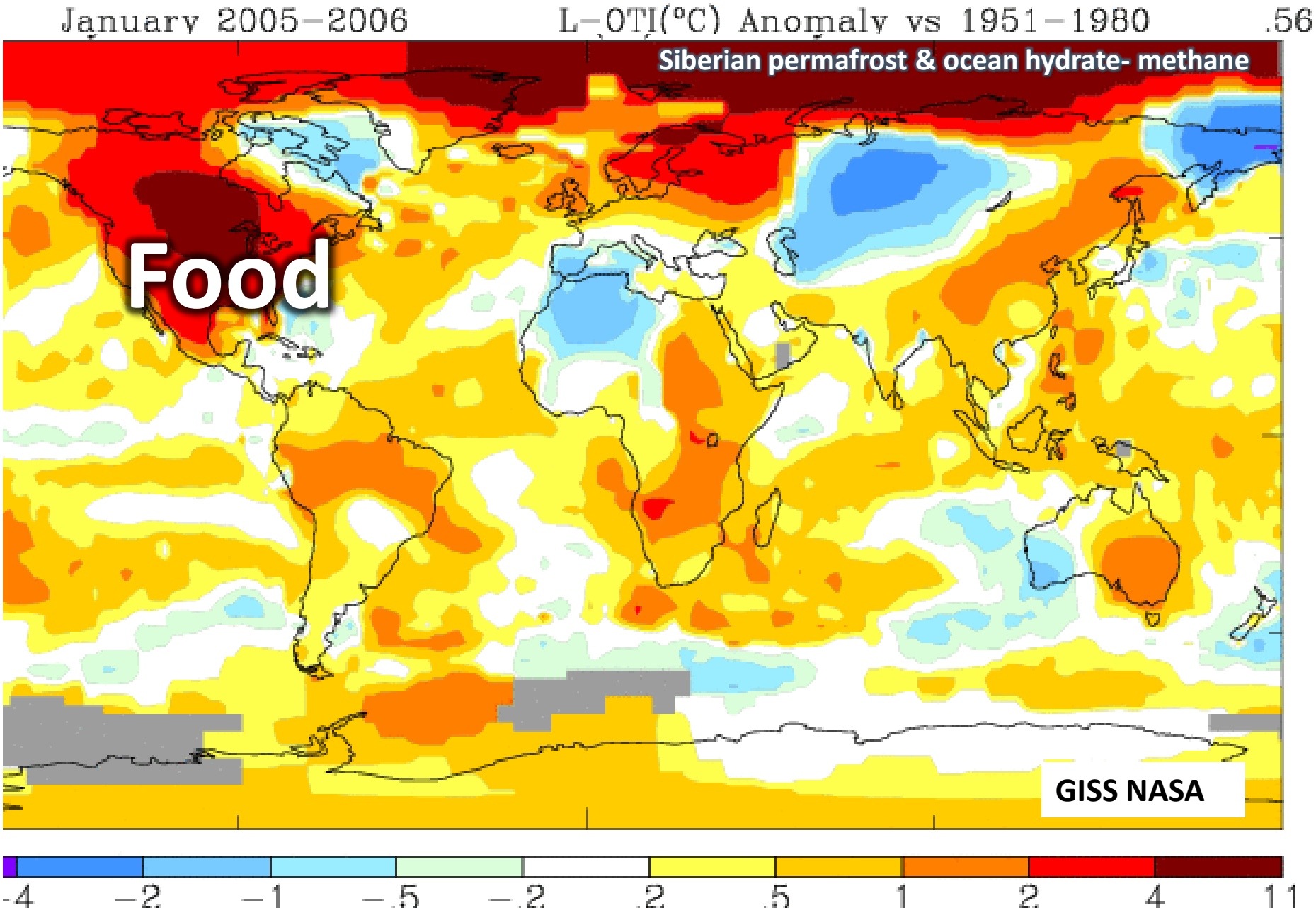
Hello

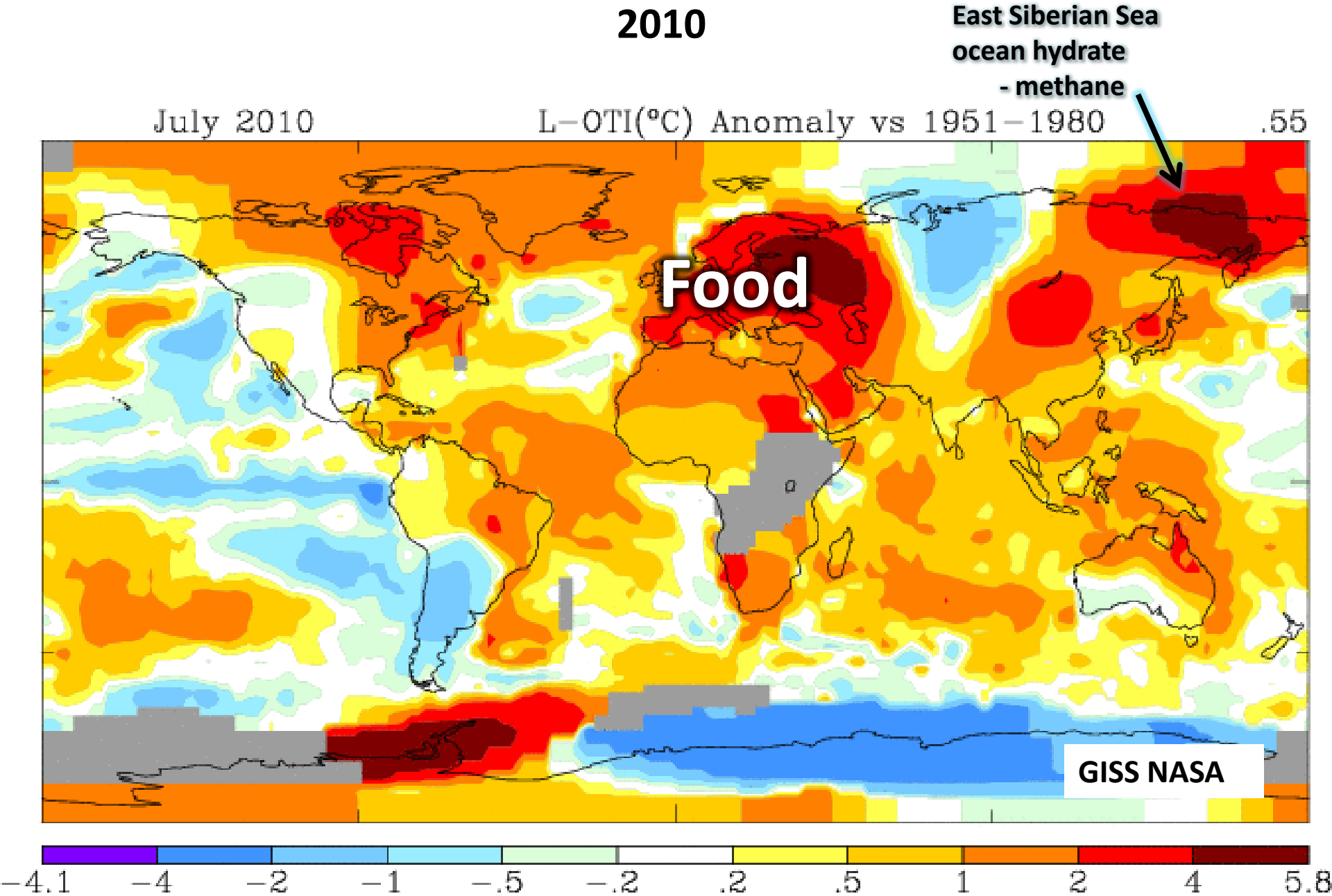
THE MAP TO THE END OF OUR WORLD

2006

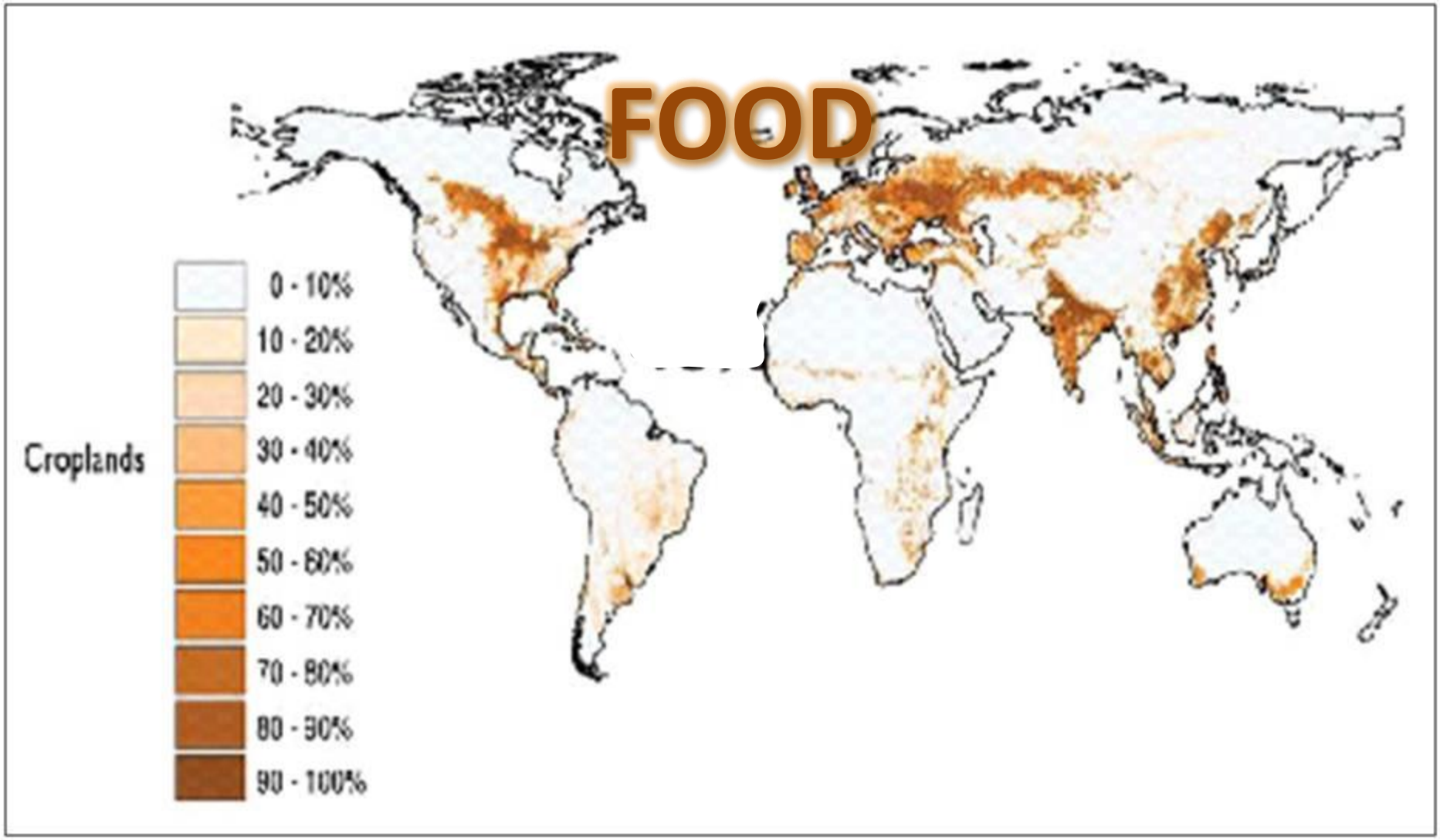


THE MAP TO THE END OF OUR WORLD

