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Building on the Experience of the US NCA, NARRCAP, and NA-CORDEX

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Expert Meeting on Assessing
Climate Information for the Regions
ICTP, Trieste, Italy
May 16-18 2018

Basics of US National Climate Assessments

- Mandated by law, to appear every four years (Global Change Research Act 1990)
- Currently in midst of NCA4
  - Two Volumes: I = *Climate Science Special Report* (released November 2017); II = *Impacts, Risk, and Adaptation*; currently 4th order draft – to be released later in 2018
  - Essentially 6-month gap between the two (from point of view of closing date for literature) or 1 year gap re publication.

Future Climate Information

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- Climate Science Special Report (CSSR) based primarily on CMIP5 information and analyses thereof
  - Extent of understanding represented by *confidence* and *likelihood* statements
  - Traceable accounts for each key finding
- RCP 8.5, 4.5, mid-century, end of century
- To provide authoritative assessment of science of climate change

Future Climate Info (cont'd)

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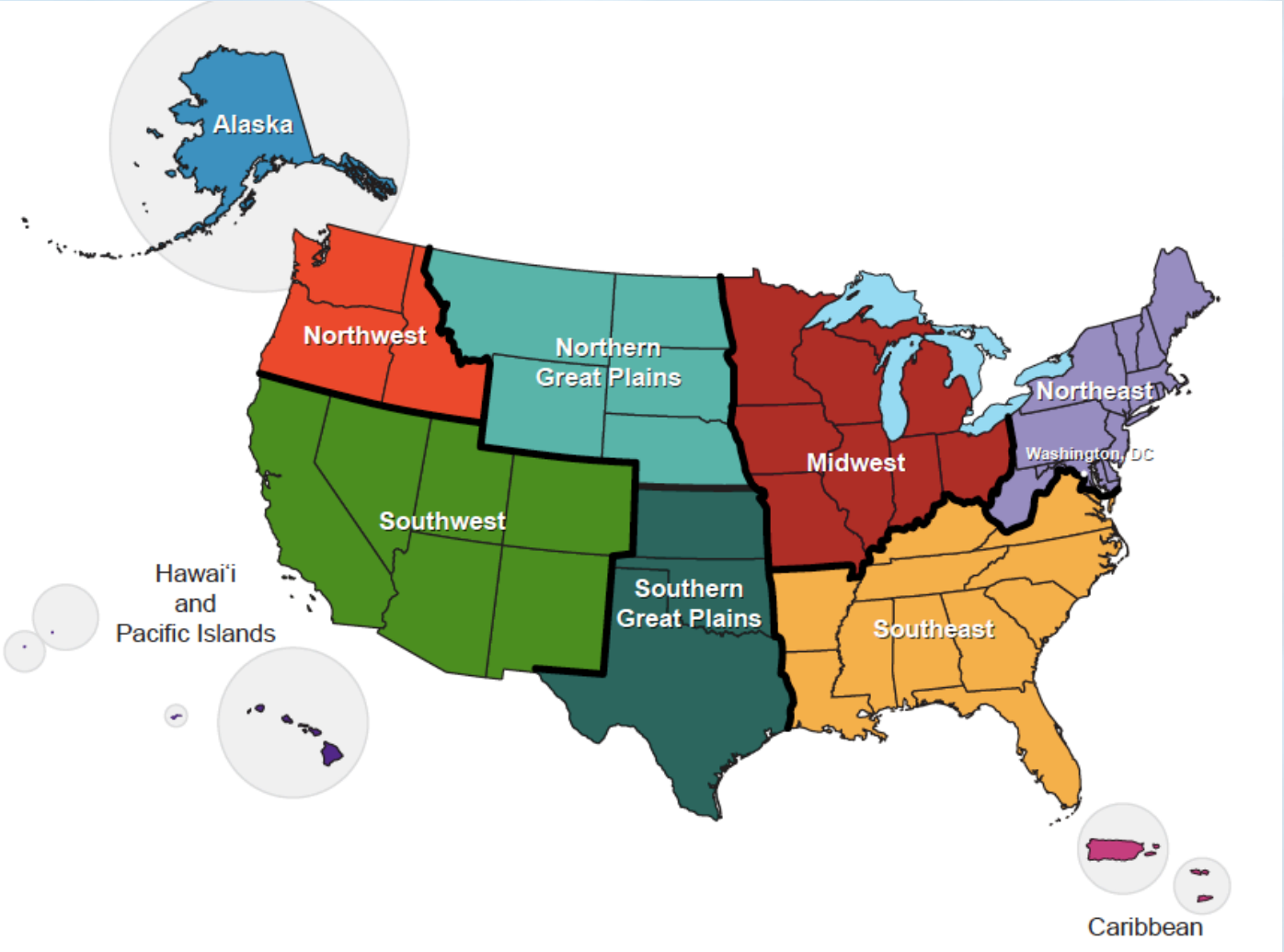
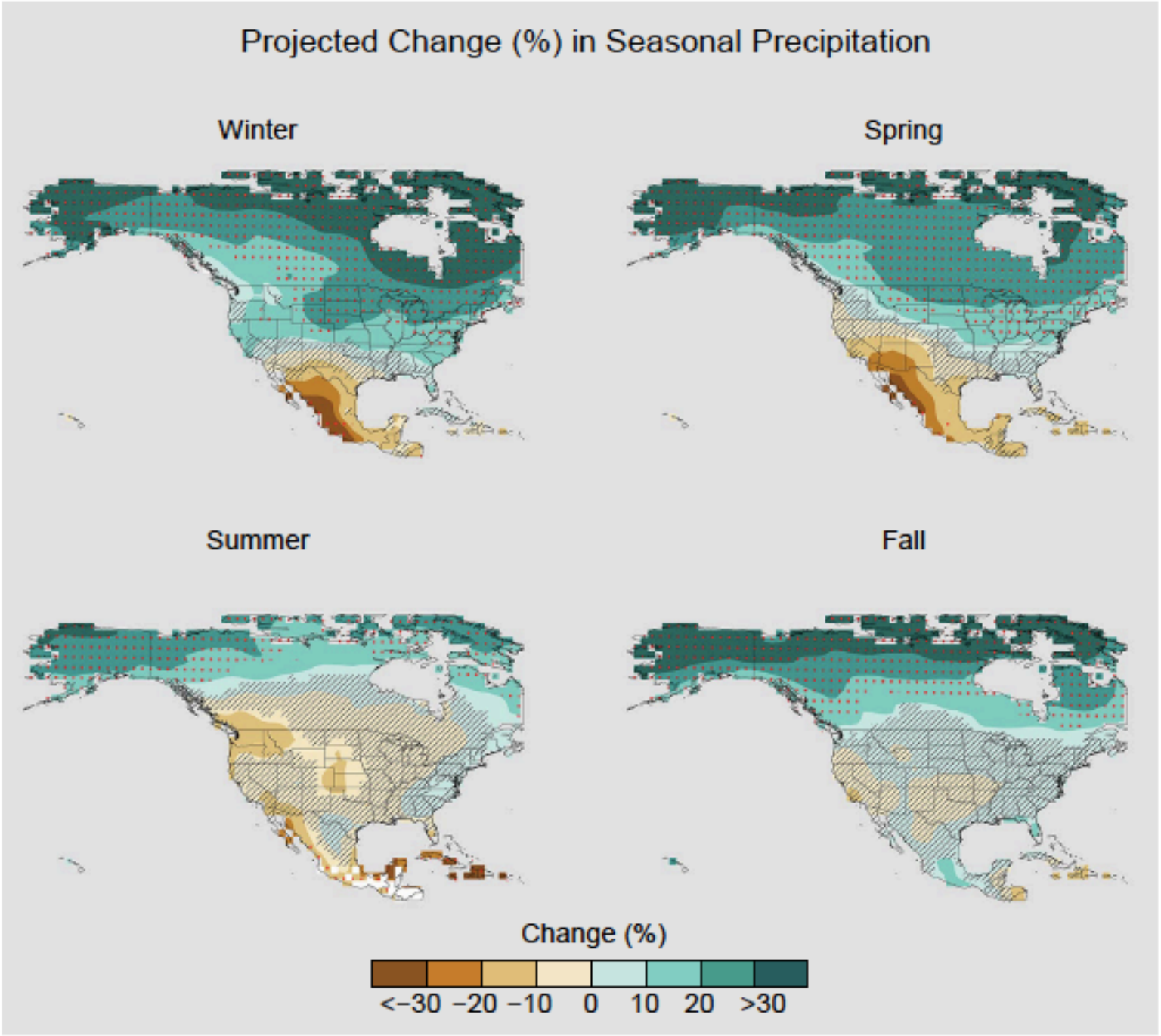
- Model results weighted (Sanderson Wehner, and Knutti, 2017) - independence and quality
- Downscaling of CMIP5 (1/16th deg.) Localized Constructed Analog Method (LOCA, Pierce et al. 2014) – maps and data on scenarios web site

