

Actuaries Climate Index and Actuaries Climate Risk Index

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Agenda

- Actuaries Climate Index (ACI)
 - Sponsors
 - Background
 - Composition: six components, 12 regions (7 in the USA + 5 in Canada)
 - Recent index findings
- Actuaries Climate Risk Index (ACRI)
 - Status Update
 - Weather-related Losses by Category
 - Combined Losses over Time
 - Statistical Approach
 - Current Status
- Q&A



ACI—Sponsors

- Actuaries Climate Index (ACI) Sponsors
 - American Academy of Actuaries
 - Canadian Institute of Actuaries
 - Casualty Actuarial Society
 - Society of Actuaries
- www.ActuariesClimateIndex.org



ACI—Background

- ❑ An educational tool providing information about weather trends in the United States and Canada
- ❑ Retrospective analysis of data as opposed to a forecast of future trends
- ❑ Updated quarterly using publicly available data from the National Oceanic and Atmospheric Administration and the Permanent Service for Mean Sea Level
- ❑ Covers rainfall, temperature, dry spells, wind speed, and sea level



ACI—Background (cont'd)

- ❑ Breaks North America into 12 regions, and analyzes each region separately
- ❑ Breaks time into monthly units
- ❑ Spans the period from 1961 to the present (with a reporting lag of 6 to 12 months)
- ❑ Uses 1961–90 as a reference period



ACI—Components

- ❑ Covers rainfall, temperature, dry spells, wind speed, and sea level
 - Frequency of temperatures above the 90th percentile (T90)
 - Frequency of temperatures below the 10th percentile (T10)
 - Maximum rainfall per month in five consecutive days (P)
 - Annual maximum consecutive dry days (D)
 - Frequency of wind speed above the 90th percentile (W)
 - Sea level changes (S).

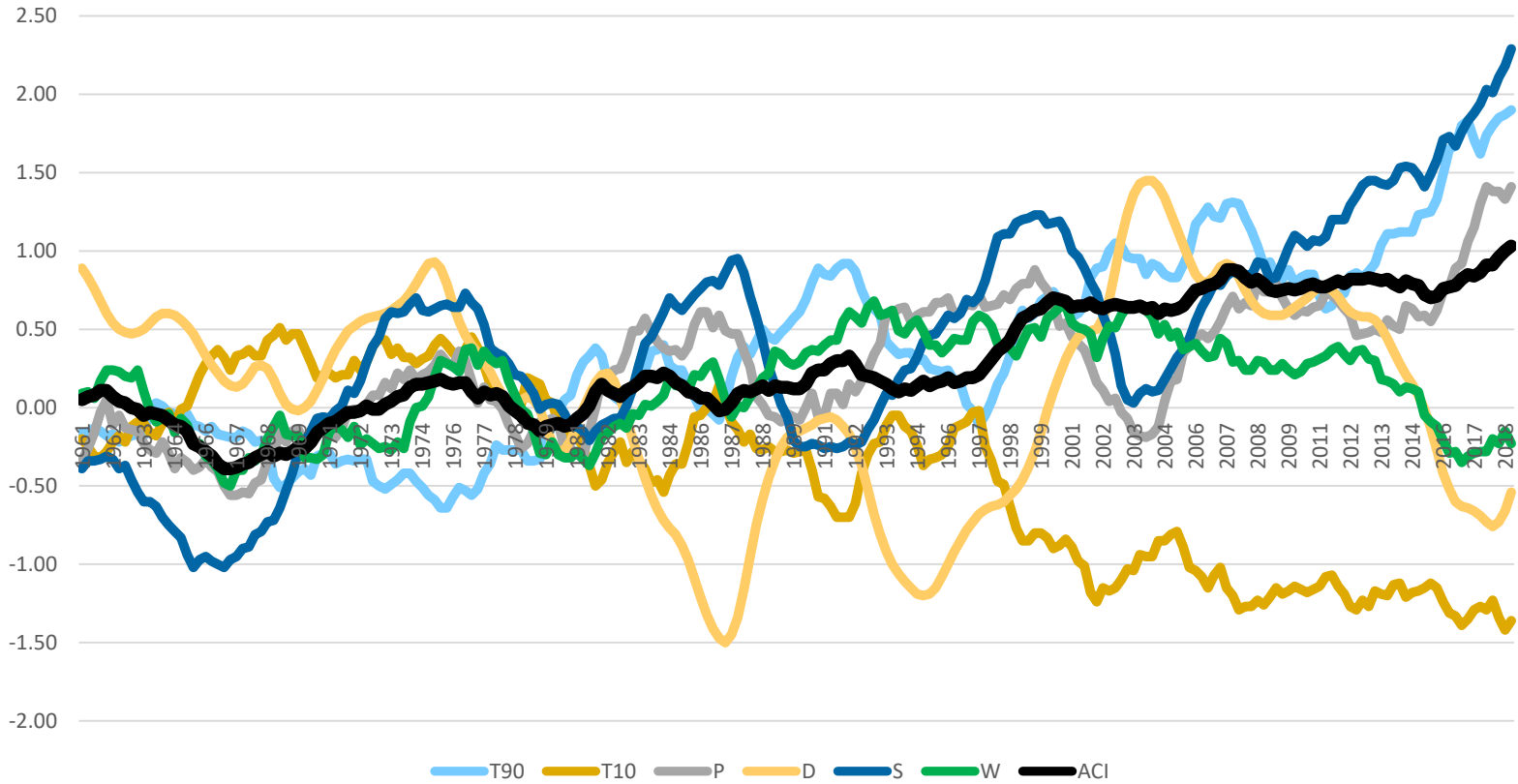
- ❑ Breaks North America into 12 regions, and analyzes each region separately