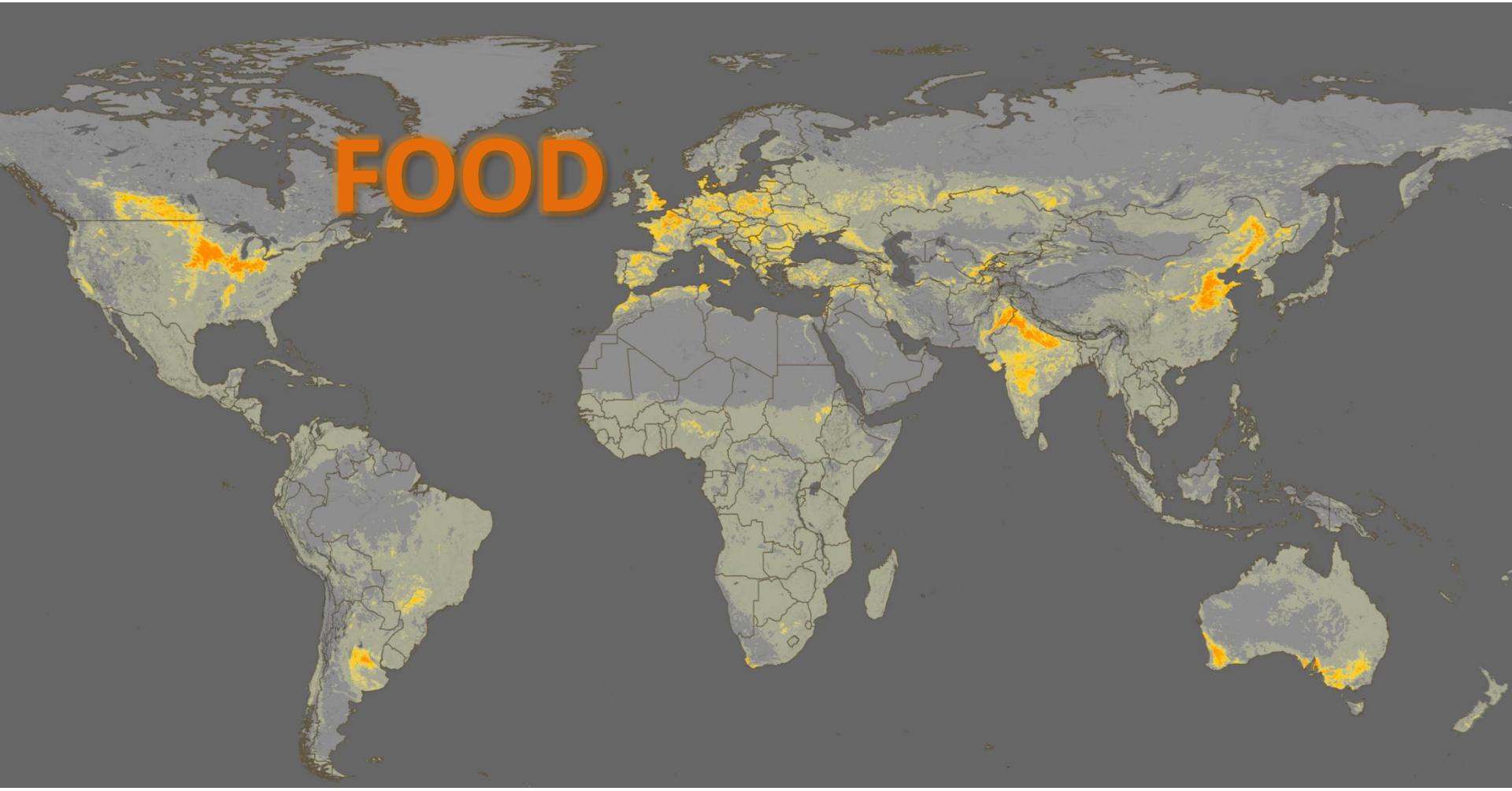
2010

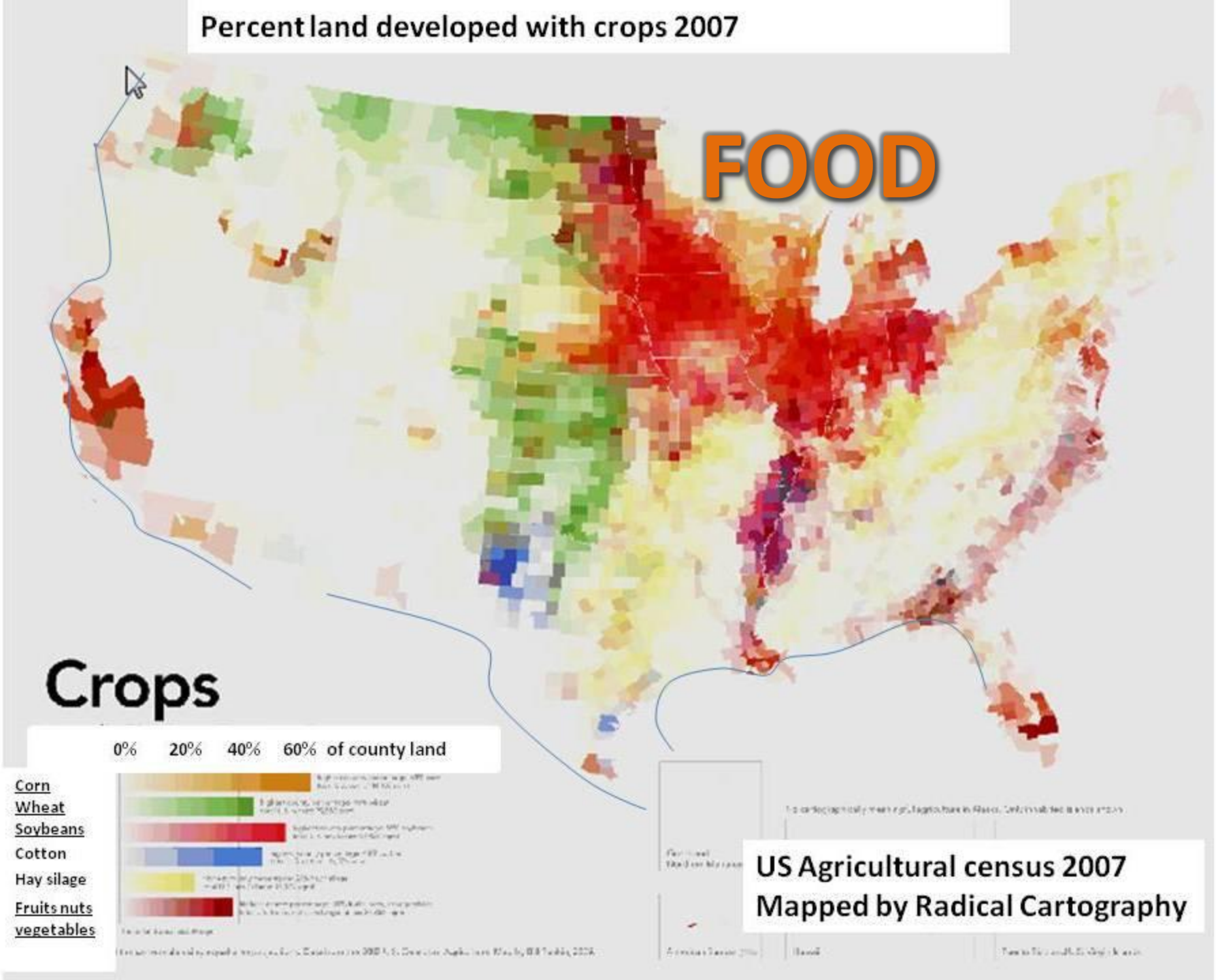


Foley et al. and Ramankutty and Foley estimate cropland and pasture to be nearly 40% of the world's terrestrial surface.

