

WELCOME TO CLIMATE 101!



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INTRODUCTION TO CLIMATE

DR. KIM WINTON

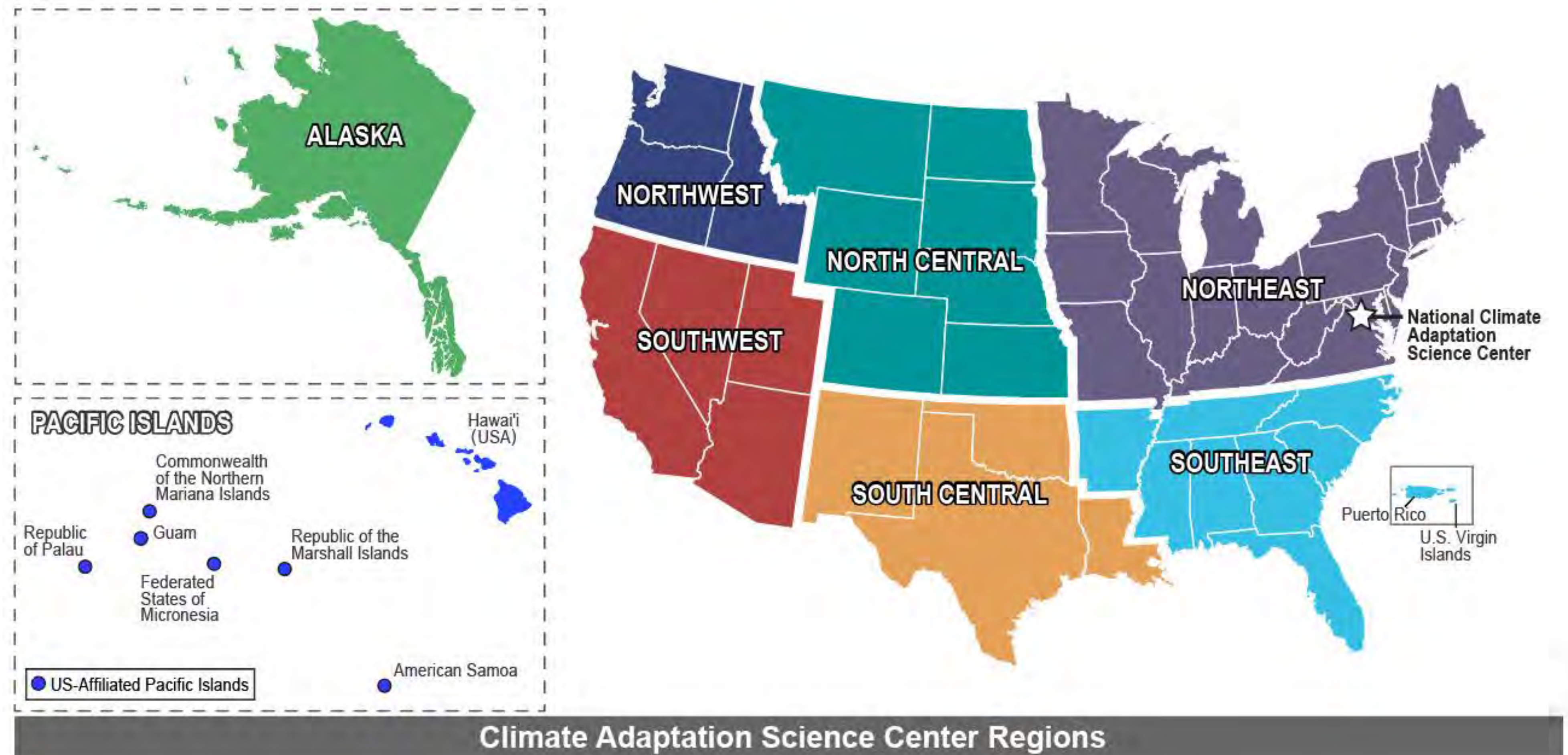
RETIRED

FORMER USGS DIRECTOR, SOUTH CENTRAL CLIMATE SCIENCE CENTER



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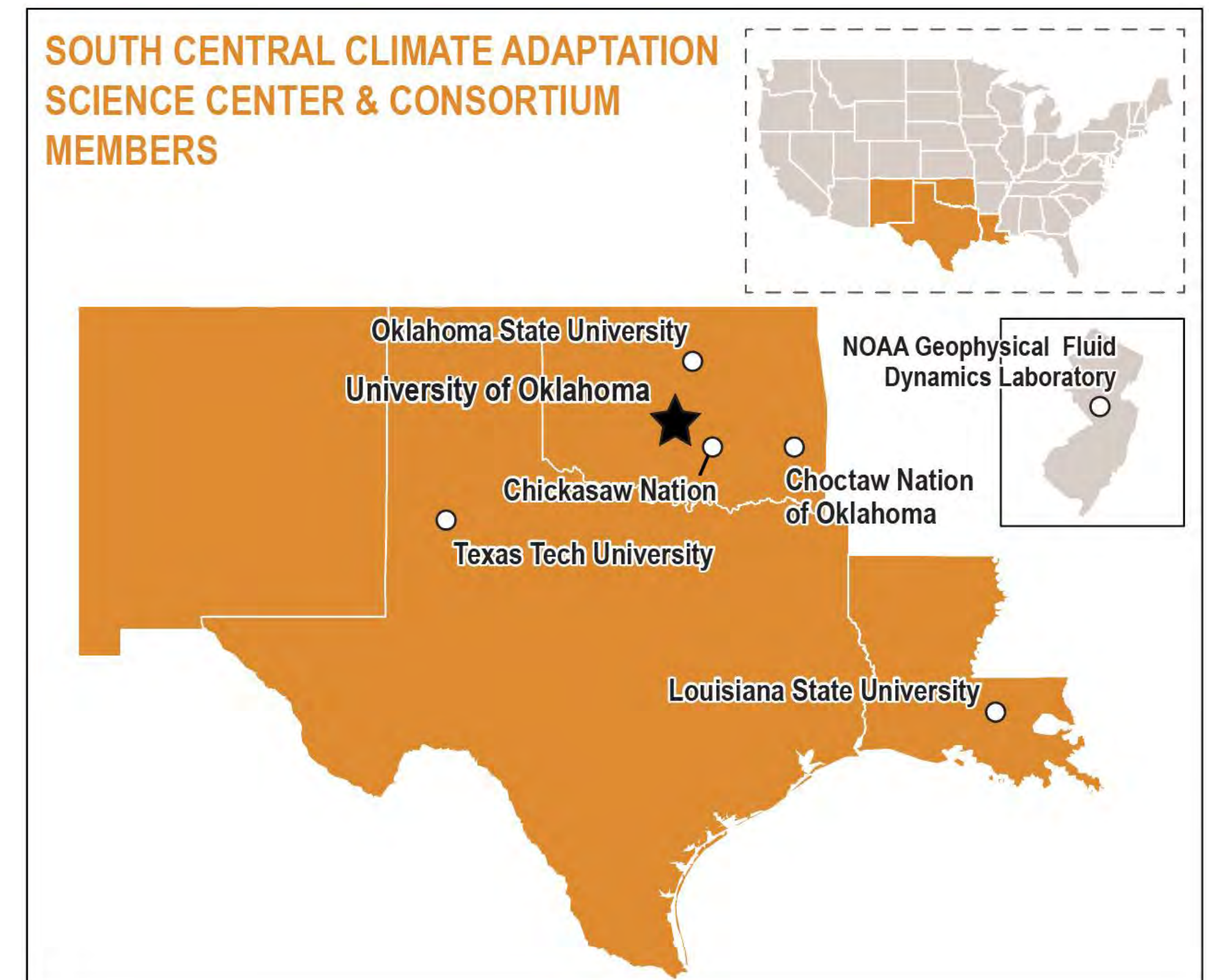
CLIMATE ADAPTATION SCIENCE CENTERS



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SOUTH CENTRAL CASC

Established in 2012, the South Central Climate Adaptation Science Center **provides natural and cultural resource managers with the science, tools, and information** they need to **address the impacts of climate variability and change** on their areas of responsibility.



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CLIMATE CHANGE IMPACTS TO...