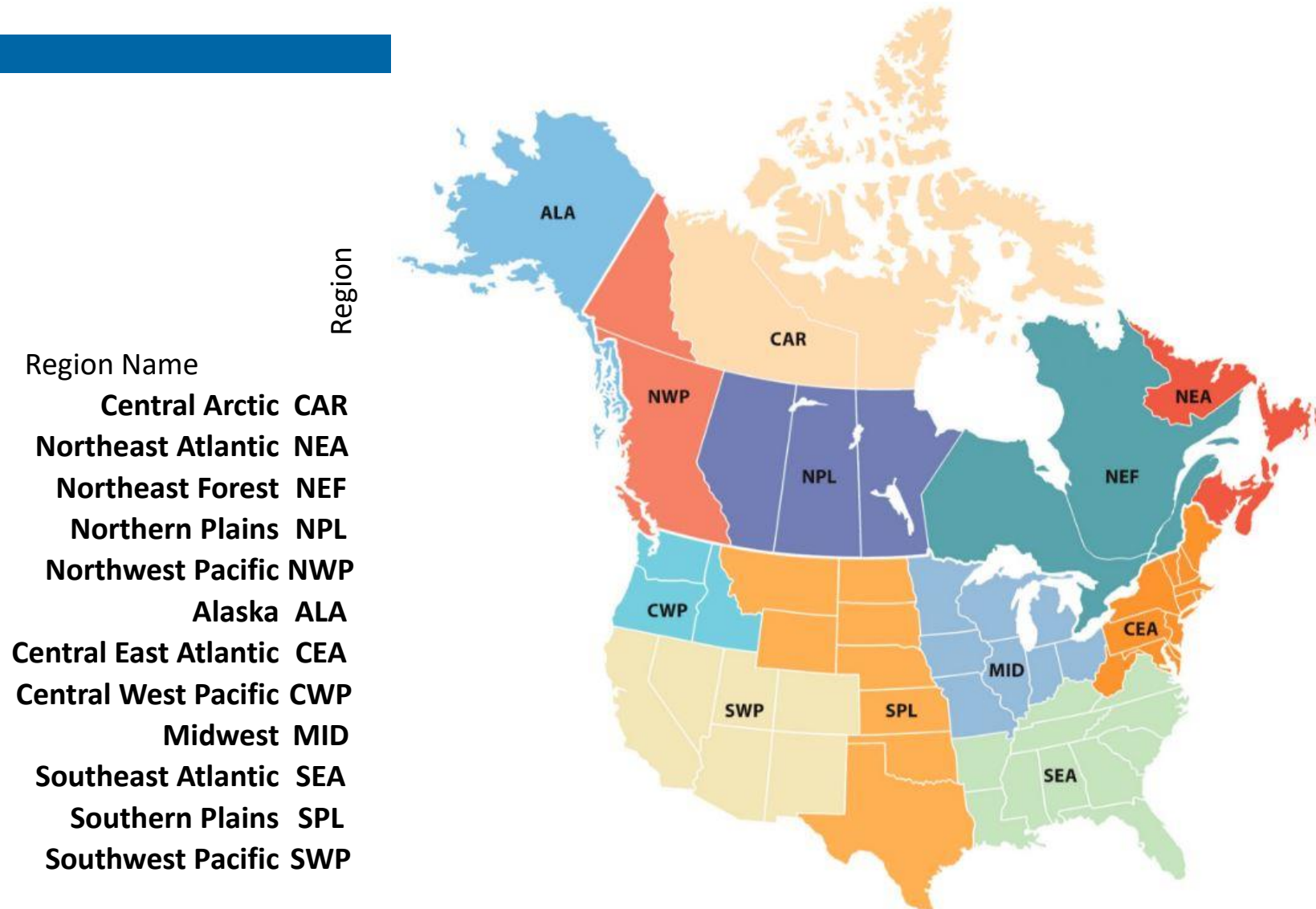
Overall ACI and Components

Seasonal Five Year Moving Averages of Components
Canada and the United States

Reference
Period
Standard
Deviations



ACI Components—Climate Regions



ACI—Recent Index Findings

- ❑ Latest press release: May 7, 2019.
- ❑ “The latest data show that the previously reported upward trend in the key five-year moving average ACI metric continues.”
- ❑ Based on data through the fall of 2018.
- ❑ “The ACI’s five-year moving average increased between winter and fall 2018 from 0.91 to 1.03, the highest level over the period studied, January 1961 through November 2018. “

