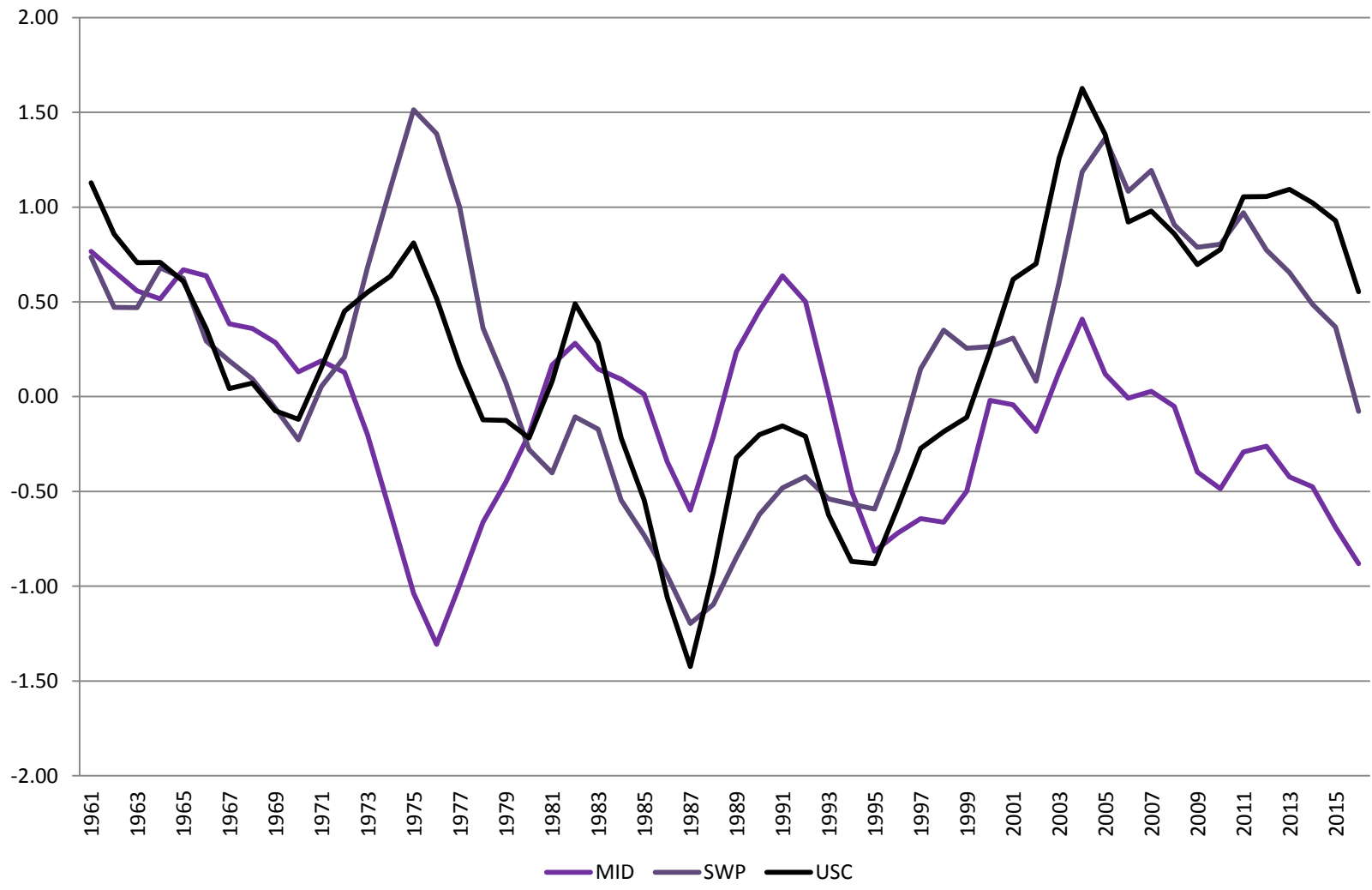
Cool Temperatures Index



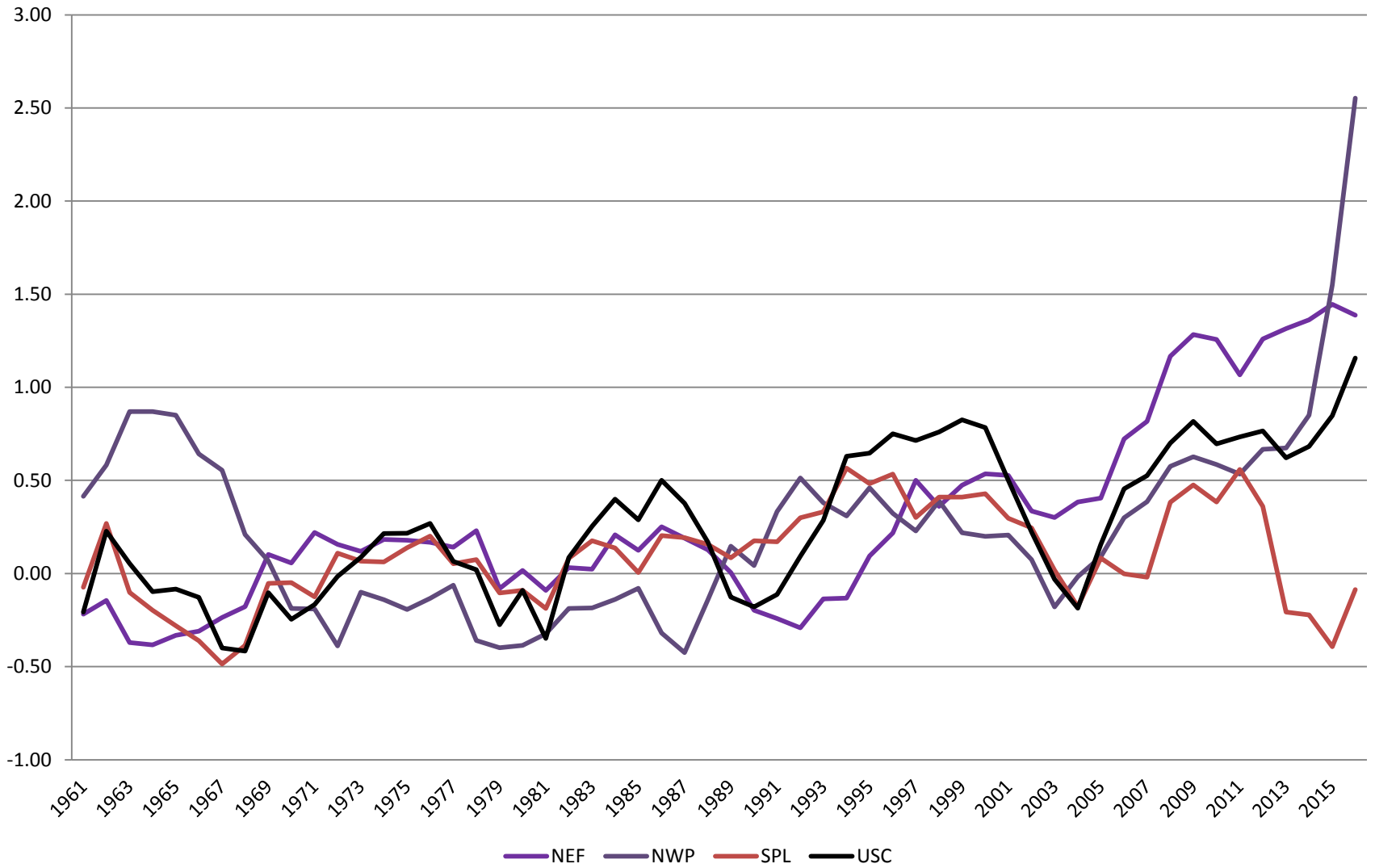
Sea Level Index