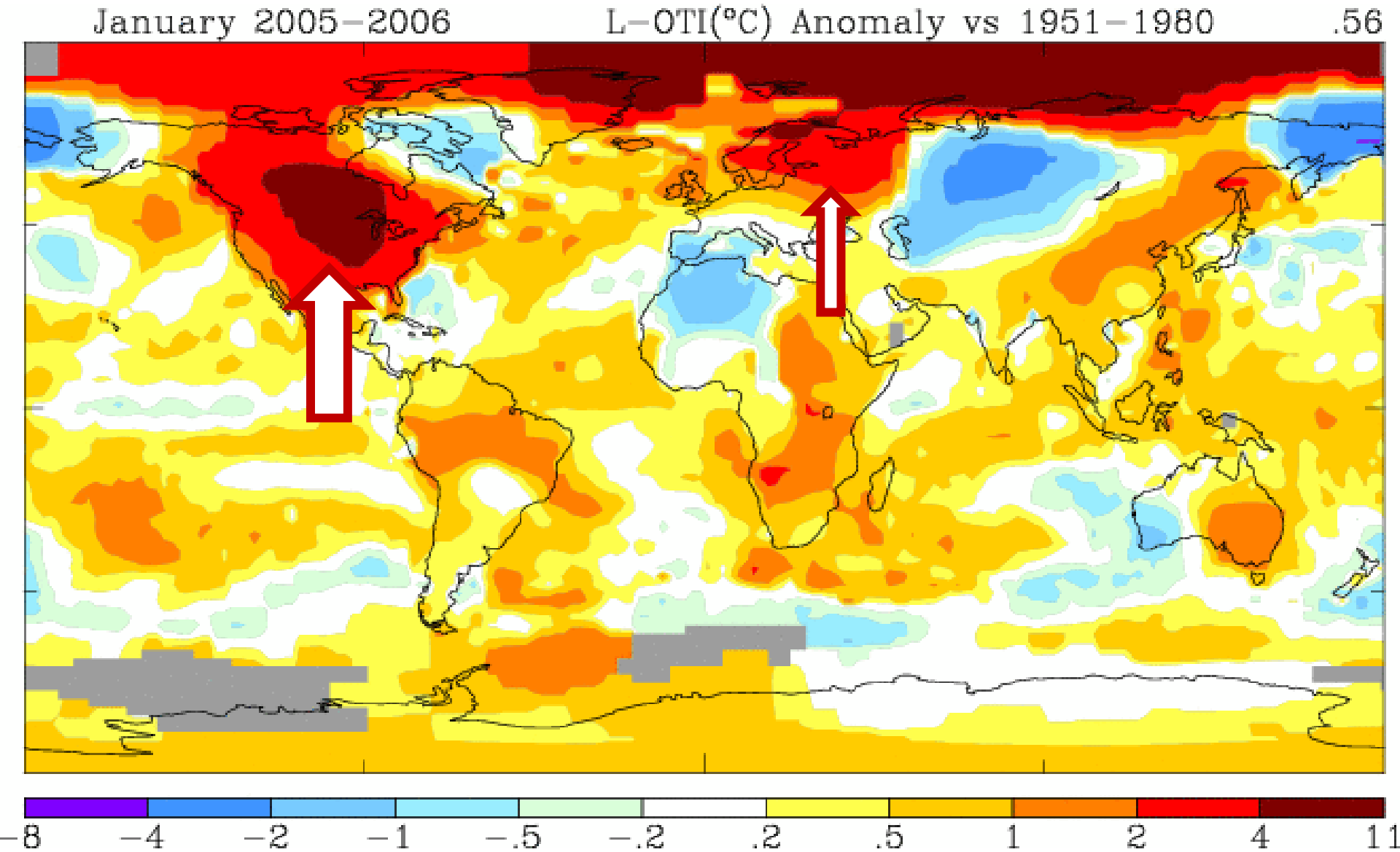


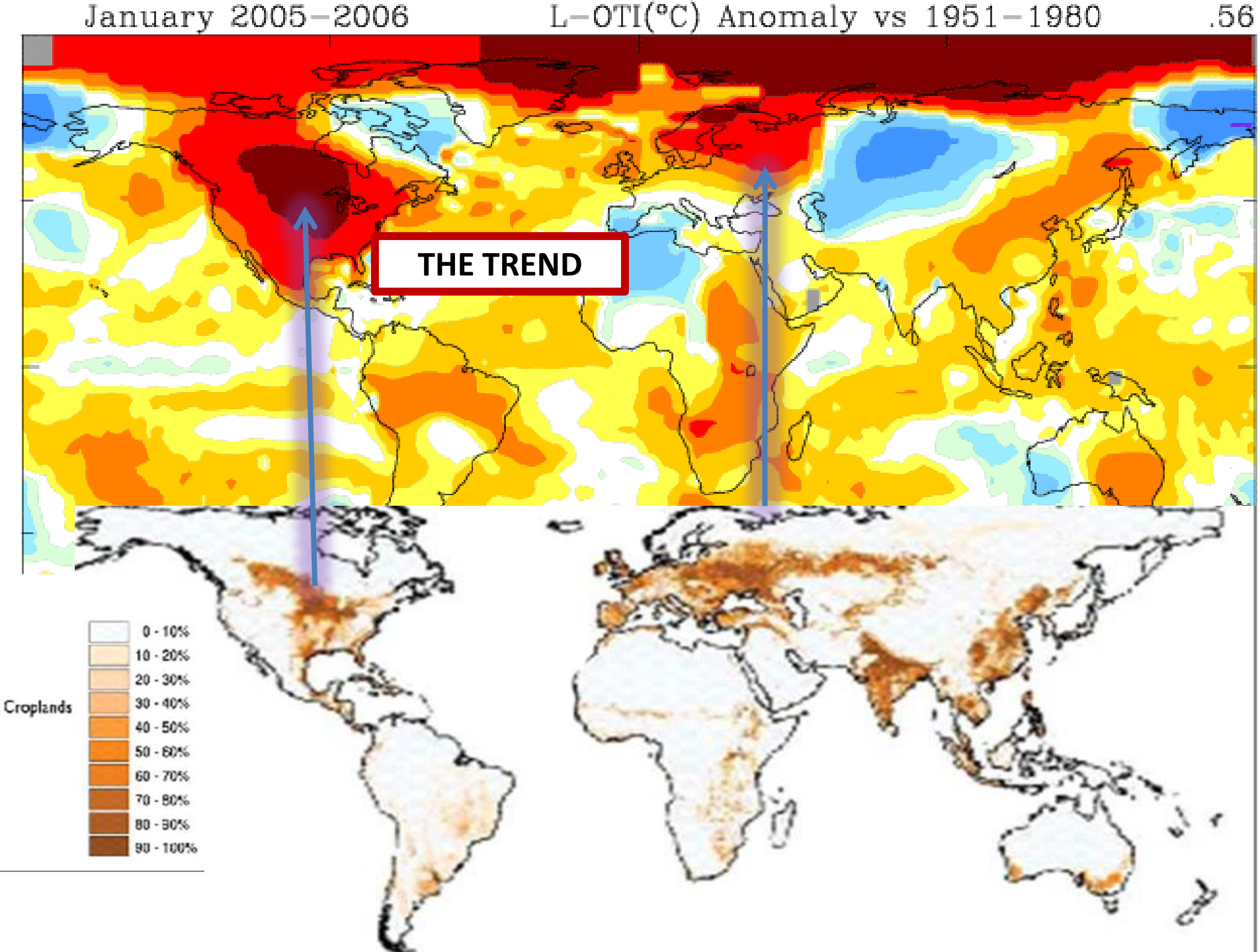
Crop Intensity (NASA)

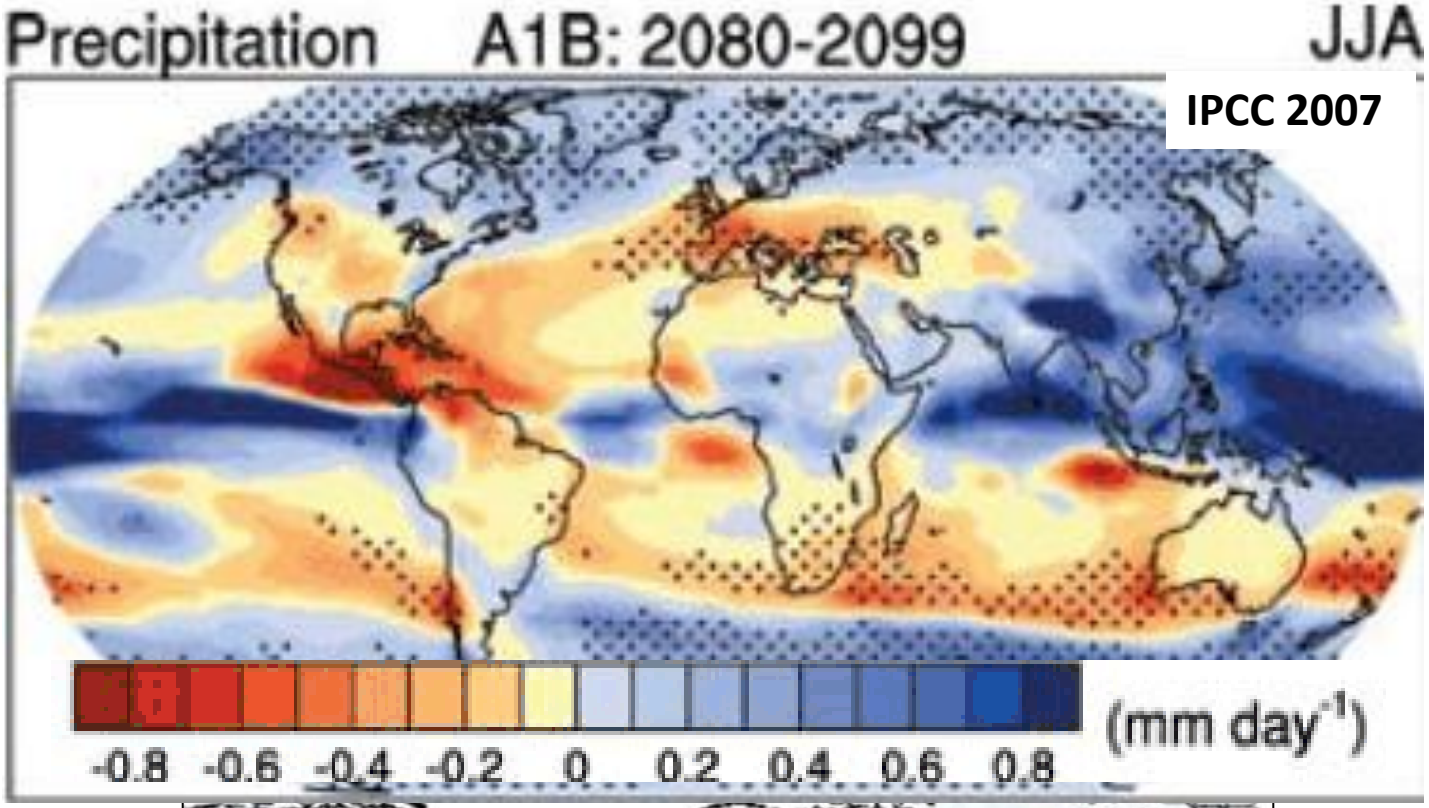


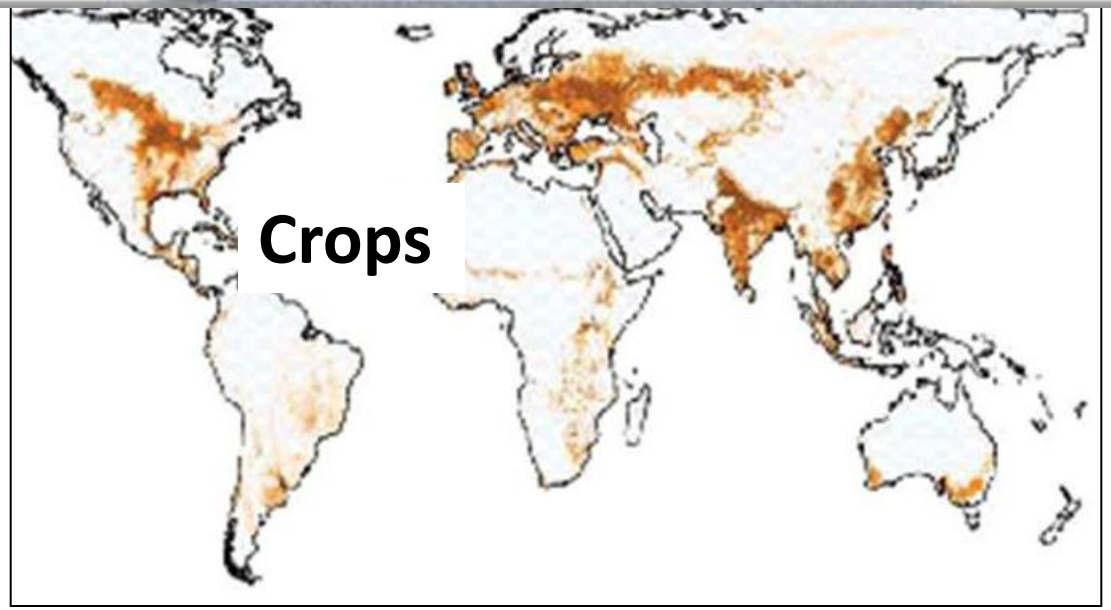

Percent land developed with crops 2007
FOOD
Crops
0%
20%
40%
60%
of county land
Corn
Wheat
Soybeans
Cotton
Hay silage
Fruits nuts vegetables
US Agricultural census 2007
Mapped by Radical Cartography

