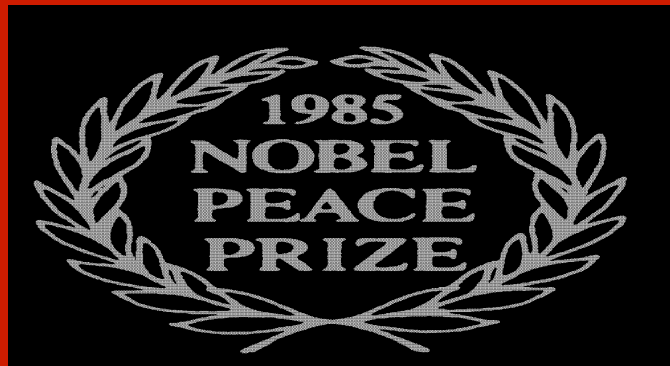


Nuclear Famine: The Global Consequences of Limited Nuclear War

Physicians for Social Responsibility

US Affiliate of

The International Physicians for the Prevention
of Nuclear War



The Dangers of Nuclear Weapons Today

Nuclear War in South Asia

- **India and Pakistan** are nuclear weapon states with a history of conflict
- **20 million deaths** in major cities in India and Pakistan
- **Radioactive contamination** throughout the region
- **Global climate disruption** from smoke and soot

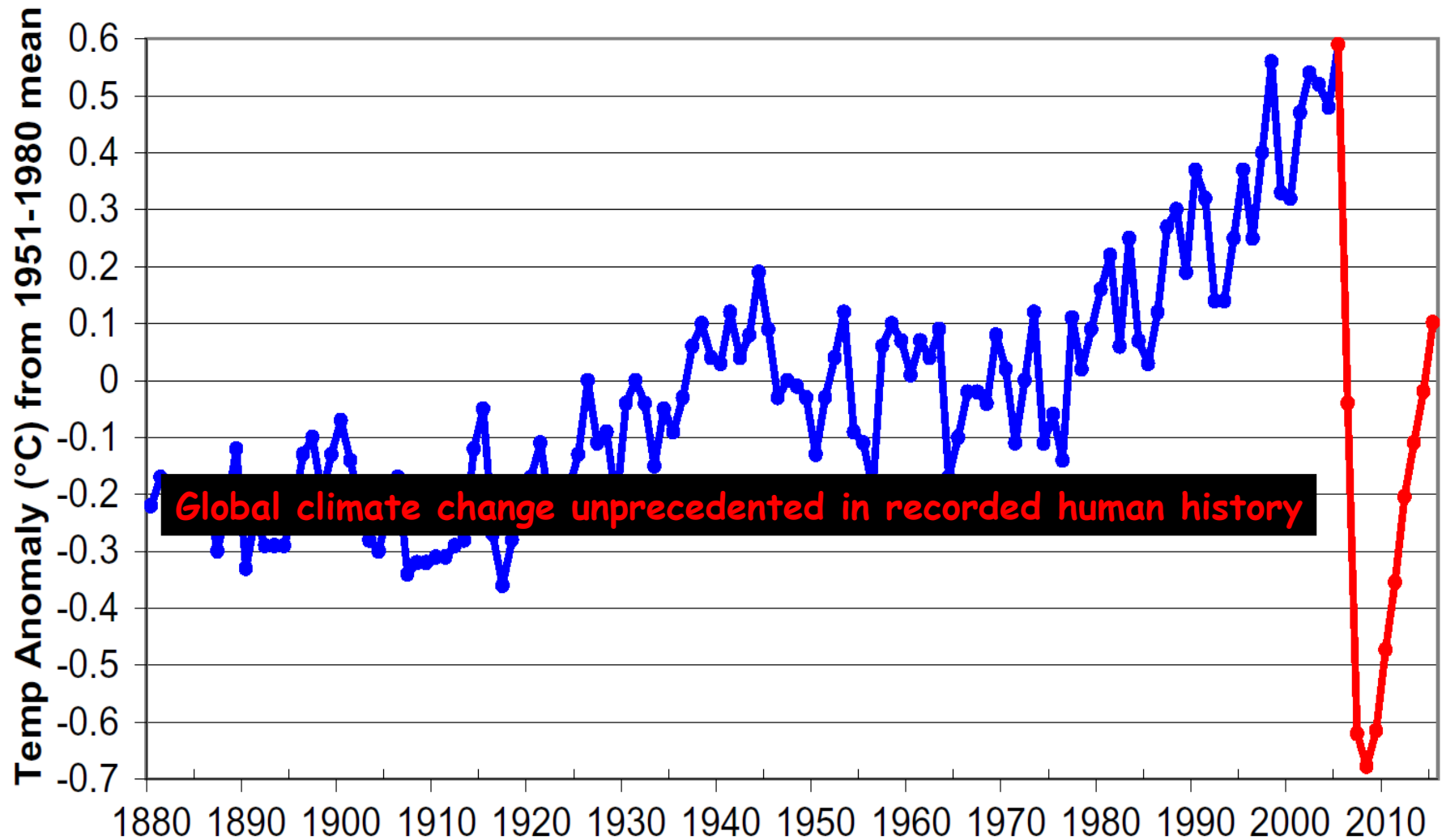
The Dangers of Nuclear Weapons Today

Nuclear War in South Asia

- Nuclear explosions ignite fires that burn whole cities
- Soot lofted high into the atmosphere absorbs incoming sunlight
- Dramatic decrease in amount of light reaching the surface
- Large, rapid drops in surface temperature (-1.25°C)