US Regions



CSSR, 2017

RCP 8.5
2070-99
vs.
1976-20
05

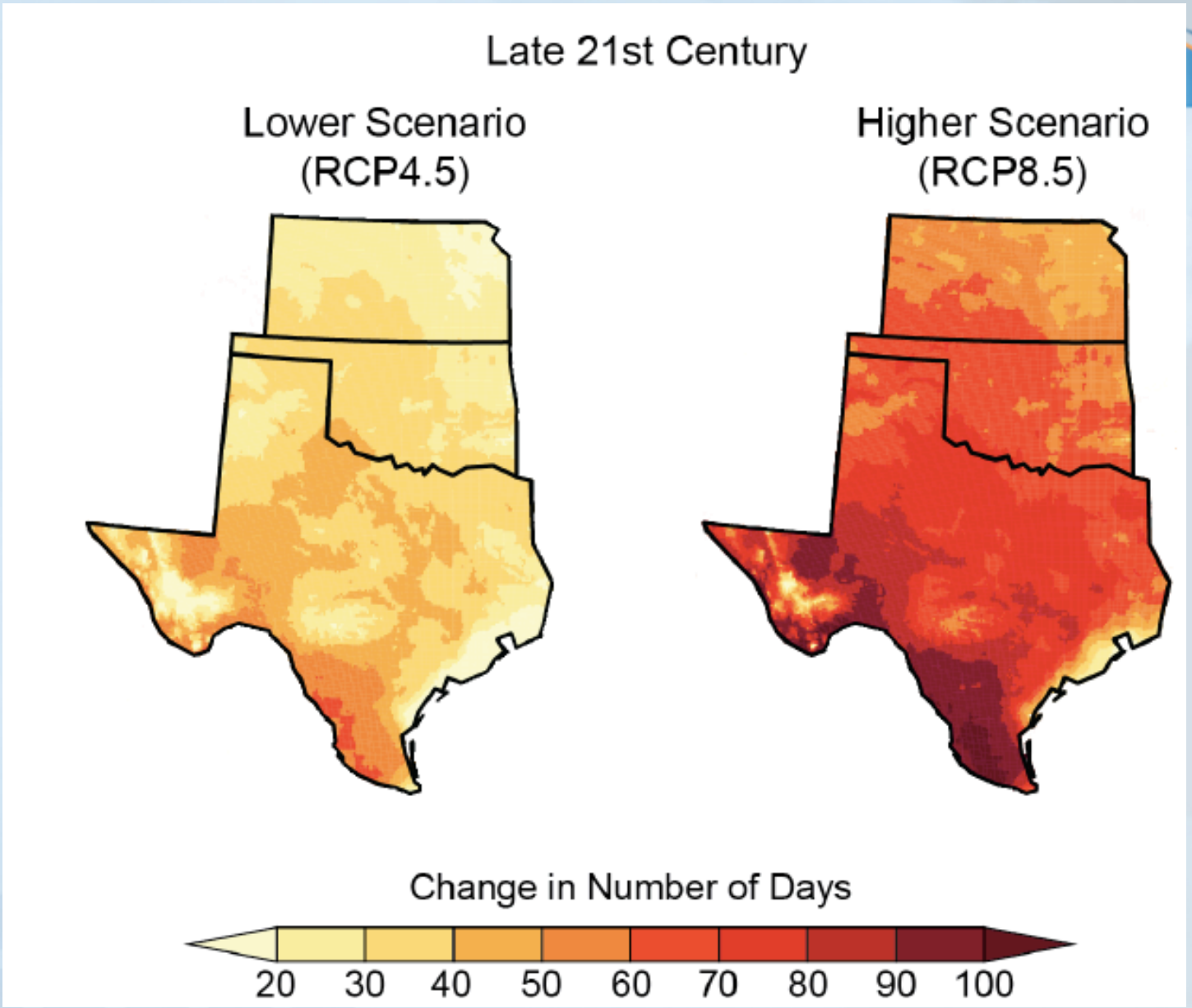


Relationship between Vols. I and II

- Volume I material to serve as foundation for efforts to assess climate related risks
- Vol. II includes national topics (e.g., agriculture, energy, water resources) and regional analyses (10 regions) (and brief representation of Vol. I material). Adaptation of risk as basic principle for Volume II.