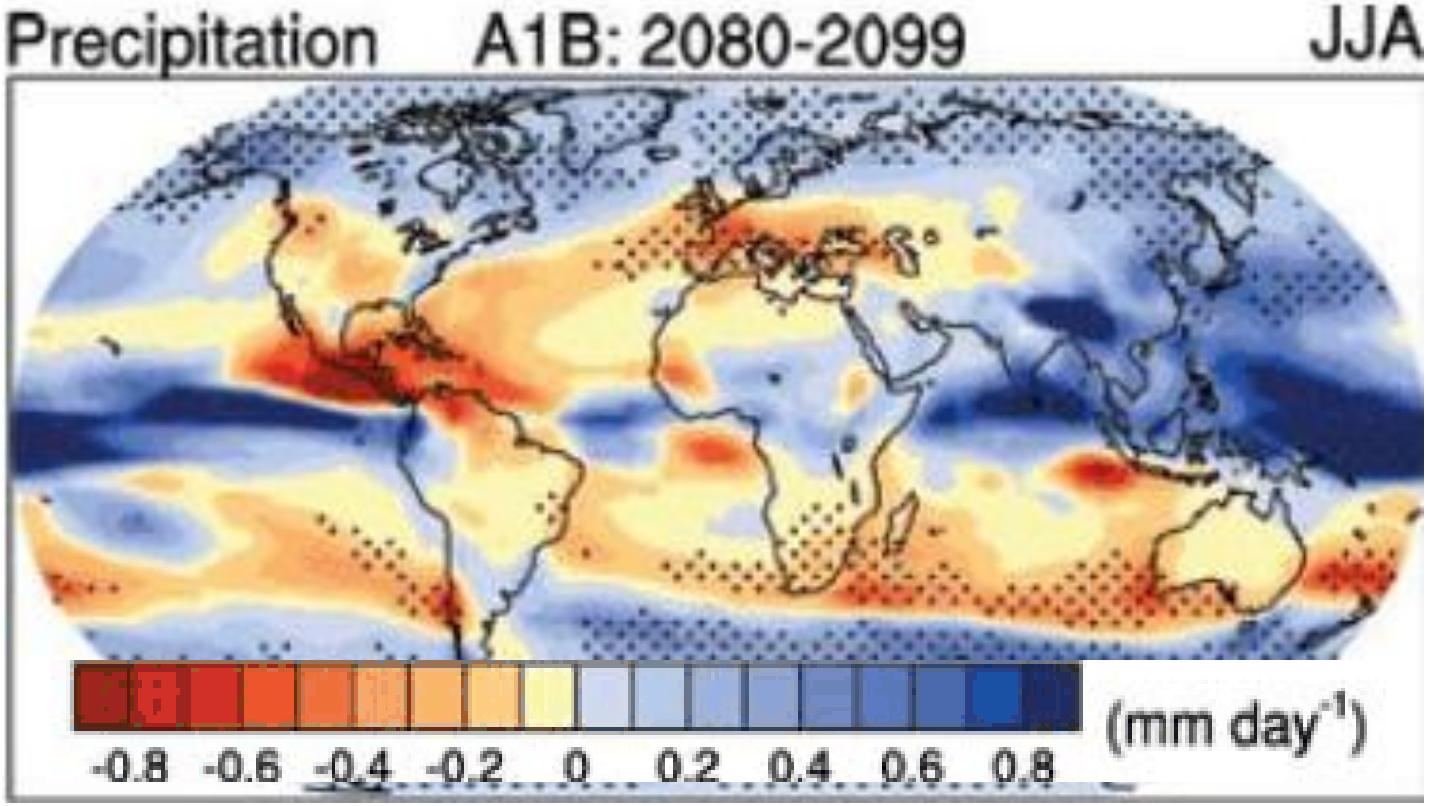
NASA Global temperature increase 1980 to 2005

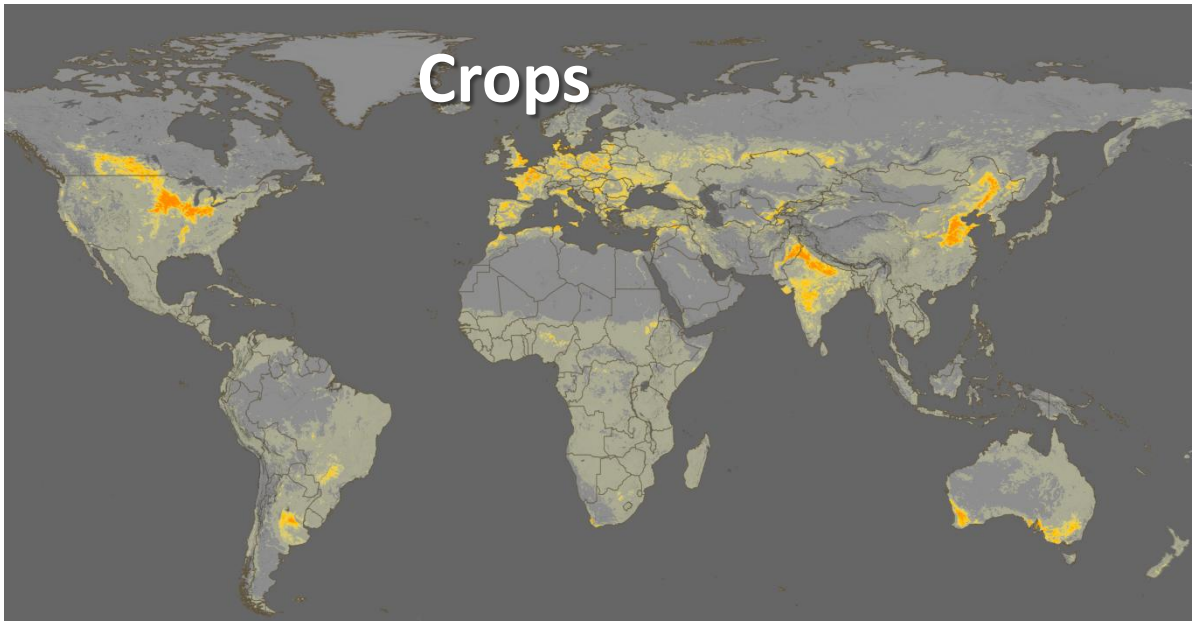



January 2005–2006
L–OTI(°C) Anomaly vs 1951–1980
.56
THE TREND
Croplands
0 - 10%
10 - 20%
20 - 30%
30 - 40%
40 - 50%
50 - 60%
60 - 70%
70 - 80%
80 - 90%
90 - 100%


Precipitation A1B: 2080-2099 JJA
IPCC 2007
-0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8
(mm day^{-1})


Crops


Precipitation
A1B: 2080-2099
JJA
-0.8
-0.6
-0.4
-0.2
0
0.2
0.4
0.6
0.8
(mm day^{-1})


Crops

Food fibre and forest products IPCC 2007 Policymakers Summary.

*Crop productivity is projected to increase and likely at mid to high latitudes for local mean temperature increases of up to 1-3° C (*from 2000 or1.6^{o}C to 3.6^{o}C from pre 1900*) depending on the crop and then decrease beyond that in some regions.*

At lower latitudes a specially dry and tropical regions crop productivity is projected to decrease for even small local temperature increases 1-2° C.. (1.6 to 2.6^{o}C fro 1900)

Globally the potential for food production is projected to increase with increases in local average temperature over a range of 1-3° C (1.6 to 3.6^{o}C fro 1900) *but above this it is projected to decrease.*

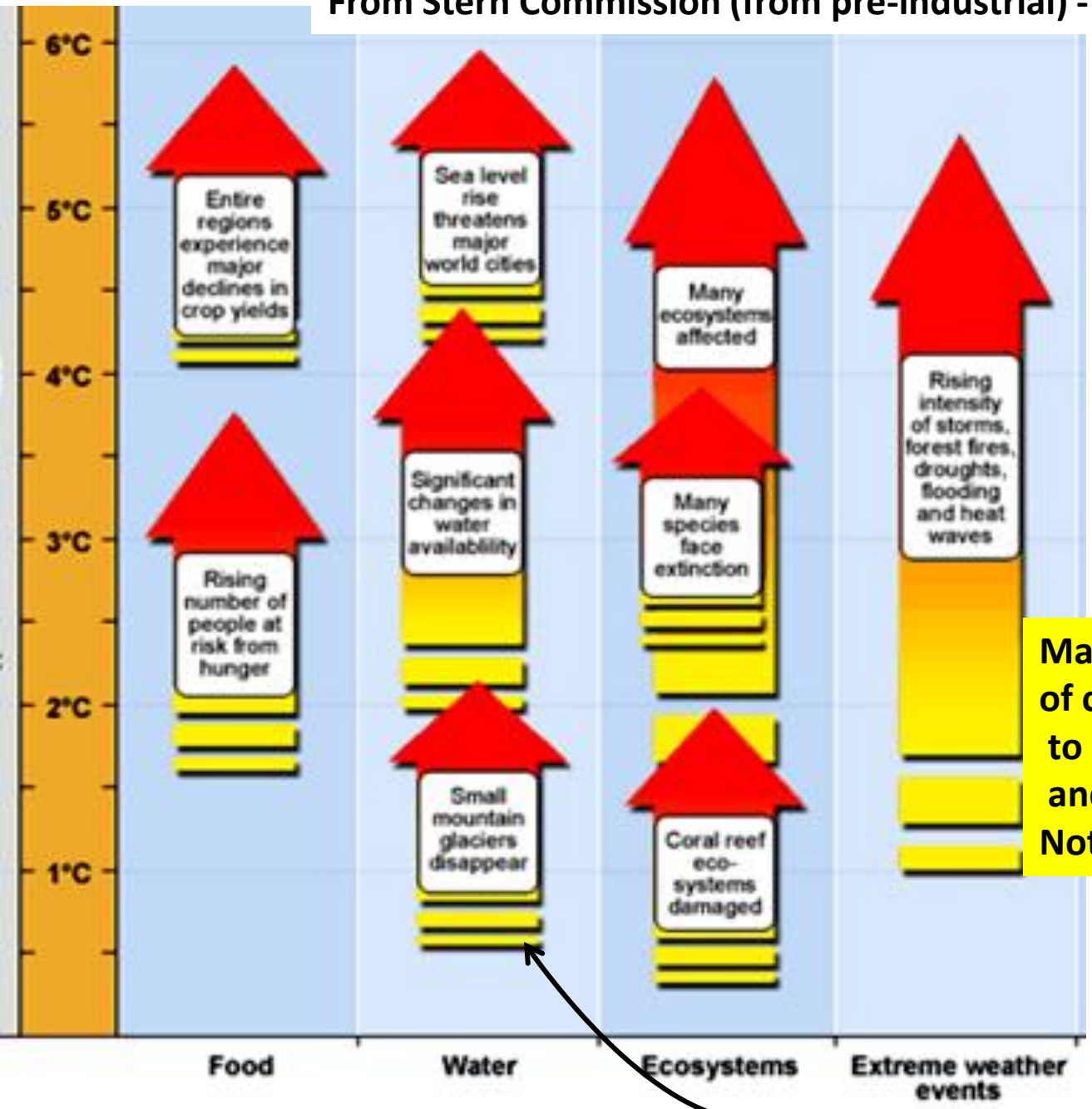
**Increases in the frequency of droughts and floods are projected to affect local crop production negatively especially in subsistence sectors at low latitudes.*

**The above are examples of extreme weather events and non linear changes which are not included in the climate crop yield models.*

Most studies on global agriculture have not yet incorporated a number of critical factors, including changes in extreme events or the spread of pests and diseases.

In addition, they have not considered the development of specific practices or technologies to aid adaptation. IPCC WG 2 Impacts Technical report

From Stern Commission (from pre-industrial) - EU version



Main single determinant of climate change damage to both human health and agriculture.
Not in IPCC models

Agriculture for over 1 billion people.
Not included in the IPCC impacts chart.