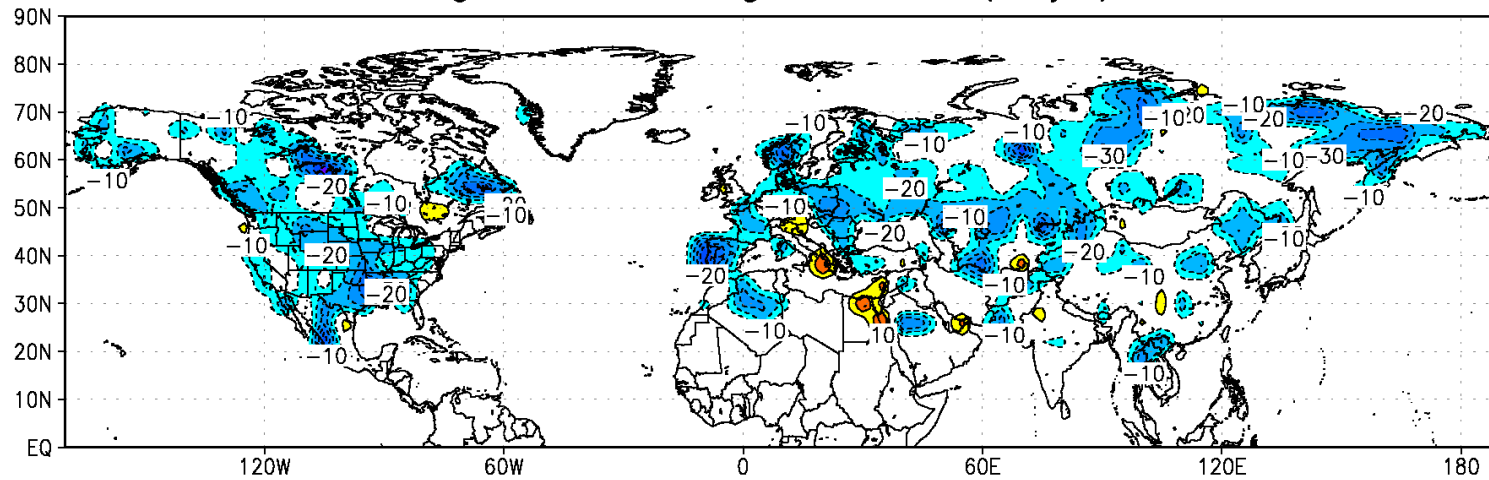
Robock et al (2007)