Agriculture



Water



Ecosystems



Communities



Commerce



Health



Energy



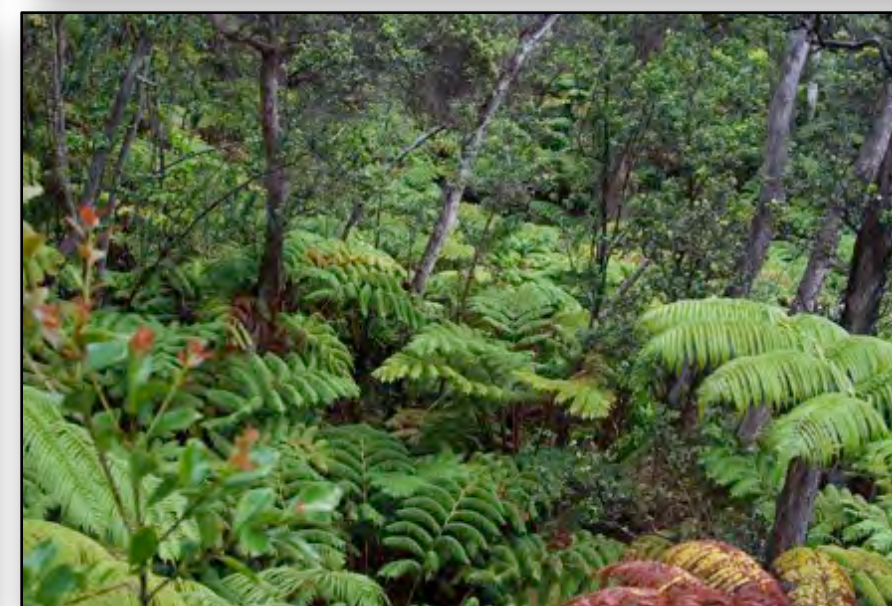
Coastal



Infrastructure



Forests

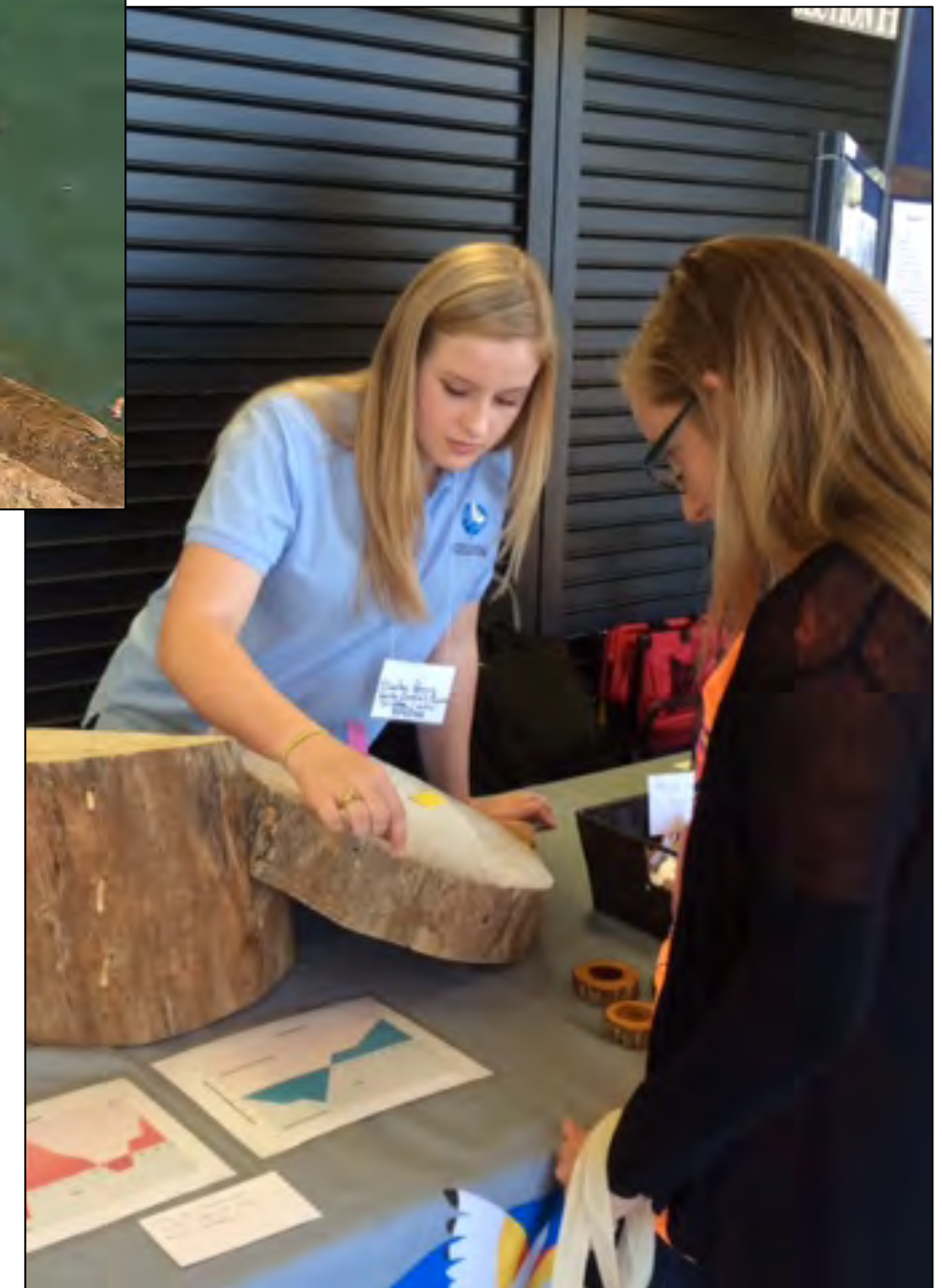
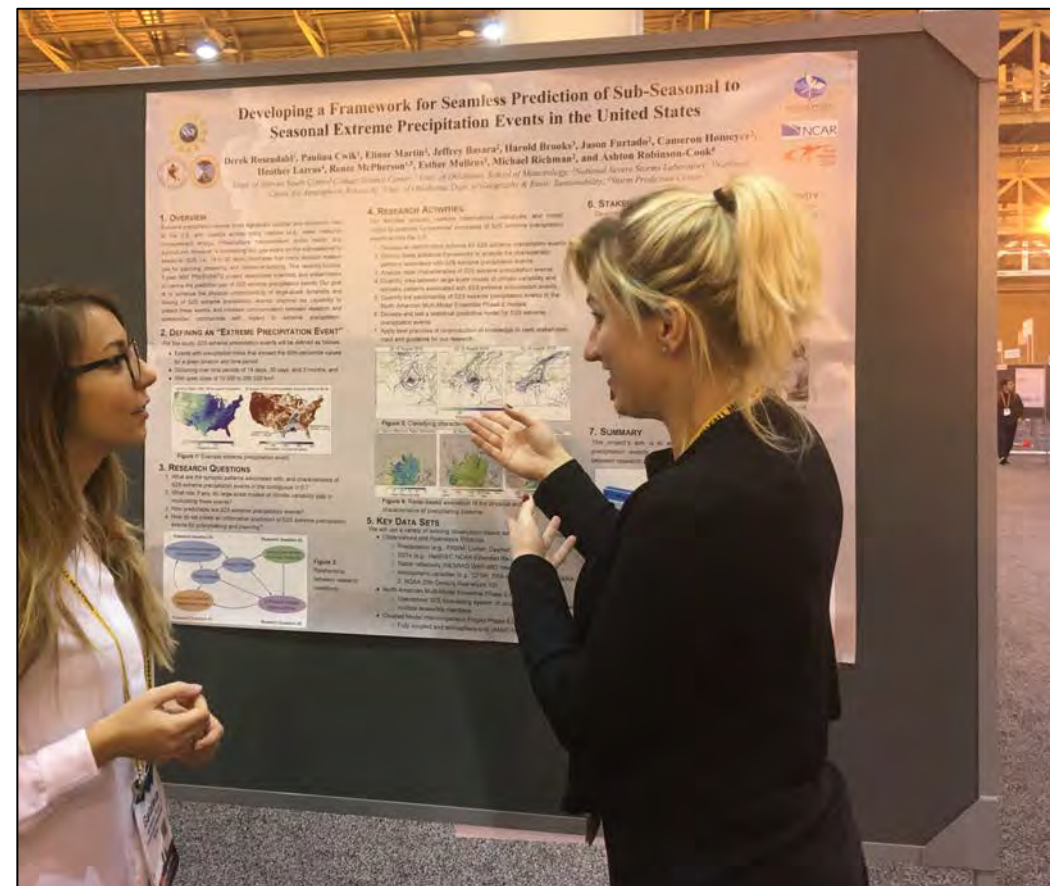


Carlye Calvin & Wikipedia photos



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SUPPORT FOR THE NEXT GENERATION

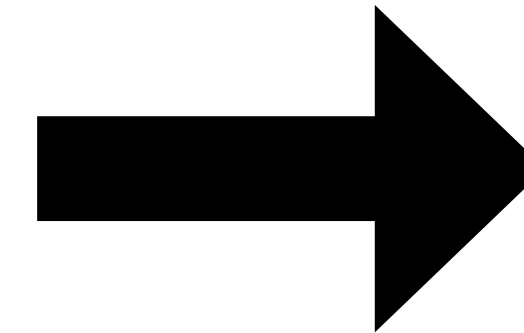


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TRIBAL ENGAGEMENT STRATEGY

Introductory meetings & outreach with Tribal staff

Time



Tribal youth programs

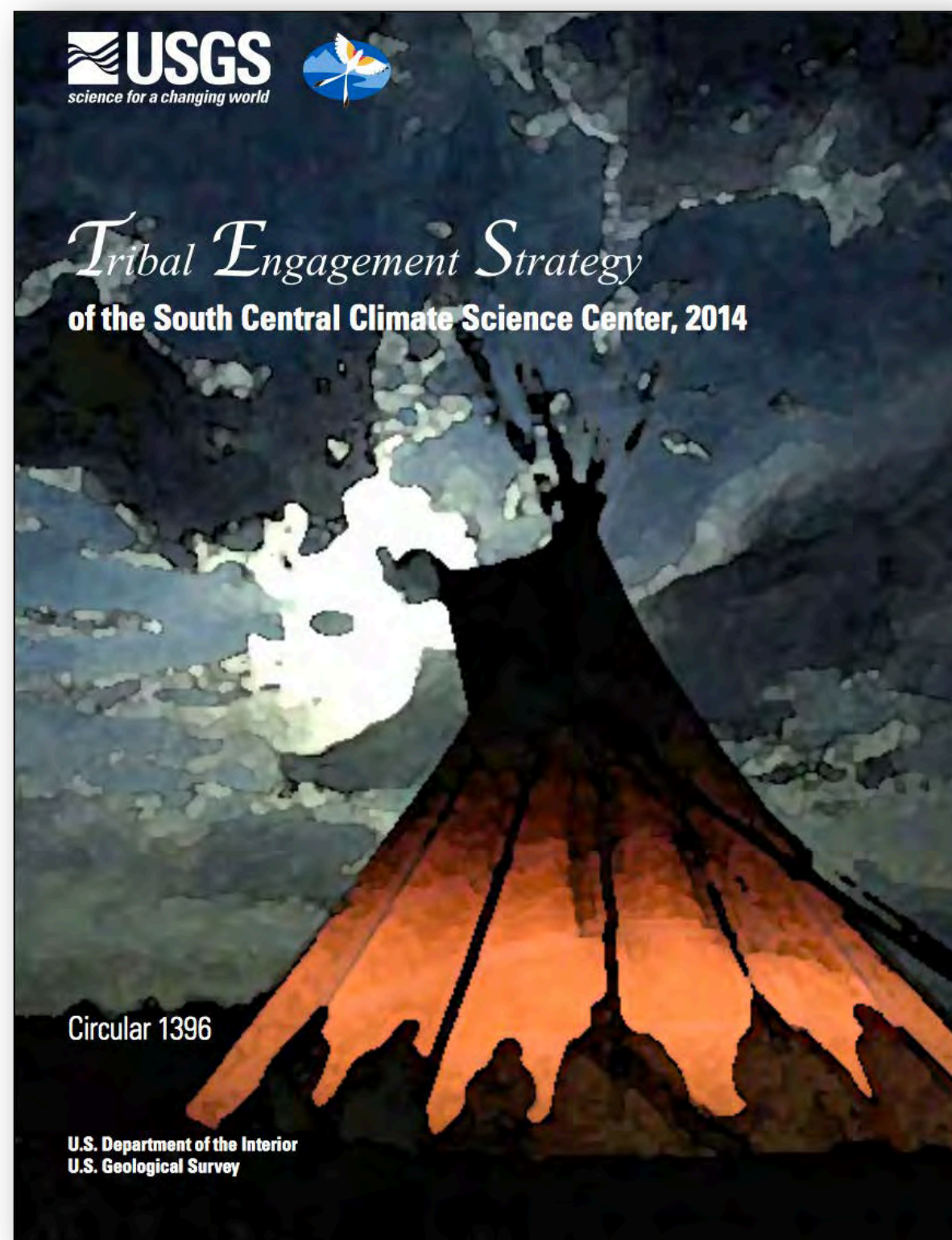
Tribal staff capacity building in climate-related areas

Researcher capacity-building in ethical research with Tribes & how to build relationships with Tribes

