



CLIMATE EMERGENCY INSTITUTE

The Health and Human Rights Approach to Greenhouse Gas Pollution

Maximum Actual Temperatures under Global Warming Regarding Crop Tolerance to Heat

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Maximum Actual Temperatures under Global Warming

27 May 2020, *Hotspots of extreme heat under global warming*, Laura Suarez-Gutierrez et al

Regarding crop tolerance to heat

“Crop yields have a large negative sensitivity to daytime temperatures around 30°C throughout the growing season (high confidence) (IPCC AR4 2007 and AR5 2014).”

At 1.5°C World food production will be in decline due to heat intolerance of crops alone

At 2°C expect a large decline in world food production

At 3°C all crops in all regions will have declined below the present baseline, leading to the collapse of civilization

CO2 removal is not feasible in the foreseeable future

Geoengineered cooling is no solution

WORLD CROPS

Countries of the world



Crop heat danger limit 30°C

“Crop yields have a large negative sensitivity to daytime temperatures around 30°C throughout the growing season (high confidence) (IPCC AR4 2007 and AR5 2014).”

Most recent map of crop intensity



Working Group on Global Croplands USGS Satellite data
Access 2017

Map USGS, 2017 satellite data

Top Food-Producing Countries

10. TURKEY

9. GERMANY

8. JAPAN

7. MEXICO

6. FRANCE

5. RUSSIA

4. INDIA

3. BRAZIL

2. U.S.

1. CHINA

1. CHINA

2. UNITED STATES

3. BRAZIL

4. INDIA

5. RUSSIA

Northern Hemisphere

NH

Southern Hemisphere

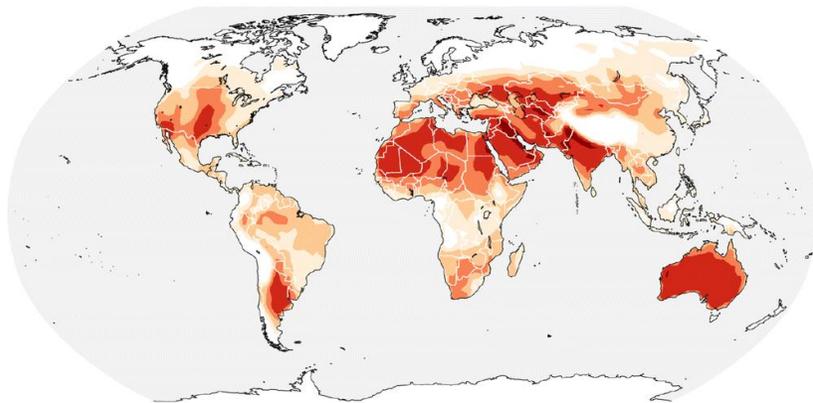
NH

NH

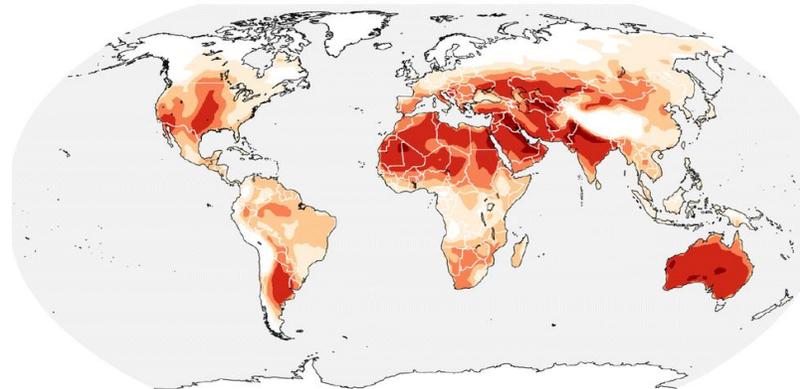
Maximum Actual Temperatures under Global Warming and Crop Tolerance

27 May 2020, *Hotspots of extreme heat under global warming*, Laura Suarez-Gutierrez et al
Absolute summer maximum temperatures.

