UNISDR Global Wildland Fire Network

GLOBAL FIRE MONITORING CENTRE (GFMC)

UN - ISDR / GFMC Global Wildland Fire Network
Regional South East European / Caucasus Wildland Fire Network

Climate change and forest fires risk

Johann G. Goldammer and Nikola Nikolov

European and Mediterranean Workshop
CLIMATE CHANGE IMPACT ON WATER-RELATED AND MARINE RISKS
26-27 October 2009
Murcia (Spain)

EUR-OPA MAJOR HAZARDS AGREEMENT
ACCORD EUR-OPA RISQUES MAJEURS

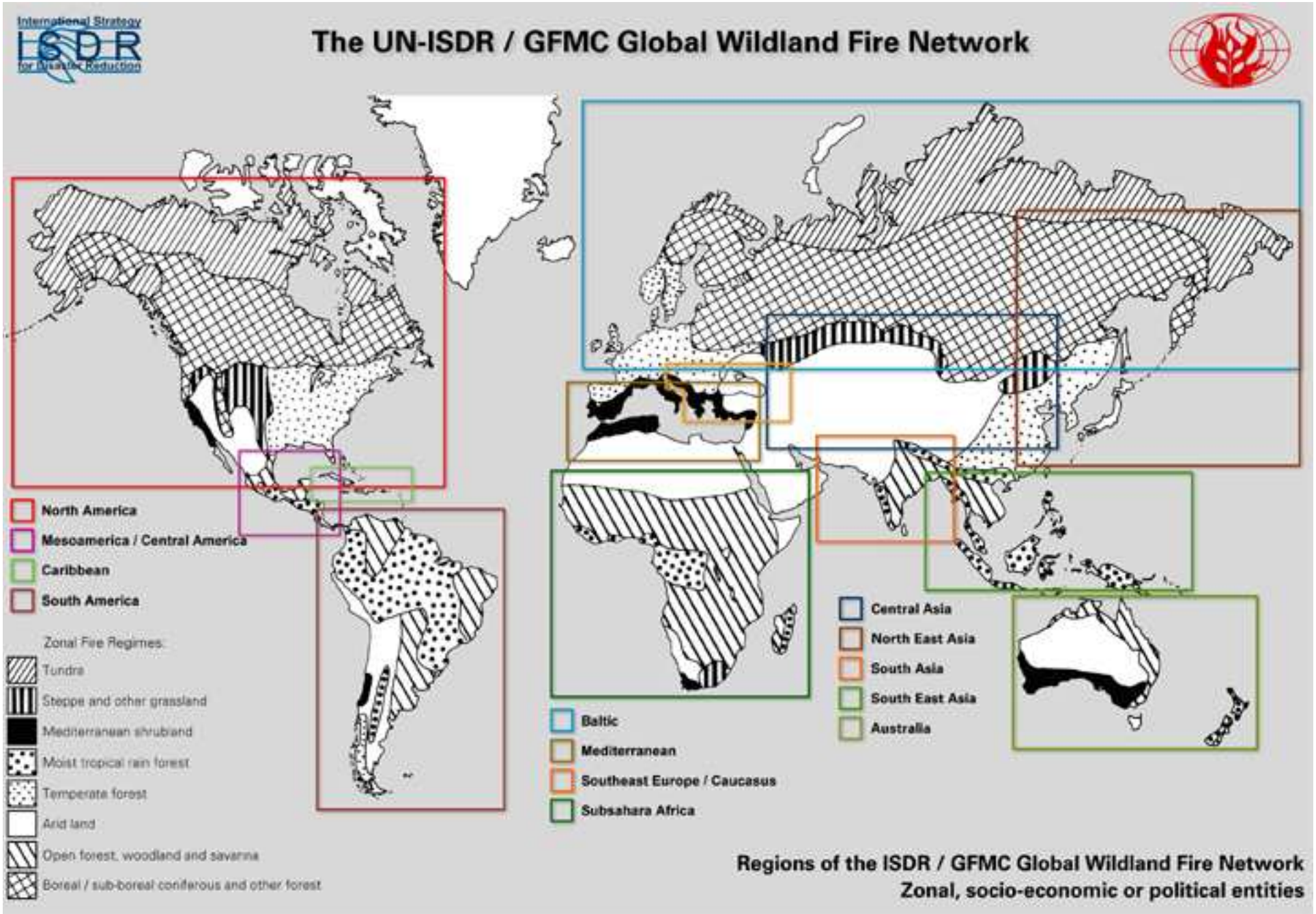