Co-production of knowledge with Tribes

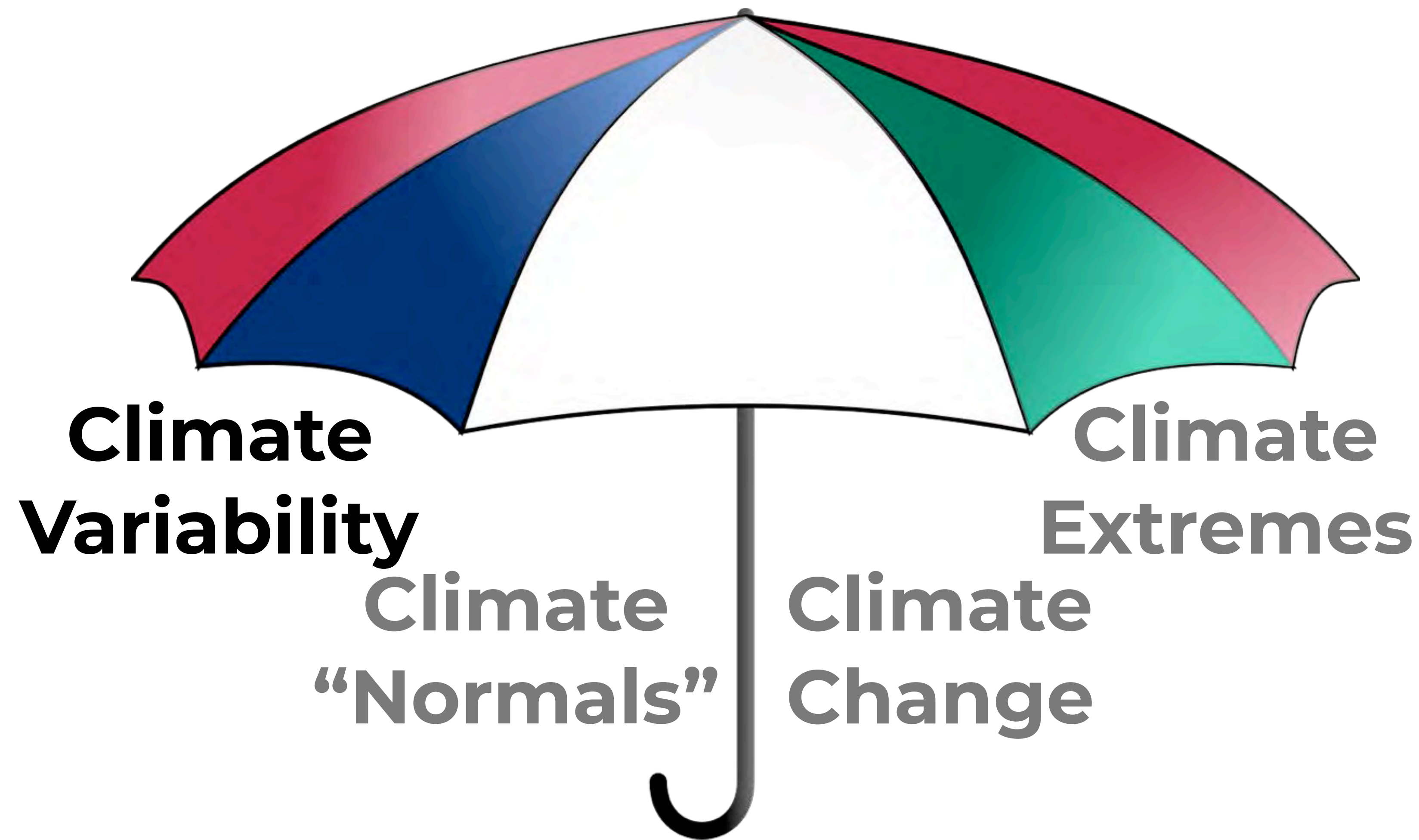
Independent Tribal climate projects & integration into Tribal plans

Increasing Involvement
& Increasing Tribal
Capacity



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THE CLIMATE UMBRELLA



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WEATHER VS. CLIMATE

Weather – **state of the atmosphere** with respect to heat or cold, wetness or dryness, calm or storm, clearness or cloudiness; **short-term**

Climate – **statistical collection of weather conditions** at a place over a period of years; **long-term**

“Climate is what you expect. Weather is what you get.”

WEATHER VS. CLIMATE

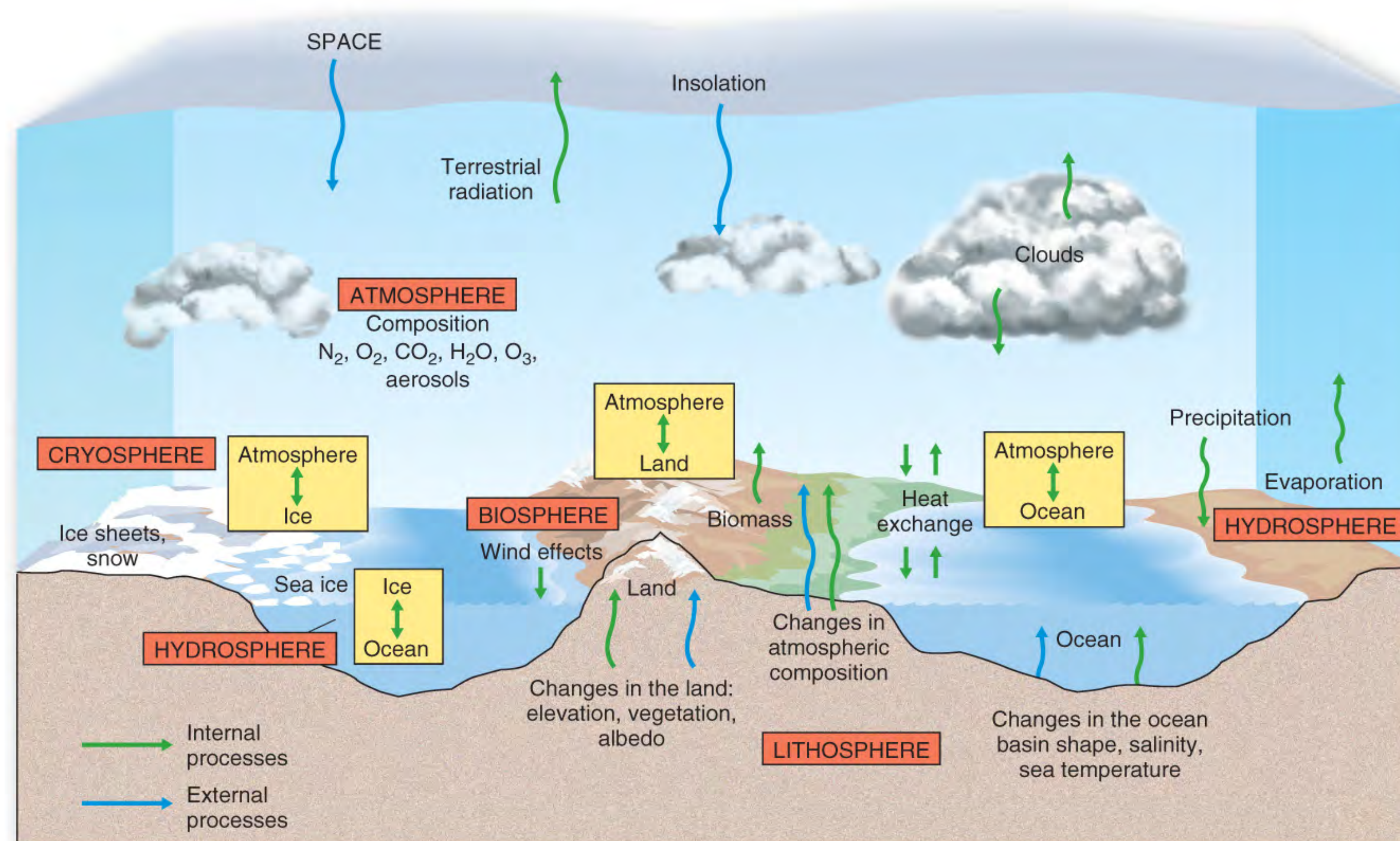
- **Weather**

- What type of clothing should I wear today?
- Should we open or close our windows today?
- Is it dry enough to harvest my crop tomorrow?

- **Climate**

- What clothing should I buy for my wardrobe?
- What materials should I build my house from?
- How much and what type of crops should I plant?

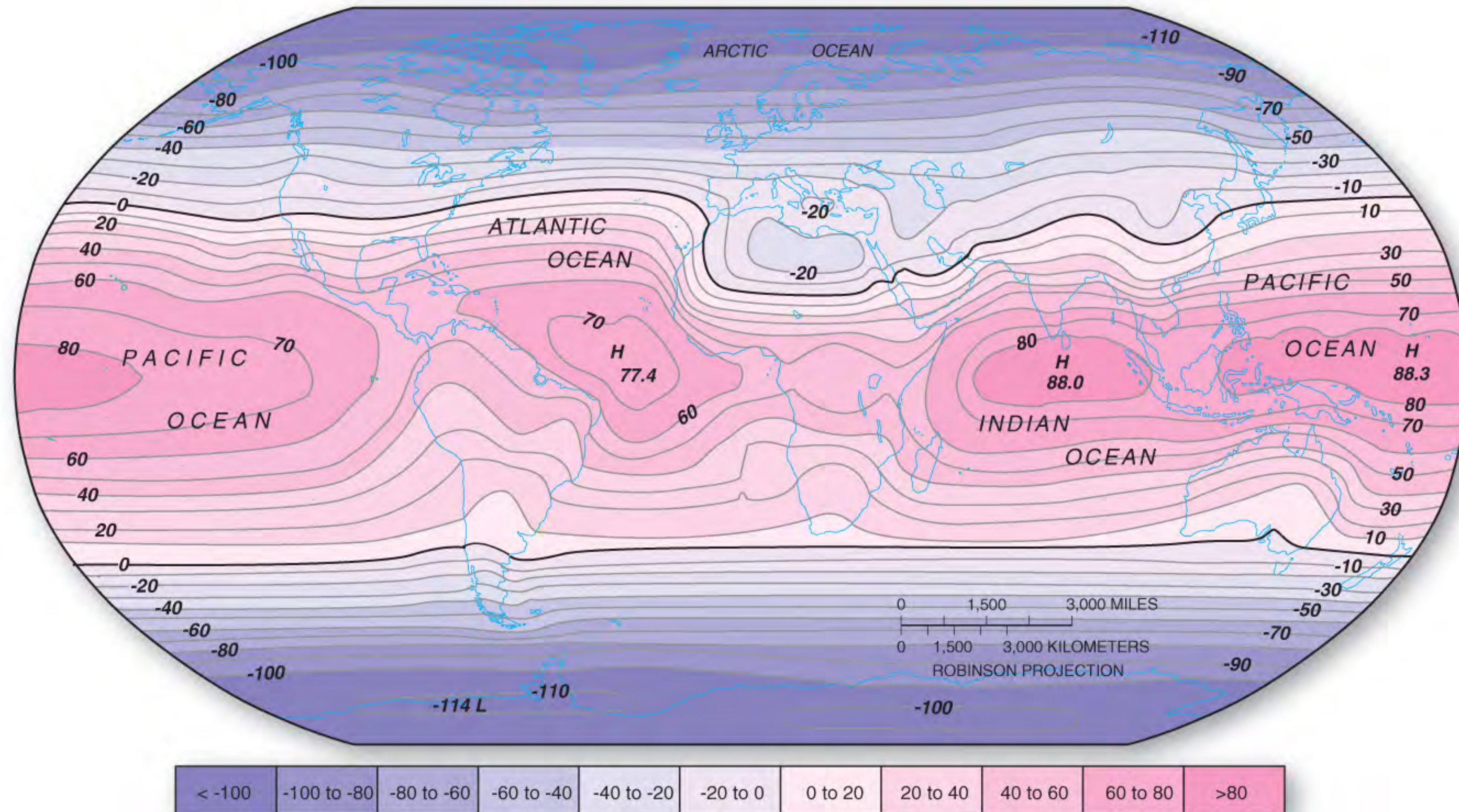
EARTH'S CLIMATE SYSTEM



EARTH'S CLIMATE SYSTEM COMPONENTS

- **Incoming & outgoing radiation** – energy input & output
- **Albedo** – percent of incoming sunlight reflected
- **Atmospheric composition** – absorption of energy at different wavelengths
- **Temperature** – driven by latitude, elevation, clouds, land-water differences
- **Pressure** – global highs & lows, prevailing winds
- **Ocean currents** – movement of cold vs. warm waters
- **Air masses** – movement of air with differing characteristics
- **Topography** – creates irregularities in other patterns
- **Precipitation** – driven by all of the above