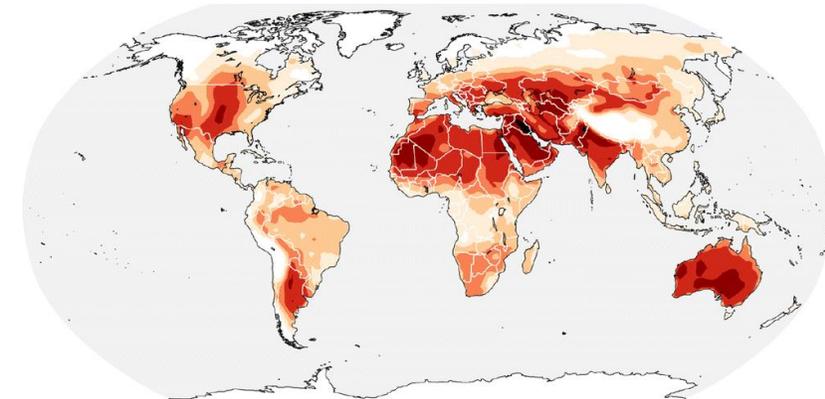
1.5°C GMST



2°C GMST

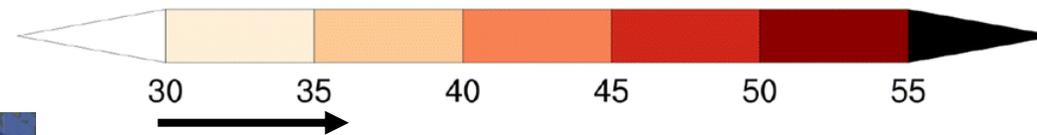


3°C GMST



GMST: global mean surface temperature

Maximum Temperature (°C)



CROPLANDS (in green)

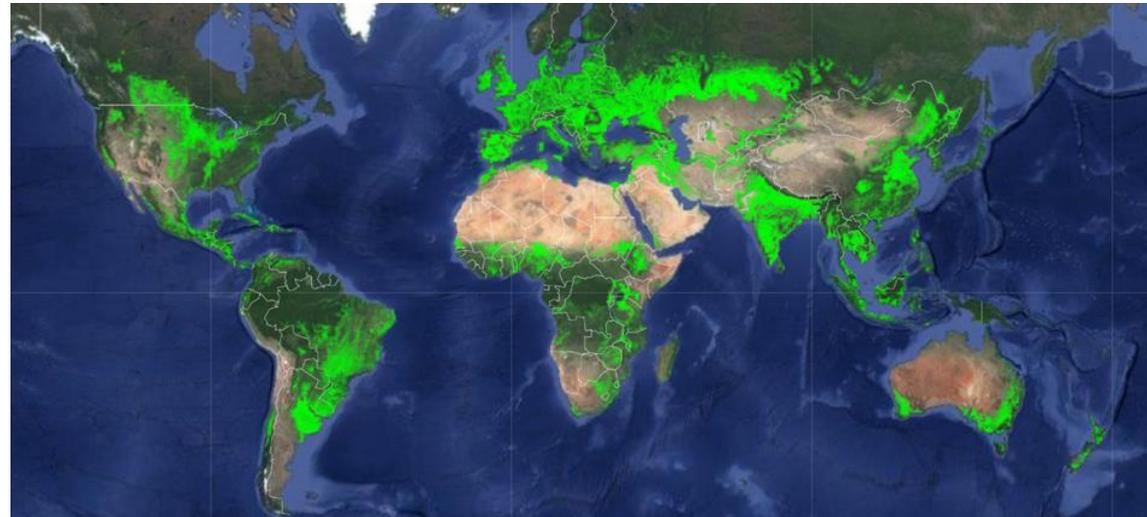
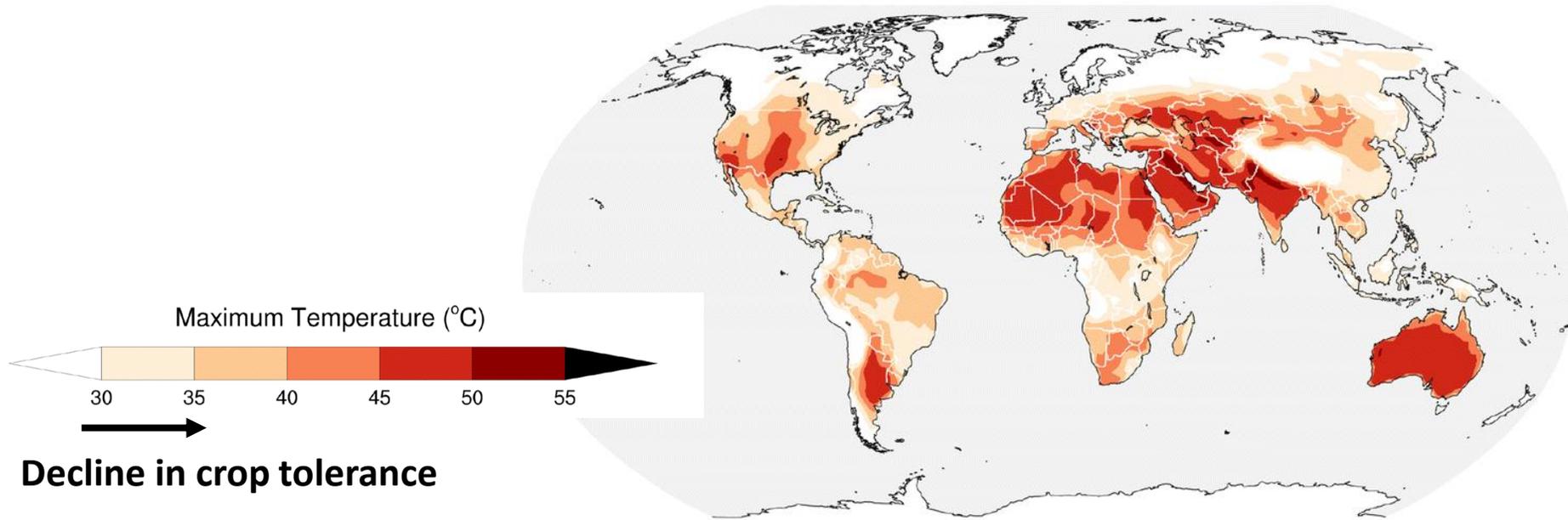