60 YEARS ANS 2009

COUNCIL OF EUROPE CONSEIL DE L'EUROPE

GOBIERNO DE ESPAÑA MINISTERIO DEL INTERIOR

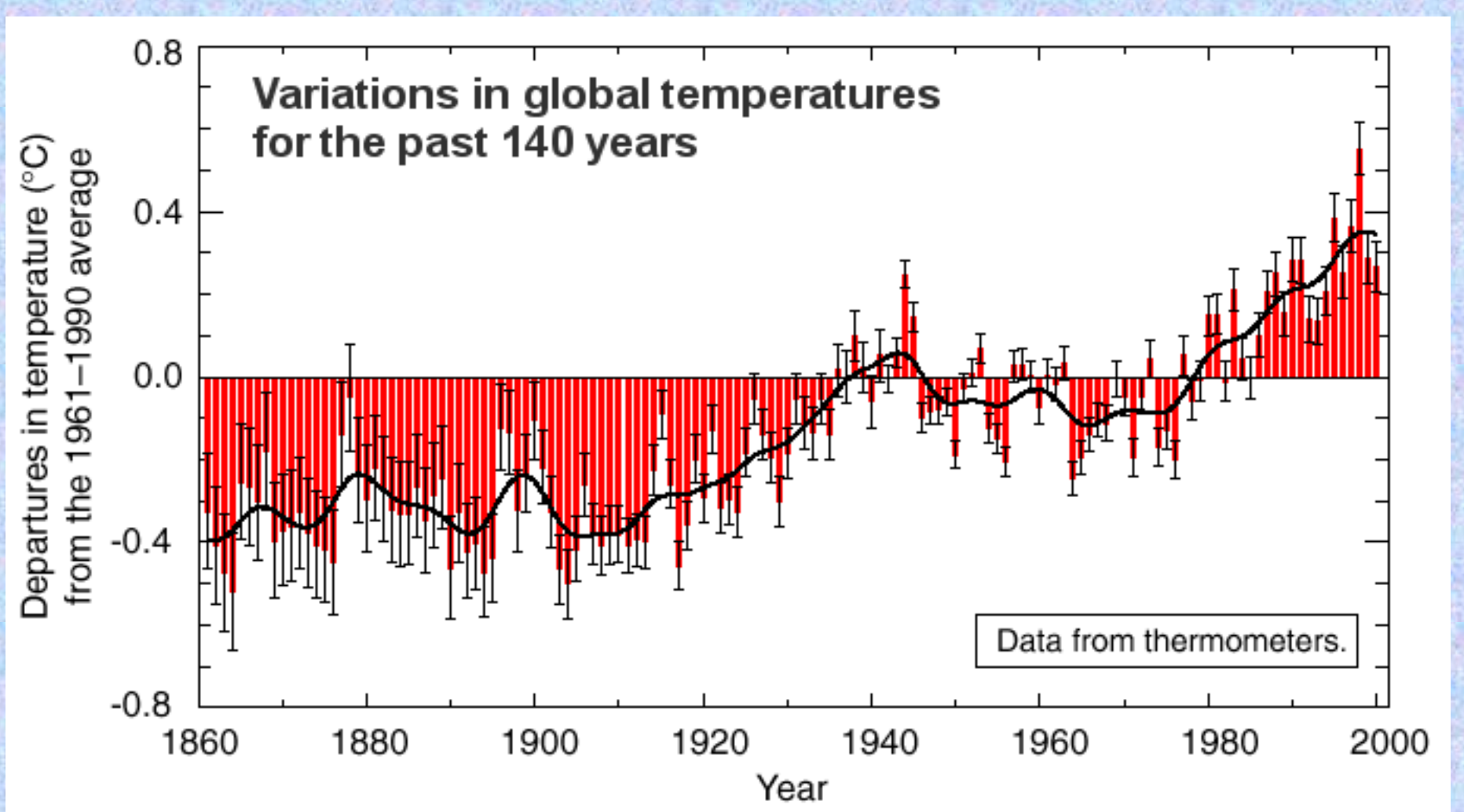
Dirección General de Protección Civil y Emergencias

http://www.fire.uni-freiburg.de



“Global warming”

“Climate change”


Variations in global temperatures
for the past 140 years
Departures in temperature (°C)
from the 1961–1990 average
0.8
0.4
0.0
-0.4
-0.8
1860
1880
1900
1920
1940
1960
1980
2000
Year
Data from thermometers.