AVERAGE NET RADIATION AT SURFACE

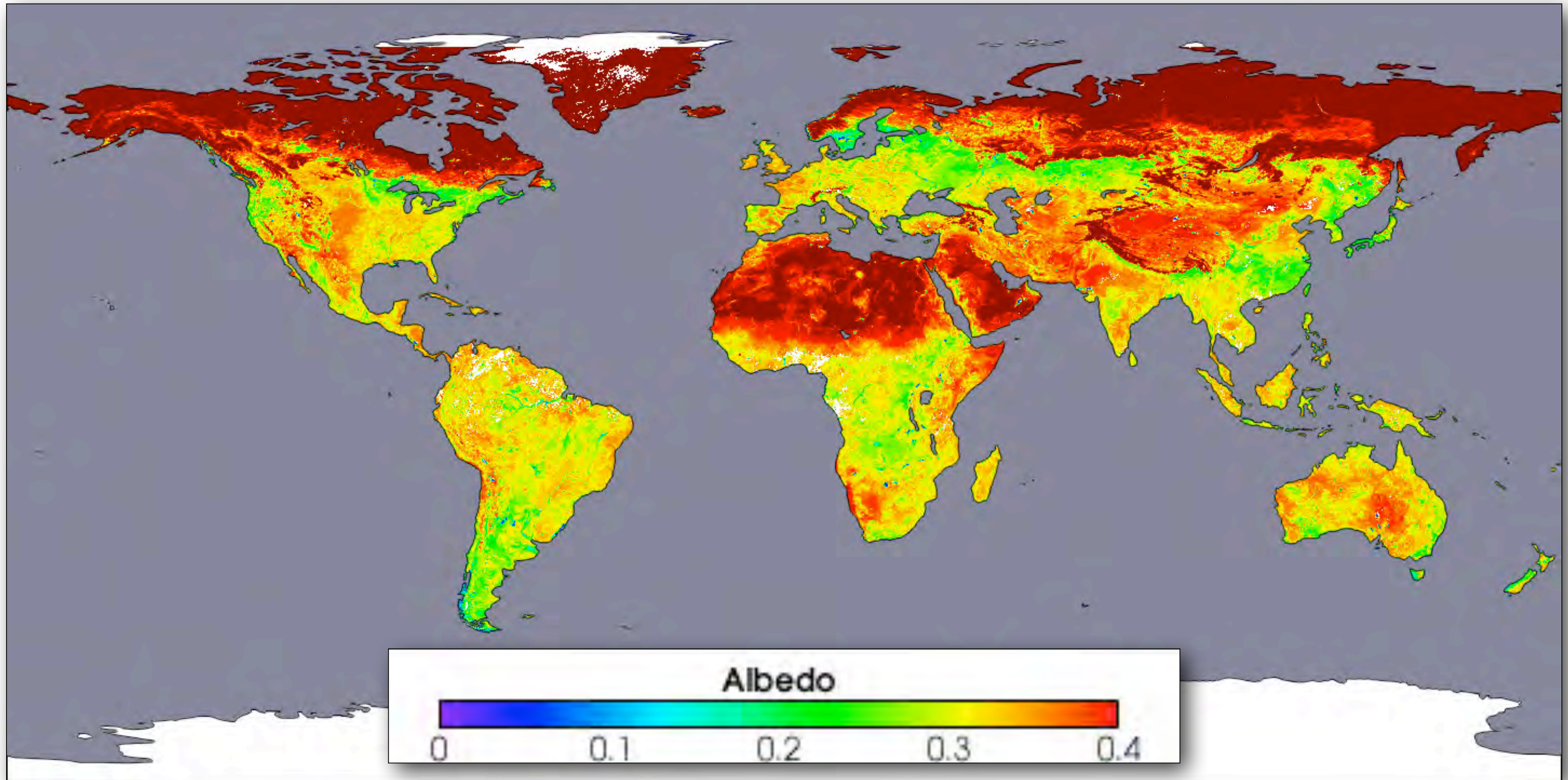


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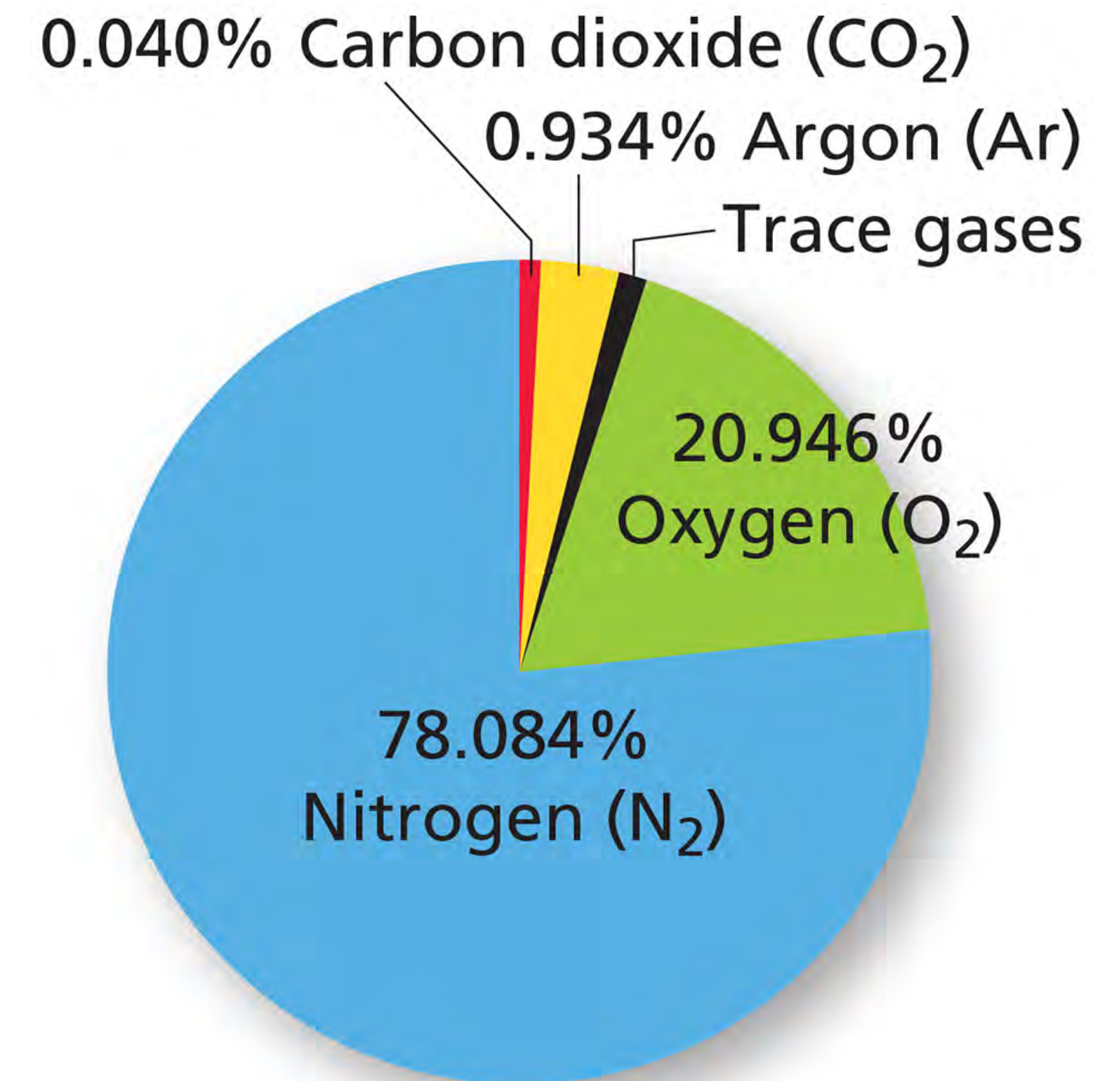
GLOBAL ALBEDO



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ATMOSPHERIC COMPOSITION

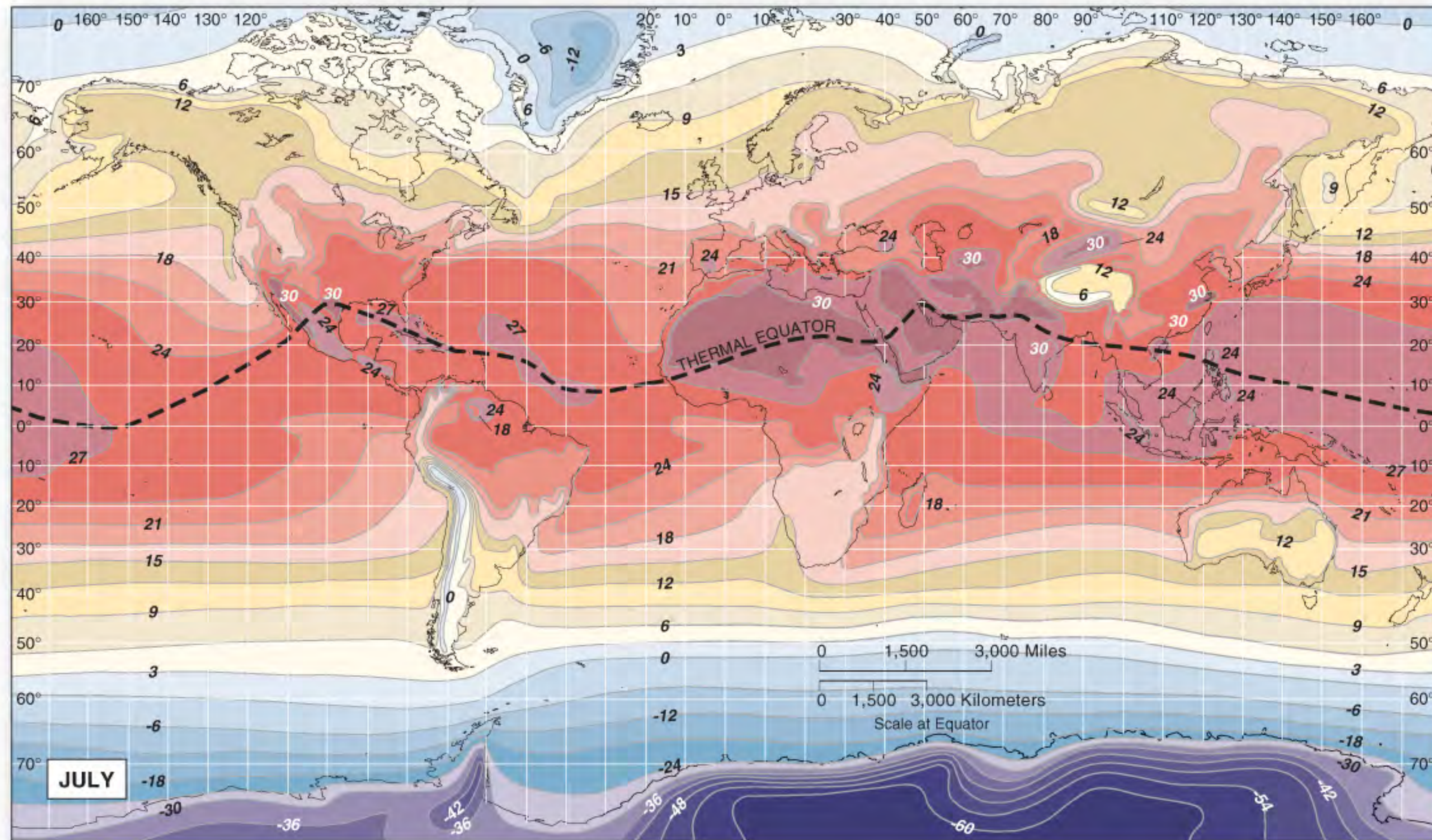
Gas	Symbol	Content
Nitrogen	N ₂	78.084%
Oxygen	O ₂	20.947%
Water Vapor	H ₂ O	0–4%
Argon	Ar	0.934%
Carbon Dioxide	CO ₂	0.0360%
Neon	Ne	0.0018%
Helium	He	0.0005%
Methane	CH ₄	0.00017%
Hydrogen	H ₂	0.00005%
Nitrous Oxide	N ₂ O	0.00003%
Ozone	O ₃	0.000004%