Decline in crop tolerance

“Crop yields have a large negative sensitivity to daytime temperatures around 30°C throughout the growing season (high confidence) (IPCC AR4 2007 and AR5 2014).”

At 1.5°C, regions of maximum temperature above crop tolerance

1.5°C GMST

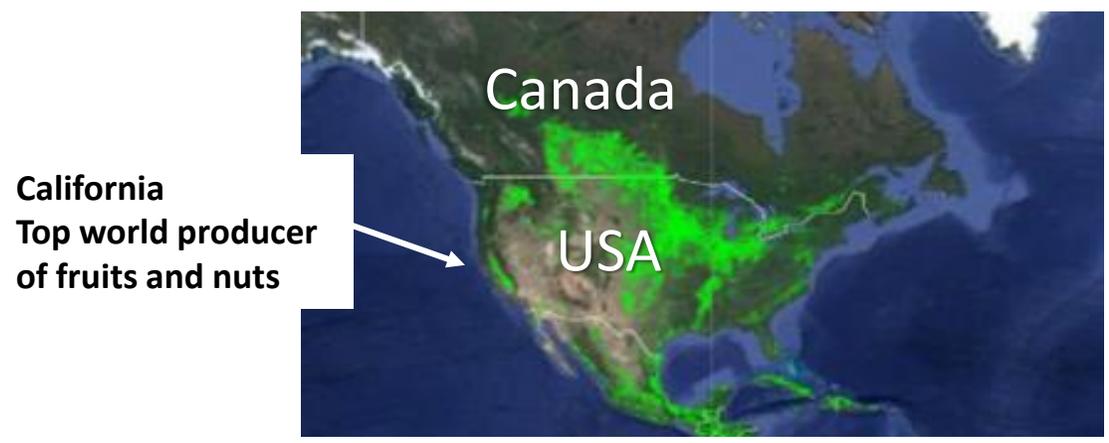
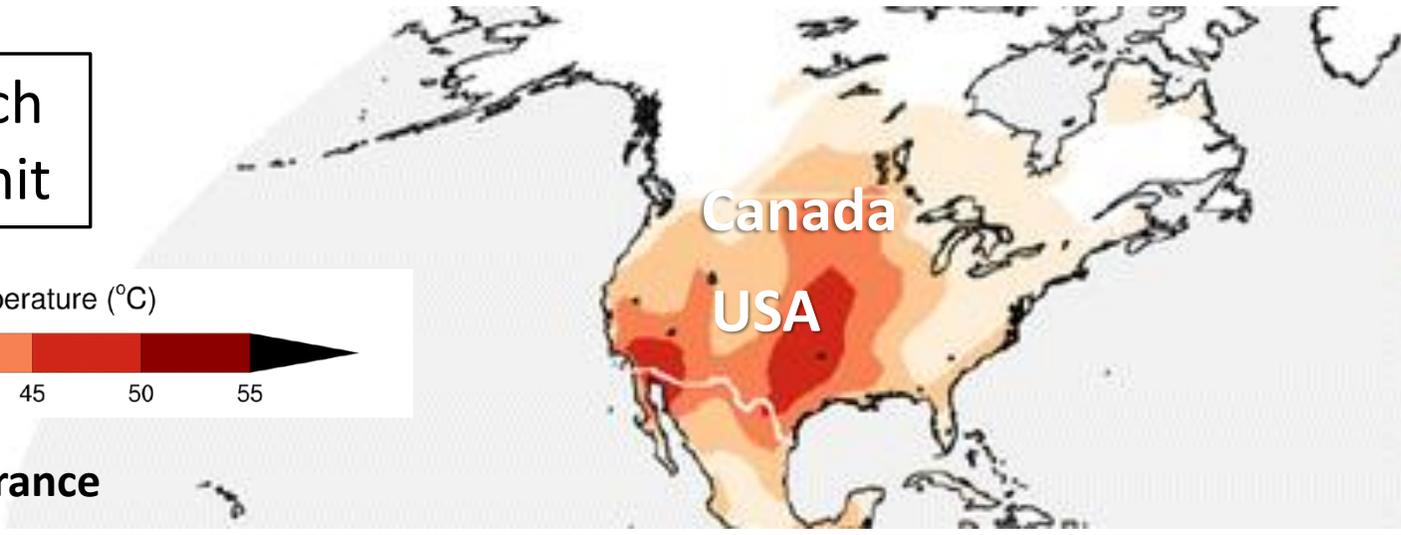
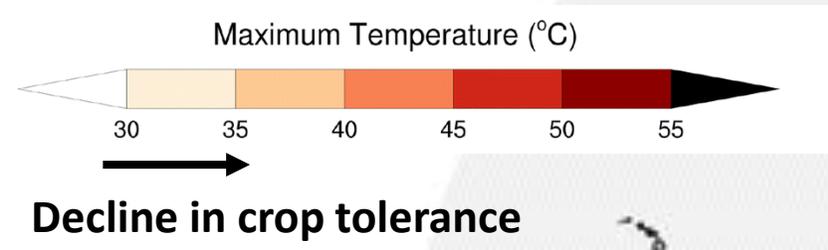