Volumes I and II (cont'd)

- Regional chapters make extensive use of LOCA downscaling maps for climate change analyses and some thresholds analysis (e.g., extremes)
- Some topic chapters use some LOCA in their beginning sections, but not all. LOCA is absent from assessment of actual impacts.
- What difference does this make?



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Threshold = 100 deg.

Example of use of LOCA results

The North American Regional Climate Change Assessment Program (NARCCAP)

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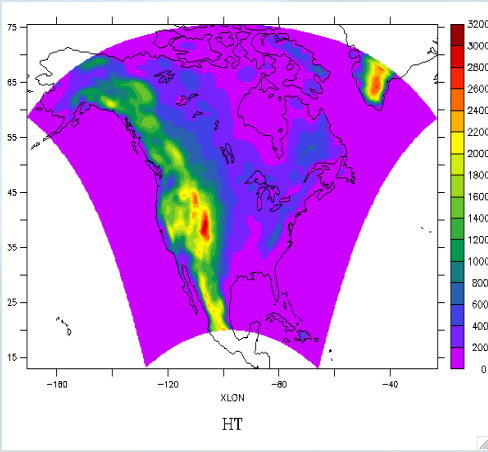
www.narccap.ucar.edu

- Explores multiple uncertainties in regional and global climate model projections
  - 4 global climate models x 6 regional climate models
- Develops multiple high resolution (50 km) regional climate scenarios for use in impacts and adaptation assessments
- Funded by multiple US government agencies



Simulations:

- 20 years simulations driven by NCEP-2 Reanalysis
- 30 year simulations driven by current of GCMs
- 30 year simulations driven by future (A2) GCMs for mid-21st century
- 12 current and future RCM-GCM pairs (1/2 of 4 x 6 matrix)

53 different variables saved at 3-hr intervals, ~ 40 TB data

NARCCAP Experimental Design

A2 Emissions Scenario

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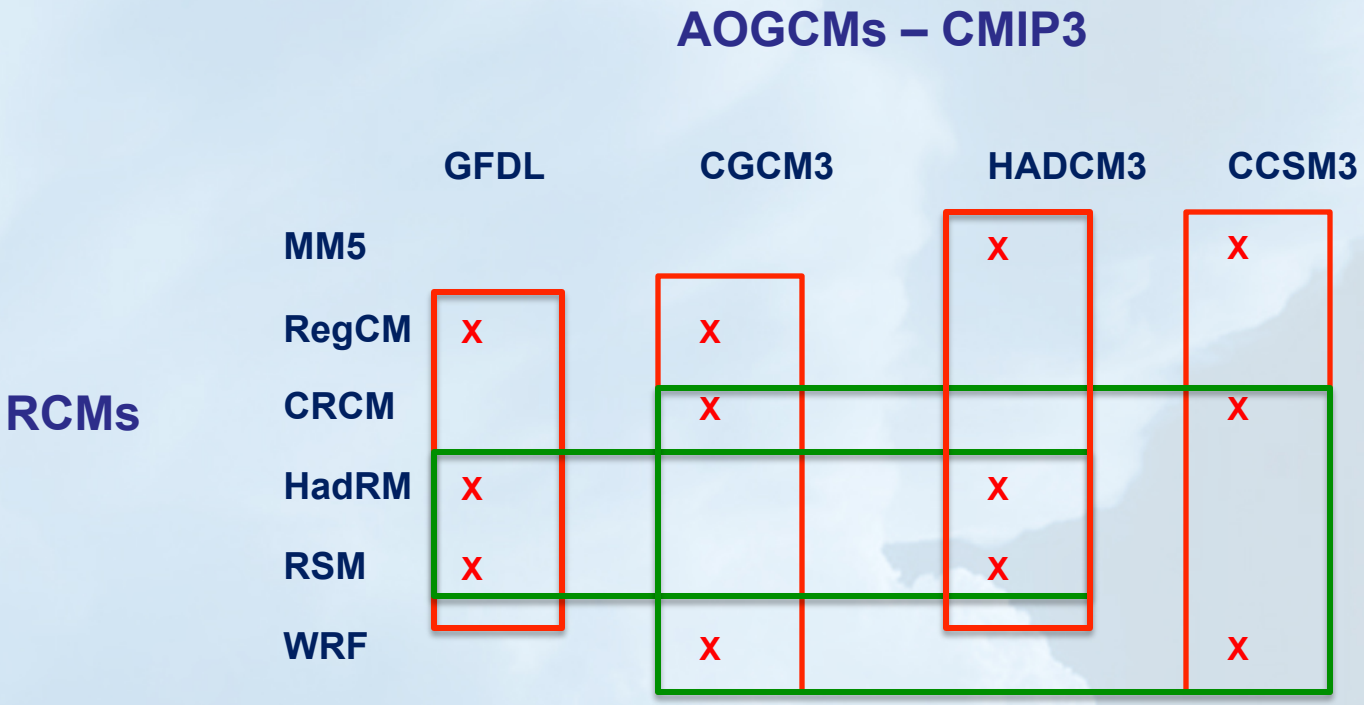