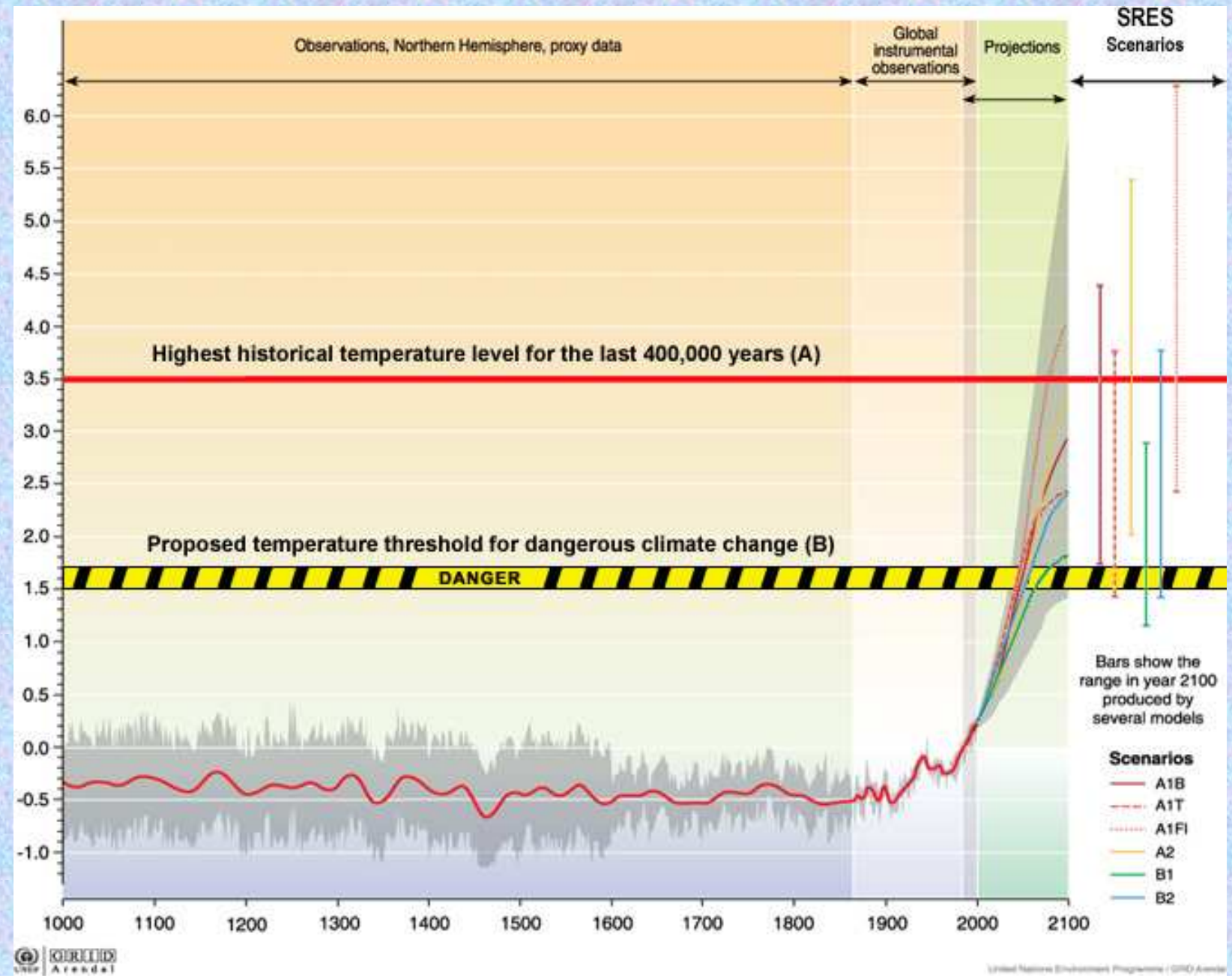

INTERGOVERNMENTAL
PANEL ON CLIMATE
CHANGE

In order to work out what kind of action should be taken on global warming, the United Nations Intergovernmental Panel on Climate Change (IPCC), created a forecast on what the climate conditions will be like by the end of the century. This forecast was called the Special Report on Emissions Scenarios (SRES).