Examples of impacts associated with global average temperature change relative to 1980-1999

0 | 1 | 2 | 3 | 4 | 5°C

WATER

- Increased water availability in moist tropics and high latitudes
- Decreasing water availability and increasing drought in mid-latitudes and semi-arid low latitudes
- Hundreds of millions of people exposed to increased water stress

ECO-SYSTEMS

- Increased coral bleaching
- Most corals bleached
- Widespread coral mortality
- Terrestrial biosphere tends towards a net carbon source as: 15% 40% of ecosystems affected
- Increasing species range shifts and wildfire risk
- Ecosystem changes due to weakening of the meridional overturning circulation

FOOD

- Complex, localised negative impacts on small holders, subsistence farmers and fishers
- Tendencies for cereal productivity to decrease in low latitudes
- Productivity of all cereals decreases in low latitudes
- Tendencies for some cereal productivity to increase at mid- to high latitudes
- Cereal productivity to decrease in some regions

COASTS

- Increased damage from floods and storms
- About 30% of global coastal wetlands lost
- Millions more people experience coastal flooding each year

HEALTH

- Increasing burden from malnutrition, diarrhoeal, cardio-respiratory, infectious diseases
- Increased morbidity and mortality from heat waves, floods, droughts
- Changed distribution of some disease vectors

ALL IMPACT ONFOODPRODUCTION

R K Pachauri Chairman, IPCC
State of the World Symposium Washington 5th January 2009

IPCC

OUR CHANGING PLANET The U.S. Climate Change Science Program for Fiscal Year 2009

A Report by the Climate Change Science Program and The Subcommittee on Global Change Research *A Supplement to the President's Fiscal Year 2009 Budget*

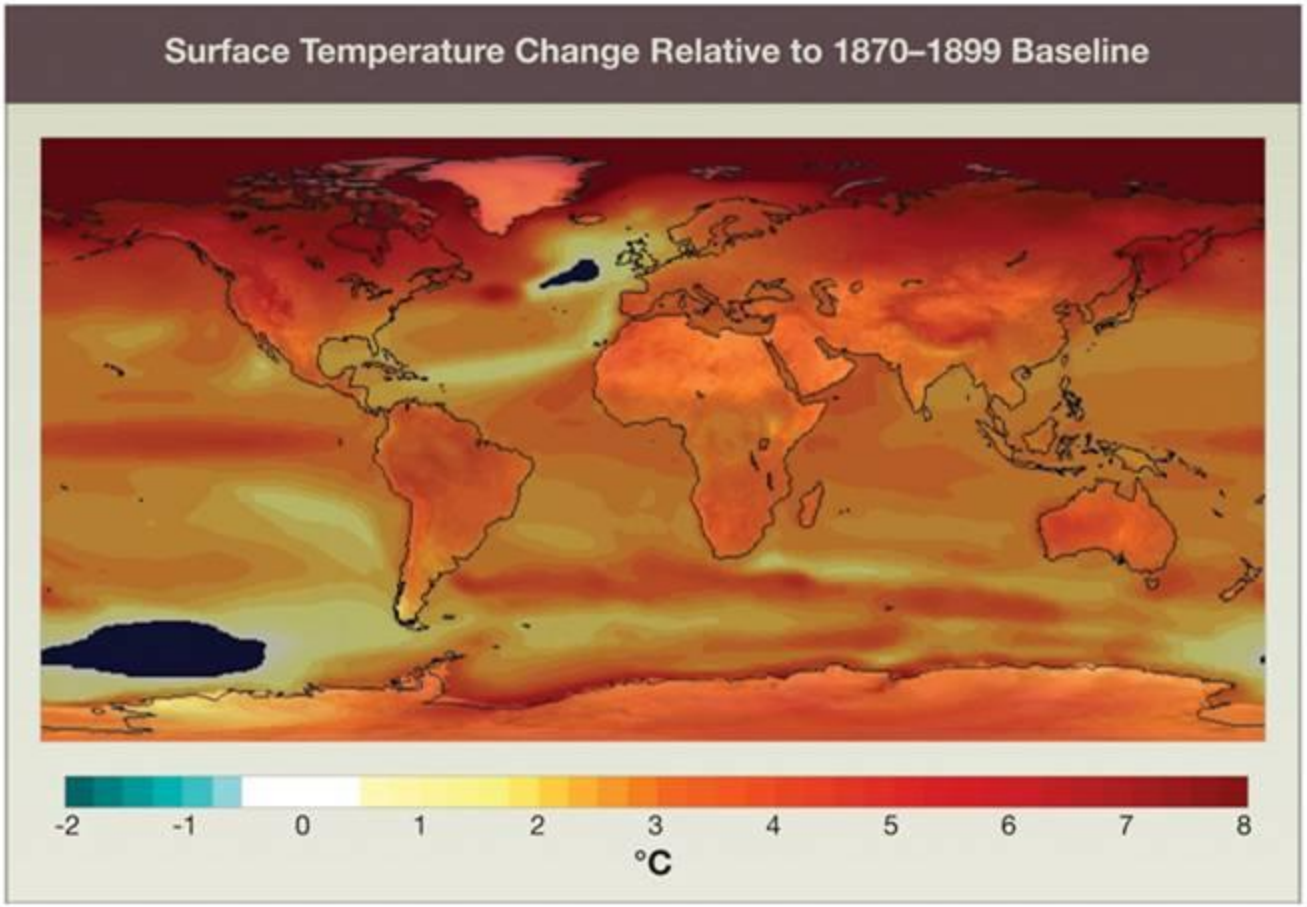
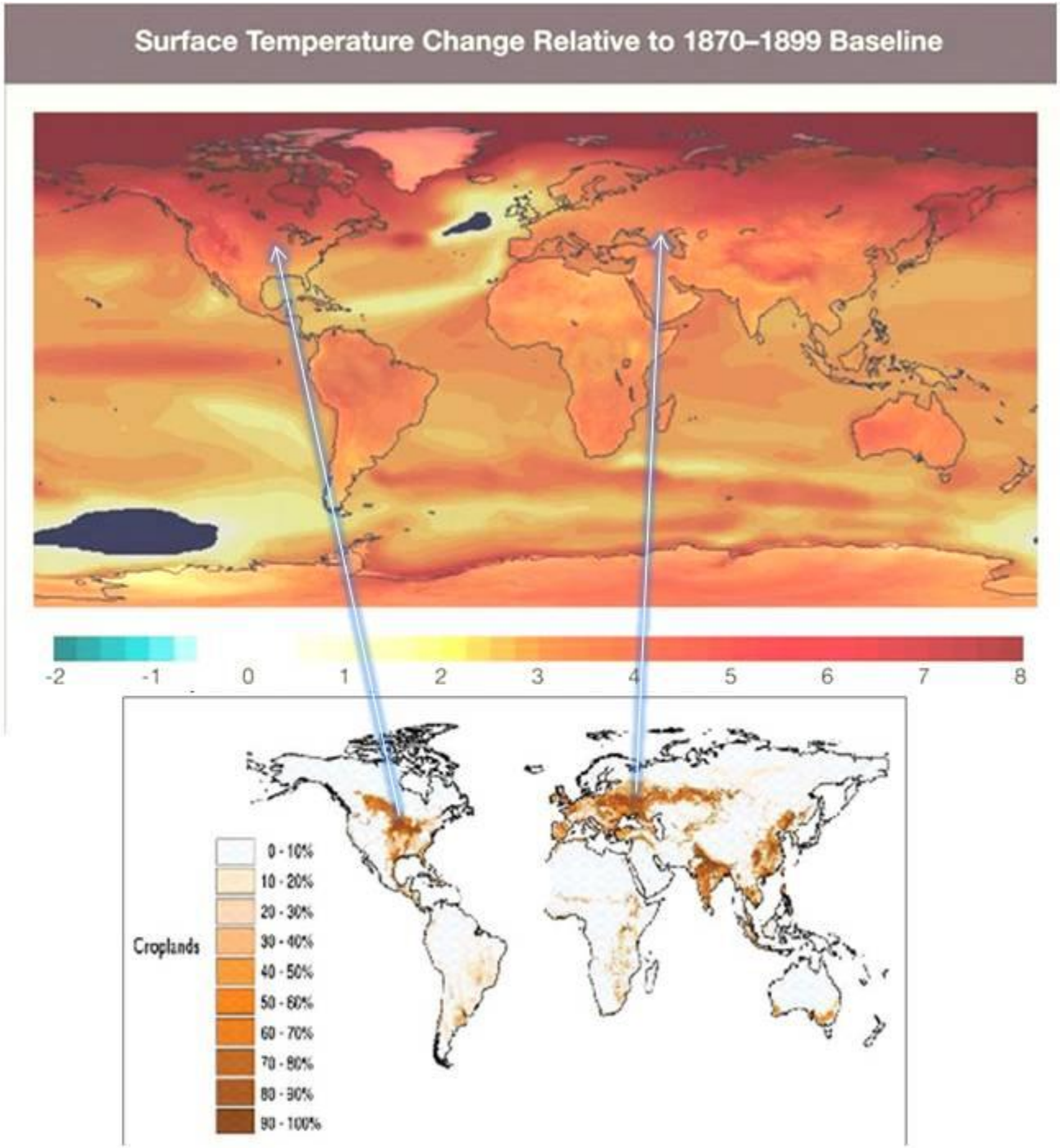
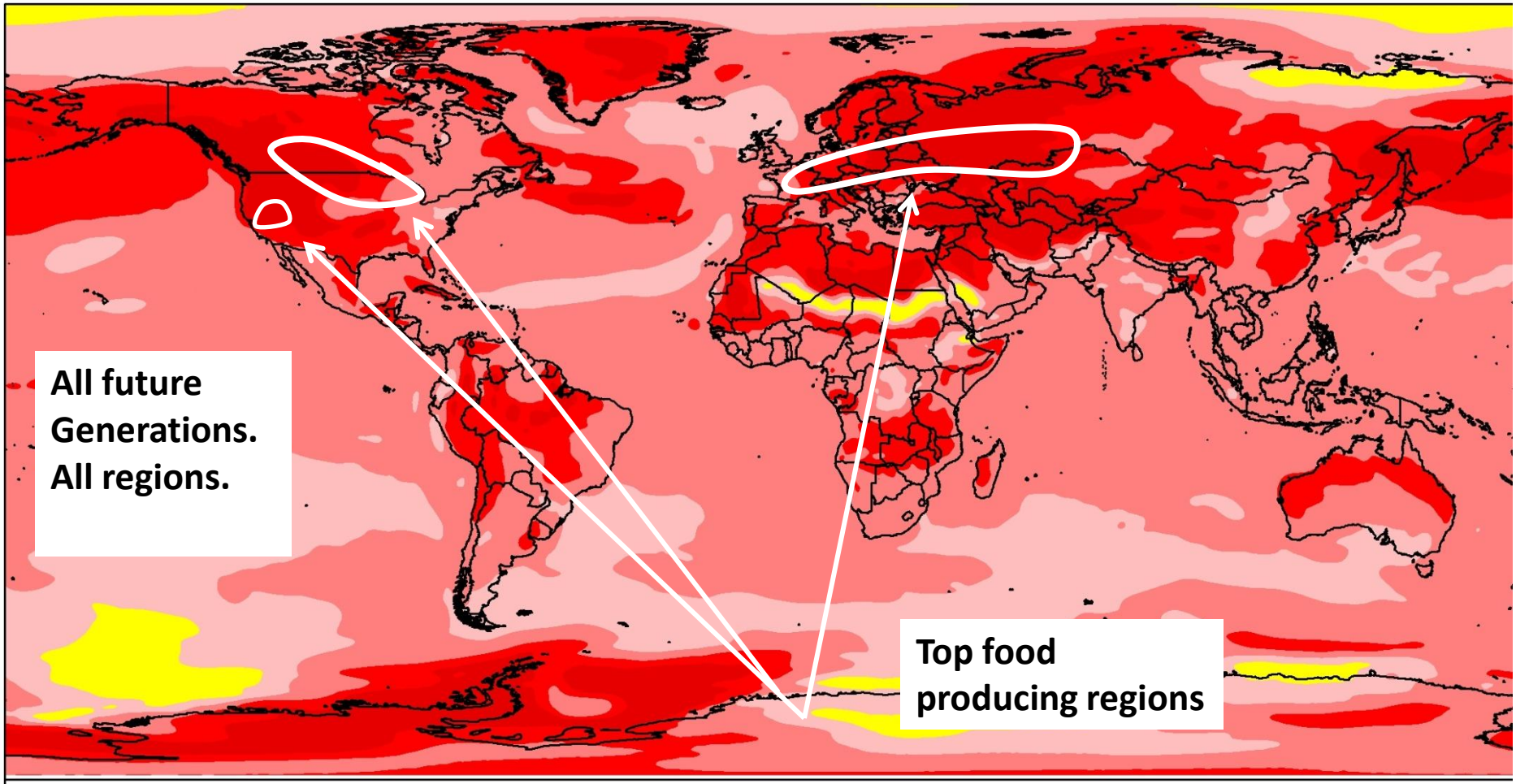


Figure 2 .. regional surface temperature increases by the end of the 21st century are roughly double the globally averaged value with the largest increases seen at high latitudes.