NARCCAP Metrics

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- Number of articles/reports published that used the data: ~ 170
- Number of users: ~ 1,000
- Citations of the Program (NARCCAP): ~1000
- Used extensively in the Third US National Assessment
  - **But**, not as fully as the CMIP3 GCMs - decisions were made by the scenarios team that precluded full use of NARCCAP

Use of NARCCAP in Impacts

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- Number of papers: ~ 70; major areas: hydrology, fire risk, human health
- Reasons given for using NARCCAP
  - Higher spatial resolution – examination spatial resolution effect
  - Number of variables available and frequency (53 at 3 hr intervals)
  - Data set developed for use in impacts (credibility and useability)
- Demonstrates need for bias correction

Mearns et al., 2015, *CCCR*

NA-CORDEX

W. Gutowski and L. Mearns, co-Chairs

- Domain – most of North America (larger)
- ERA-Interim Simulations: 1990-2009
  - 9 RCMs – 50, 25,12 km (CRCM5, WRF, RegCM4))
- 6 RCMs, 5 CMIP5 GCMs (1950-2100) (full transient)
  - Some 50-km & 25-km resolution (RegCM4, WRF, CanRCM4, CRCM5); a few at 12 km
  - RCP8.5 scenario (some also with RCP 4.5)
- Hosting most commonly used variables from all completed simulations at NCAR, with access at na-cordex.org

NA-CORDEX

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CS	GFDL-ESM2M (2.5)	MPI-ESM-LR (3.6)	HadGEM2-ES (4.6)	CanESM2 (3.7)	EC-EARTH (3.3)
RegCM4 (Iowa State & NCAR)	25km 50km	25km 50km	25km 50km		
WRF (U. of Arizona & NCAR)	25km 50km	25km 50km	25km 50km		
HIRHAM5 (DMI)					50km
CanRCM4 (CCCma)				25km 50km	
RCA4 (SMHI)				50km	50km
CRCM5 (UQAM)		25km* 50km*		50km	

Orange = RCP4.5 and RCP8.5, all others RCP 8.5 only; * runs in progress

Improving Useability

- Providing bias-corrected data for 7 variables (so far done for temperature and precipitation) for all simulations (daily time scale)
- Providing some explicit guidance for use