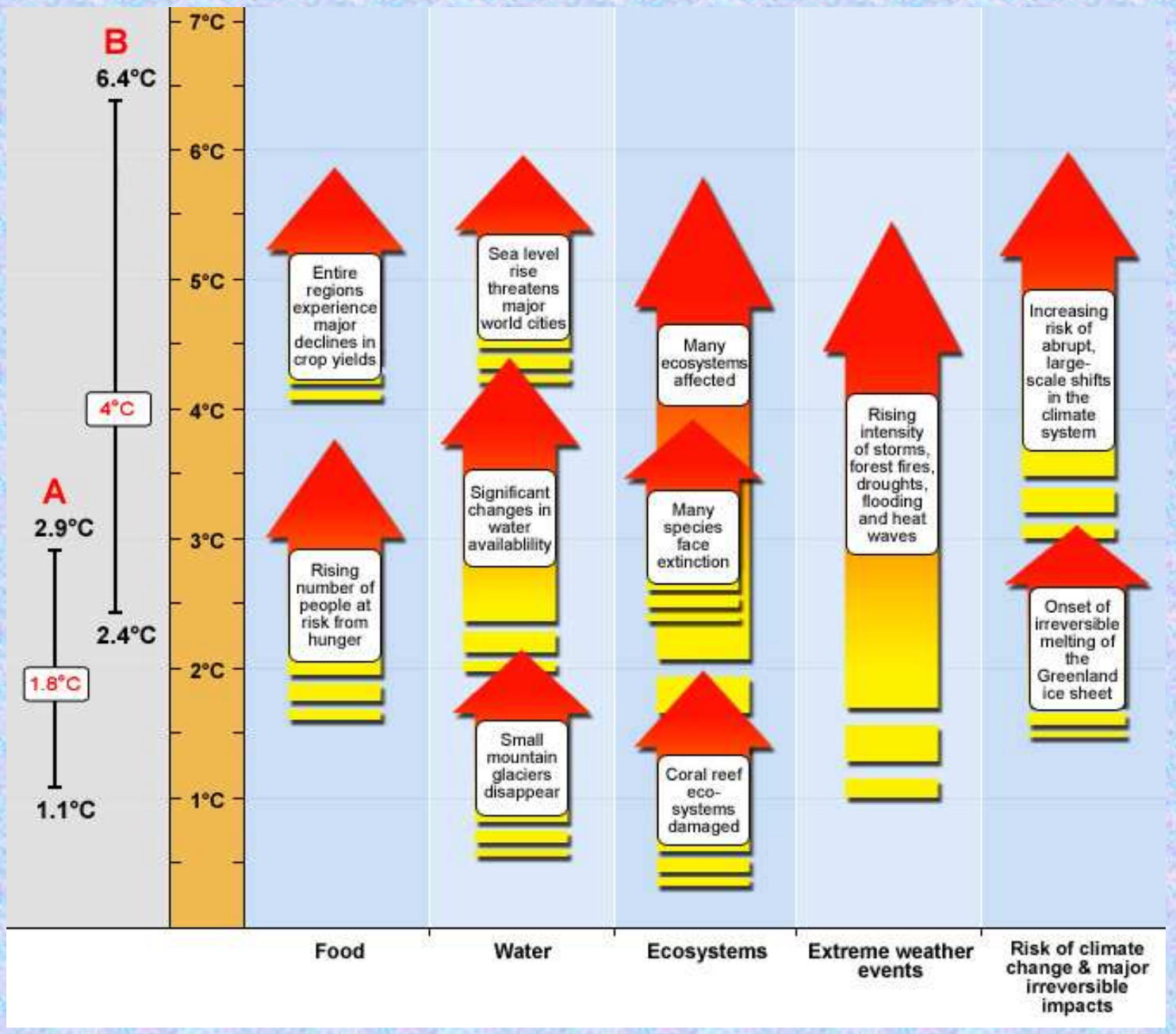
SRES Temperature forecasts

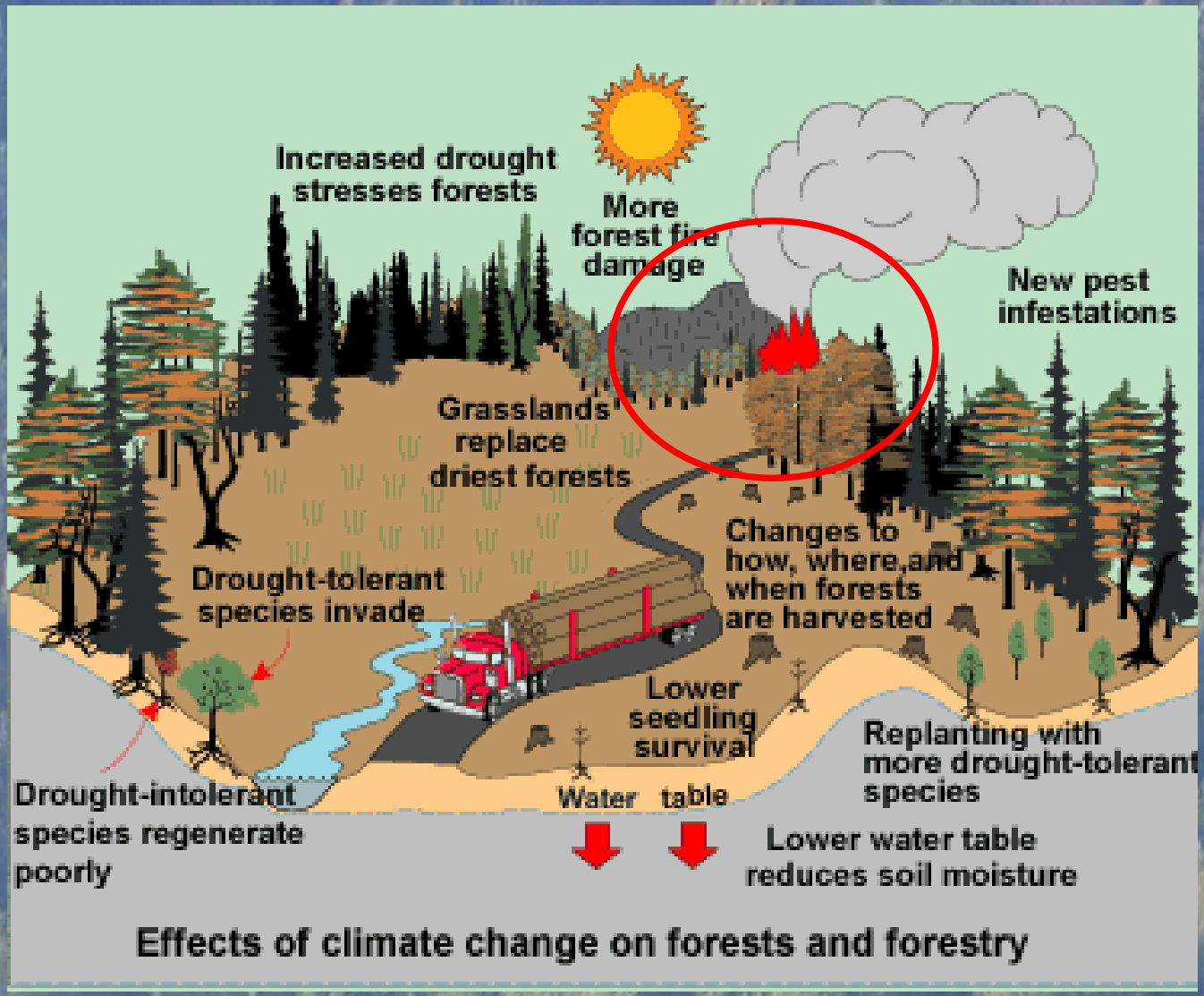
Case	Temperature increase Best estimate to 2100	Temperature increase Likely range to 2100
B1 scenario	+1.8	+1.1 – 2.9
A1T scenario	+2.4	+1.4 – 3.8
B2 scenario	+2.4	+1.4 – 3.8
A1B scenario	+2.8	+1.7 – 4.4
A2 scenario	+3.4	+2.0 – 5.4
A1FI scenario	+4.0	+2.4 – 6.4

Departures in temperature in ℃ (from the 1990 valu e)



Global Warming Impacts




Increased drought stresses forests
More forest fire damage