Surface temperature increases in the tropics are much less


Surface Temperature Change Relative to 1870–1899 Baseline
-2
-1
0
1
2
3
4
5
6
7
8
Croplands
0 - 10%
10 - 20%
20 - 30%
30 - 40%
40 - 50%
50 - 60%
60 - 70%
70 - 80%
80 - 90%
90 - 100%



Projected July Temperature Difference, 2000 to 2050

Oakridge A2

Min Temp = - 2.0
Max Temp = 5.0
Mean = 2
Standard Deviation = 1

Temp Diff (deg C)

- -2- 0
- 0 - 1
- 1 - 2
- 2- 3
- 3 - 5

Heat Waves

Fig. 4. Intensity of heat waves from A1FI. Oakridge climate model

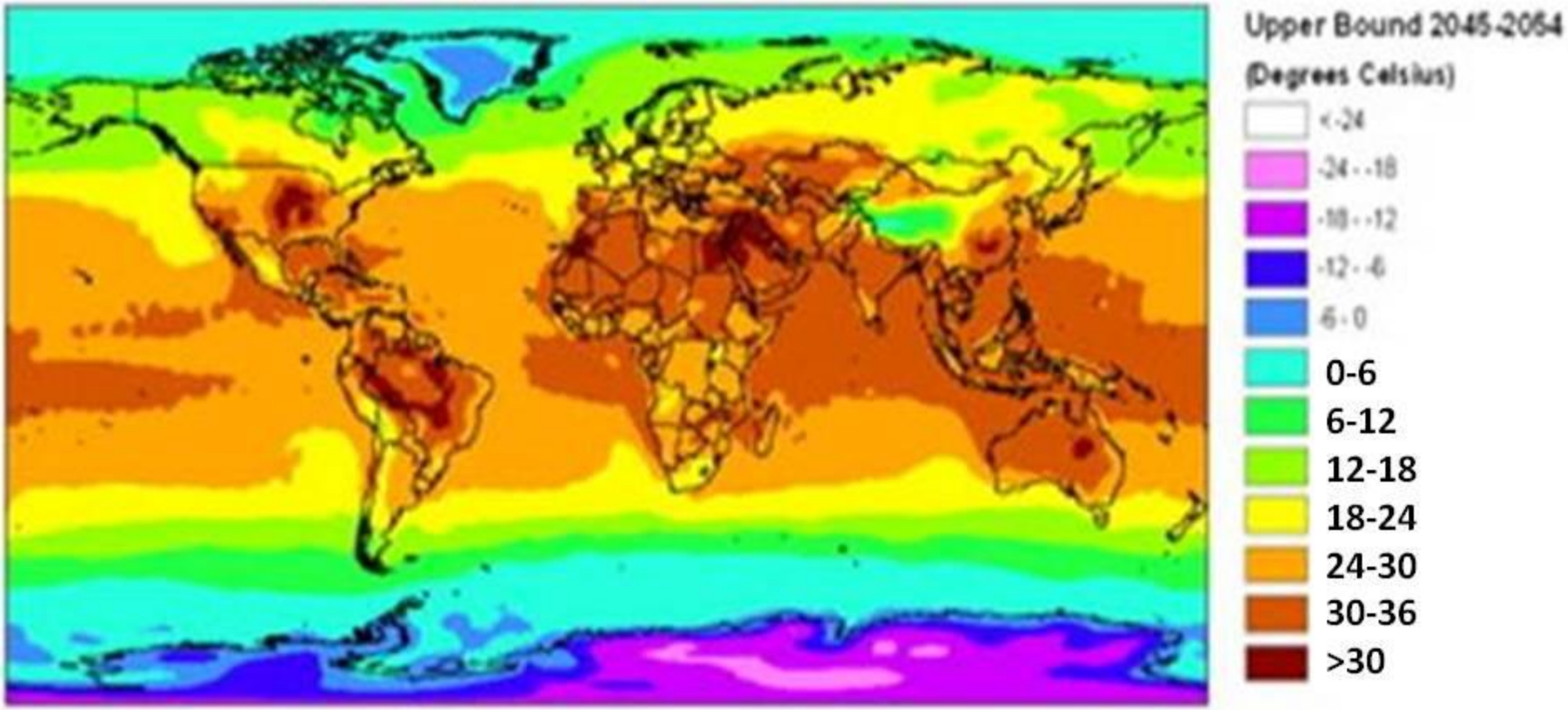
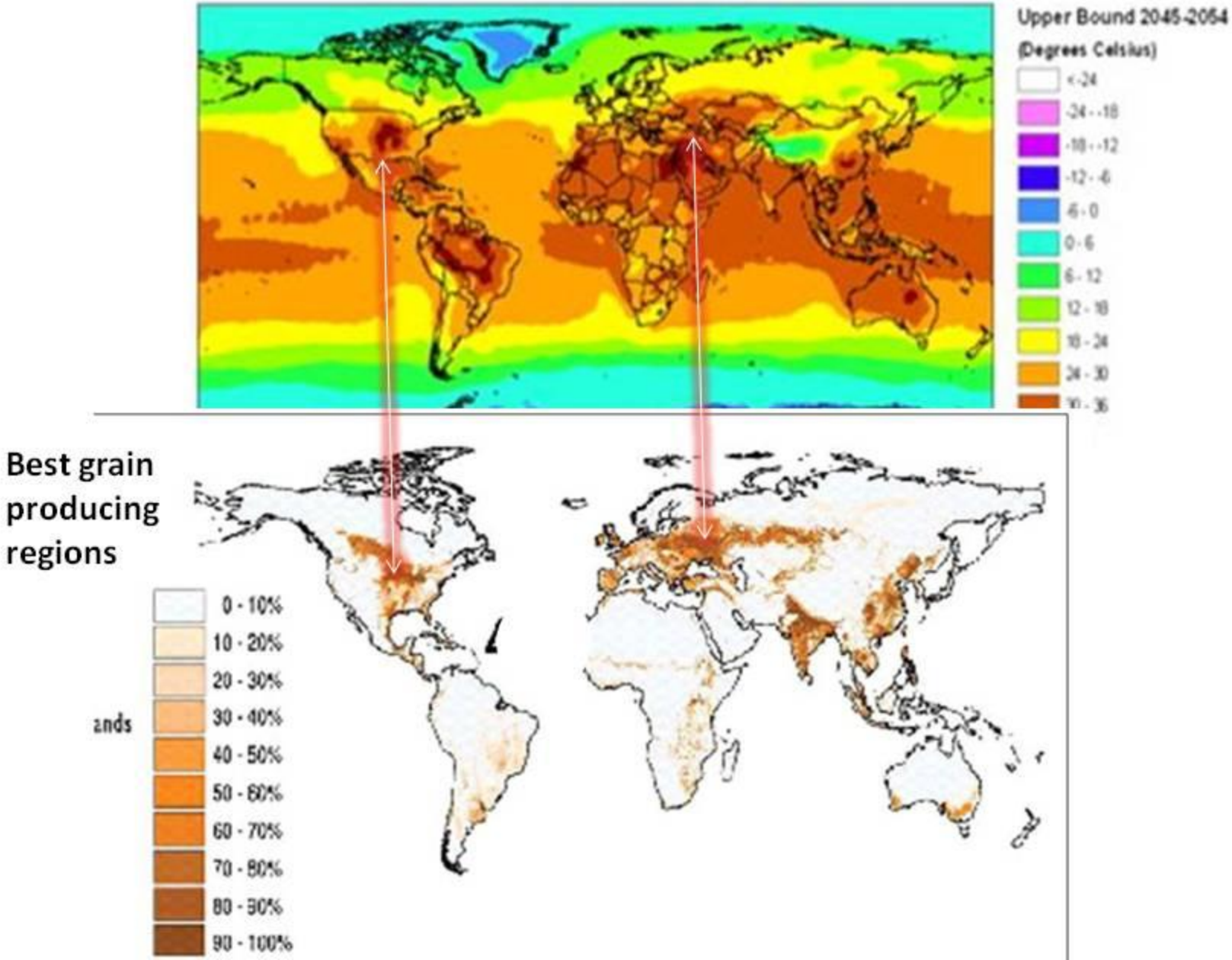


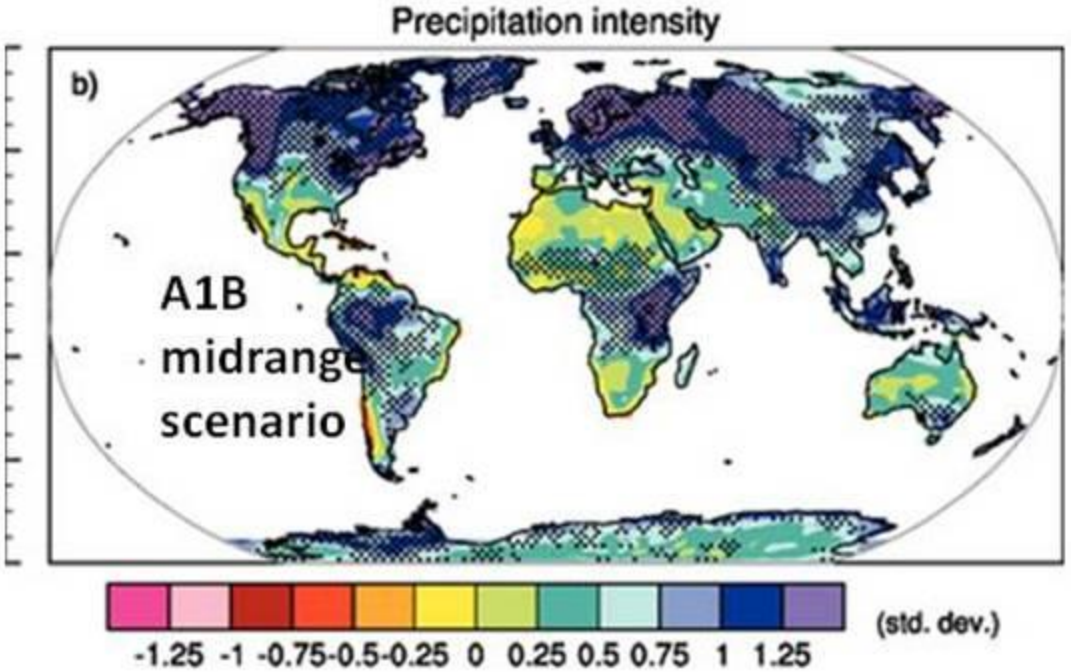
Fig. 4. Intensity of heat waves from A1FI. Oakridge