GISS Global Average Temperature Anomaly + 5 Tg smoke in 2006



Graph courtesy of Alan Robock

NH Change in Growing Season (days) Year 1



SH Change in Growing Season (days) Year 1-2

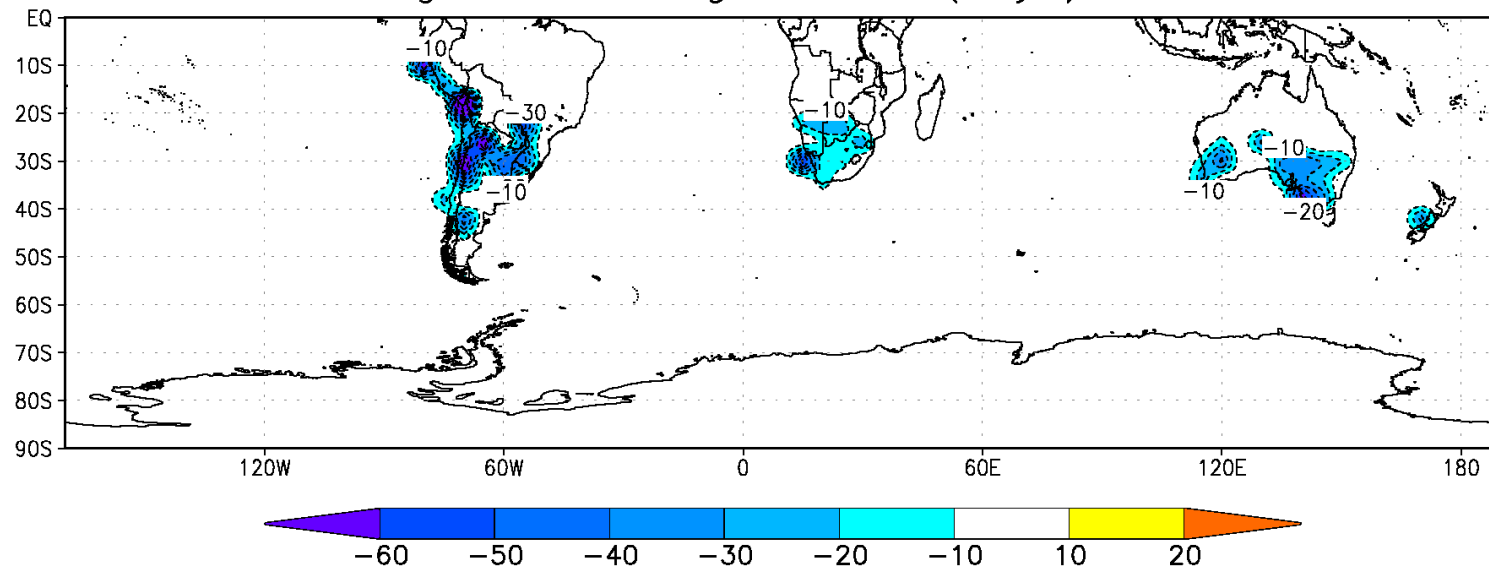


Chart courtesy of Alan Robock

Change in Precipitation (%) JJA Year 1

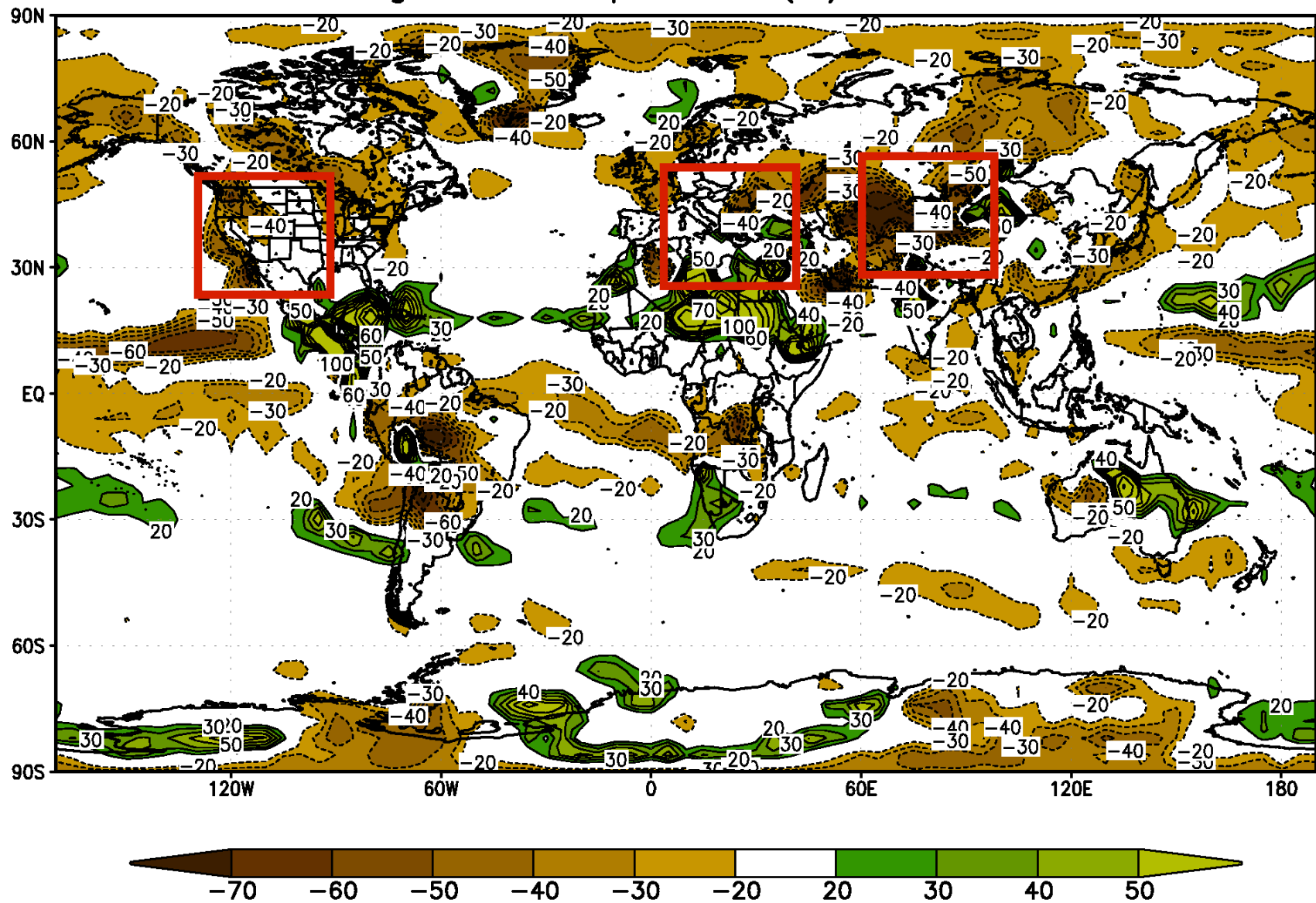


Chart courtesy of Alan Robock

Tambora Volcano

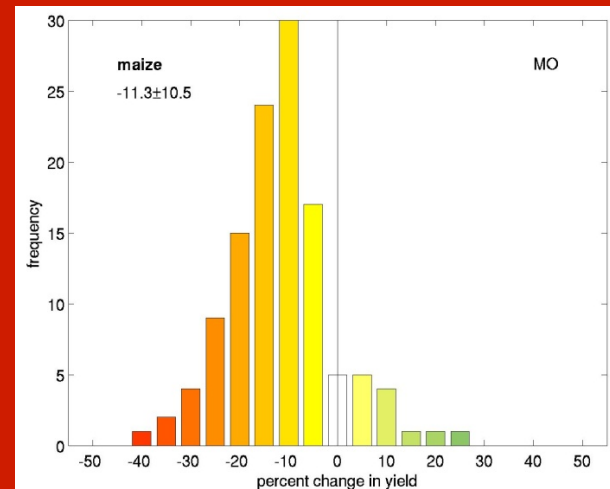
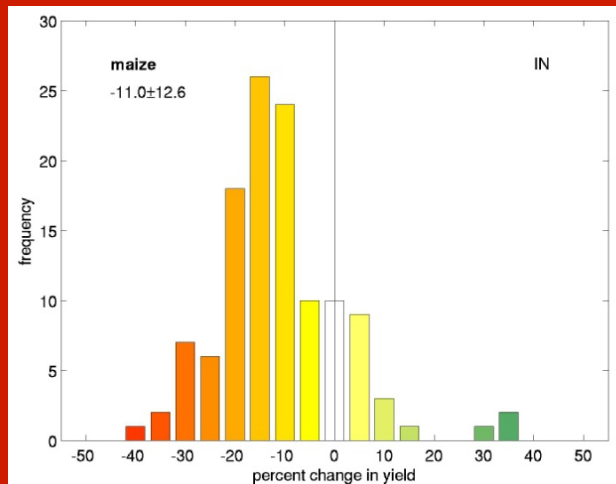
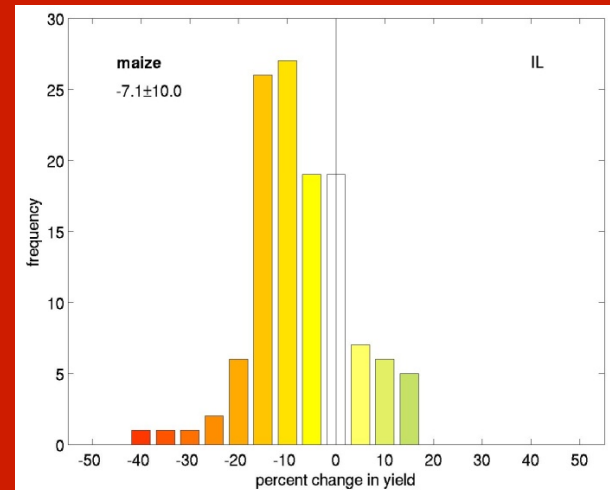
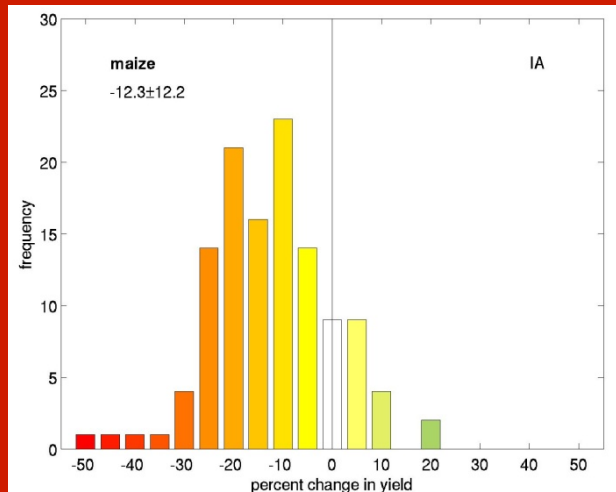


- Erupted April 1815
- -0.7 degrees C temperature drop
- Dramatic shortening of growing season
- Killing frosts in June, July and twice in August in US
- Famine reported in Ireland, France, Switzerland, the German states and India