New pest infestations
Grasslands replace driest forests
Changes to how, where,and when forests are harvested
Drought-tolerant species invade
Lower seedling survival
Replanting with more drought-tolerant species
Drought-intolerant species regenerate poorly
Water table
Lower water table reduces soil moisture
Effects of climate change on forests and forestry

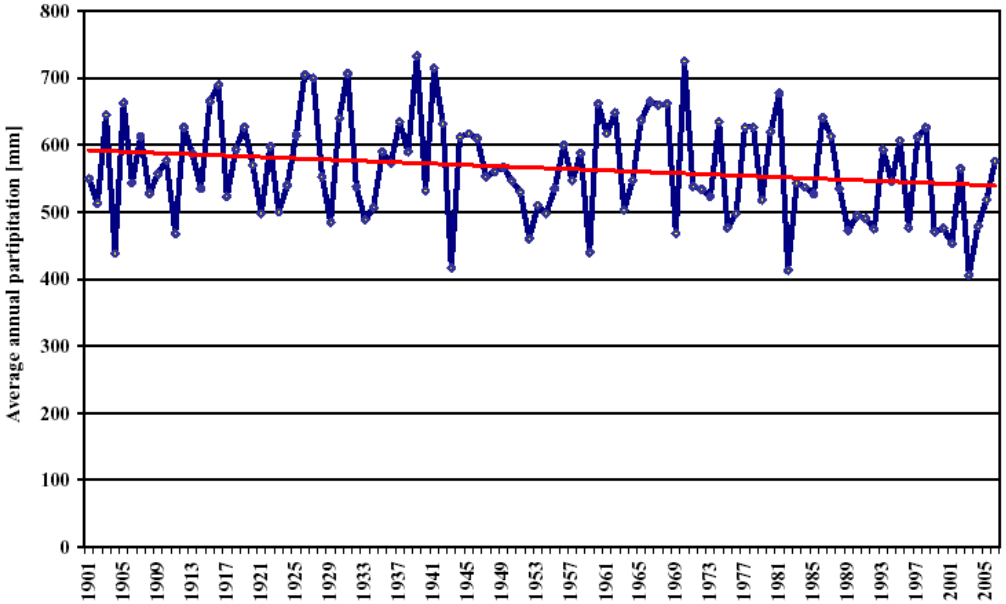


Figure 2—Variations in mean annual total precipitation levels in Poland from 1901 to 2006