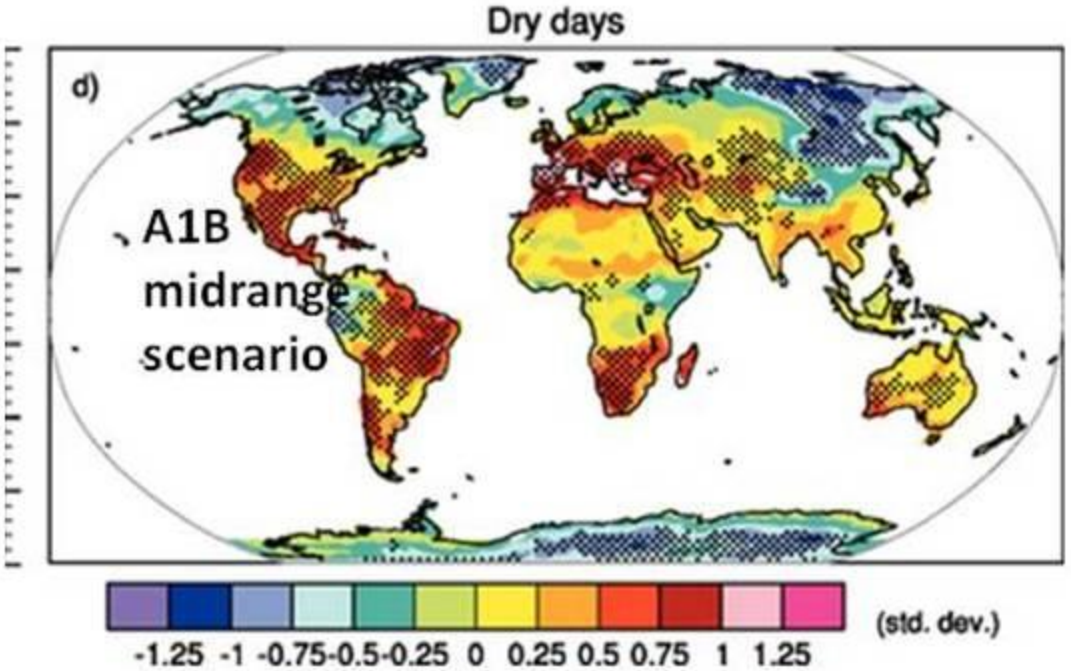


Wetter and Drier

+3.3^{o}C world

Increased dry days and rainfall intensity is damaging to crops

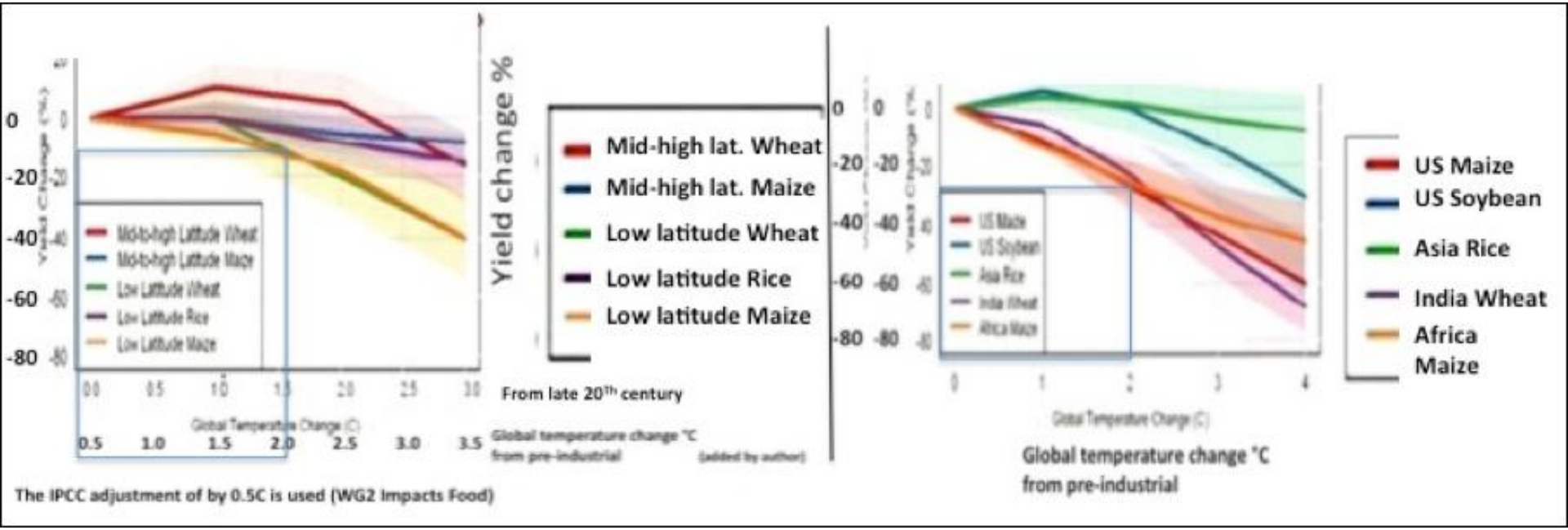




A1B 2100 is +3.3C by 2100 from 1900

IPCC 2007

These estimates do not include additional losses due to weeds, insects, and pathogens, changes in water resources available for irrigation, effects of increased flood or drought frequencies; or responses to temperature extremes. {5.1}



Climate Stabilizations Targets
National Science Foundation 2010

2ºC

18%

HOW WILL MAIZE YIELDS IN THE UNITED STATES RESPOND TO CLIMATE CHANGES?

Nearly 40% of global maize (or corn) production occurs in the United States, much of which is exported to other nations. The future yield of U.S. maize is therefore important for nearly all aspects of domestic and international agriculture.

Higher temperatures speed development of maize, increase soil evaporation rates, and above 35 °C can compromise pollen viability, all of which reduce final yields. High temperatures and low soil moisture during the flowering stage are especially harmful as they can inhibit successful formation of kernels. In Northern States, warmer years generally improve yields as they extend the frost-free growing season and bring temperature closer to optimum levels for photosynthesis.

The majority of production, however, occurs in areas where yields are favored by cooler than normal years, so that warming associated with climate change would lower average national yields. The most robust studies, based on analysis of thousands of weather station and harvest statistics for rainfed maize (>80% of U.S. production), suggest a roughly 7% yield loss per °C of local warming, which is in line with previous estimates (USCCSP, 2008b).

Climate Stabilizations Targets
National Science Foundation 2010

What I see from the NSF crop model graphs

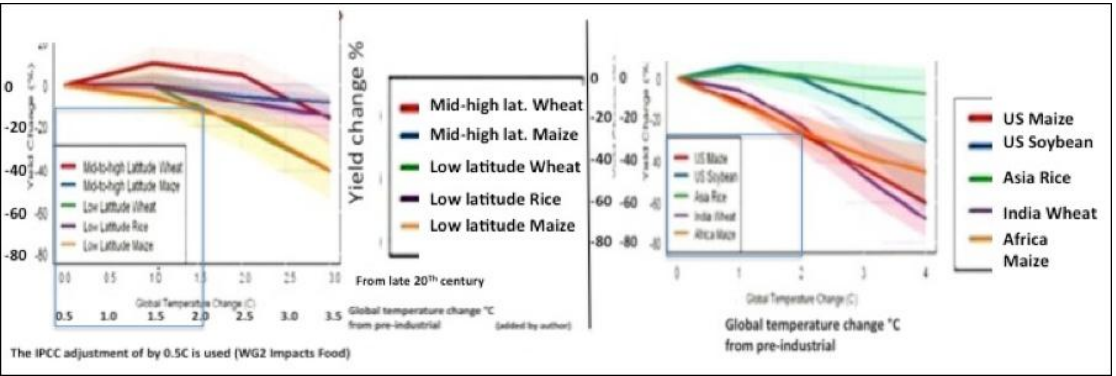
All crop yields have gone into a decline by 1.5°C from 1900, indicating 1.5° **C is the limit of crop tolerance above which all yields in all regions will progressively decline with increasing temperatures.**

That means a global temperature increase of +1.5°C is dangerous for all crops and regions.
Low latitude crop yields decline from current yields by 10%to 30% depending on the crop for a 2°C global increase.

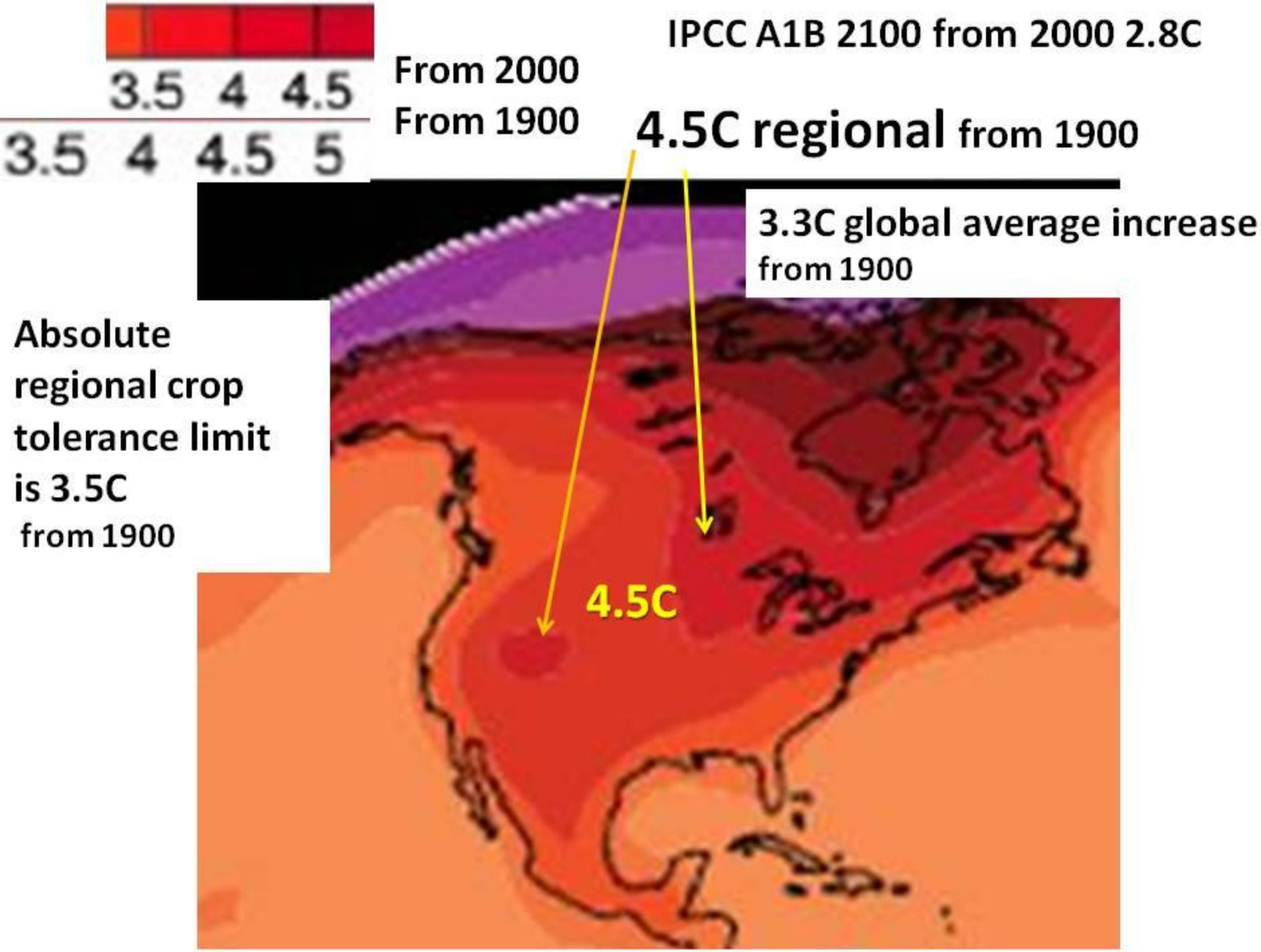
Mid/high latitude wheat declines from current yield at 2.8°C (pre-industrial).
Mid/high latitude maize declines from current yields at 1.7°C – slow decline.
Low latitude wheat decline from current yields at 1.5°C - sharp decline.
Low latitude rice declines from current yields at 1.7°C – slow decline.
Low latitude maize declines from current yields at 1.0°C – sharp decline.
US Maize declines from current yield at 0.5°C
US Soybean declines from current yield at 2.2°C
Asia Rice declines from current yield at 2.5°C
India Wheat declines from current yield at 0.7°C
Africa Maize declines from current yield at 0.5°C

