The NOAA Drought Task Force (DTF-2)
Research Themes & Activities

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(science leads)

and

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[4]Terrestrial Hydrology Research Group, Princeton University
[5]Climate Program Office, OAR, NOAA

MAPP Webinar
9 June 2015

Drought Task Force- 2 Composition

Multi-Institutional, Multi-Agency

To run 2014-2017

- NOAA/Climate Prediction Center (CPC)
- NOAA/Environmental Modeling Center (EMC)
- NOAA/National Environmental Satellite, Data, and Information Service (NESDIS)
- NOAA/Physical Sciences Division (PSD)
- NASA Goddard Space Flight Center (GSFC)
- NOAA/STAR
- U.S. Department of Agriculture (USDA)
- National Center for Atmospheric Research (NCAR)
- North Central RFC
- UCAR/Colorado Basin River Forecast Center (CBRFC)
- North Carolina State University
- International Research Institute for Climate and Society (IRI)

- University of Maryland
- University of California, Irvine
- University at Albany
- Princeton University
- University of Nebraska - Lincoln
- University of California, Los Angeles
- Michigan State University
- University of Portland
- Texas A&M University
- University of Texas at Austin
- CIMSS - UW Madison
- Lamont-Doherty Earth Observatory (LDEO) of Columbia University
- University of Hawaii

NOAA Drought Task Force: Phase 2

DTF-2 Foci Based on Funded Projects and Expertise

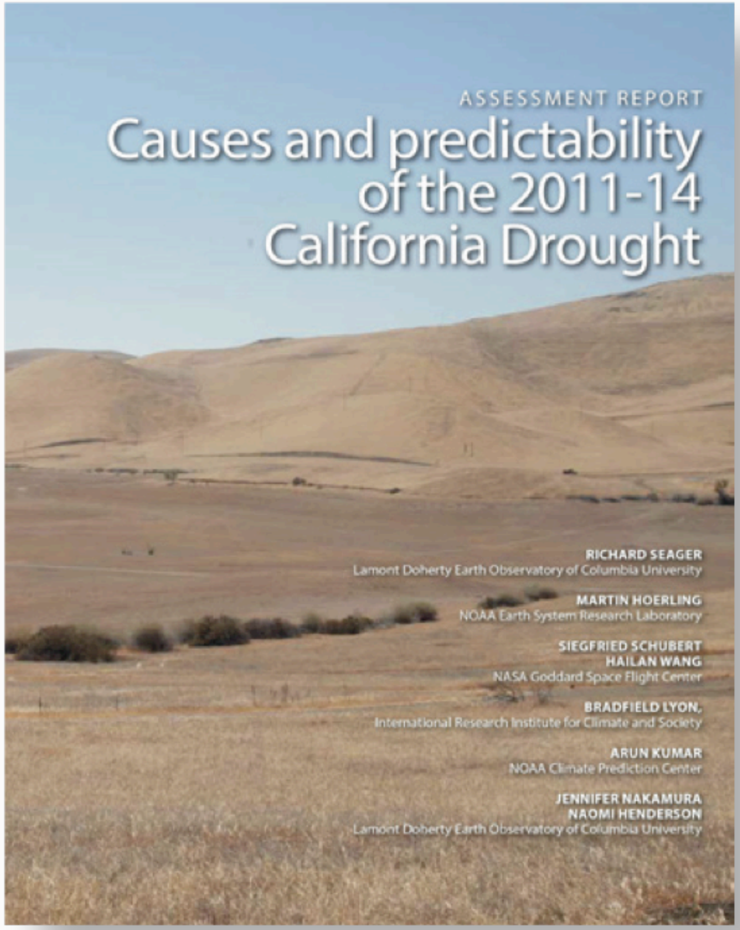
Monitoring: ***Improve Characterization of Drought***

Short-Term Prediction: ***Drought Onset & Retreat***

Oceans and Drought: ***Drivers of Long-Lived Drought***

Activities of NOAA Drought Task Force-2:

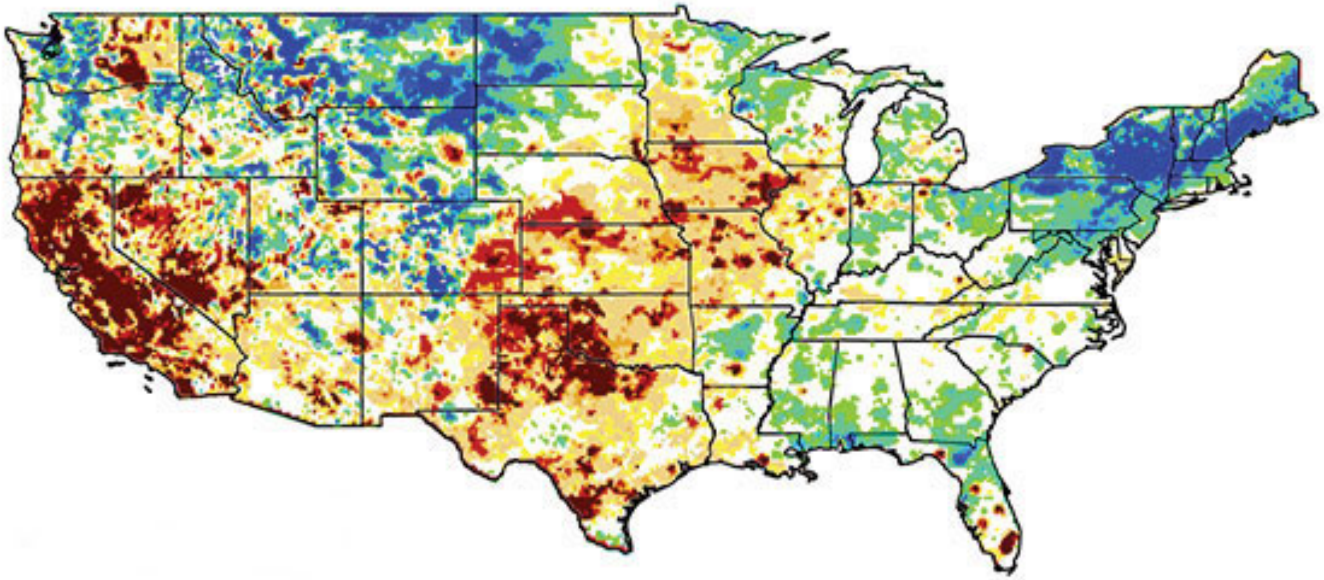
° Drought Narrative and Assessment Reports