Impact from global warming on the occurrence of forest fires in Poland

Ryszard Szczygieł, Barbara Ubysz, Józef Piwnicki

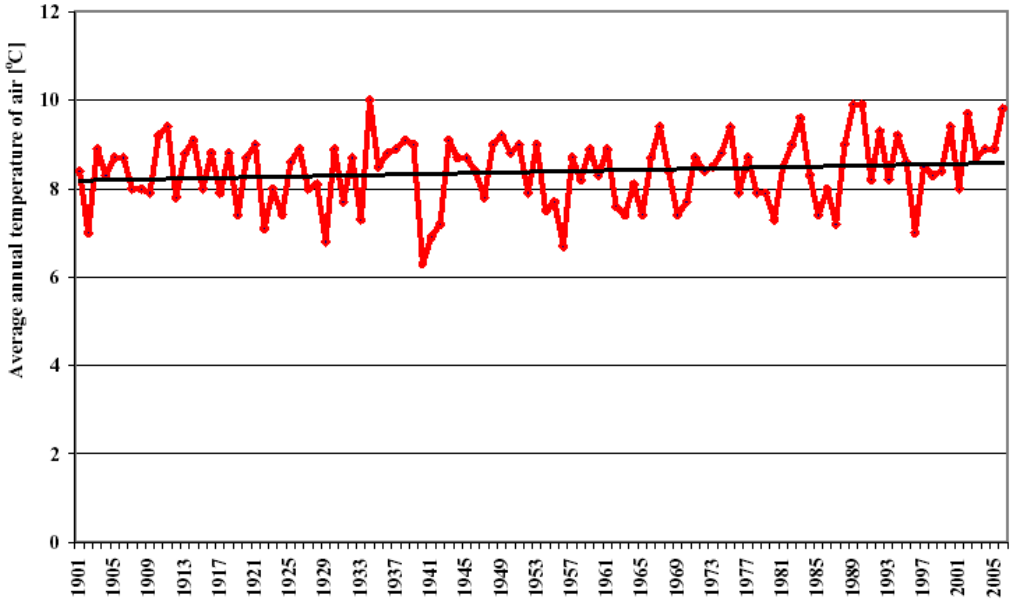


Figure 3—Variations in mean annual air temperature levels in Poland from 1901 to 2006