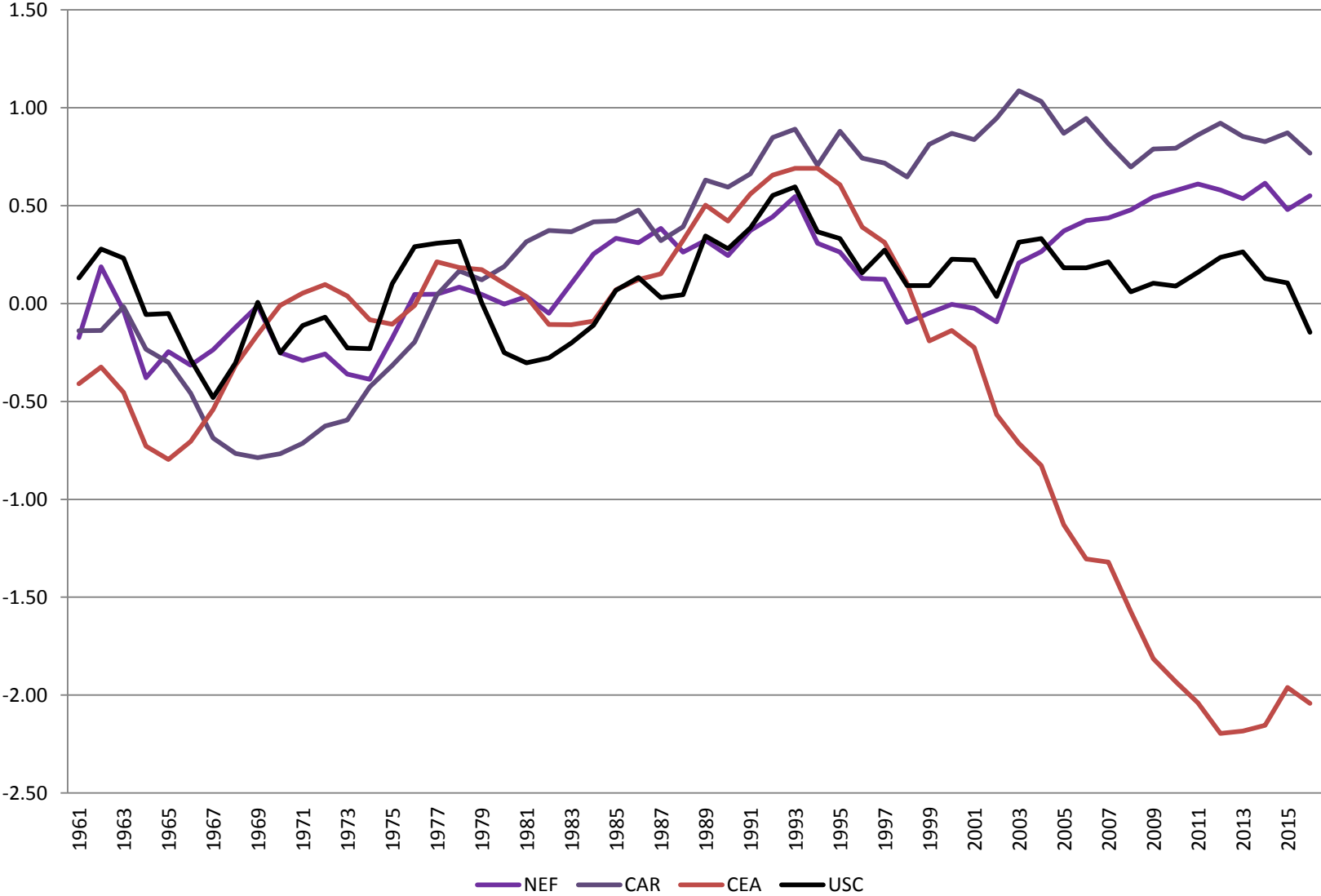
Drought Index



Precipitation Index



Wind Power Index