Nuclear War: The Impact on Agriculture

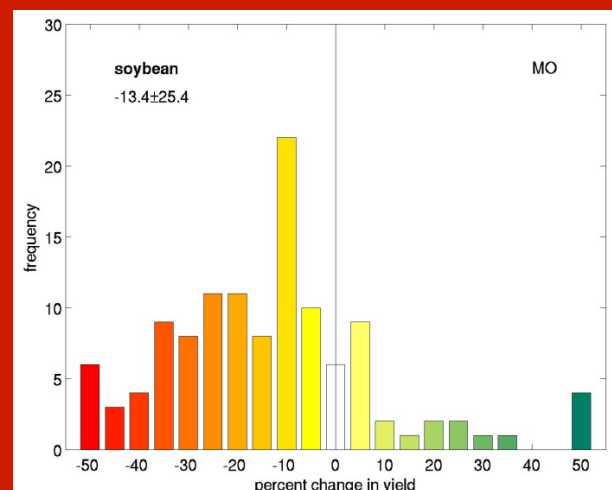
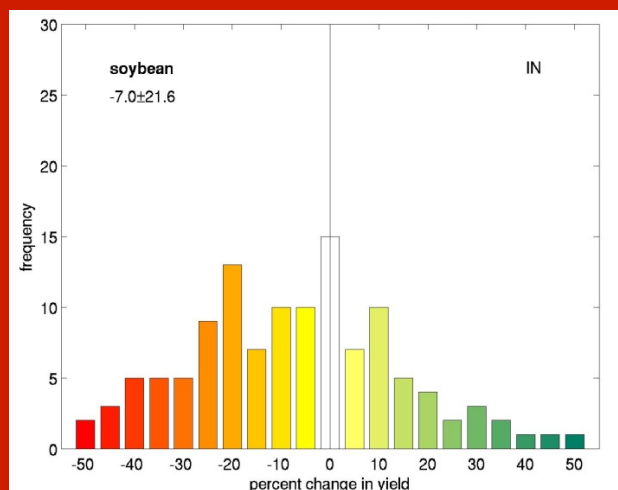
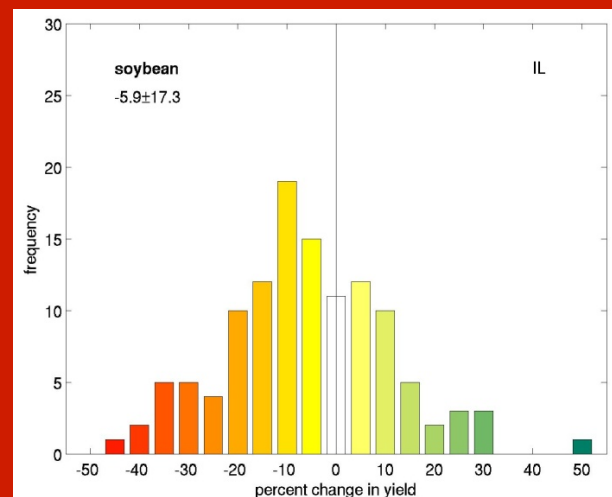
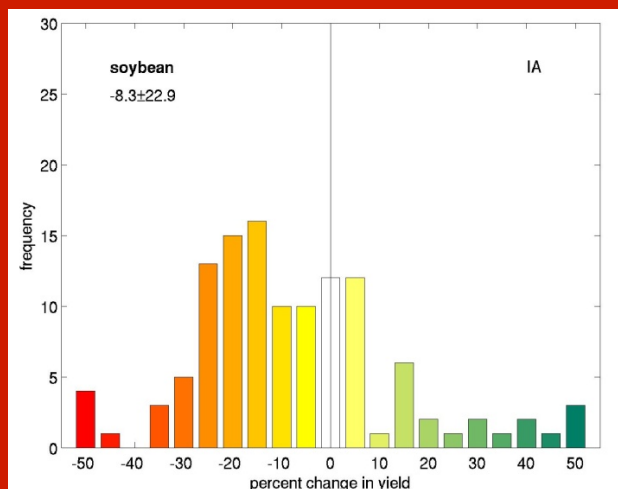
- **Sudden cooling**, decreased sunlight, less rainfall shortens growing seasons; reduces crop yields
- Stratospheric **ozone depletion** damages crops sensitive to UV-B
- **Disruption of petroleum supplies** affects use of farm machinery, fertilizer and pesticide production
- **Radioactive and toxic contamination** takes farmland out of production
- **Collapse** of distribution system

US Corn Production



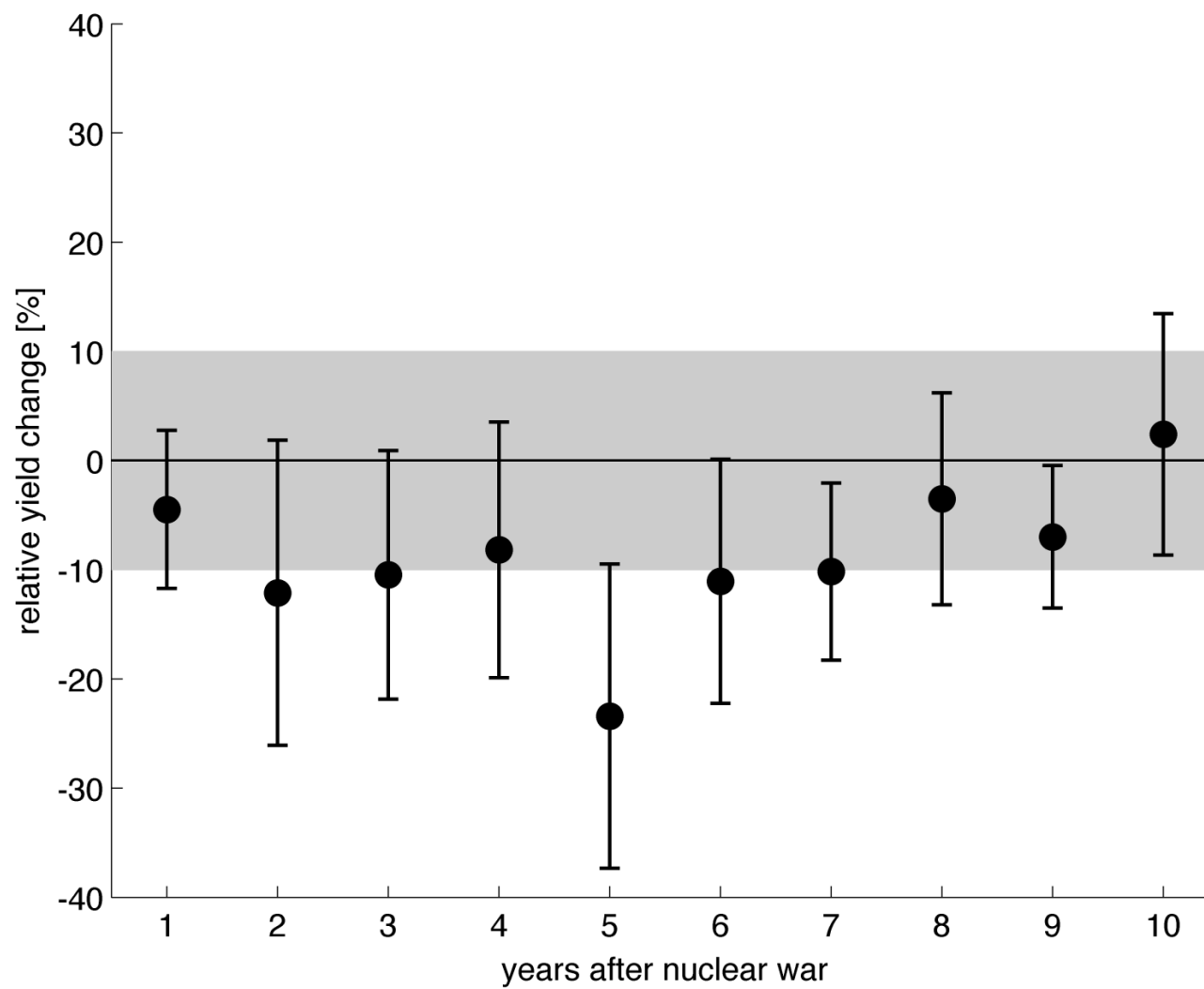
Probable change in maize production for 4 sites averaged over 10 years
Mutlu Ozdogan et al (2011)