AGU CHAPMAN CONFERENCE

Irvine, CA, USA | 20-22 April 2015

California Drought: Causes, Impacts, and Policy



NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

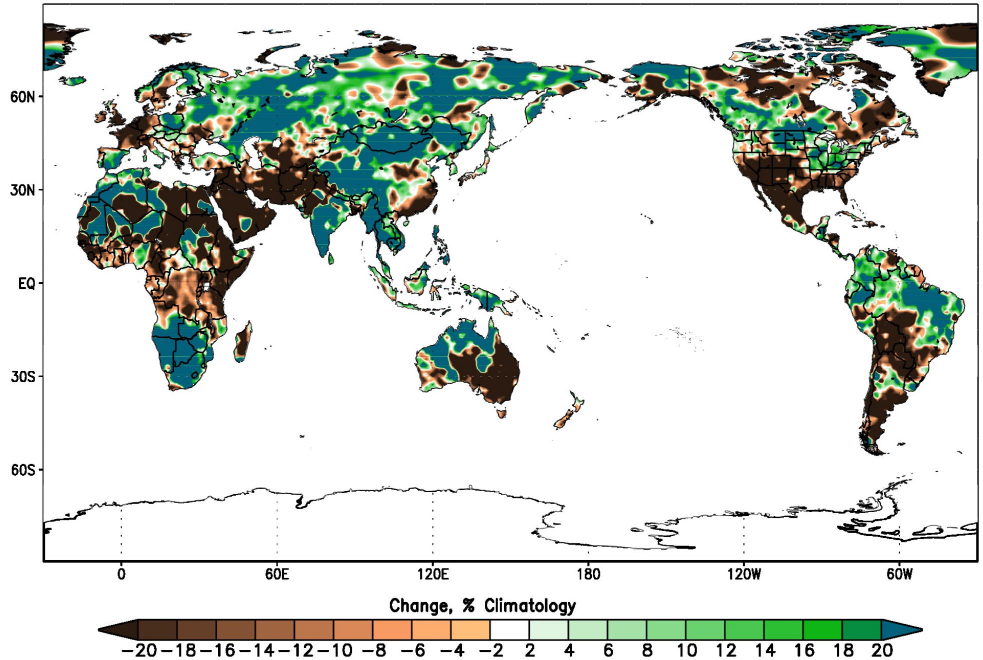
Drought Trends During Springtime Rainy Seasons

Martin Hoerling, NOAA/ESRL/PSD

MAPP Webinar: *Drought Monitoring, Understanding, and Prediction*

Observed (GPCC) Precip. Trend for MAM

1979–2013



Major boreal spring rainy seasons have failed in the recent decade.

Droughts have increased over the Greater Horn of Africa, Southwest Asia, Southeast China, the Murray Darling Basin, the US Great Plains and the American Southwest

Why? Are These Drought Trends Linked? What is Likely to Happen Next?

Indications from our Research on Understanding

Drought Trends During Springtime Rainy Seasons

Collaborators Xiao-wei Quan, Jon Eischeid, Brant Liebmann, Chris Funk, Andy Hoell, Ileana Blade

- Many of the regional MAM drying trends (1979-2013) have been strongly forced.

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- The key forcing has been the trend component in SSTs since 1979.

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- The responsible SST trend has been regional (Pacific basin), not a globally uniform warming.

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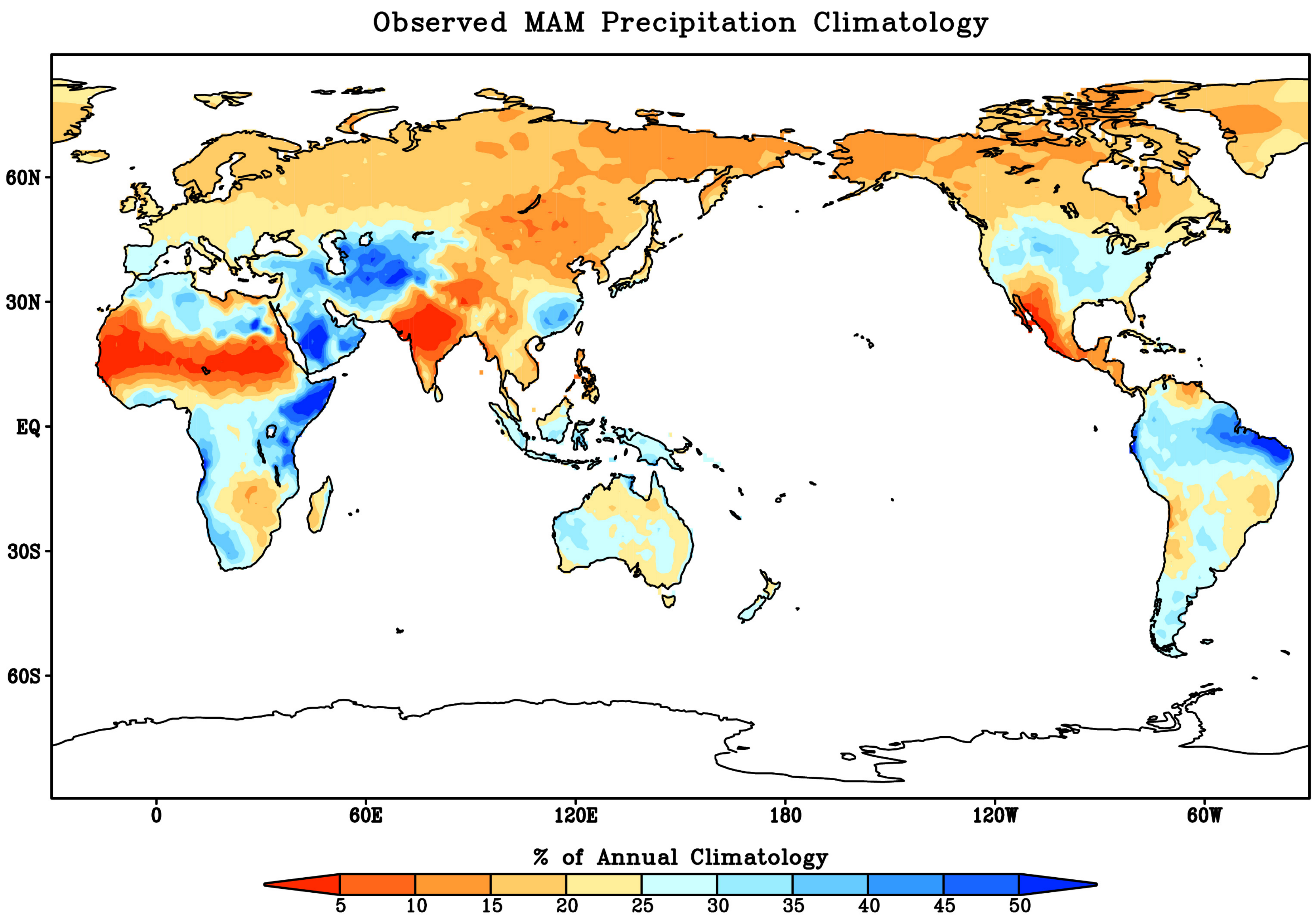
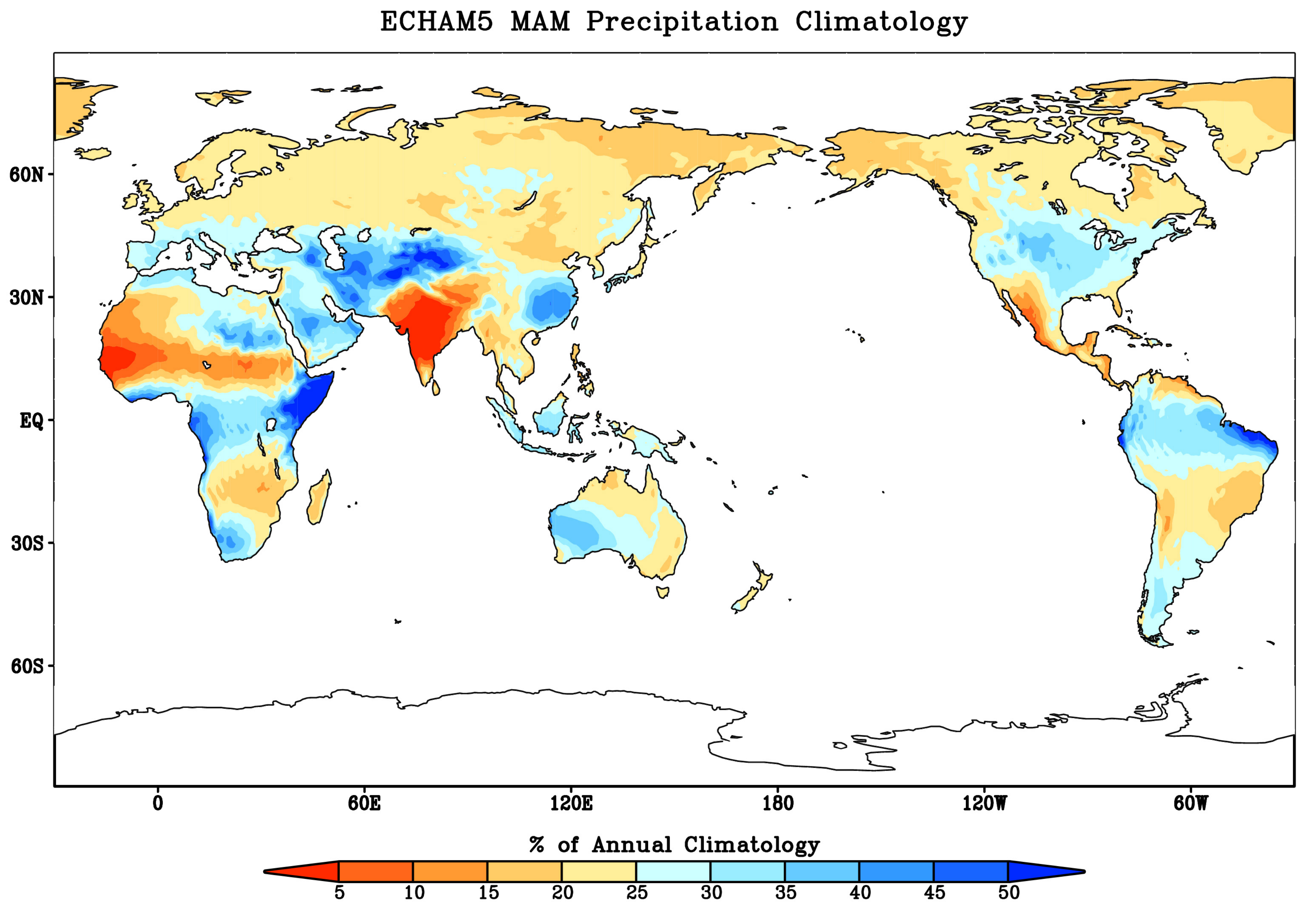
- They have had a common cause, being connected & synchronized through SST forcing.
- The key forcing has been the trend component in SSTs since 1979.
- The responsible SST trend has been regional (Pacific basin), not a globally uniform warming.
- The recent increase in regional droughts is likely transient; near-term recovery is probable.