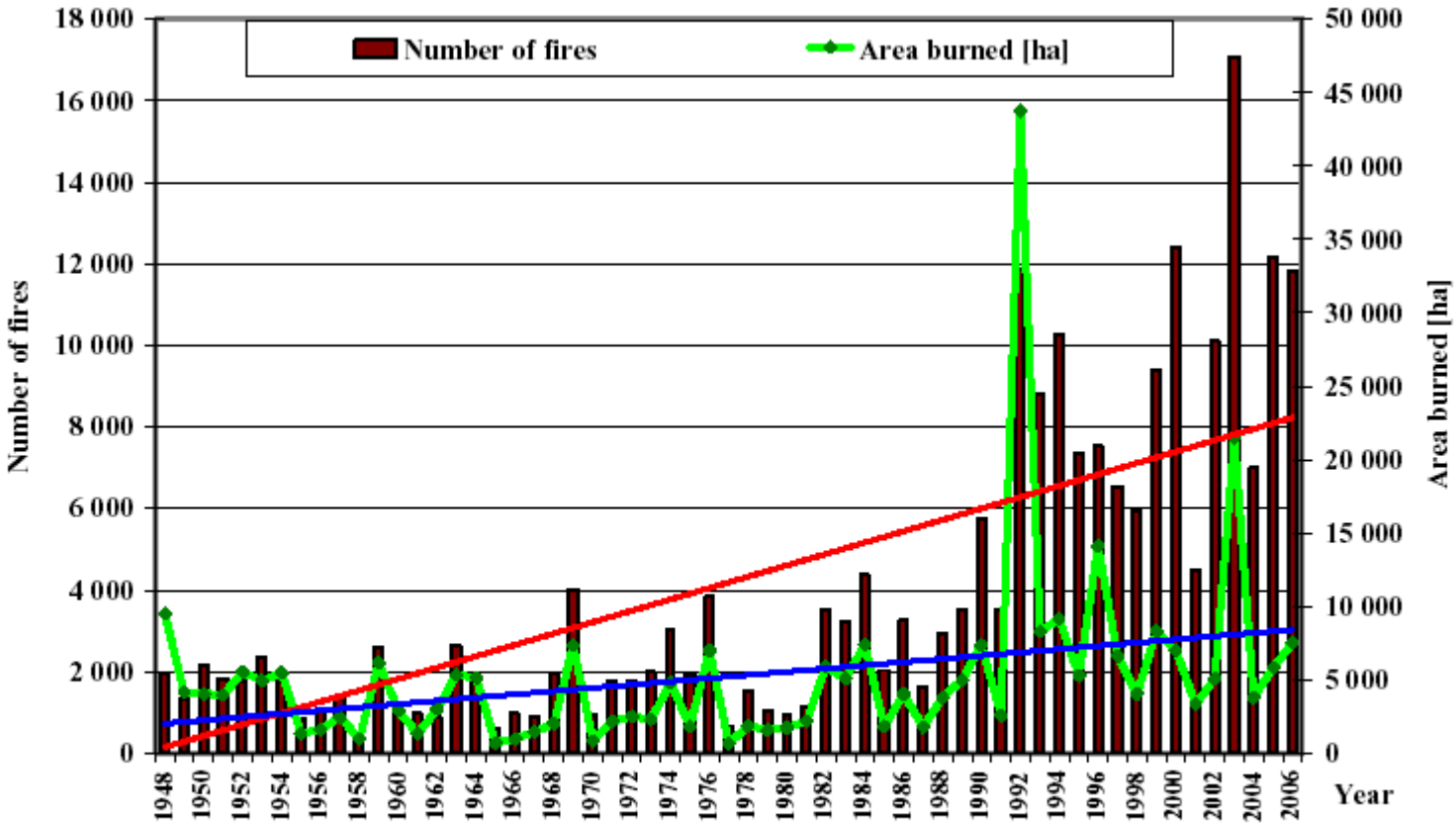


Figure 4—The number of forest fires and the area burnt in Poland from 1948 to 2006 and the trends which characterised them