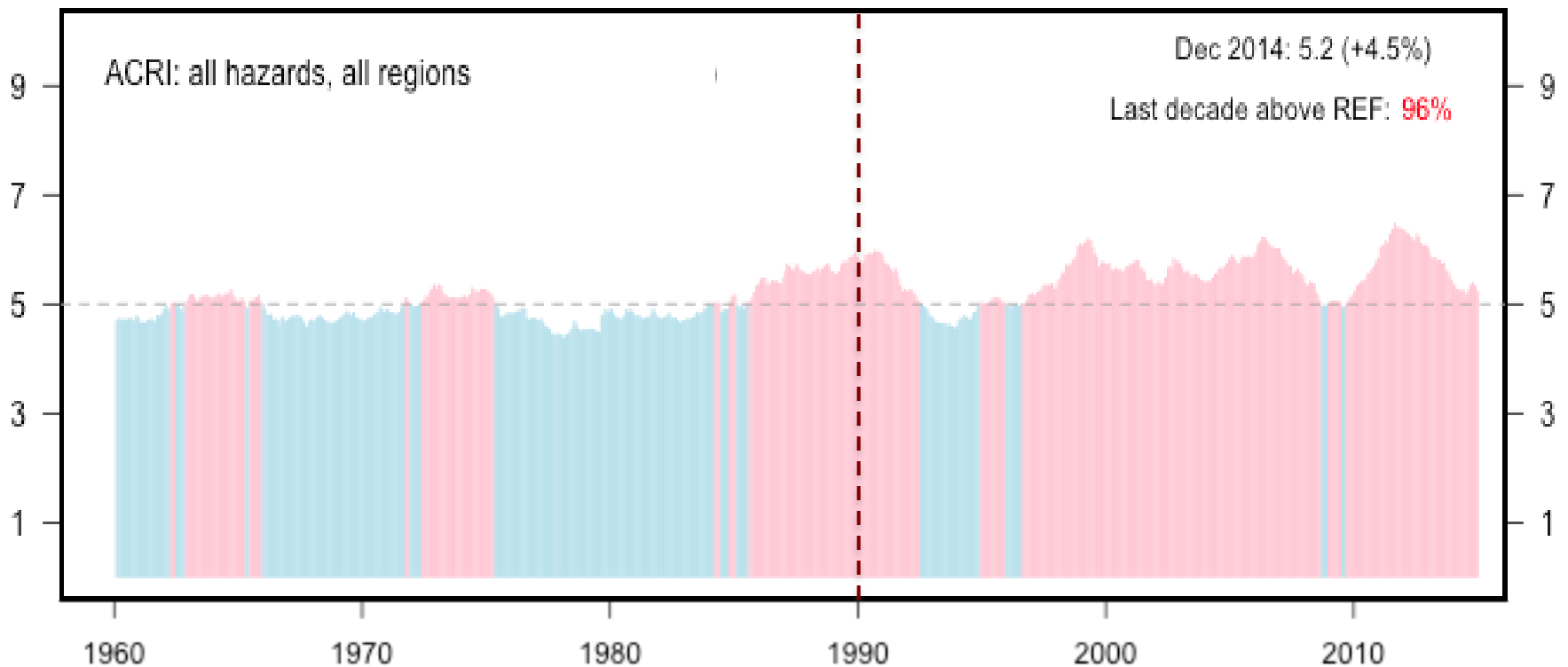
The Actuaries' Climate Risk Index (ACRI) adjusts for exposure and correlates to losses