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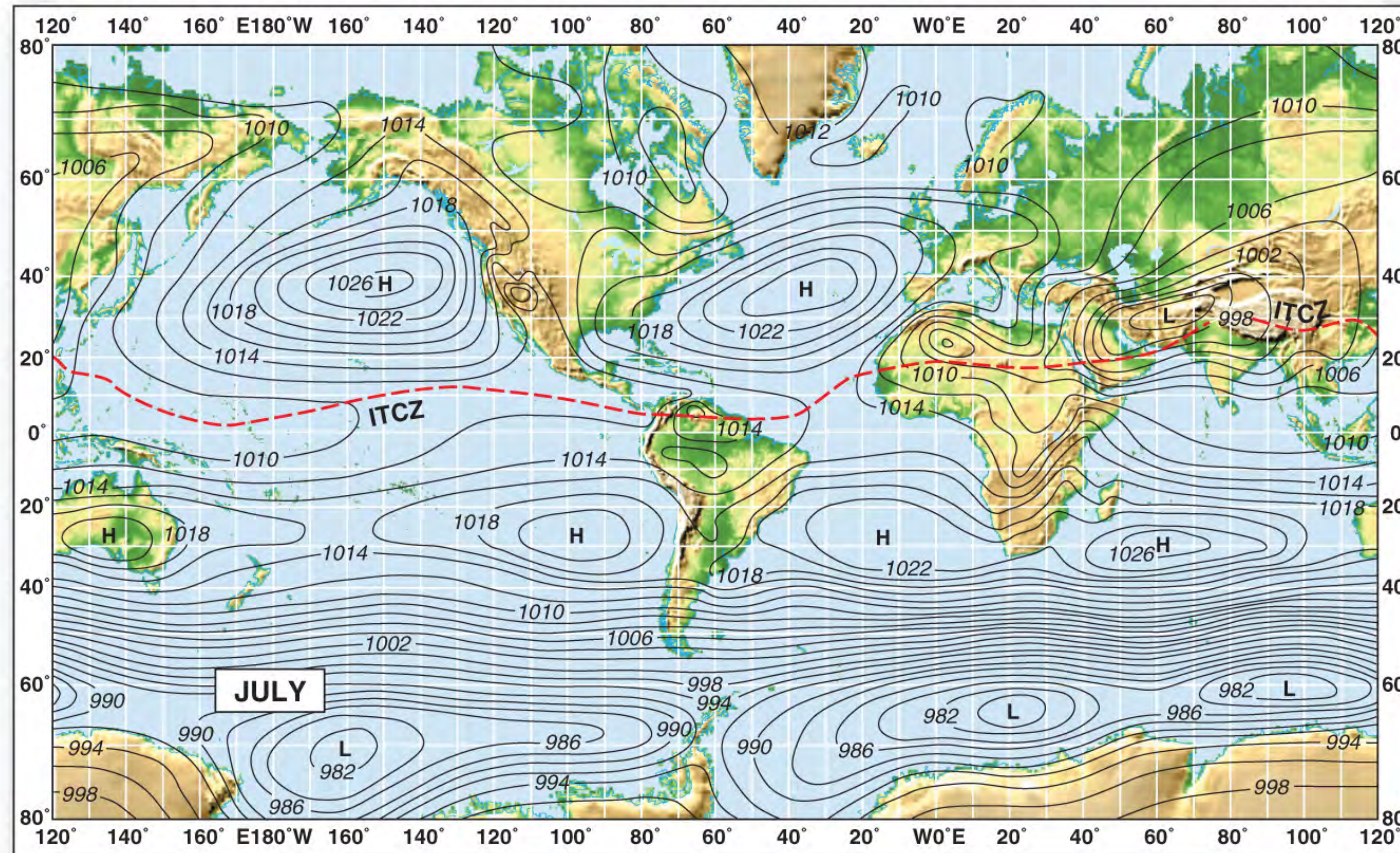
GLOBAL AIR TEMPERATURES (JULY)



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Figure 5.16

GLOBAL PRESSURE PATTERNS (JULY)



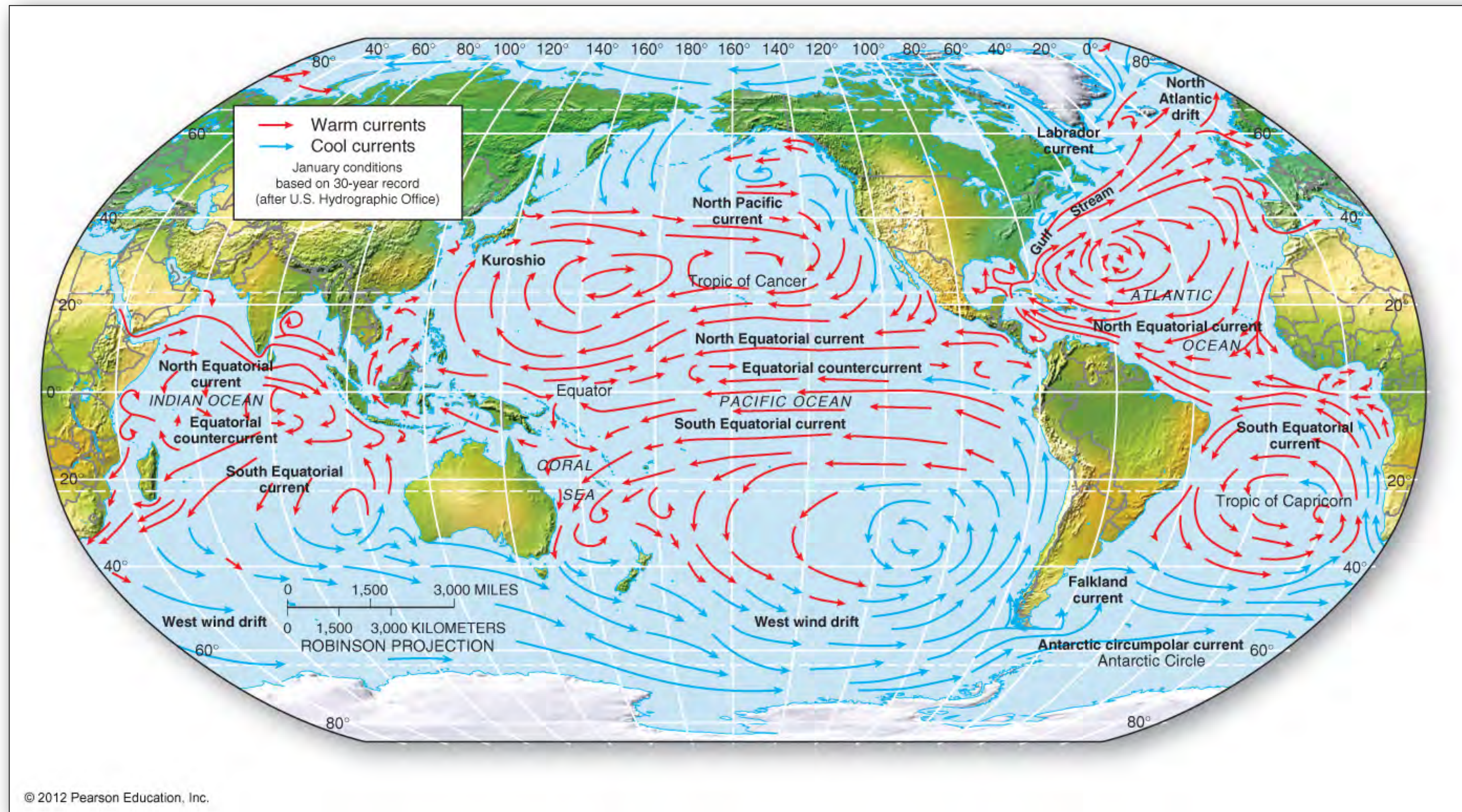
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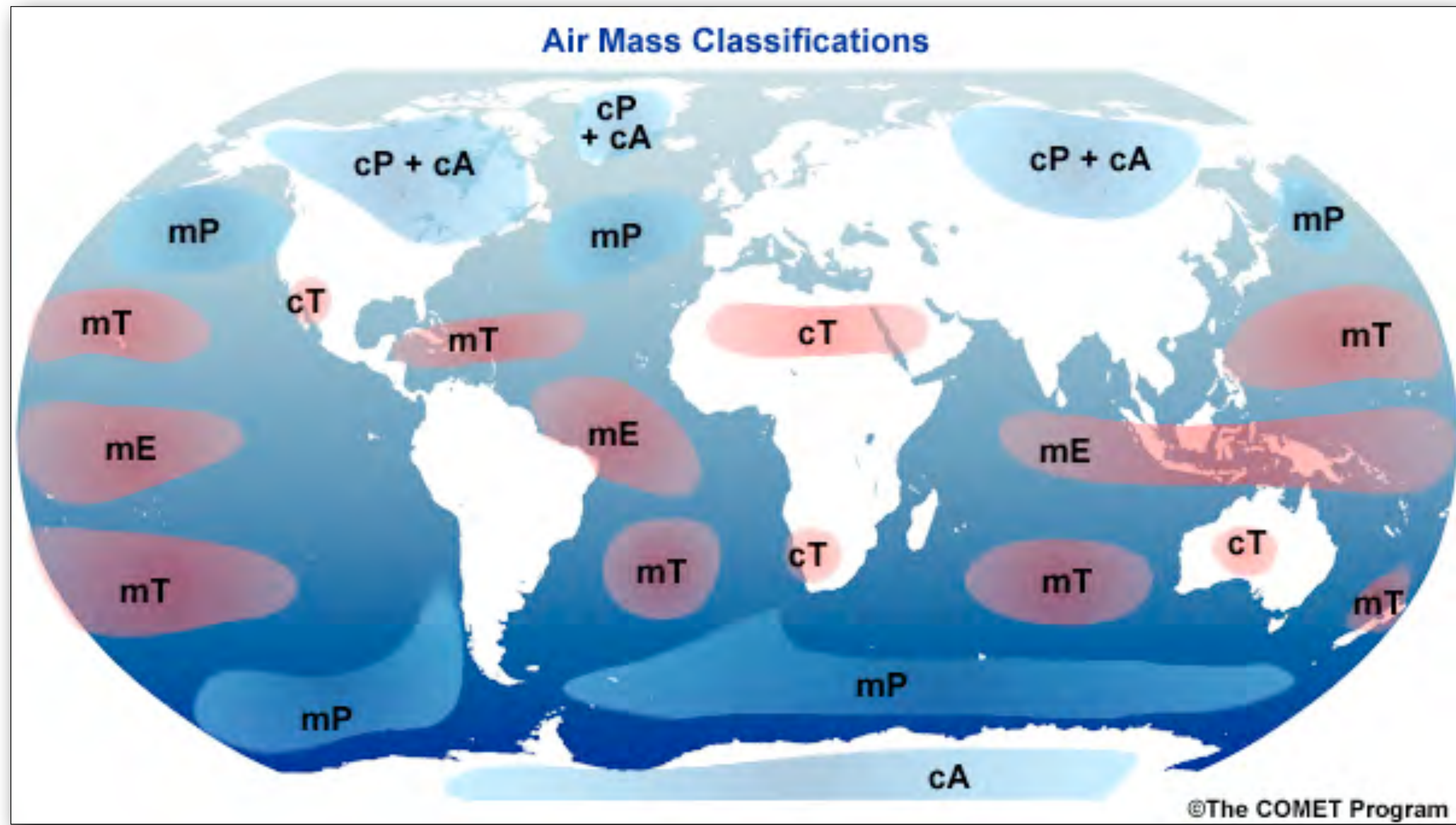
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MAJOR OCEAN CURRENTS