Spring Rainy Seasons

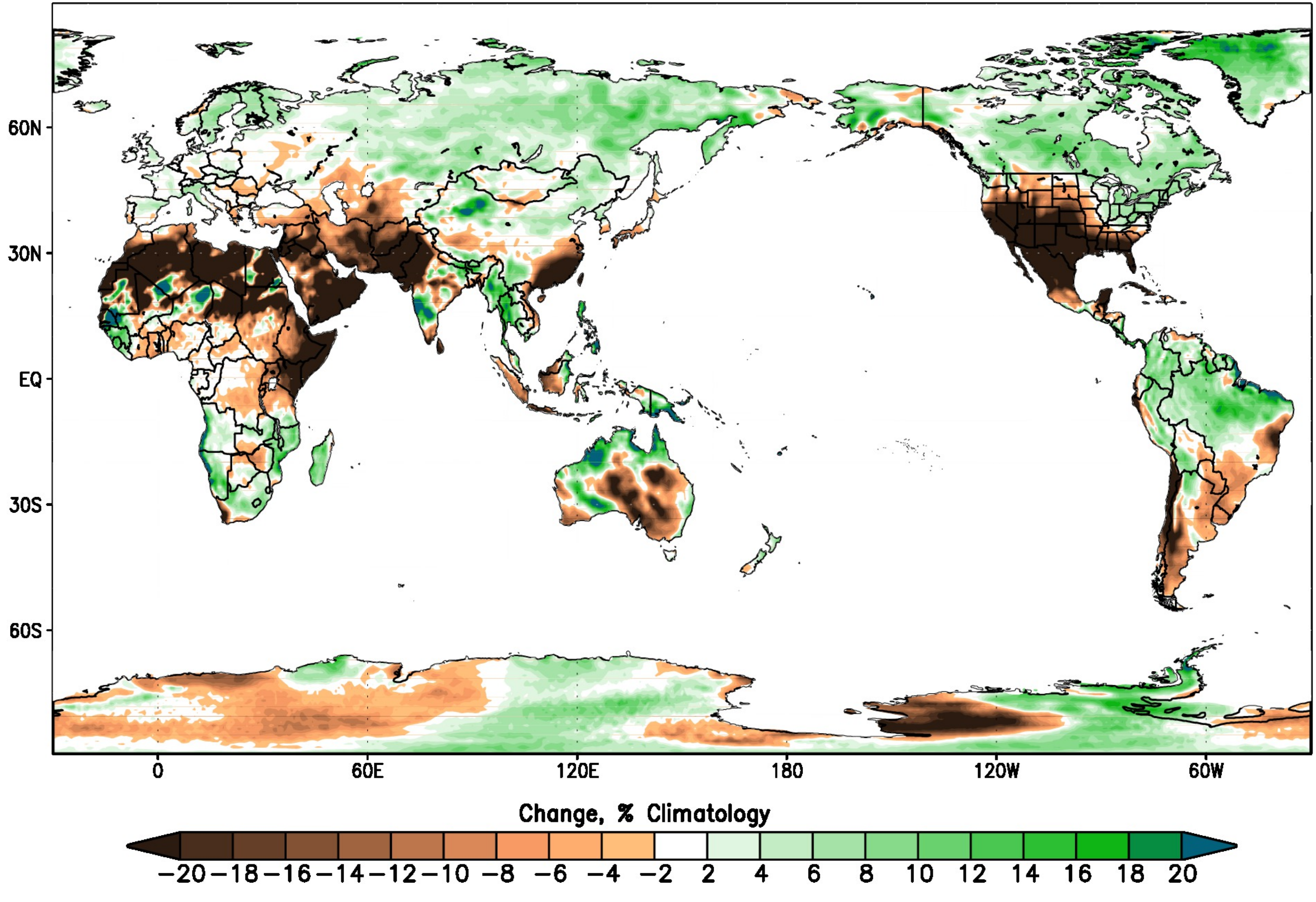


Spring Rainy Seasons



ECHAM5 Precip. Trend for MAM

1979–2013



Observed (GPCC) Precip. Trend for MAM