US Soybean Production



Probable change soybean production 4 sites averaged over 10 years

Per Cent Decline in Corn Production over Time



Chinese Rice Production

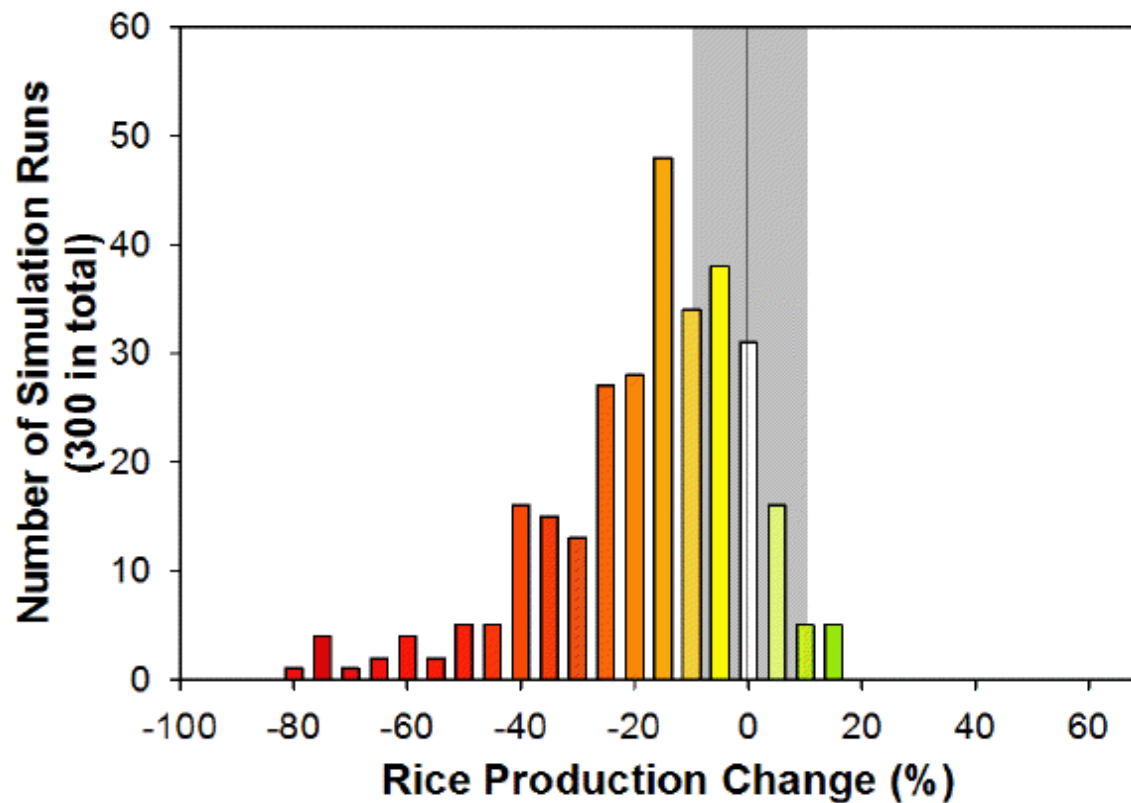


Figure 4: Distribution of rice production change (%): hot colors indicate negative changes and green shades indicate positive changes. The gray area shows ± 1 standard deviation from the control runs, illustrating the effect of interannual weather variations.

Decline in Rice Production Over Time

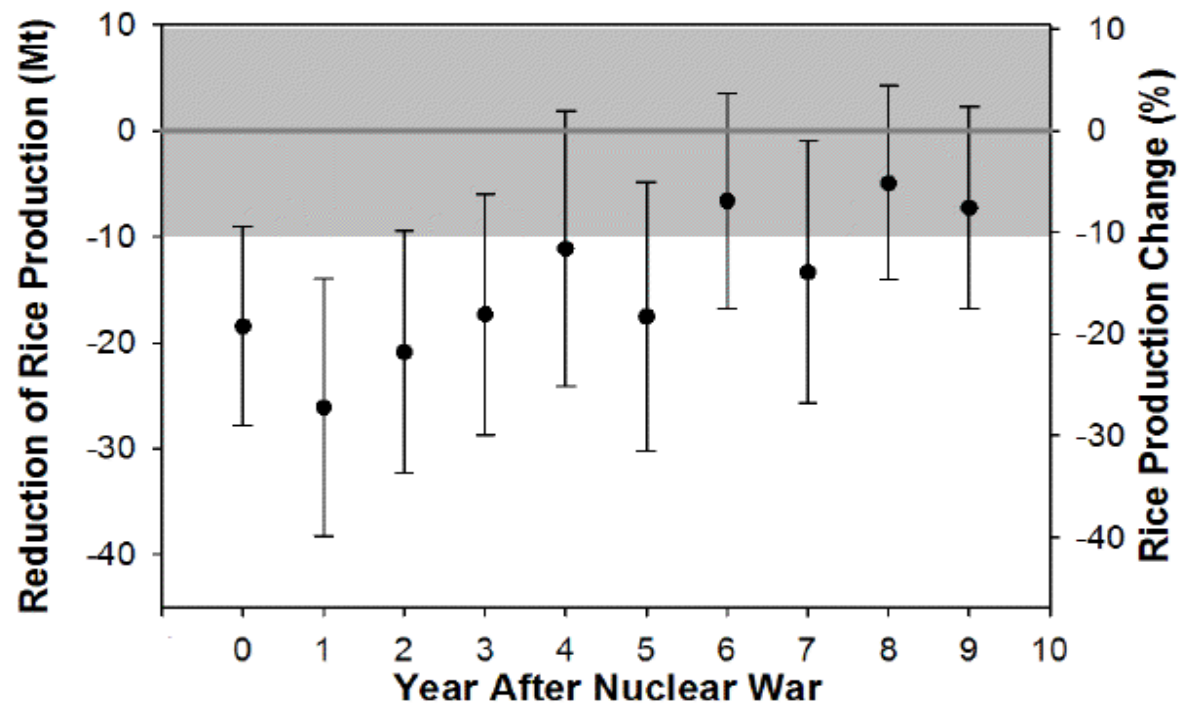


Figure 5: Reduction of rice production with whiskers showing one standard deviation for each nuclear war year. The gray area shows ± 1 standard deviation from the control runs, illustrating the effect of interannual weather variations.