ECS vs. Annual Mean Delta T

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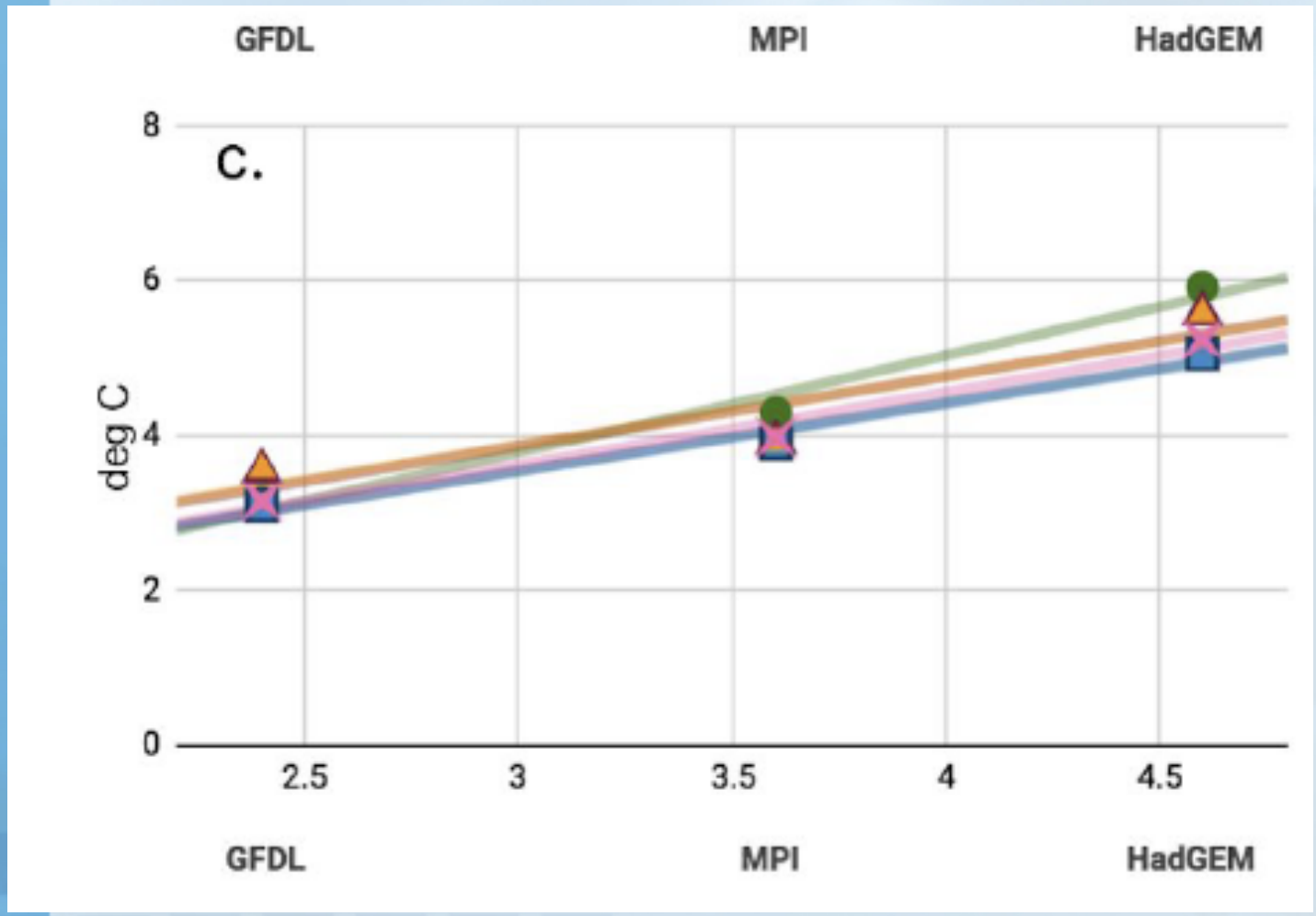