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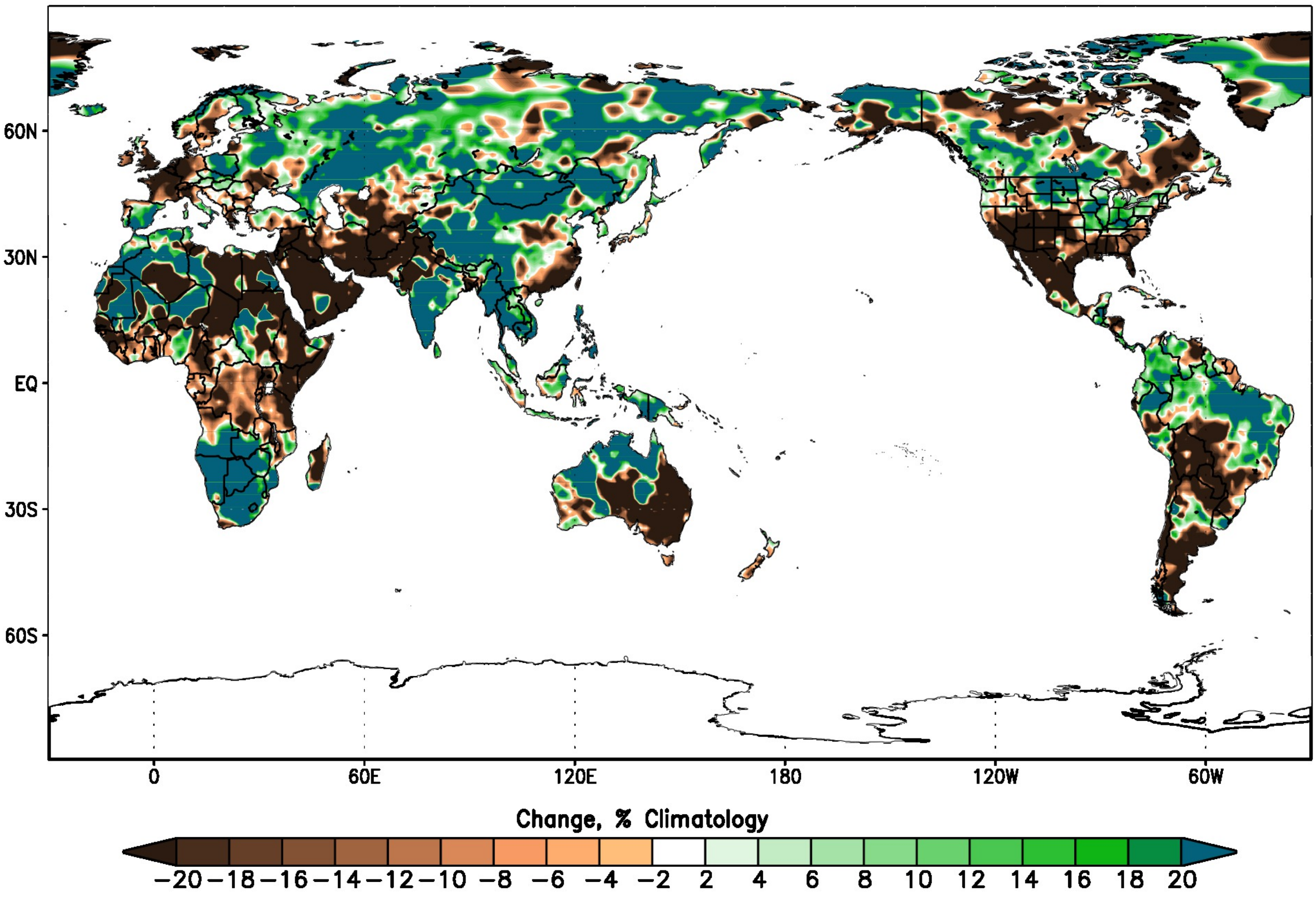
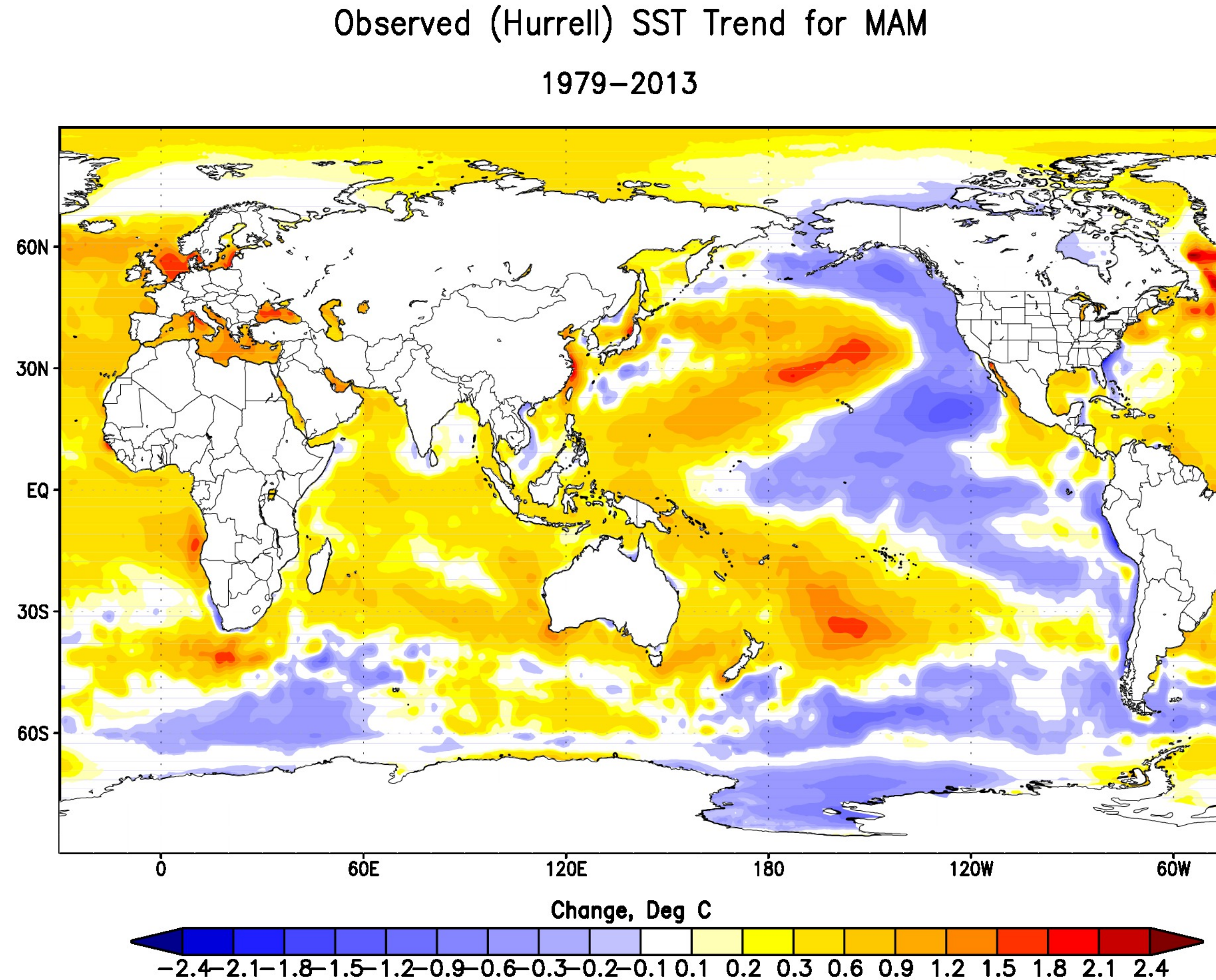
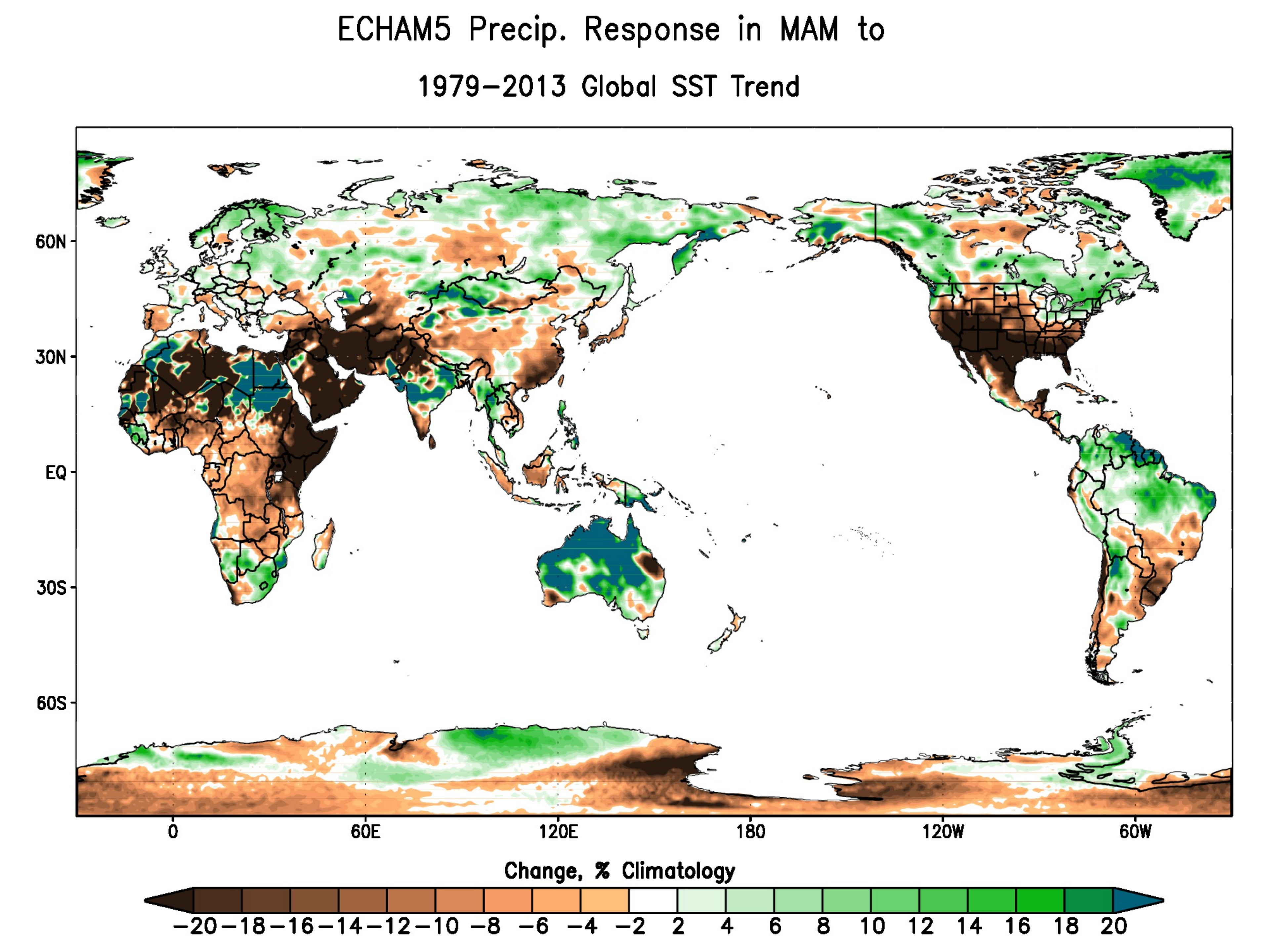