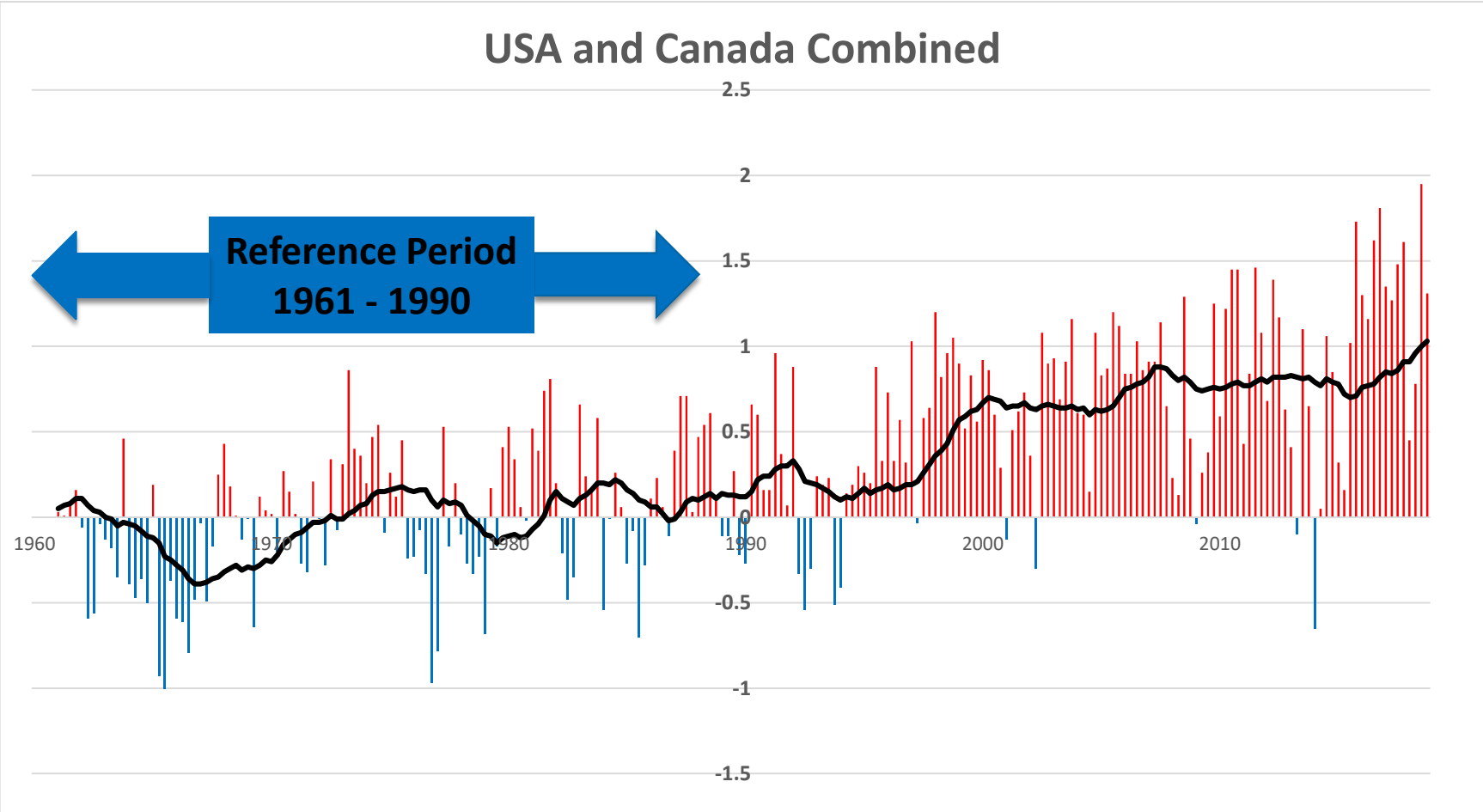


ACI—Recent Index Findings, continued

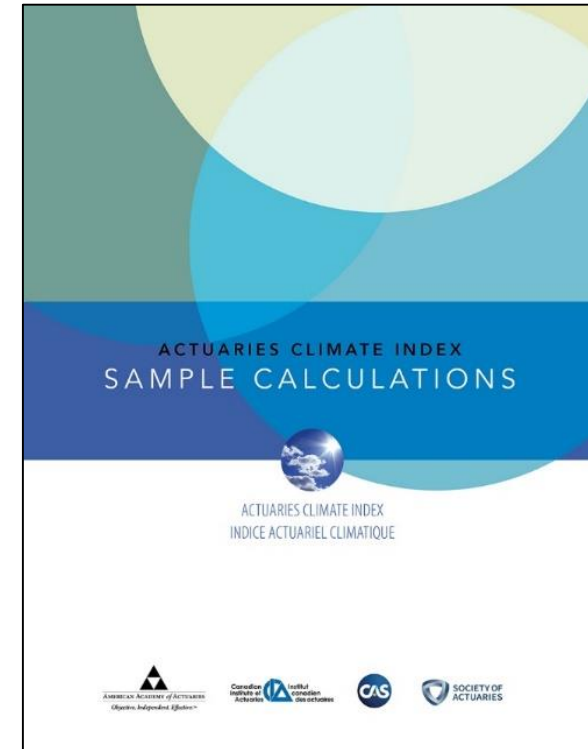
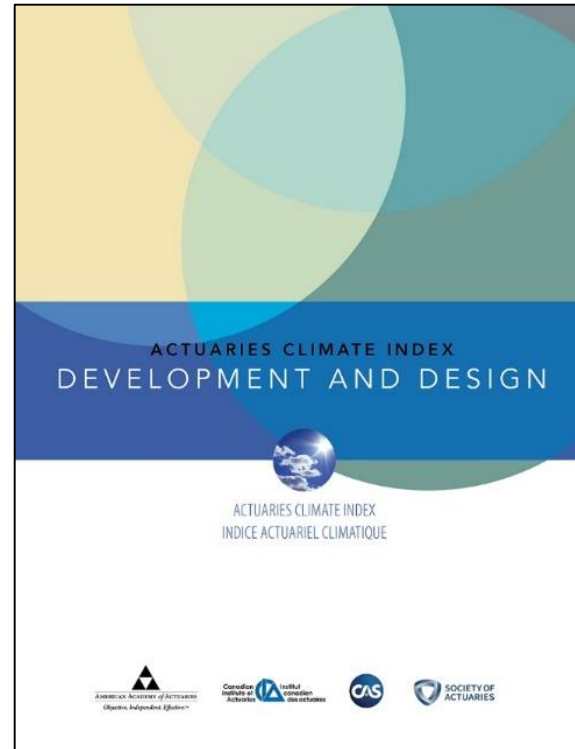
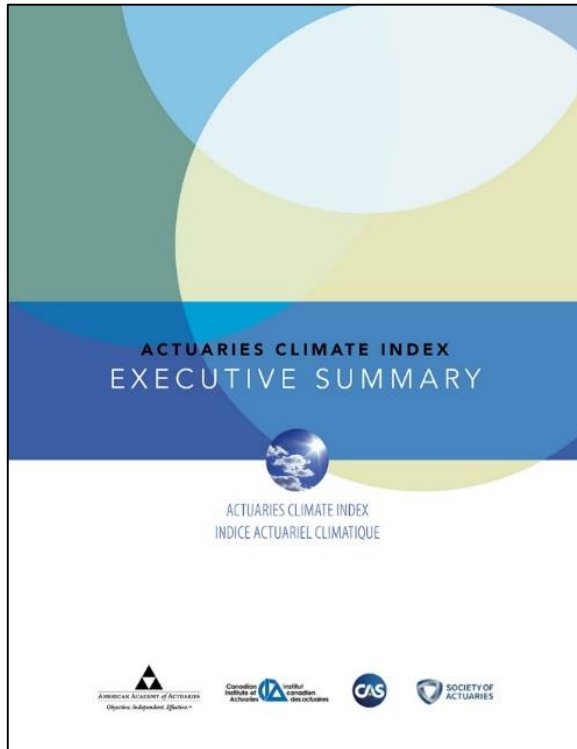
- “We applied a new methodology with this release of the ACI to ensure a high standard of scientific rigor going forward in measuring how climate extremes and sea level are changing,” says Doug Collins, Chair of the Climate Index Working Group. “The working group introduced this change after identifying an increased frequency of missing data in northern Canada, which led us to restricting the ACI to locations with consistently reported data.”