1.5°C is food catastrophe for low latitude nations and disastrous for food security for other regions

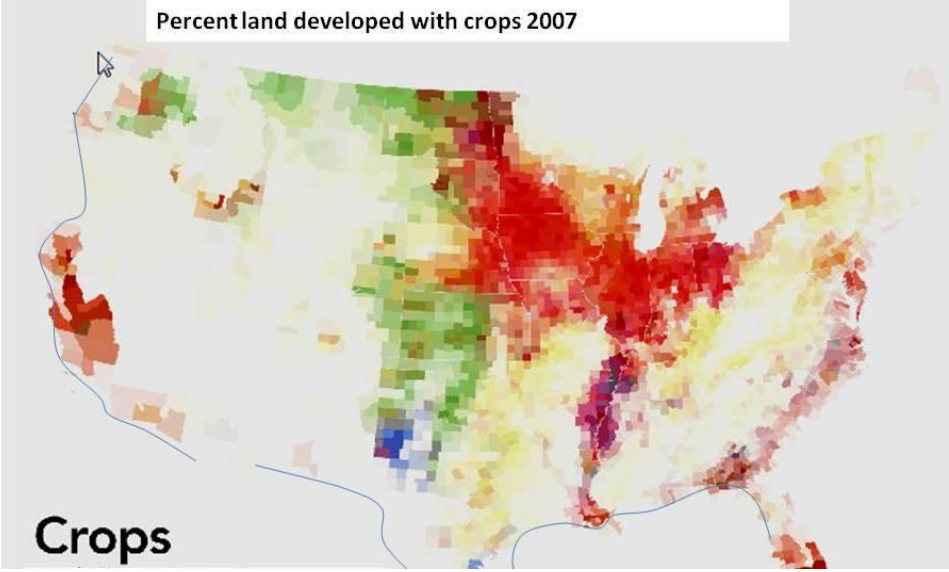
Above 2.0°C is global food catastrophe with global agriculture is in decline and civilization with it.

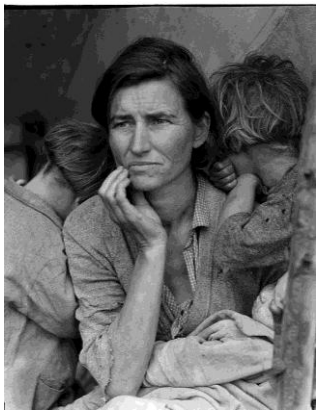


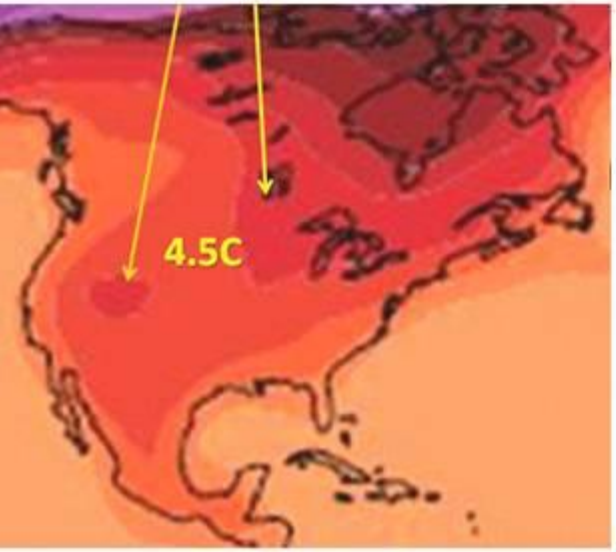
Climate Stabilizations Targets
National Science Foundation 2010


3.5 4 4.5
3.5 4 4.5 5
From 2000
From 1900
IPCC A1B 2100 from 2000 2.8C
4.5C regional from 1900
3.3C global average increase
from 1900
Absolute
regional crop
tolerance limit
is 3.5C
from 1900
4.5C

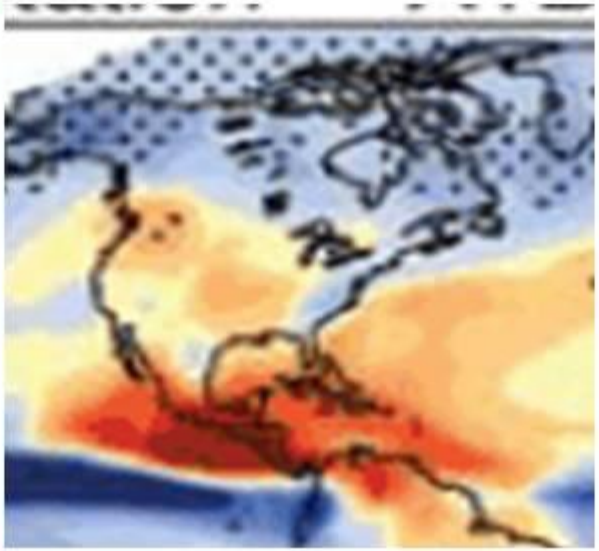
The Death Trend for the US



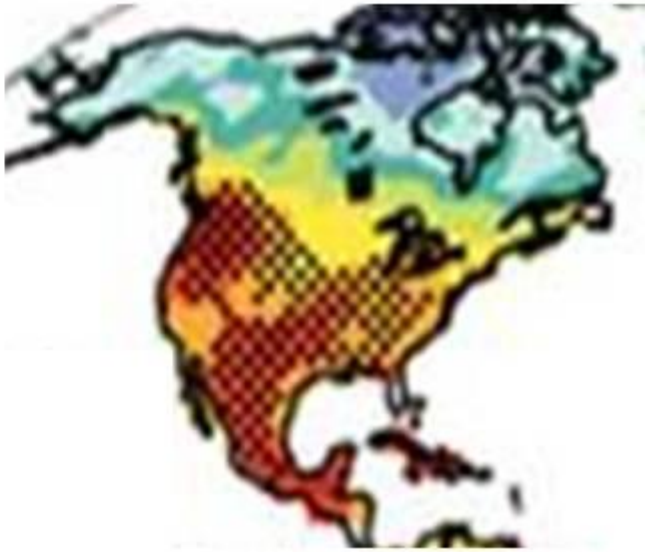




Temperature increase



Rain fall Summer JJA



Dry days increase

Robust Negative Impacts of Climate Change on African Agriculture

Wolfram Schlenker - Stanford University
David Lobell - Stanford University Published by Environmental Research Letters, Vol. 5 February 2010

Here we show that by combining historical crop production and weather data into a panel analysis, a robust model of yield response to climate change emerges for several key African crops. By mid-century, the mean estimates of aggregate production changes in SSA under our preferred model specification are - 22, - 17, - 17, - 18, and - 8% for maize, sorghum, millet, groundnut, and cassava, respectively. In all cases except cassava, there is a 95% probability that damages exceed 7%, and a 5% probability that they exceed 27%.

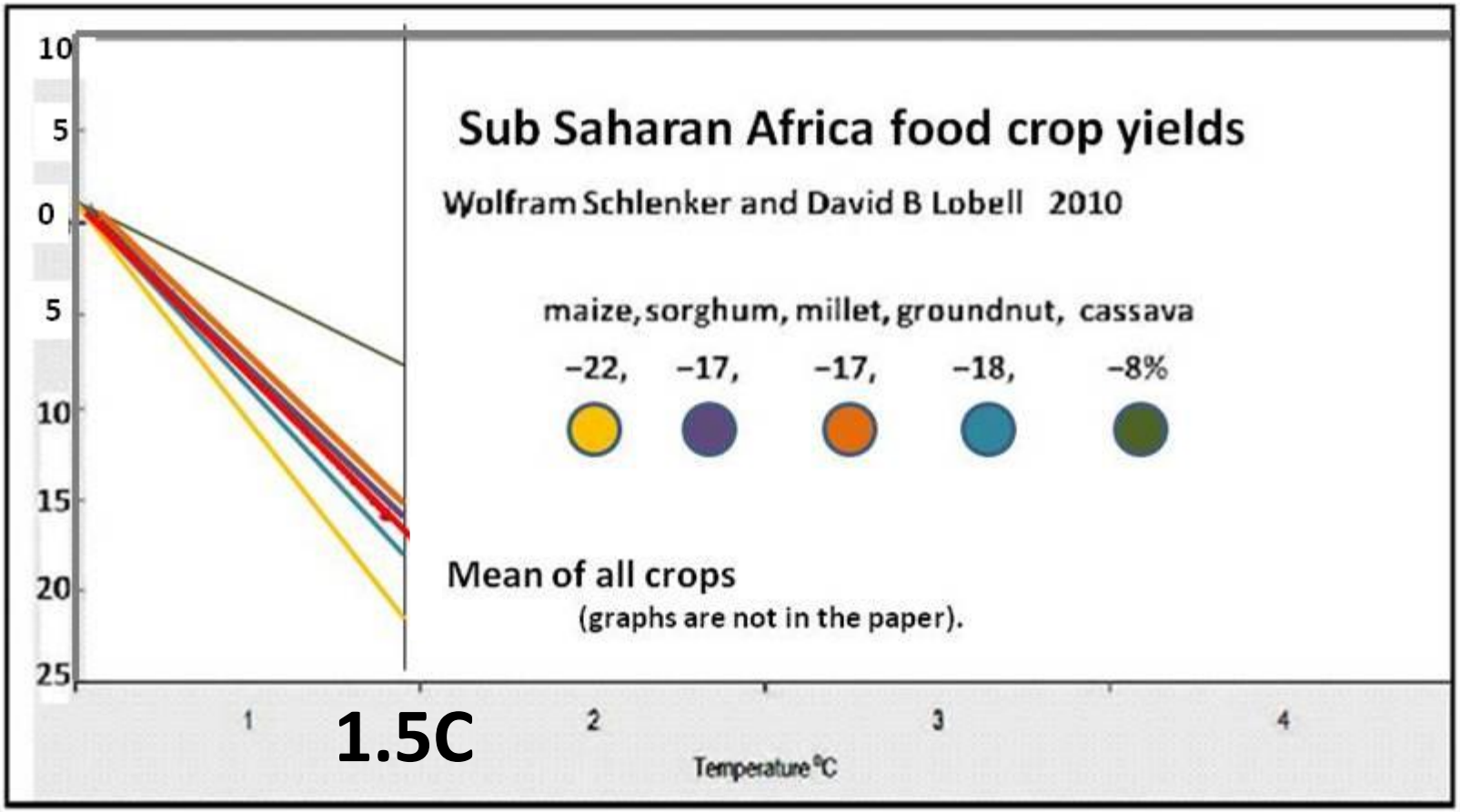
Moreover, countries with the highest average yields have the largest projected yield losses, suggesting that well-fertilized modern seed varieties are more susceptible to heat related losses.

Robust Negative Impacts of Climate Change on African Agriculture

Wolfram Schlenker - Stanford University
David Lobell - Stanford University
Published by Environmental Research Letters, Vol. 5
February 2010

(My graphic illustration PC)

Climate Change Genocide



Wolfram Schlenker and David B Lobell 2010
A1B is the SRES applied for the study which is +1.5°C at 2050 by IPCC

Good bye