"SST Trend" Simulation

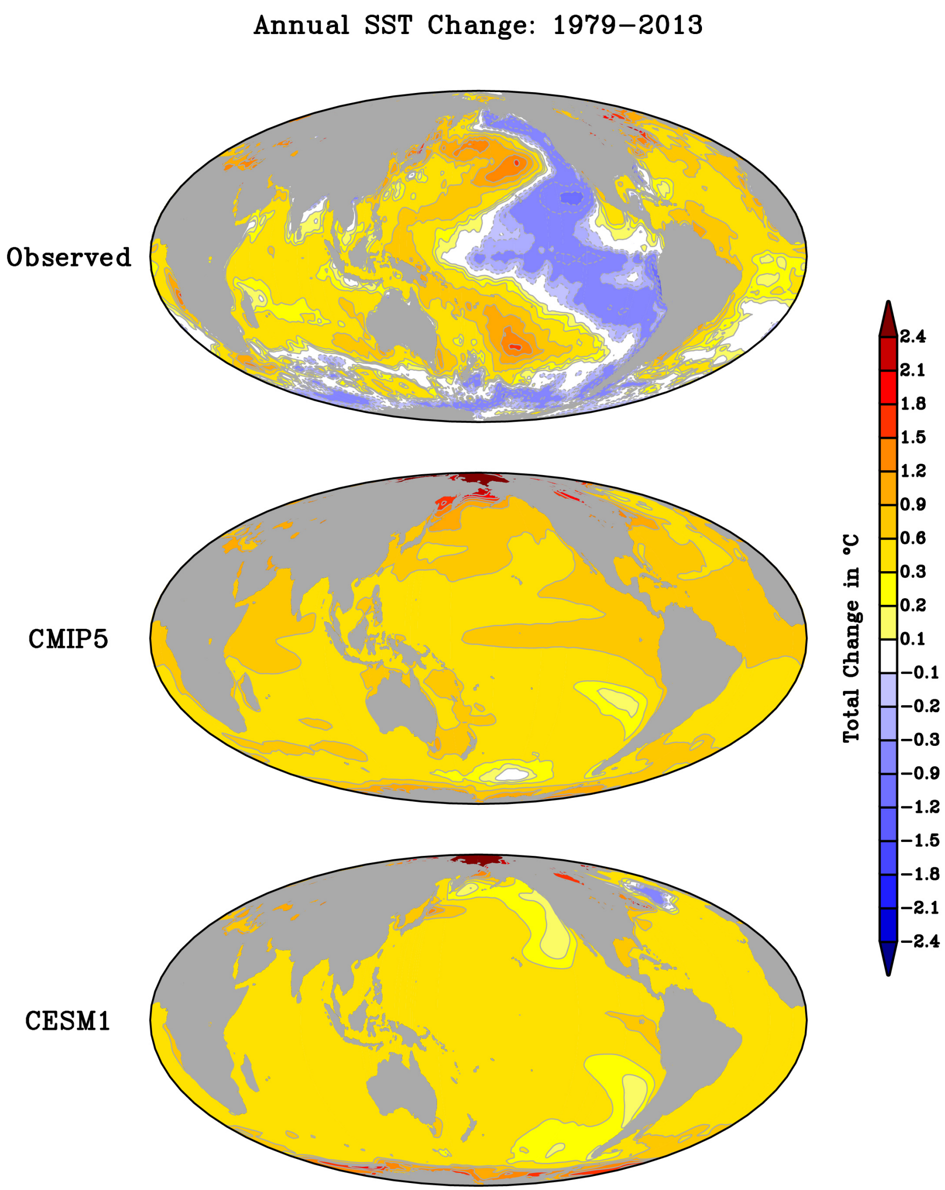
Specified the 35-yr Change (1979-2013) in global SSTs as a fixed SST forcing, 50-yr run