Actuaries Climate Index--Overall



Three Foundational Documents on the ACI Website



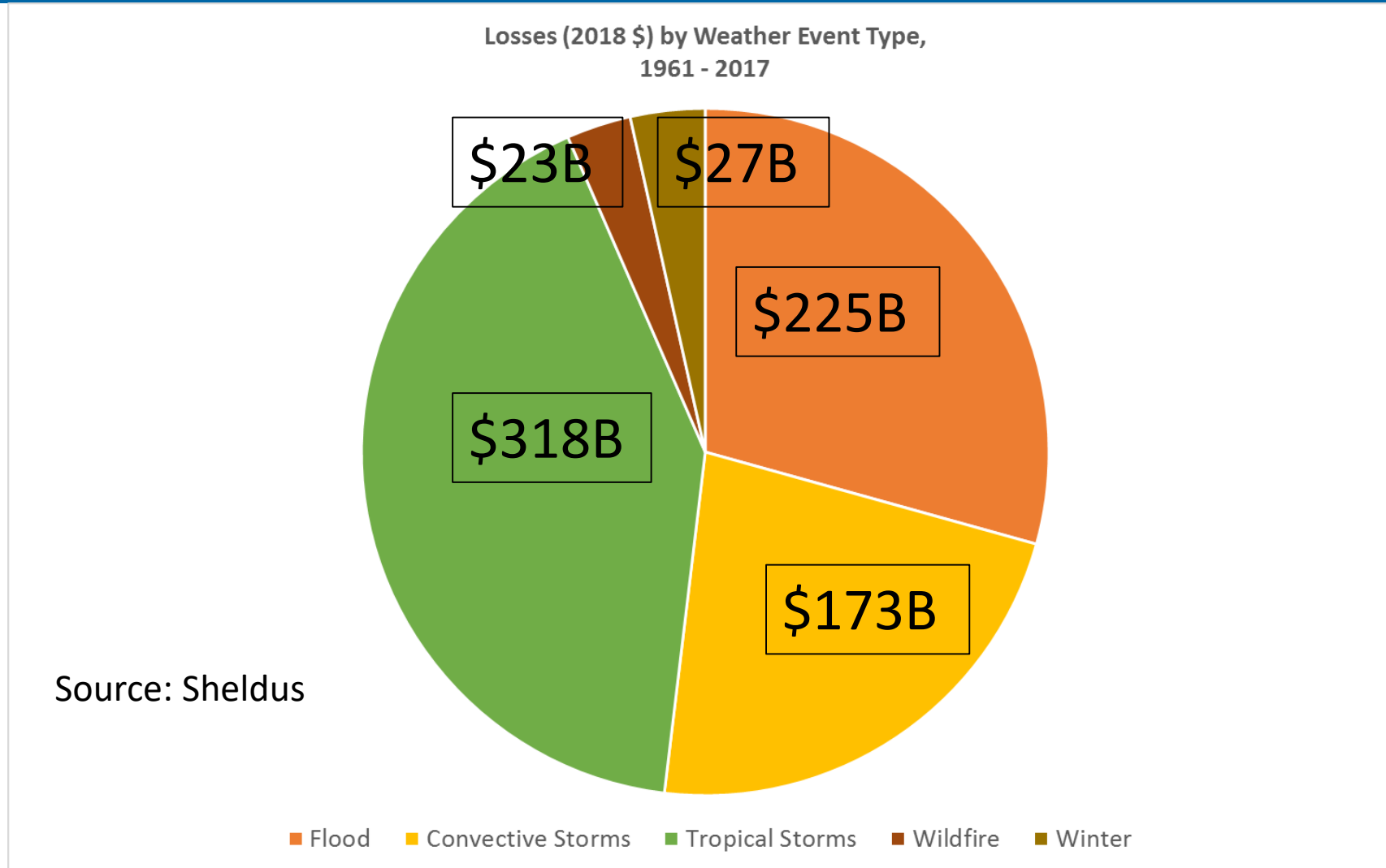
actuariesclimateindex.org

ACRI—Status Update

- ❑ Currently being developed by the sponsoring organizations
- ❑ Estimates relationships between the ACI's weather metrics and weather-related losses
- ❑ Initial model is undergoing revision after peer review
- ❑ ACRI 1.0 will focus only on the United States due to data limitations for Canada
- ❑ ACRI 1.0 Research Update expected publication Summer 2019