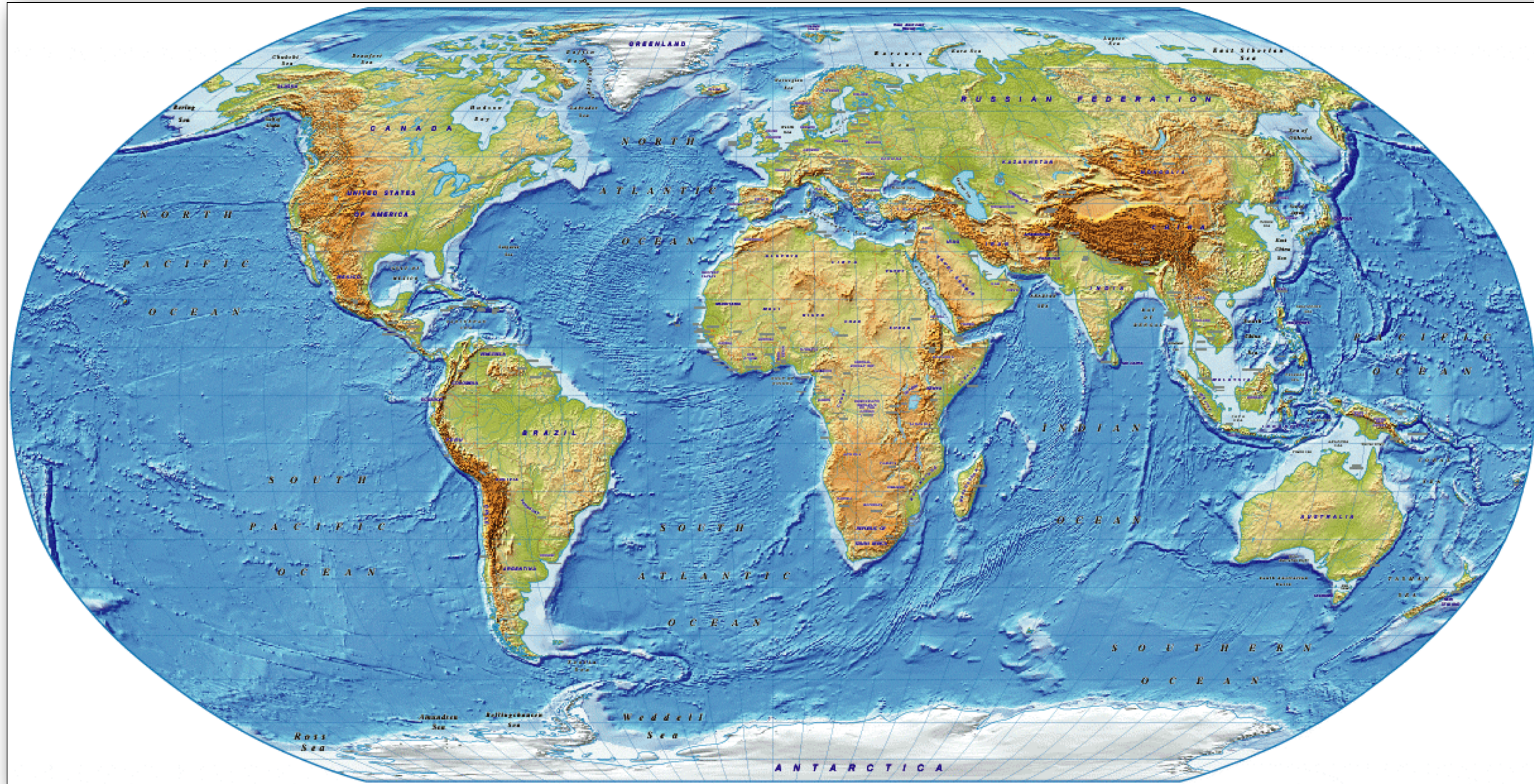


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AIR MASSES (TEMPERATURE & MOISTURE)

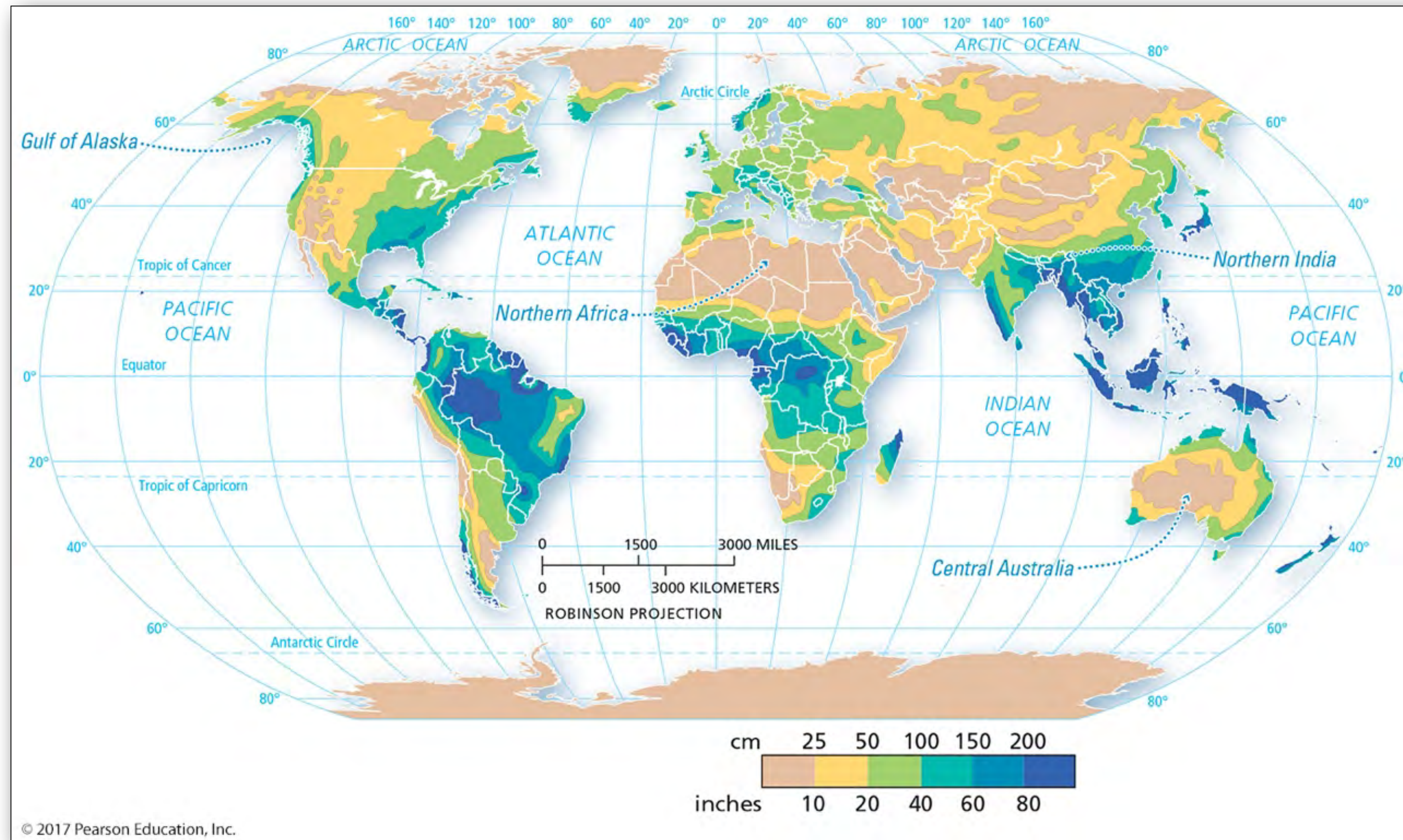


TOPOGRAPHY

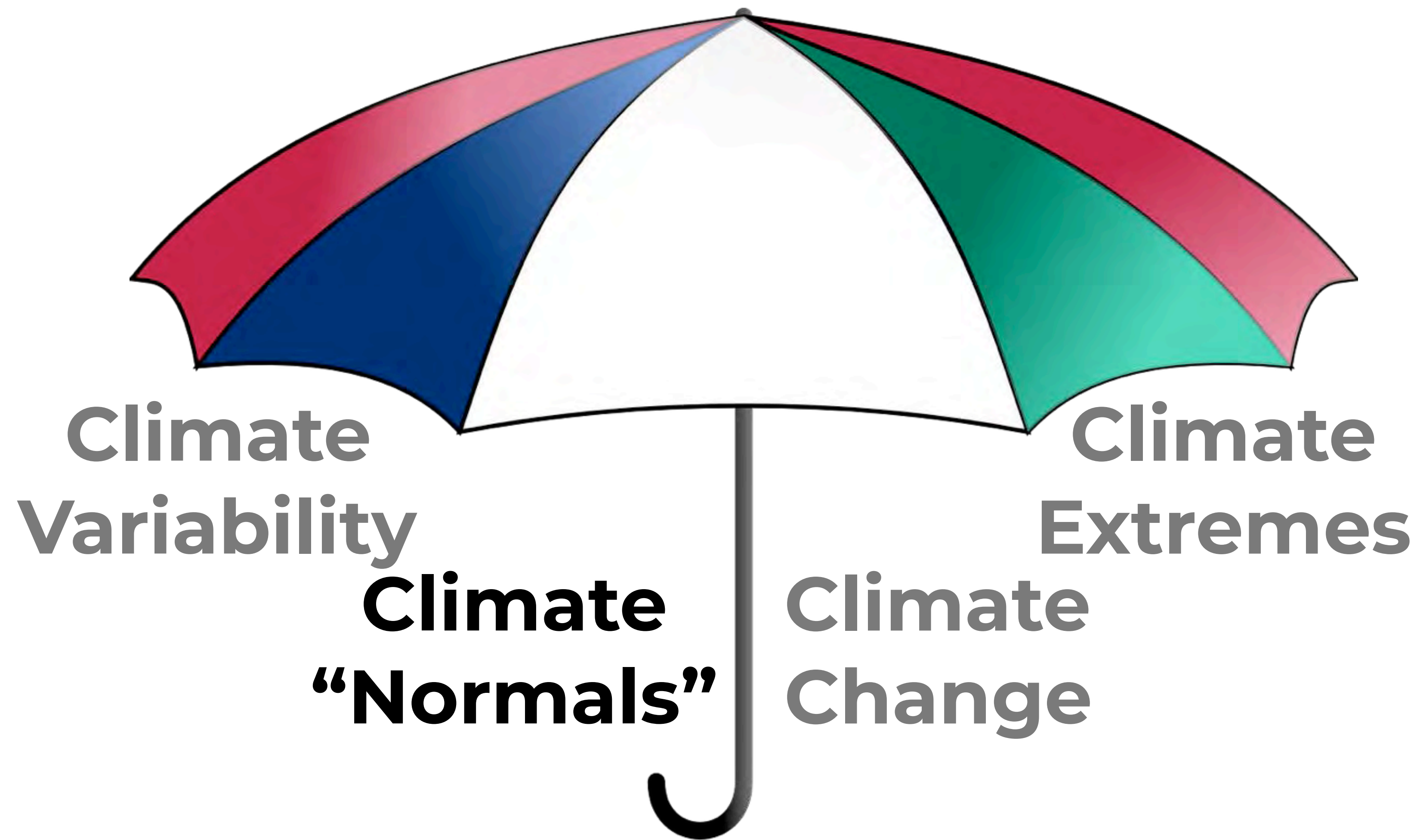


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WORLDWIDE AVERAGE PRECIPITATION