Caption. *Linear trend of observed MAM sea surface temperatures during 1979-2013. Plotted as the total change over the 35 yr period (°C).*

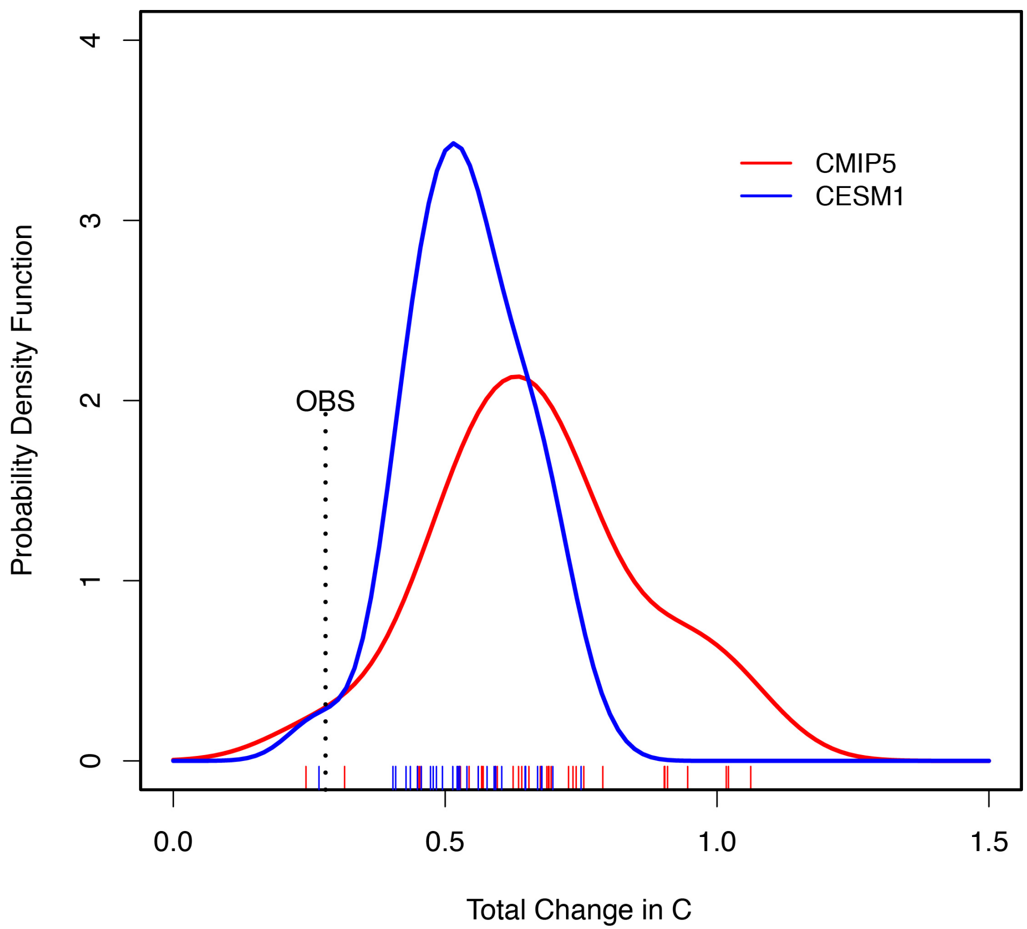


ECHAM5 Precip. Response in MAM to
1979–2013 Global SST Trend
60N
30N
EQ
30S
60S
0
60E
120E
180
120W
60W
Change, % Climatology
−20 −18 −16 −14 −12 −10 −8 −6 −4 −2 2 4 6 8 10 12 14 16 18 20



Observed SST change since 1979 differed from estimates of externally forced change

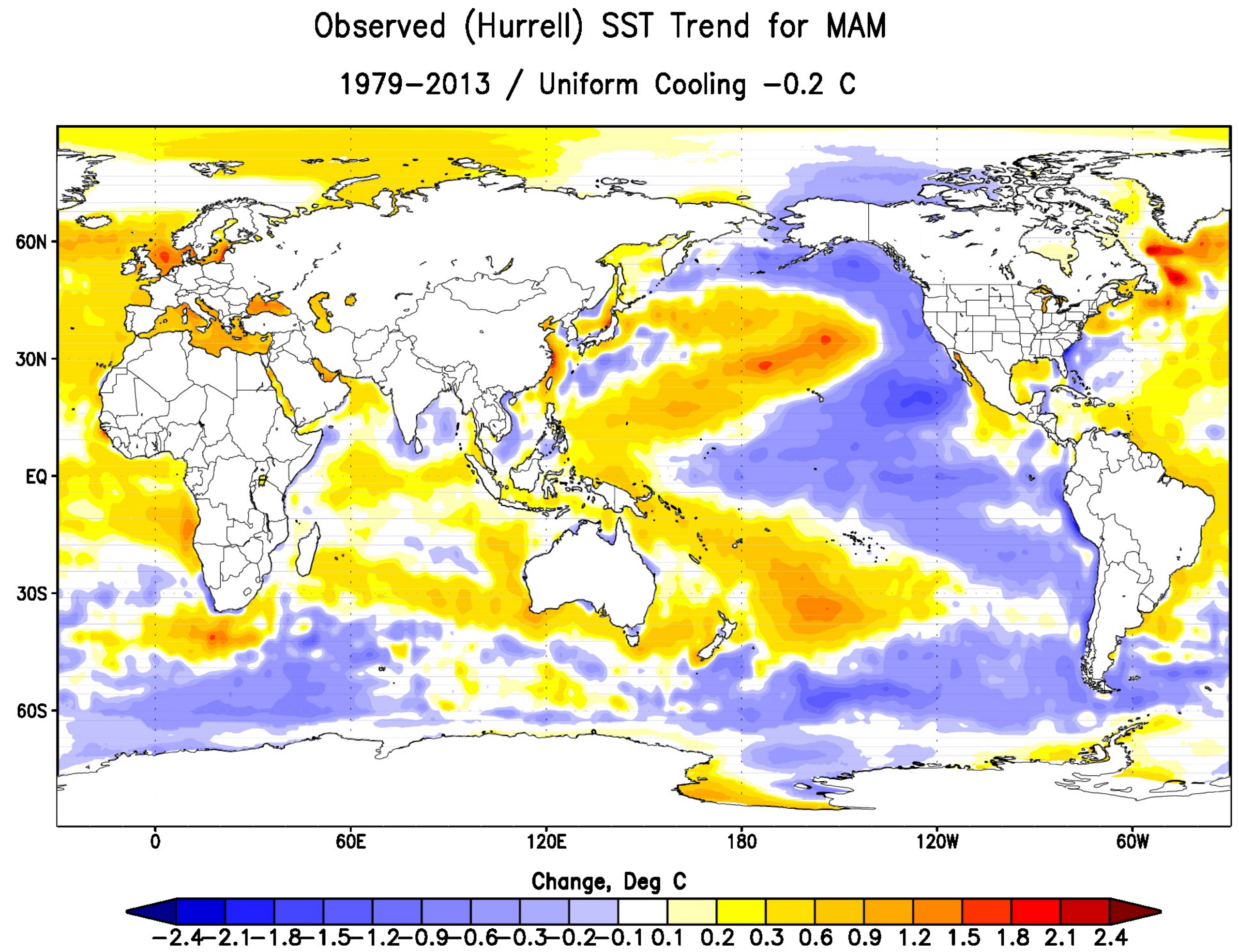
Annual SST Trend 1979–2013



Observed (+0.3°C) global SST warming since 1979 is a low probability (reduced warming) event compared to the statistical distributions of CMIP5 and CESM1 simulations.