Change in Rice Yield by Province

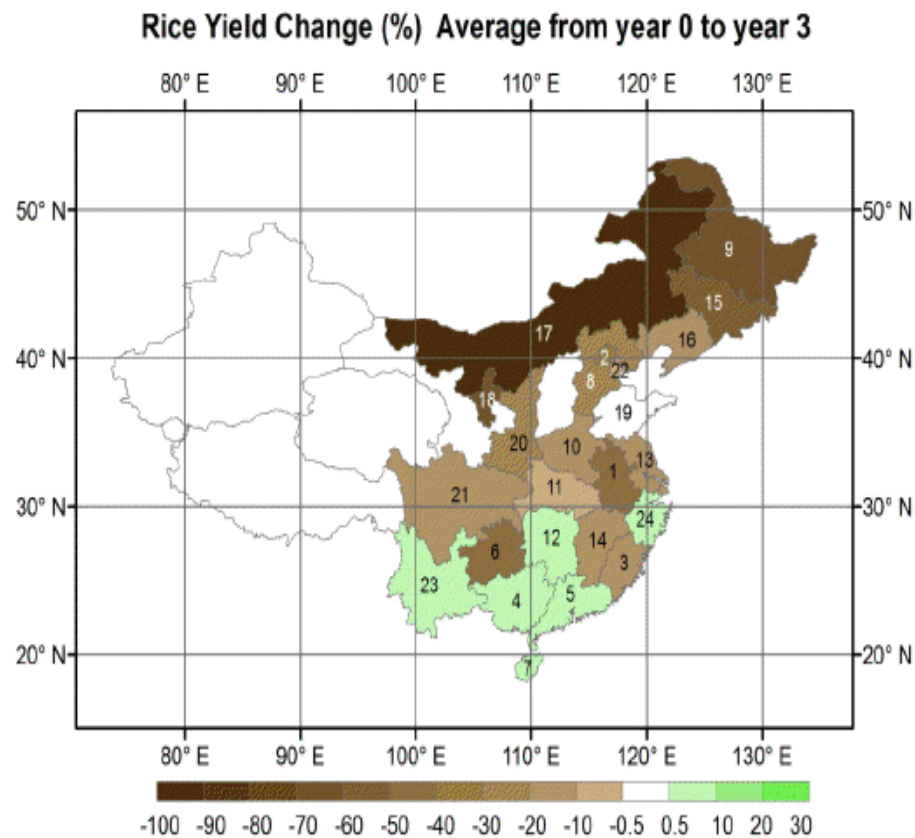
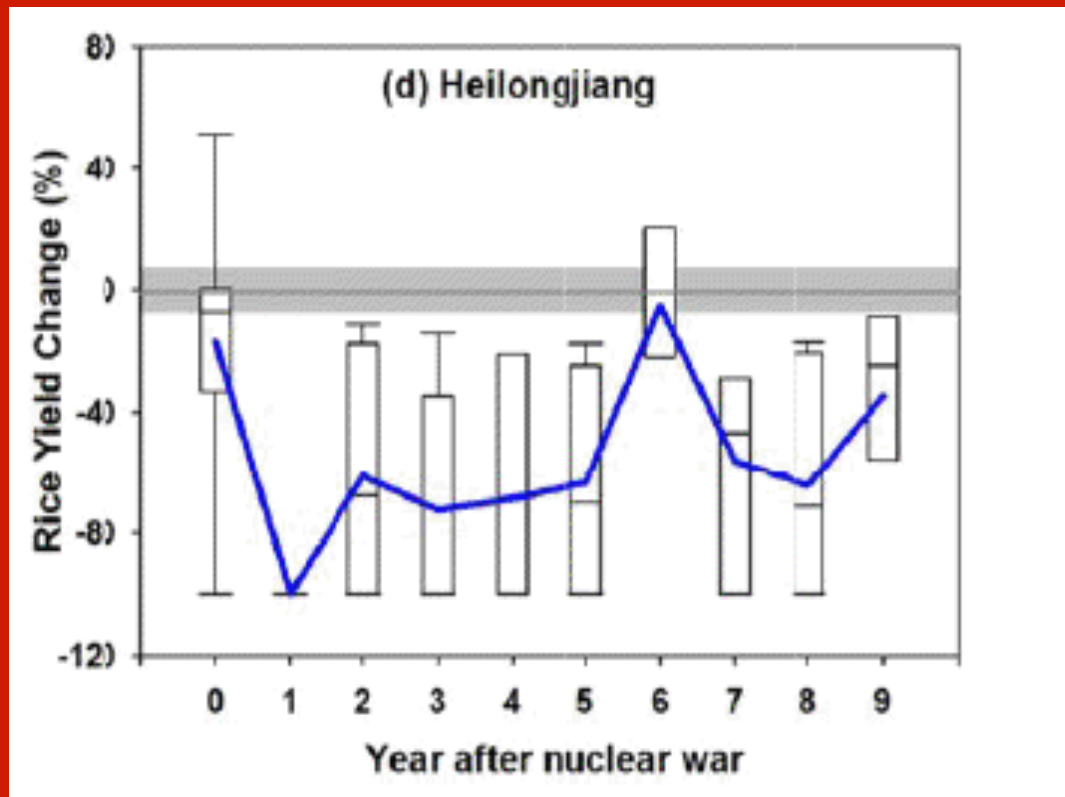


Figure 6: Map of rice yield reduction (%) for the first 4 years after regional nuclear conflict. Brown indicates negative change, and green indicates positive change. The numbers correspond to the names of the different provinces listed in Table 1. White regions without numbers are provinces for which we did not conduct model simulations.

Heilongjiang Province (36m people)



Global food reserves



100 to 120 days -> 70 to 80 days



Chronic Malnutrition Today

- 1,800-2,200 calories
minimum daily requirement
- 925 million people at or below
this level of daily intake

Conservative Nutrition Impact

- The rise in food prices associated with the average 1 year decline in food production would cause an additional 40 million people to become malnourished.
- The largest annual decline in food production in year 5 would cause 67 million to enter the ranks of the malnourished.
- The cumulative effect over 10 years would cause a total of 215 million people to become malnourished

Webb et al (2011)

Effect on Existing Malnourished

- 925 million people receive 1750 calories per day.
- 10% decrease puts entire group at risk if famine persists for full decade.
- If market turmoil causes big spike in food prices, the decline in food consumption would be much greater.