At 1.5°C, N. America maximum temperatures above crop tolerance

The USA is one of two top food-producing regions in the world (with China #1).

The US crop-producing regions make it highly vulnerable to surface heating.

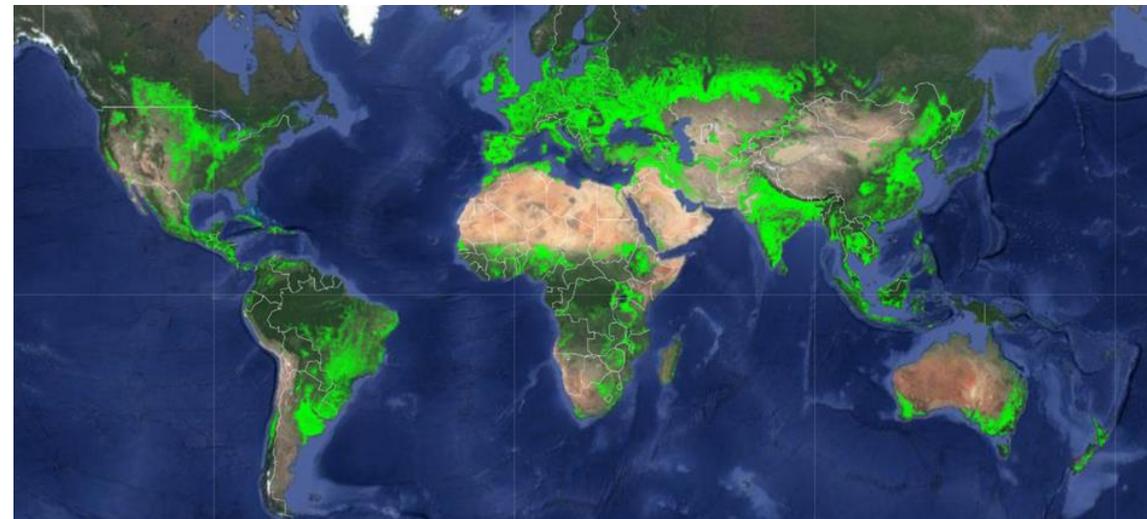
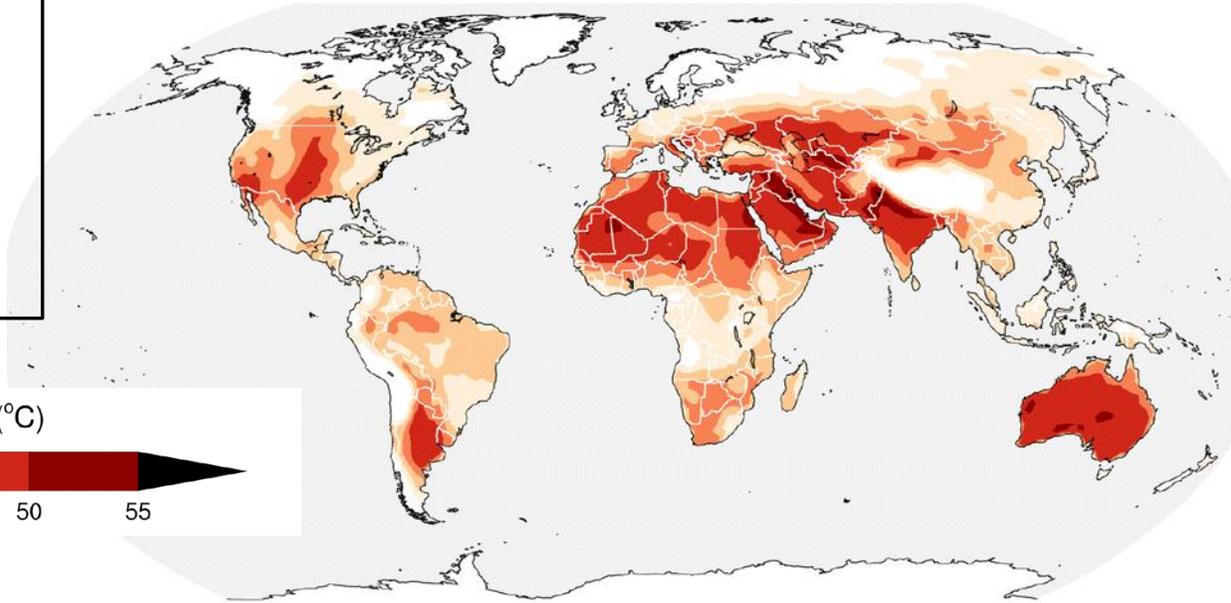
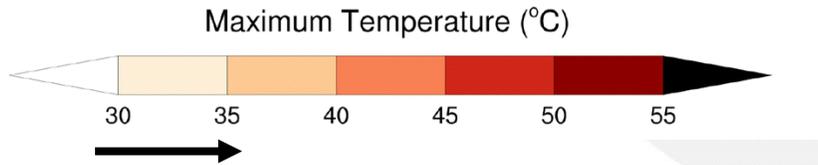