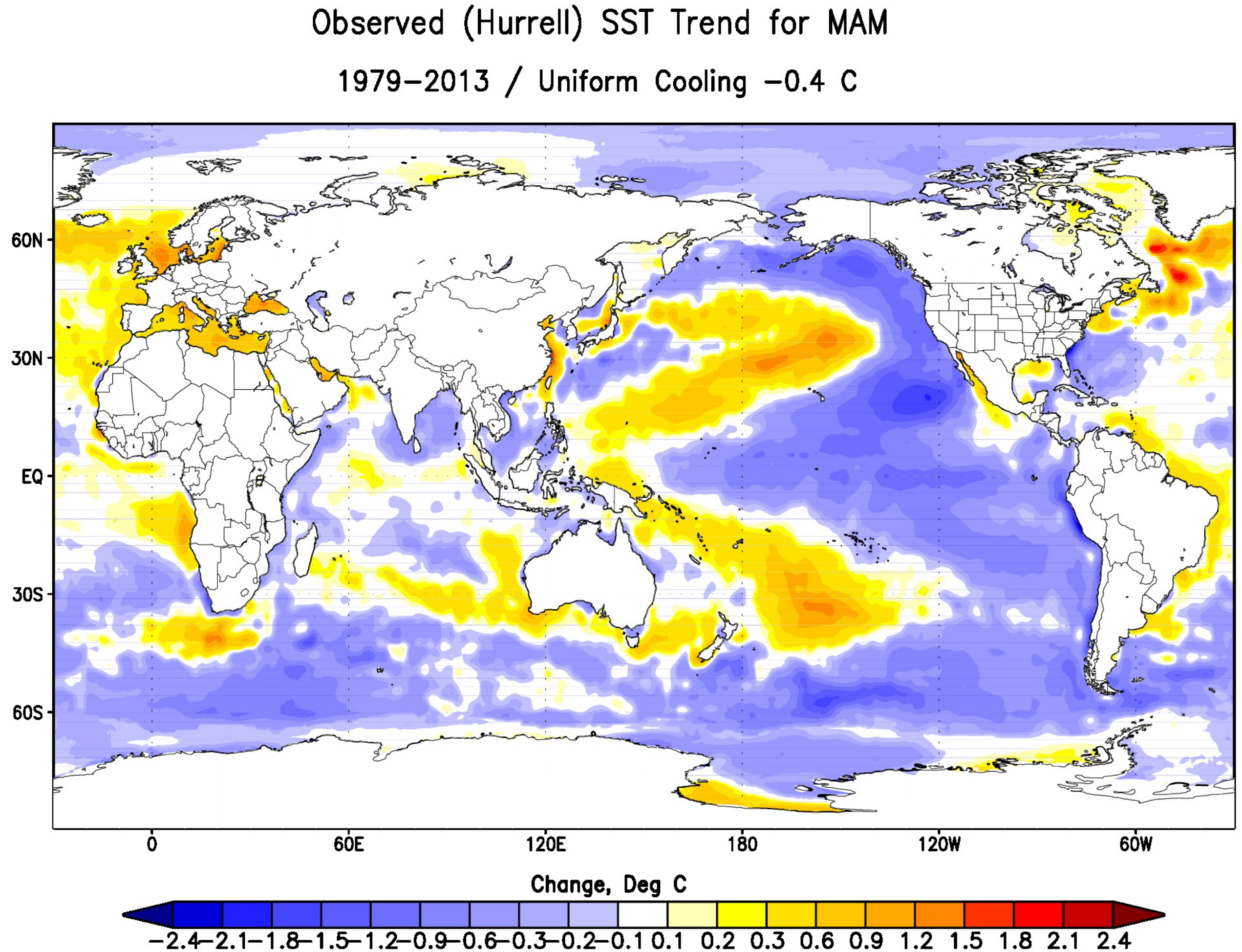
- *Observed may have been an extreme event involving strong decadal cooling of the Pacific.*
- *Historical simulations may fail to accurately depict forcing, esp. recent volcanic & anthro. aerosol effects.*
- *Bias may exist in coupled model sensitivities to recent external radiative forcing*