1951-2000
vs.
2050-2099

PDFs of grid point R^2 values

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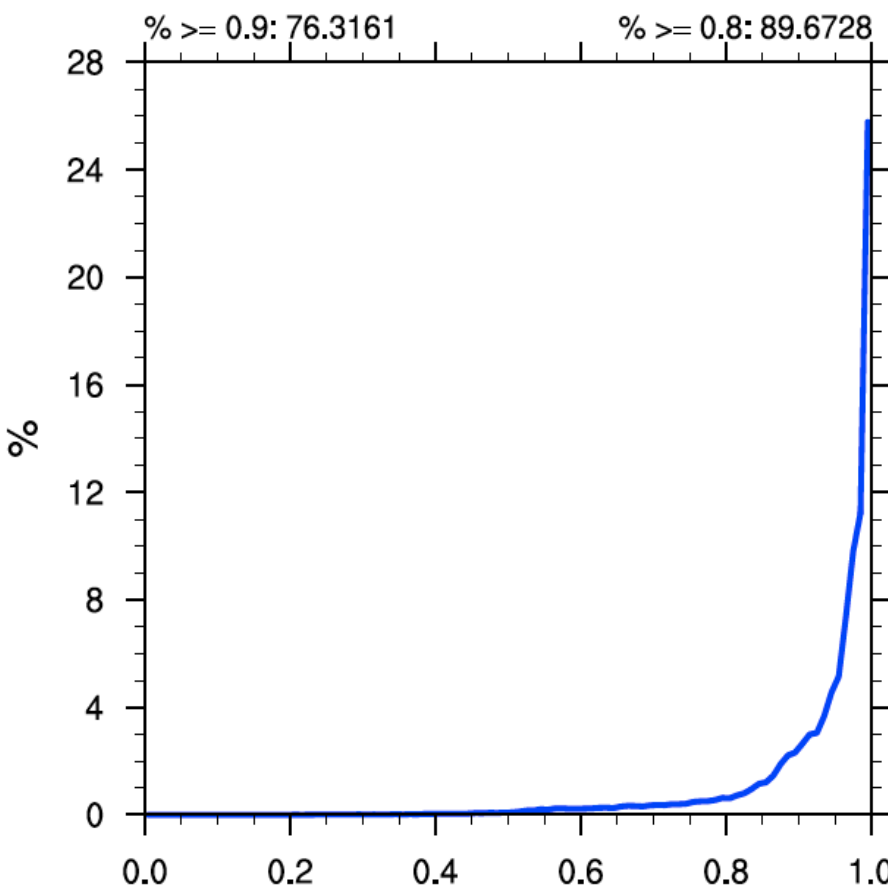
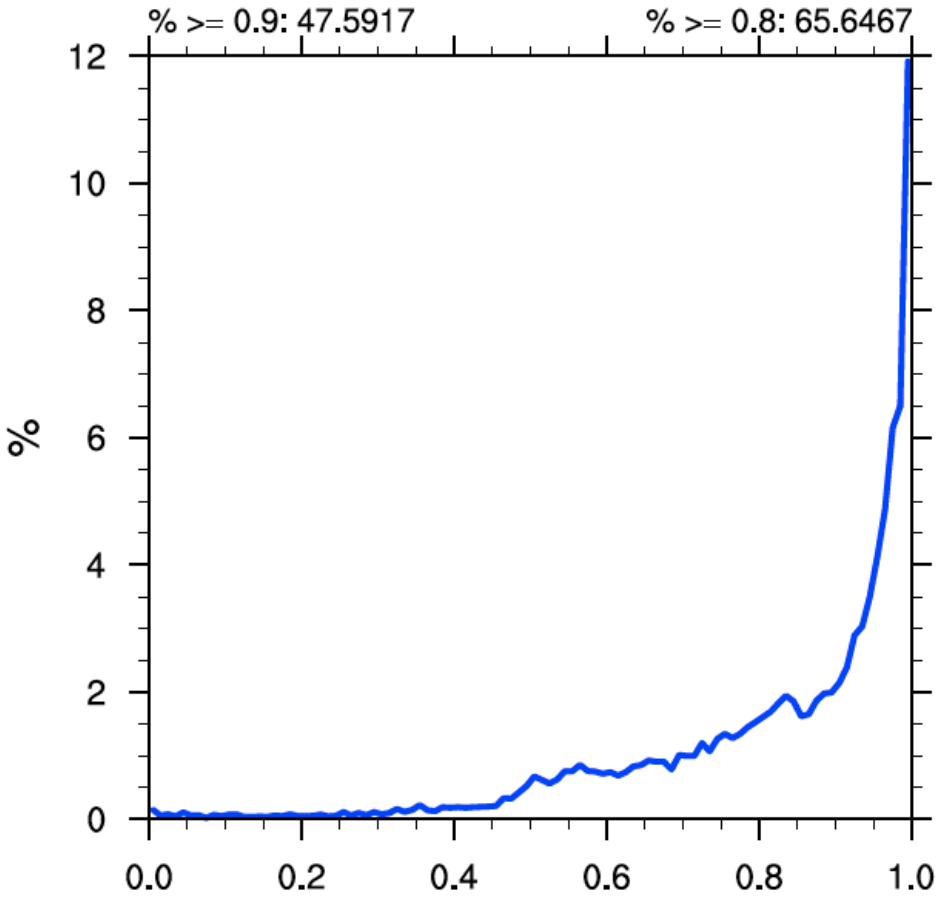
RegCM4