THE CLIMATE UMBRELLA



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CLIMATE “NORMALS”

- **Normal** – the average of a climatological element computed over three consecutive decades
 - For example, the normal annual temperature for Norman, OK, is the average of each year’s annual temperature for 30 years.
- In the U.S., we **update this 30-year window every 10 years** (e.g., 1961–1990, 1971–2000)
- Our **current normals** are calculated for **1981–2010**



EXAMPLE: NORMAL OCTOBER RAINFALL

October Rainfall: Norman, OK

1981	5.19"	1986	8.22"	1991	3.05"	*1996	2.53"	2001	2.67"	2006	2.68"
1982	0.92"	1987	1.29"	1992	0.89"	*1997	3.23"	2002	4.48"	2007	3.85"
1983	16.50"	1988	1.84"	1993	0.80"	*1998	6.76"	2003	0.80"	*2008	1.63"
1984	5.93"	1989	2.76"	1994	2.22"	1999	2.25"	2004	4.66"	2009	7.61"
1985	4.07"	1990	2.23"	1995	1.54"	2000	13.19"	2005	2.55"	2010	1.80"

Norman's normal October rainfall is 3.94 inches

EXAMPLE: NORMAL OCTOBER RAINFALL

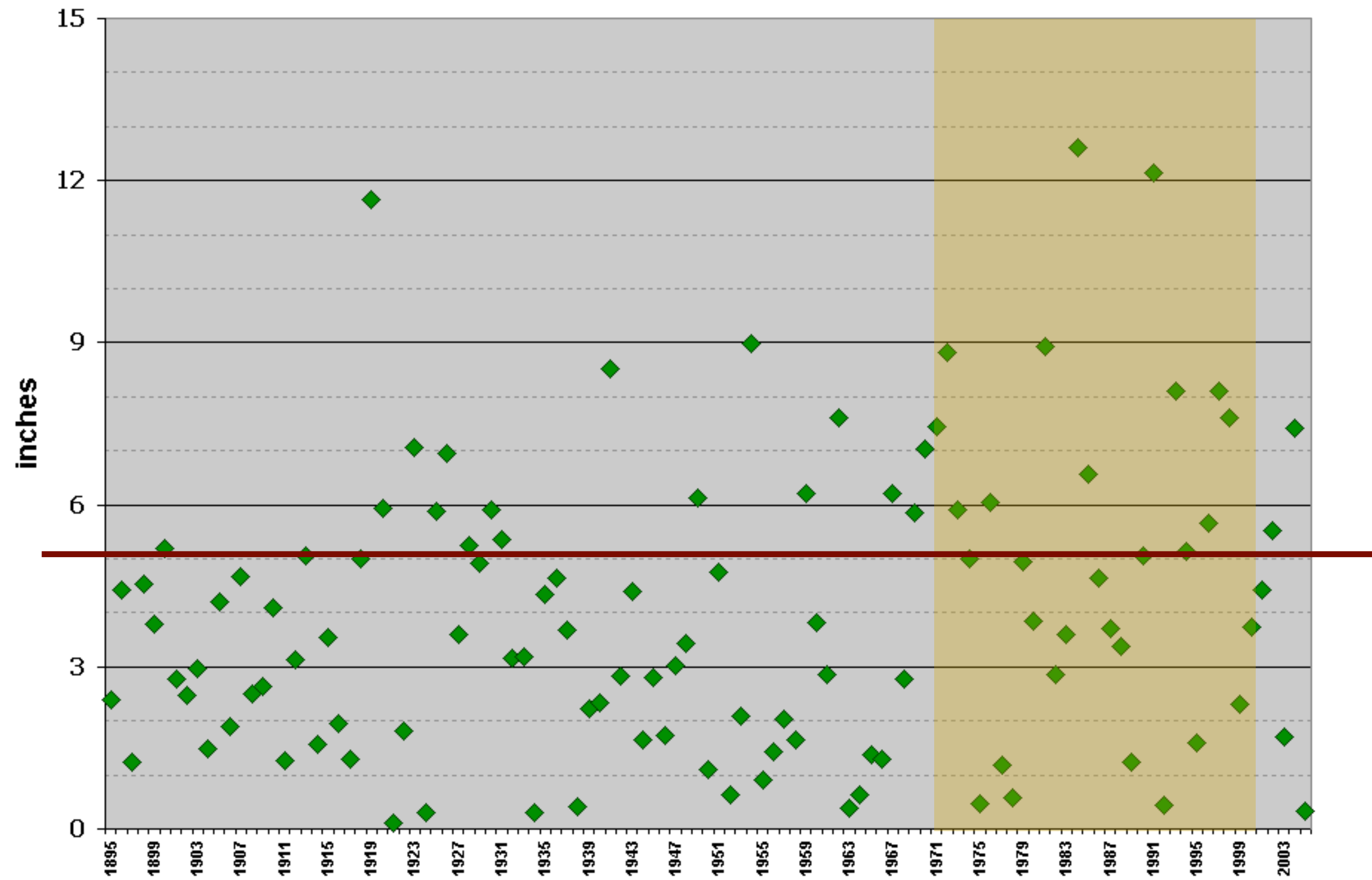
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Norman's normal October rainfall is 3.94 inches