SST Trend Simulation
Global Mean SST Reduced 0.2°C

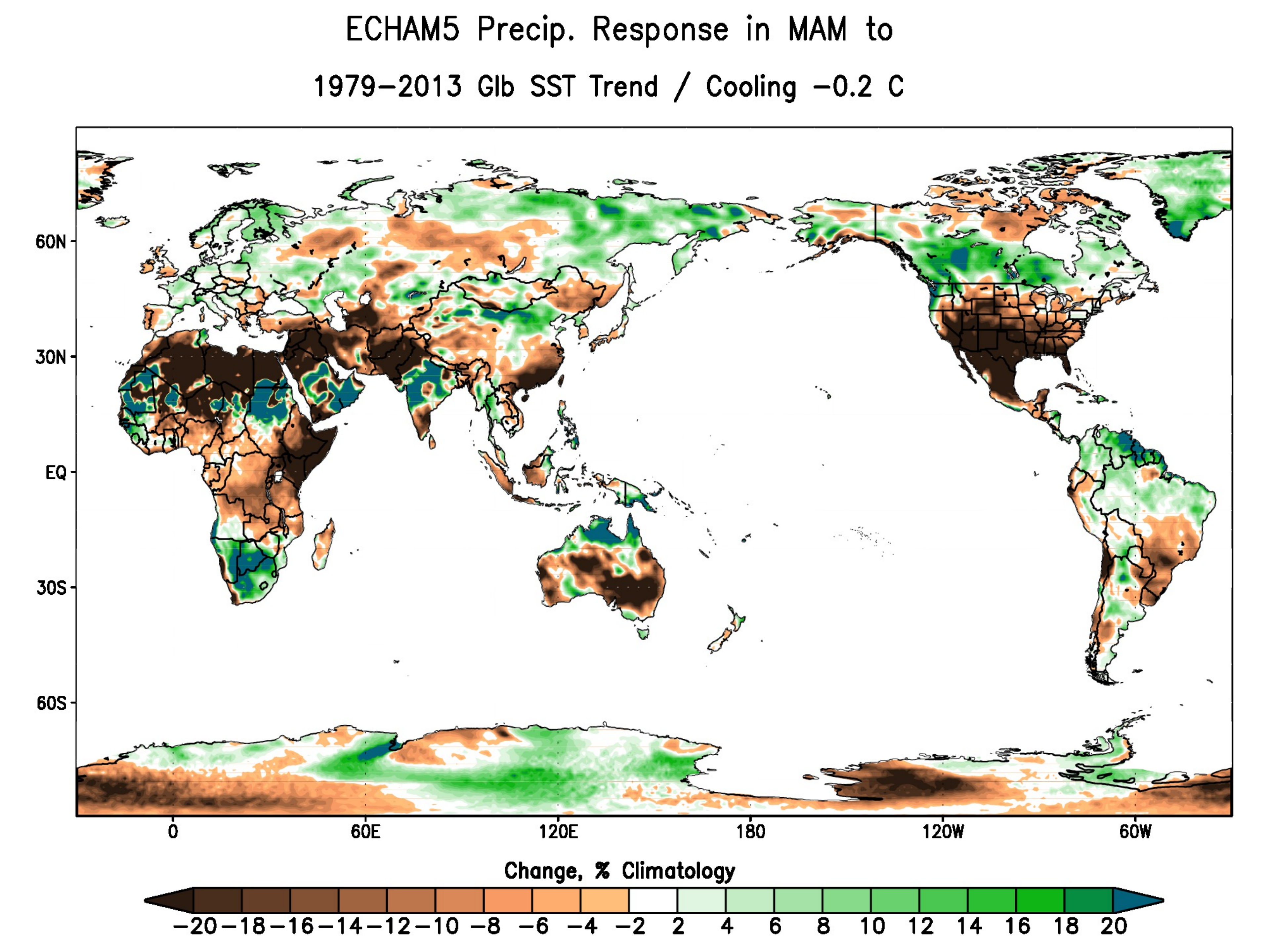


Caption. *Linear trend of observed MAM sea surface temperatures during 1979-2013. Plotted as the total change over the 35 yr period (°C), with change reduced by 0.2°C at all grid points.*

SST Trend Simulation
Global Mean SST Reduced 0.4°C

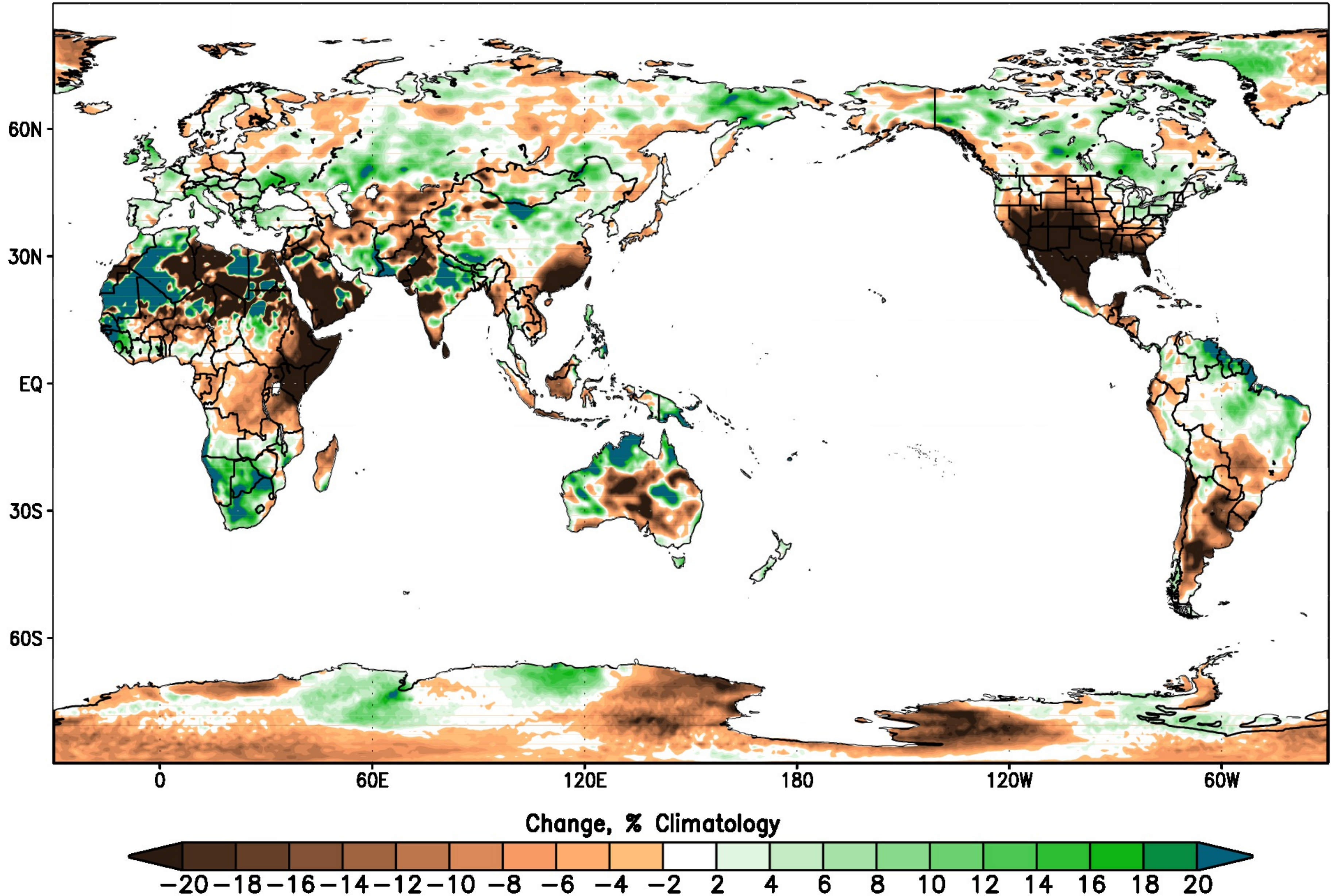


Caption. *Linear trend of observed MAM sea surface temperatures during 1979-2013. Plotted as the total change over the 35 yr period (°C), with change reduced by 0.4°C at all grid points.*


ECHAM5 Precip. Response in MAM to
1979-2013 Glb SST Trend / Cooling -0.2 C
60N
30N
EQ
30S
60S
0
60E
120E
180
120W
60W
Change, % Climatology
-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 2 4 6 8 10 12 14 16 18 20

ECHAM5 Precip. Response in MAM to

1979–2013 Glb SST Trend / Cooling –0.4 C



What You Heard

Major boreal spring rainy seasons across the globe have failed in the recent decade. Droughts have increased over the Greater Horn of Africa, Southwest Asia, Southeast China, the Murray Darling Basin, the US Great Plains and the American Southwest. We are seeking to understand this global pattern of observed trends in March-May precipitation. We are using a hierarchy of model simulations, both with historical forcings of the atmosphere and idealized forcings to probe the factors responsible for the observed regional drought trends. We are learning that the various droughts are correlated with each other, and furthermore have been strongly forced. The drying trend pattern has unfolded because there exist common sensitivities of each region's rainfall to a time series of forcing. The forcing is a trend in global SSTs. Our tentative view is that the key element of the forcing organizing these droughts in time and space has been natural decadal, and not strongly tied to a global increase in SSTs. Better understanding this emergent situation is central to an improved awareness of whether and when these drought trends are likely to either intensify or reverse.