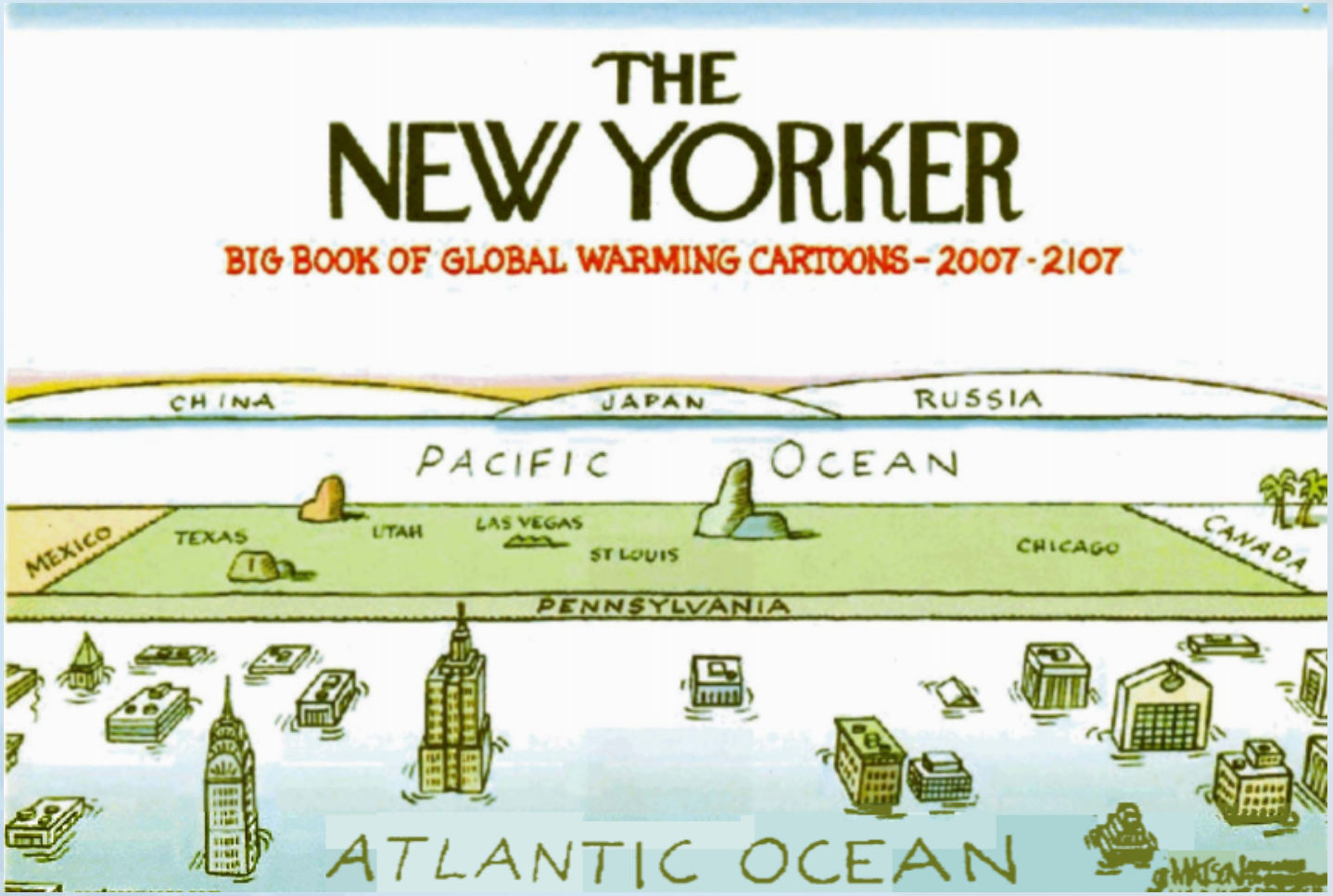


WRF



R^2

The End


THE
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BIG BOOK OF GLOBAL WARMING CARTOONS - 2007 - 2107
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