NORMAL OCTOBER PRECIP IN SOUTHEAST OK



***Normal
rainfall was
5.05" for
1971–2000***

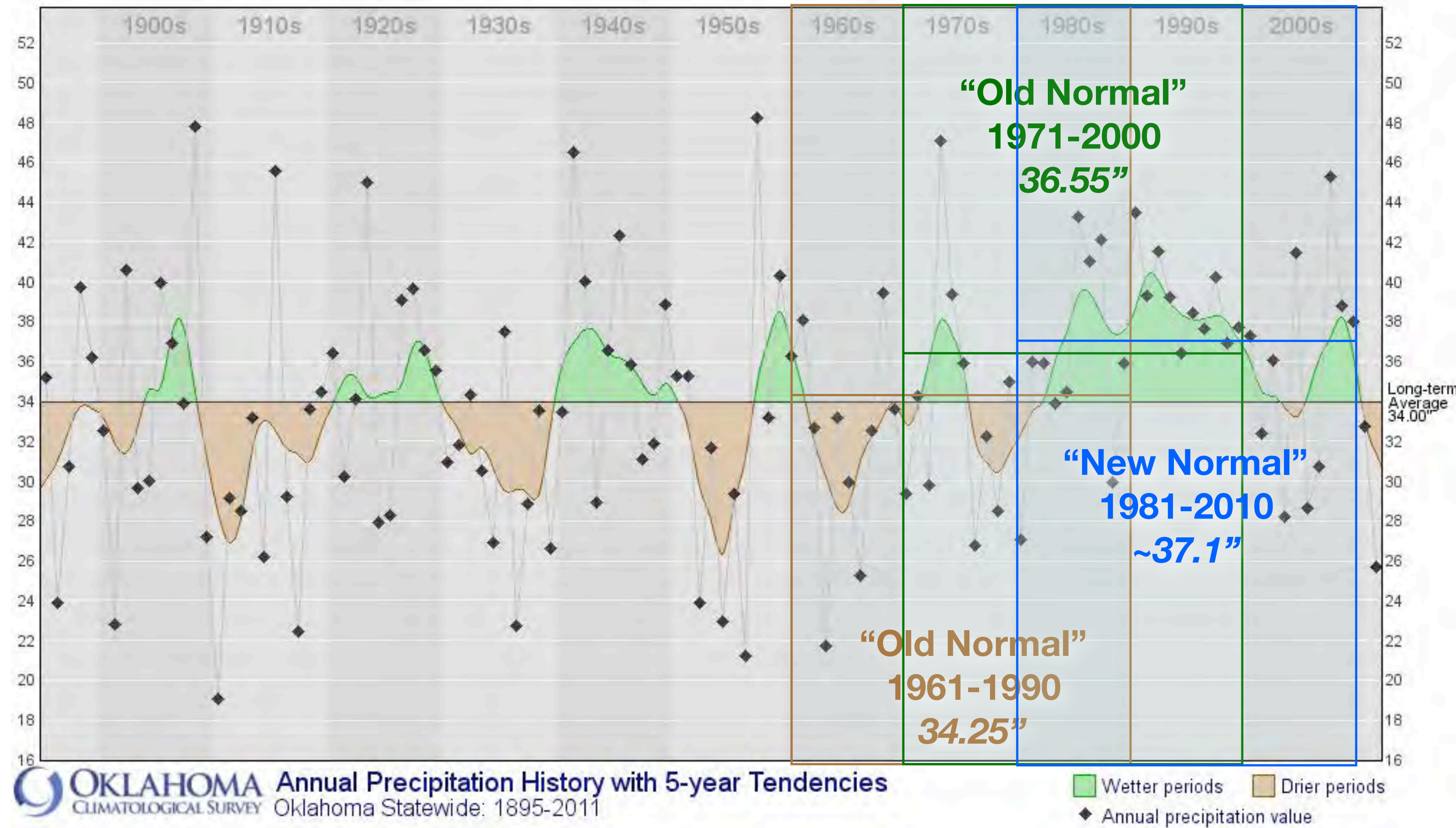


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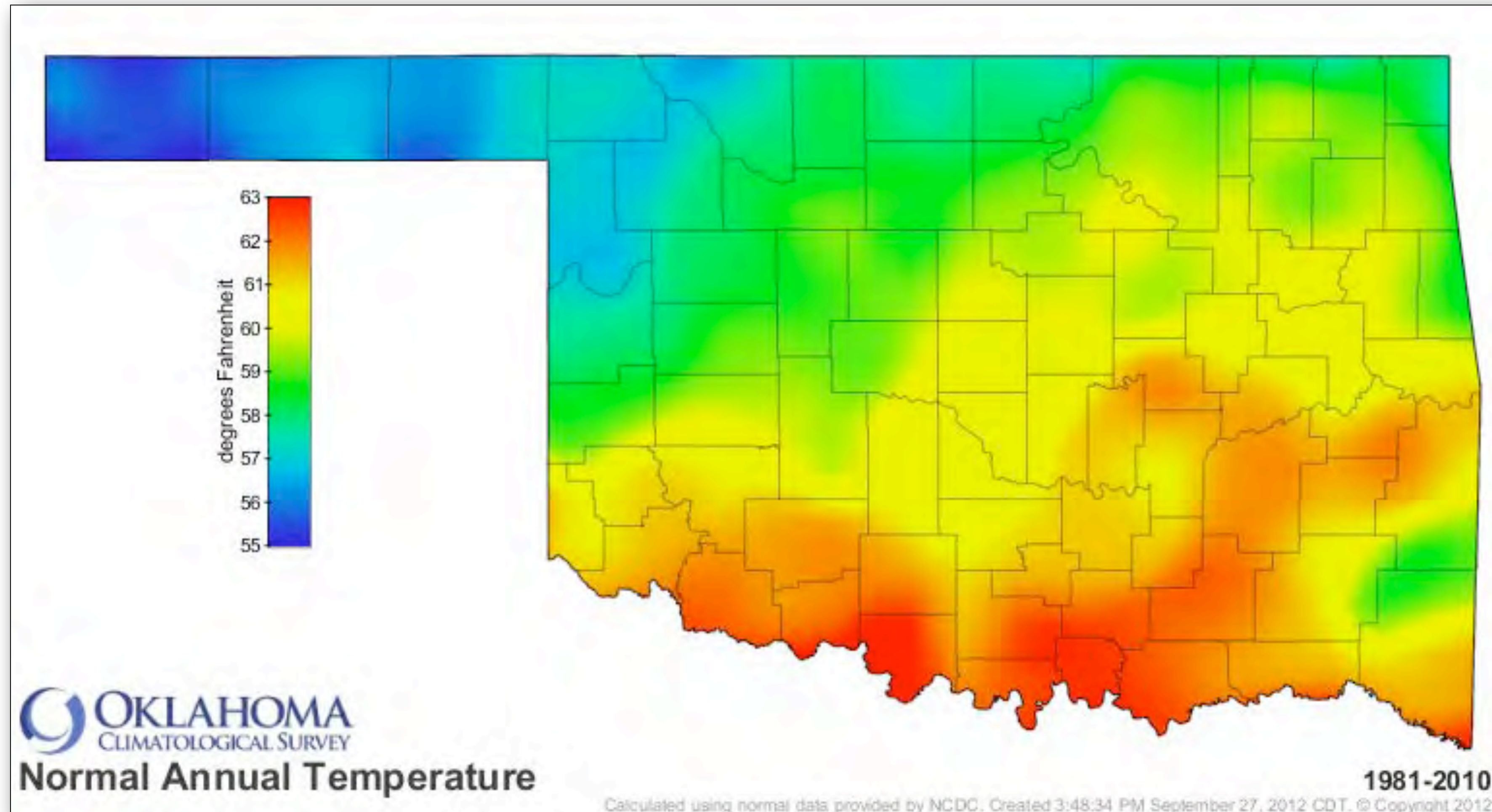
WHY HAVE NORMALS?

- **People adjust their practices based on recent history**
- Normals **represent recent history** (about a generation of history), so they have been a **great planning tool** (e.g., agriculture, water resources)
- Normals are a good tool to **put events in perspective**
- **BUT, normals change each decade**, especially with climate change!!!

CHANGES IN NORMALS

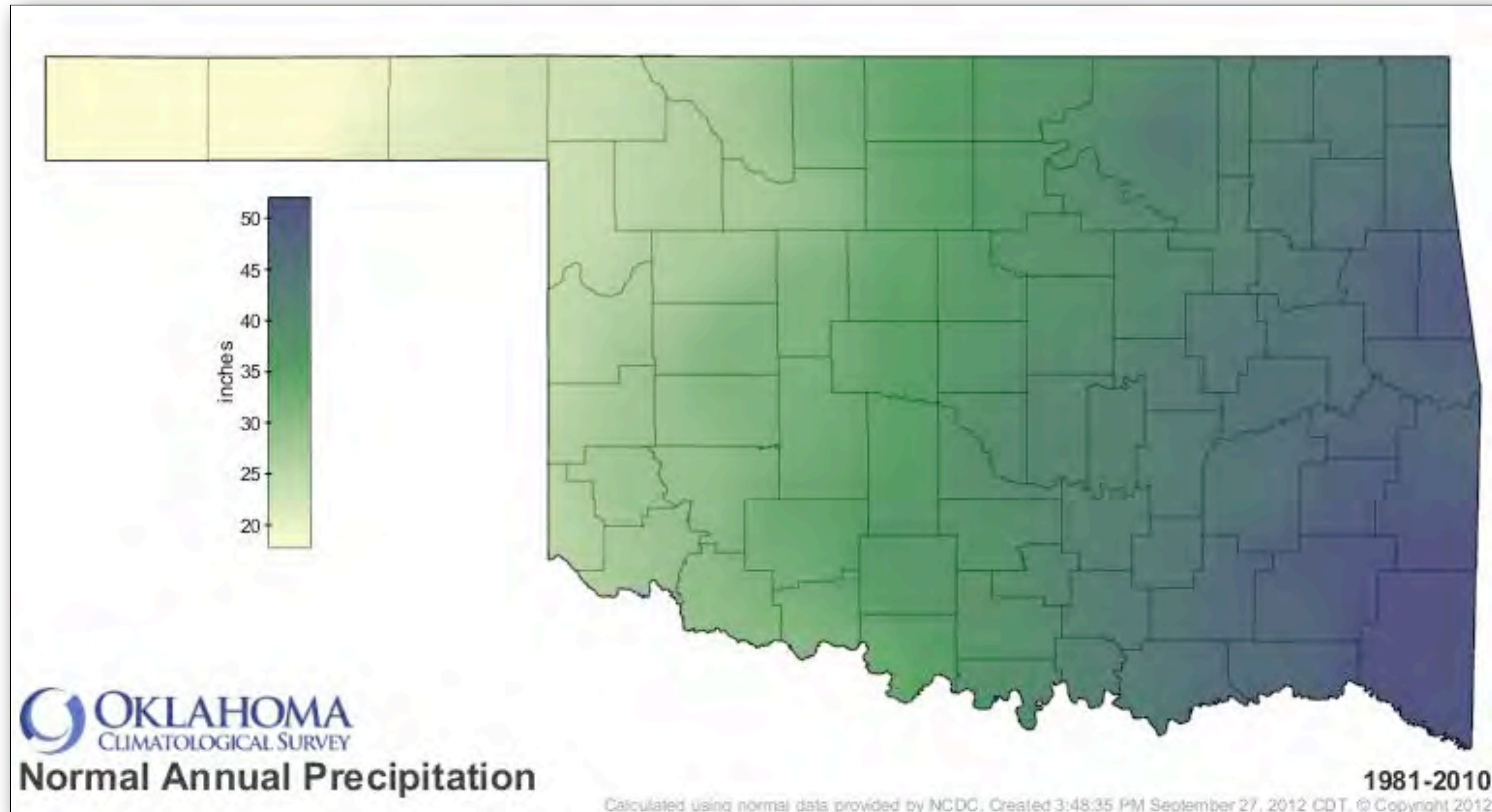


NORMAL ANNUAL TEMPERATURE



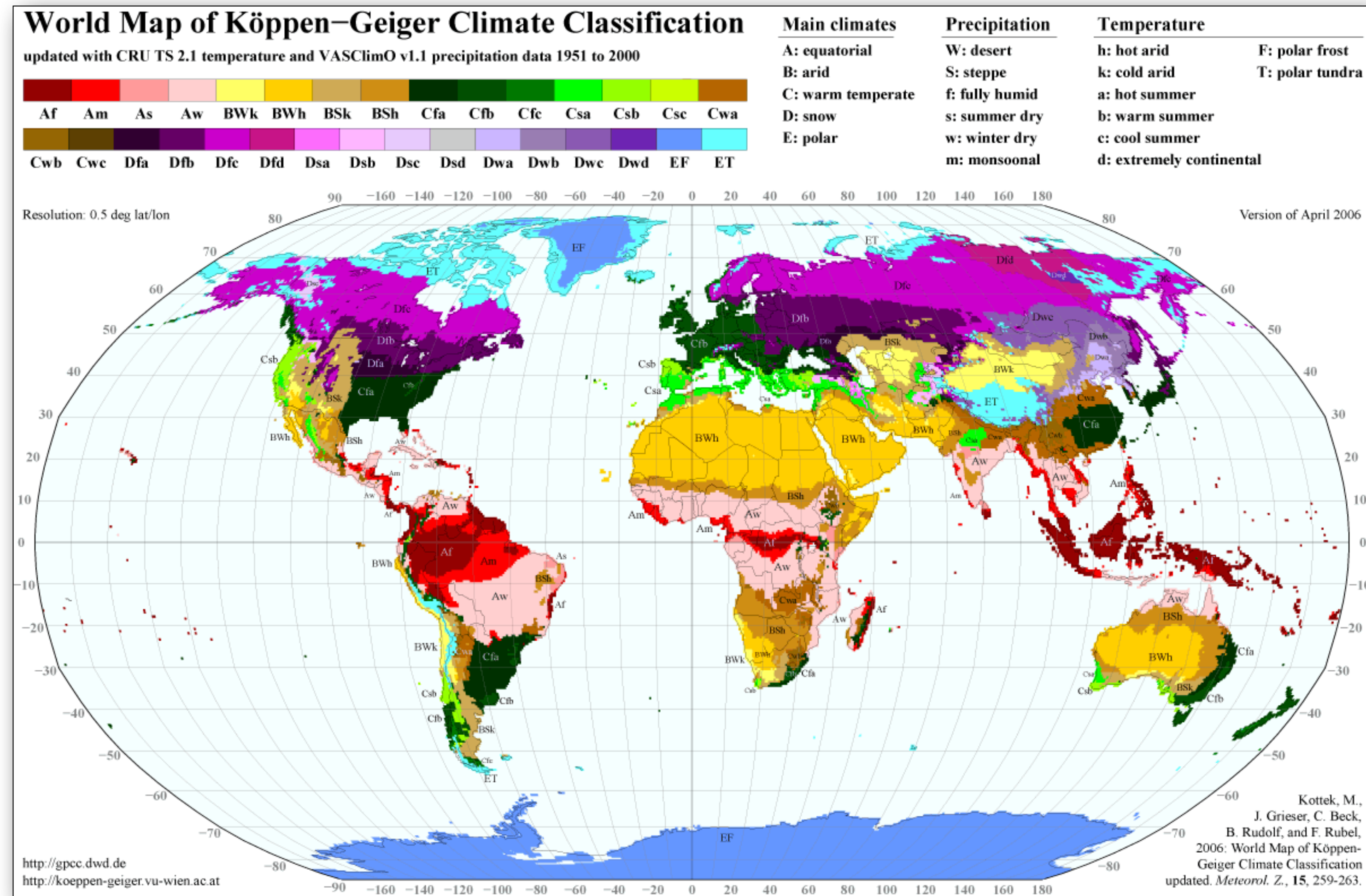
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NORMAL ANNUAL PRECIPITATION



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KÖPPEN-GEIGER CLIMATE CLASSIFICATION



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QUESTIONS?



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