Great Bengal Famine of 1943

- Food production declined only 5%
- Actually 13% higher than 1941
- when there was no famine
- 3 million people died



**1 billion dead
from starvation
alone?**

Epidemic Disease

- Plague
- Cholera
- Malaria
- Typhus





...further use of nuclear weapons?

These findings require a
fundamental change in our
thinking about nuclear
weapons

First, we must understand that it is not only the arsenals of the US and Russia that pose a global threat.

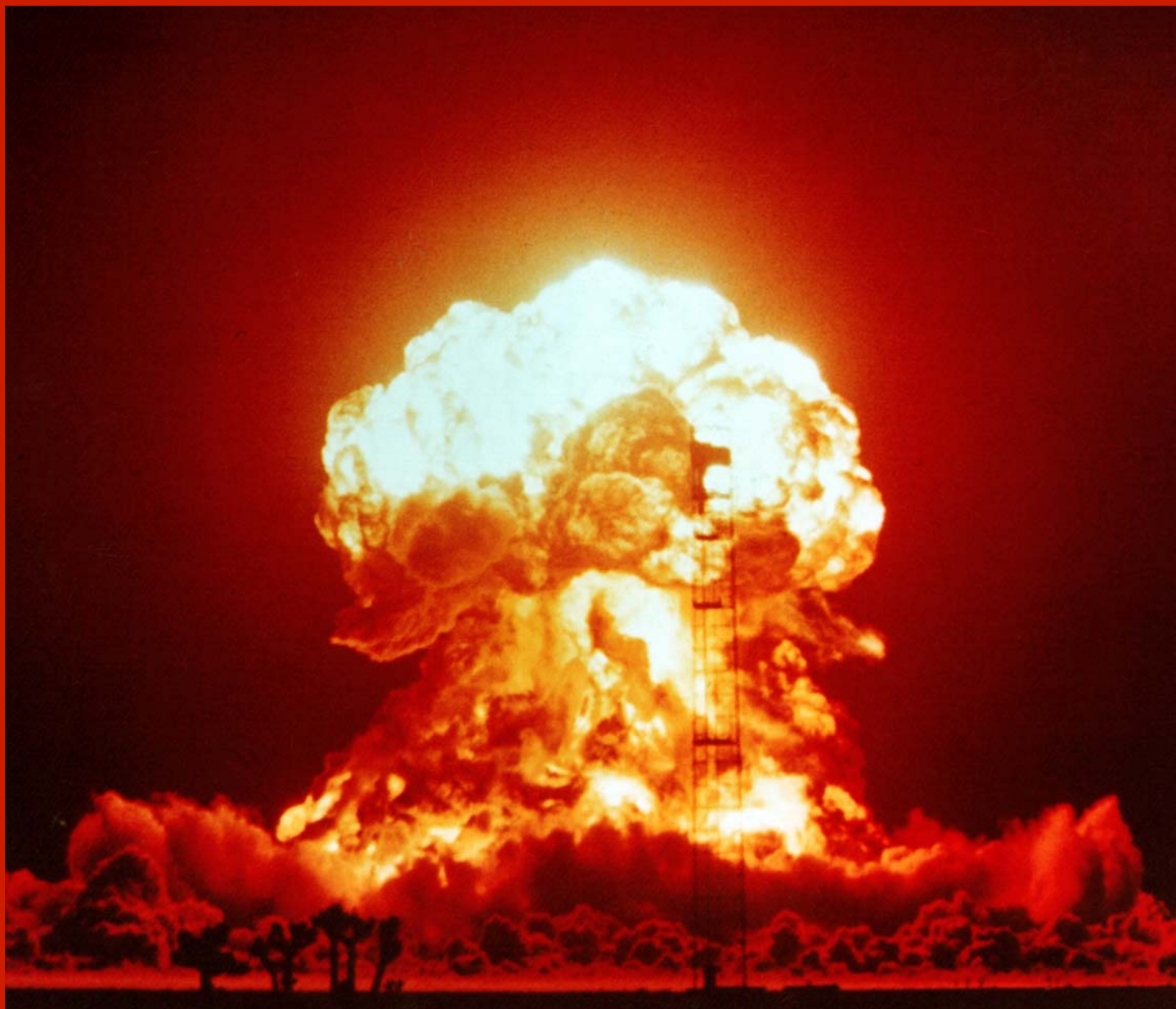
Smaller nuclear powers like India and Pakistan threaten not only each other, but all humanity

Second, we need to look at the much larger arsenals of the other nuclear powers, and particularly the US and Russia in a totally different way.