The world will breach the 1.5°C danger limit



At 2.0°C, regions of maximum temperature above crop tolerance

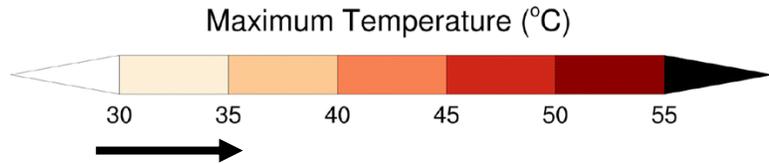
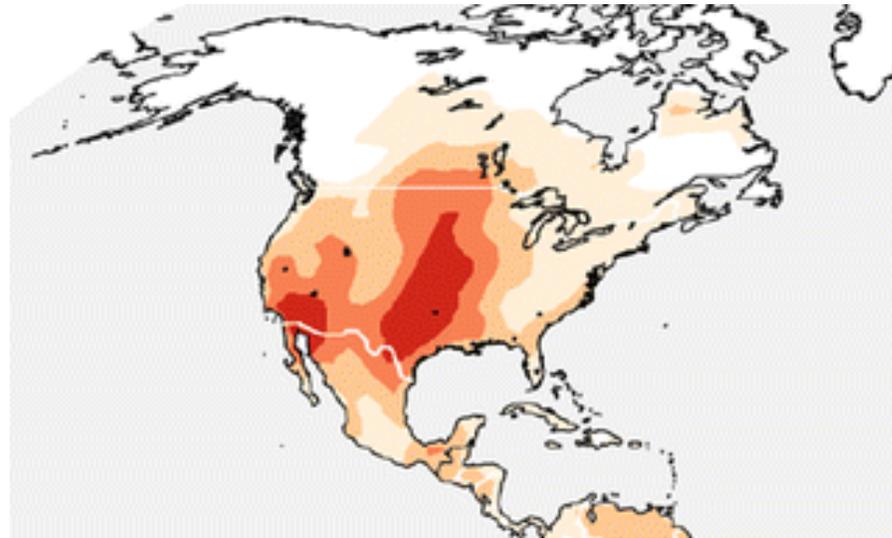
The world will breach the 2°C danger limit, because global emissions are increasing rapidly (in post-Covid economic recovery).

