



**NIEHS**

**National Institute of  
Environmental Health Sciences**



## **Climate Change and Health**

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## What is Weather? What is Climate?

- Weather – state of atmosphere – wind, temperature, clouds, moisture, air pressure.
- Climate -- average weather conditions at a particular place over a long period of time.
- Climate change is any long-term significant alteration in the weather patterns.





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## How do we know that the earth is warming?

- Observations
- Predictive modeling



## Aerial View of Arctic Sea Ice

- Arctic summer sea ice is melting at a significantly faster rate than projected.
- The IPCC estimated that the Arctic could be free of summer sea ice somewhere between 2050 and 2100.



1979 SSMI Composite Data



2003 SSMI Composite Data

# HEALTH EFFECTS OF CLIMATE CHANGE



*Temperature Rise* <sup>1</sup>

*Sea level Rise* <sup>2</sup>

*Hydrologic Extremes*

<sup>1</sup> 3°C by yr. 2100  
<sup>2</sup> 40 cm " "  
IPCC estimates

**Urban Heat Island Effect**

→ Heat Stress  
Cardiorespiratory failure

**Air Pollution & Aeroallergens**

→ Respiratory diseases, e.g.,  
COPD & Asthma

**Vector-borne Diseases**

Malaria  
Dengue  
Encephalitis  
Hantavirus  
Rift Valley Fever

**Water-borne Diseases**

Cholera  
Cyclospora  
Cryptosporidiosis  
Campylobacter  
Leptospirosis

**Water resources & food supply**

→ Malnutrition  
Diarrhea  
Toxic Red Tides

**Mental Health & Environmental Refugees**

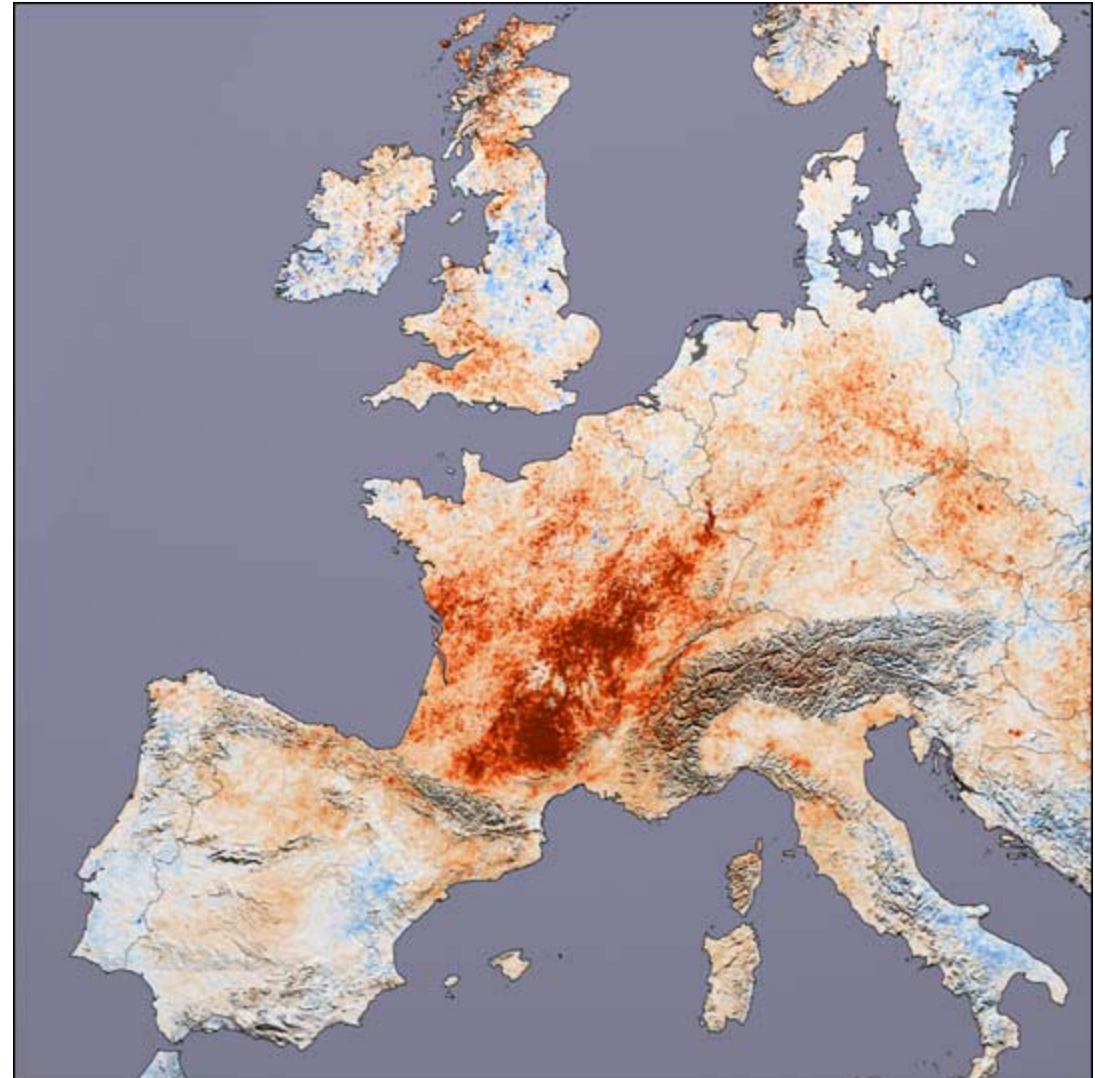
→ Forced Migration  
Overcrowding  
Infectious diseases  
Human Conflicts