- Unlike the ACI, the ACRI for U.S., Canada and total are constructed using weighted averages of the ACRI by region, with weights based on region population
 - Population is a proxy for exposure
 - Shifts the question from “Is climate change happening?” to “Is it happening where there are people and property?”
- The ACRI is based on the historical correlations of economic losses, mortality, and morbidity to monthly ACI data by region
 - Correlations are measured by peril; results used where statistically significant
 - Separate correlations constructed for each region
 - Results converted to a scale of 1-10, and including a term to reflect variation relative to base period variation
- The overall ACRI for each region is the maximum value of the results for each peril

The ACRI has been above its reference period value (5.0) about 96% of the time since 2005

Heat has been the primary driver of the index, although drought and flood have also been high at times.

(Combined index for all of US and Canada)



Plans for ACI and ACRI

- ACI and ACRI information will be publicly available on a new website, as a resource for use in further research
 - www.actuariesclimateindex.org
 - www.indiceclimatiqueactuaries.org
 - Website will include commentary, documentation, charts of index components, maps showing variation by region, index data for download, and links to other information
 - Commentary will be provided in English and French
 - ACI and ACRI data will be updated quarterly on the website, based on data for each meteorological season (3 months ending February, May, August and November)
- We envision quarterly press releases announcing the results of each update, with commentary



Potential Uses and Further Research

- Potential uses
 - Educate actuaries and insurance industry
 - Relevant to property, liability, life, health
 - Need to incorporate climate trends into pricing
 - Need to reflect higher risk into risk management
 - May need to reconsider coverage and availability
 - Inform the public debate
- Potential further research
 - Further analysis of ACI component data; what else does it tell us?
 - Addition of other regions beyond US and Canada.
 - Further research focusing on linkage of insurance claims to ACI components; ACRI uses economic losses, many would be interested in losses specific to insurance

Index Resources

- Donat, M. G., et al. 2013. Global land-based datasets for monitoring climatic extremes. Bulletin of the American Meteorological Society, July, 997-1006, doi:10.1175/BAMS-D-12-00109.1.
- Hansen J., et al. 1998, A Common Sense Climate Index: Is Climate Changing Noticeably? PNAS, 95, 4113-4120.
- Peduzzi, P., et al. 2009, Assessing global exposure and vulnerability towards natural hazards: the Disaster Risk Index. Natural Hazards and Earth System Sciences, 9, 1149-1159.
- Solterra Solutions, Determining the Impact of Climate Change on Insurance Risk and the Global Community, Phase I: Key Climate Indicators, November 2012. Available at: www.casact.org/research/ClimateChangeRpt_Final.pdf
- Data sources:
 - GHCNDEX: www.climdex.org
 - GHCN-Daily: www.ncdc.noaa.gov/oa/climate/ghcn-daily/
 - Sea Level: www.psmsl.org/data/obtaining/
 - Wind: www.esrl.noaa.gov/psd/data/gridded/datancep.reanalysis.html
 - Economic Losses:
http://webra.cas.sc.edu/hvriapps/sheldus_setup/sheldus_login.aspx
<http://www.publicsafety.gc.ca/cnt/rsrscs/cndn-dsstr-dtbs/>