2°C GMST (global mean surface temperature)



At 2.0°C, North America maximum temperature above crop tolerance

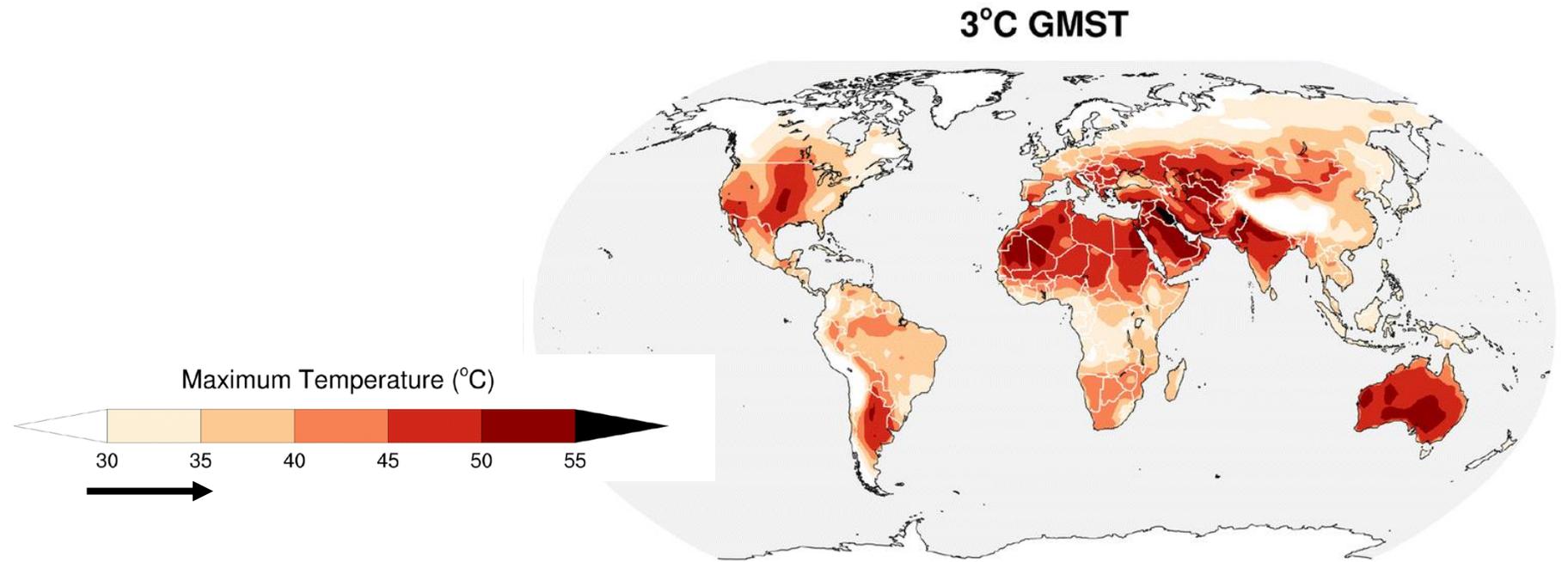
The world will breach the 2°C danger limit, because global emissions are increasing rapidly (in post-Covid economic recovery).



California
Top world producer
of fruits and nuts



At 3.0°C, regions of maximum temperature above crop tolerance



Current national climate policies put the world at 3°C this century.

It has been known for decades that at 3°C, all crops in all regions will have declined below today's production.



At 3.0°C, North America maximum temperature above crop tolerance