*Patz, 1998*

## Extreme Weather Events

### Example: 2003 EUROPEAN HEAT WAVE

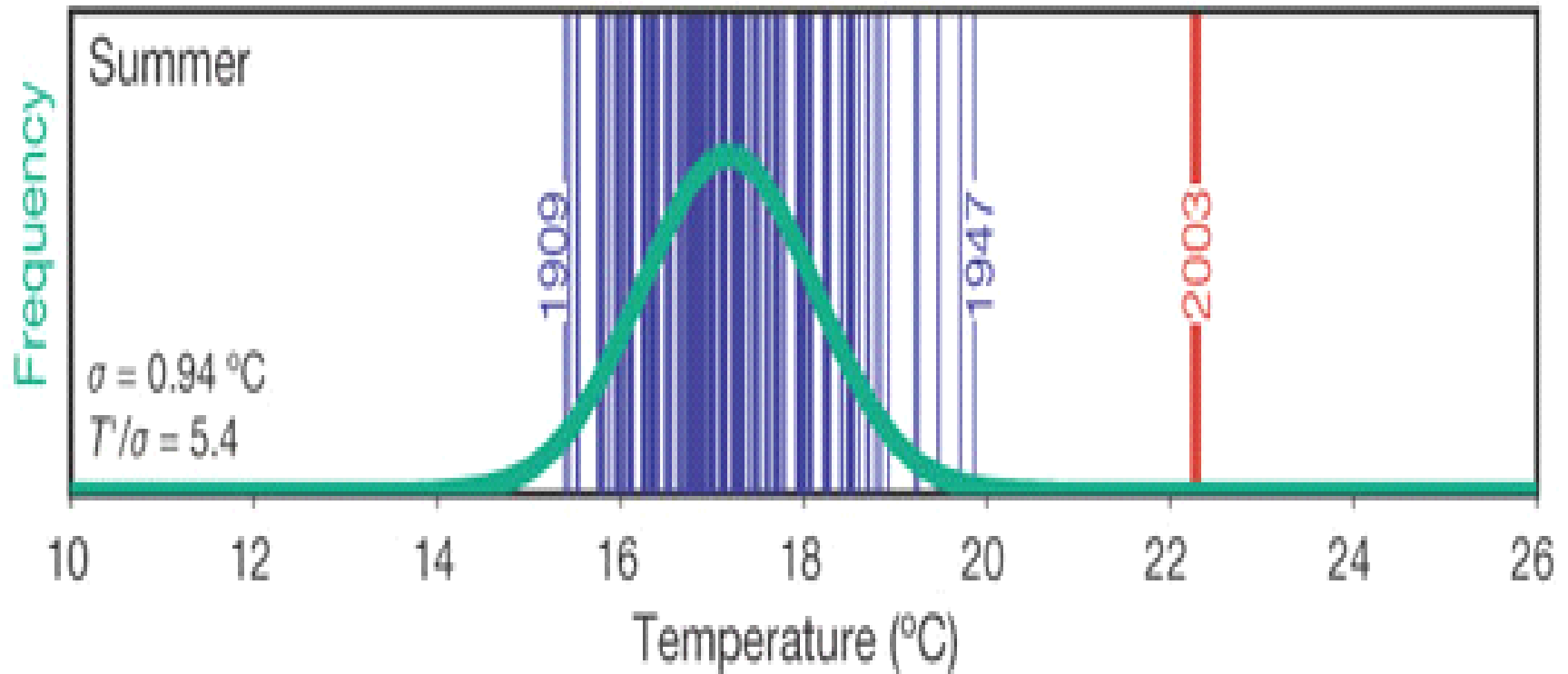
- One of the hottest summers on record in Europe.
- 35,000 people died as a result of the heat wave.
- Night-time temperatures did not fall.
- Climate scientists predict that heat waves will be longer, more severe, and twice as frequent.