Trident Submarine

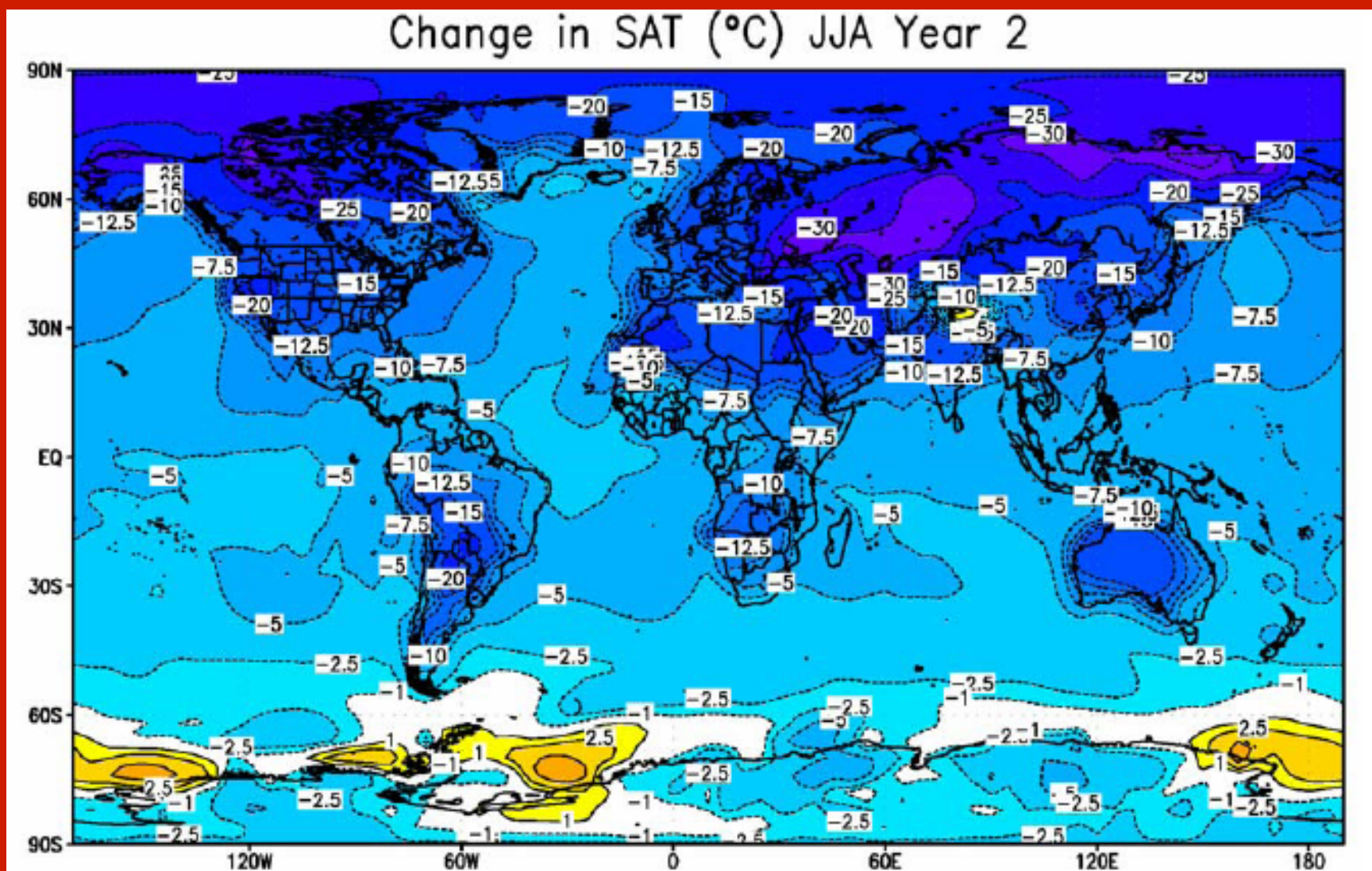


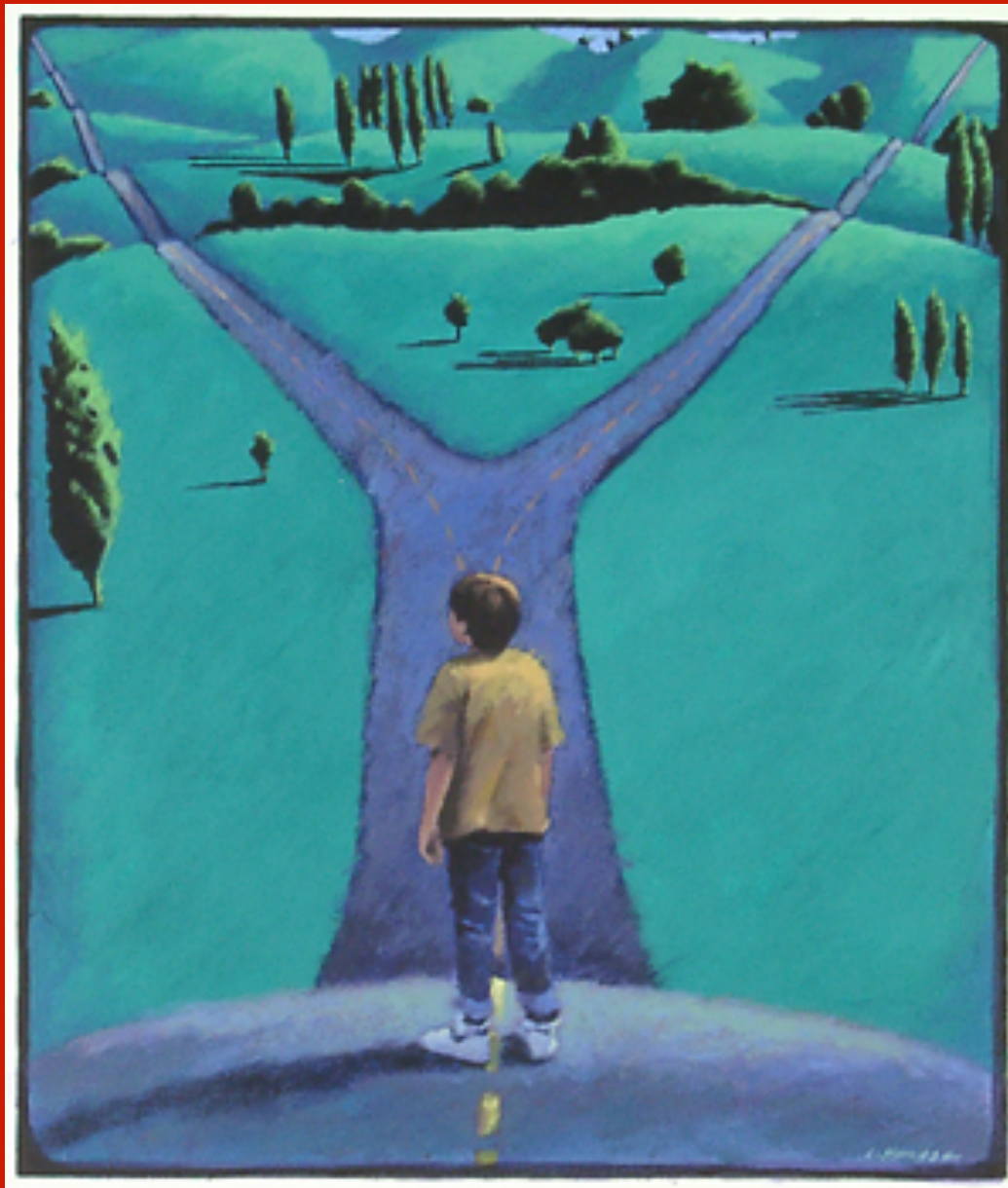
24 missiles, 96 warheads, each of which is 20 to 30 times more powerful than the Hiroshima-sized bombs used in the South Asian scenario... 14 subs!



New START allows for 1550 weapons each...

Surface Air Temperatures 2 years after 150 million tons of smoke enters stratosphere





The study contains a number of conservative biases that tend to Underestimate the impact: 1) 100 Hiroshimas could generate up to 6.6 Tg. We only assume 5 Tg. South Asian arsenals have up to 200 weapons; we only use 100. 3) Many of thewse weapons are up to 45 KT; we assume all are only 15KT. 4) One of the climate models has suggested that 5 Tg drops temperatures by up to 2 degrees; we assume only 1.3 degrees. 5) Neithr food study takes into account effect Of increased UV light, or of daily temperature extremes (ie “frost events”) Which might greatly increase the crop loss. 6) Model assumes that markets Continue to behave “rationally” and that food prices only go up 19.7 % with a 20 % drop in food production. Actual experience suggests that markets will Behave very irrationally and prices may go up much, much more.