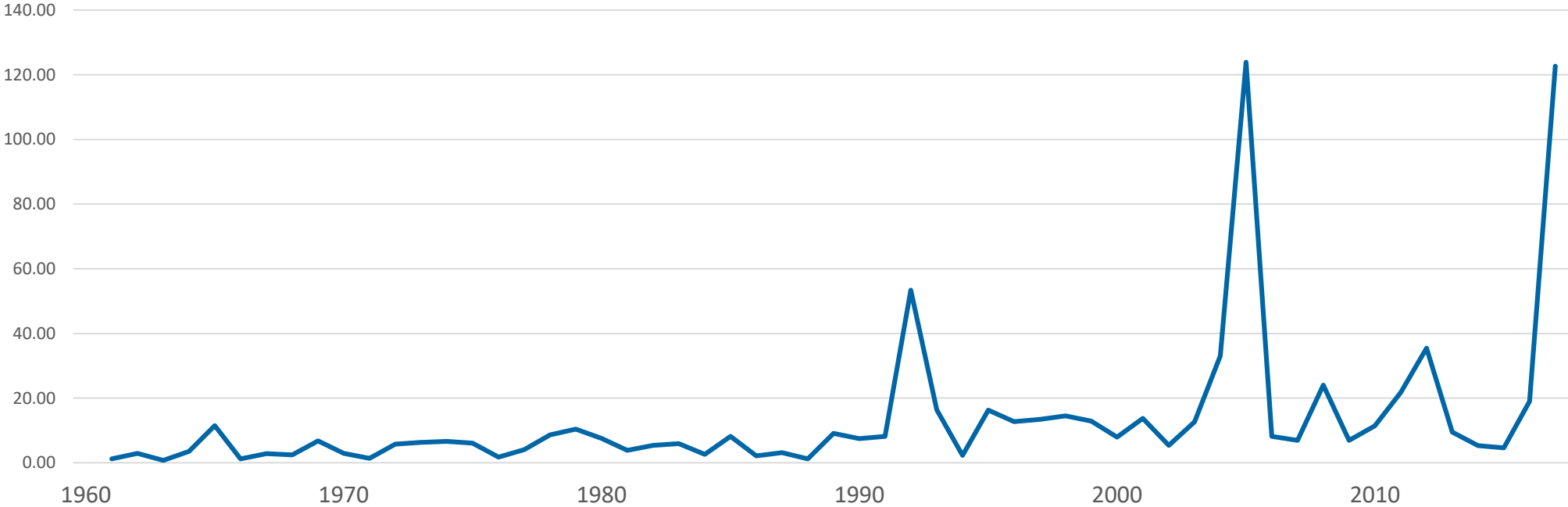


Losses by Weather Categories, 1961 - 2017



Weather-related Losses Combined, 1961 - 2017

TOTAL Losses from Weather Categories Combined
USA Total, Billions of 2018 \$
1961 - 2017
Source: Sheldus



Statistical Approach to ACRI

- Combine losses from all weather categories
- Fit exponential model of Losses to Set of ACI weather metrics using OLSQ
$$\text{Losses}(\$) = A * T90^a * T10^b * \text{Precip}^c * \text{Wind}^d * \text{Exposure}^e$$
- Use a pooled, cross-section for Region-Months
- ACRI for a region-month equals predicted losses – average predicted loss during reference period



ACRI: Current Status

- Aims to describe the losses due to extreme weather events during the post-reference period (1991 – 2016)
- Challenges, inspiring us to version 2.0
 - ▣ Lack of granularity in current data
 - ▣ Singularity of large losses



The Academy

- The American Academy of Actuaries is a 19,500-member professional association whose mission is to serve the public and the U.S. actuarial profession. For more than 50 years, the Academy has assisted public policymakers on all levels by providing leadership, objective expertise, and actuarial advice on risk and financial security issues. The Academy also sets qualification, practice, and professionalism standards for actuaries in the United States.



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