Temperature Anomaly (°C)



## Comparing the 2003 Heatwave to past summer climate



European heat wave of 2003, from Schär et al., 2004

## Sea Level Rise and Poor Health Outcomes

- A 1-meter rise in sea level would create millions of refugees. In Bangladesh alone, tens of millions of people would be displaced.
- New breeding grounds for cholera and other pathogens.
- Loss of infrastructure: roads, hospitals, agriculture, clean water, sanitation...





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## What about Forest Fires?

- Changes in temperature and precipitation patterns -- longer and more severe fire seasons.
- Atmospheric haze creates health problems, including worsening asthma; and causes flight cancellations, airport and school closures, among other challenges.
- Wildlife habitats and wildlife displacement.



## Spread of infectious agents: Malaria

- Malaria, caused by a parasite carried by a mosquito, kills nearly 2 million people each year.
- Warming of the planet thought to be associated with malaria found at higher altitudes, contributing to increasing incidence of disease.
- Standing water, residual from floods and other extreme weather events, fertile breeding ground for malaria vectors.



**Asian Tiger Mosquito**

- Food insecurity – malnutrition
- UV radiation, ozone hole
- Conflict
- Mental health implications



## Who are most vulnerable to the health impacts of climate change?

- Children. WHO projects that children will bear the greatest burden (malaria, malnutrition, trauma in acute situations, diarrheal disease).
- Elderly.
- Indigenous people.
- Those on the margins of society -- including poor, disenfranchised.



## How can health research help?

- Knowledge about normal development and function and abnormal or disease states (respiratory disease, cardiovascular disease, mental illness) AND how risk factors are involved in the establishment and progression of disease
- Fostering understanding of how humans and ecosystems interact.
- Informs policies aimed at protecting and improving health – evidence-based decisionmaking
- Development and implementation of prevention and treatment strategies. Prediction and prevention of ill health is the goal.



*An image of the Earth from space*

*Courtesy of NASA*



## What can you do?

Understand the links between climate change and health.

----Ask questions about energy sources and how energy production, development, distribution and use (combustion) impacts human health.

•Think about sustainable technologies and impacts on the environment of individual and collective decisions.



## Learn more! References

- IPCC - Intergovernmental Panel on Climate Change (<http://www.ipcc.ch/>)
- WHO - World Health Organization (<http://www.who.int/en/>)
- The National Academies: Advisers to the Nation on Science (<http://www.nationalacademies.org/>)
- NIEHS - <http://www.niehs.nih.gov>
- Framing the NIEHS Agenda on Climate Change – Meeting Report (<http://www.niehs.nih.gov/about/od/associate/docs/framingreport.pdf>)