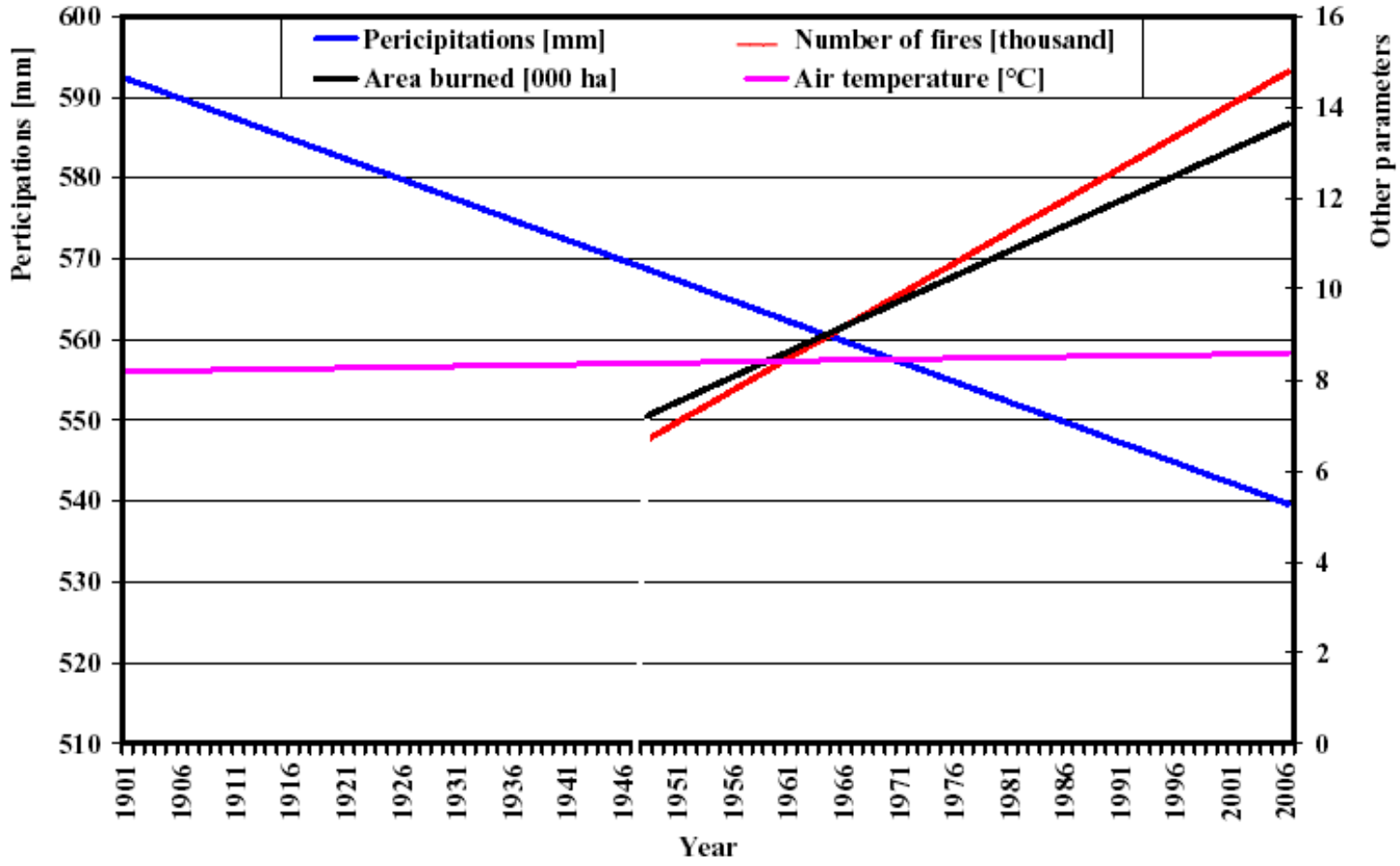


Figure 5—The trends of change in mean annual precipitation levels, air temperature levels, the number of forest fires and the area burnt in Poland from 1948 to 2006

FAO global assessment of forest fires-2005

ROME - Climate change is making forest fires around the world bigger and more intense, increasing the threat to people and the environment and costing countries millions in damage and firefighting expenses, the United Nations reports.

Mediterranean countries also said that warmer temperatures and reduced rainfall in summer — both associated with climate change — would increase the risk of fires in the region and beyond.

JRC Scientific and Technical Reports

Report No 9

Forest Fires in Europe 2008

EUR 23971 EN - 2009

JRC EUROPEAN COMMISSION ies DIRECTORATE-GENERAL ENVIRONMENT

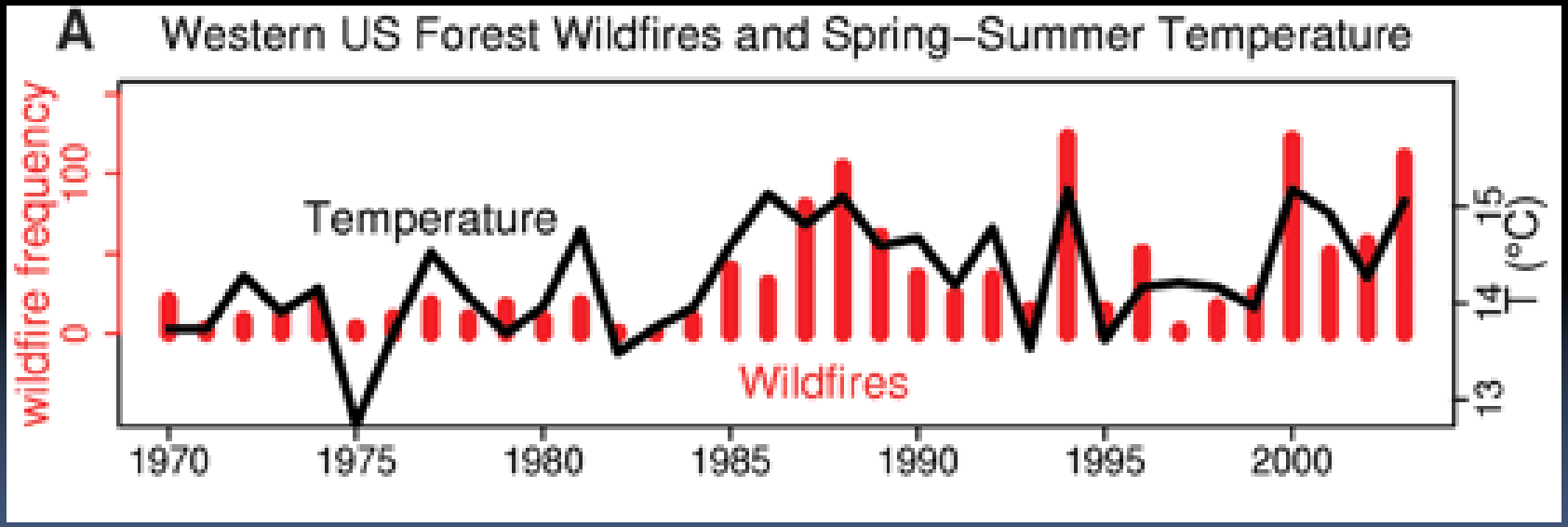
Table 1. Number of fires and burnt area in the five Southern Member States in the last 29 years.

Number of fires	PORTUGAL	SPAIN	FRANCE	ITALY	GREECE(*)	TOTAL
2008	13 832	11 612	2 781	6 486	1 481	36 192
% of total in 2008	38%	32%	8%	18%	4%	100%
Average 1980-1989	7 381	9 515	4 910	11 575	1 264	34 645
Average 1990-1999	22 250	18 152	5 538	11 164	1 748	58 851
Average 2000-2008	24 819	18 664	4 362	7 463	1 765	57 073
Average 1980-2008	17 920	15 333	4 956	10 157	1 586	49 952
TOTAL (1980-2008)	519 686	444 647	143 731	294 555	45 995	1 448 614

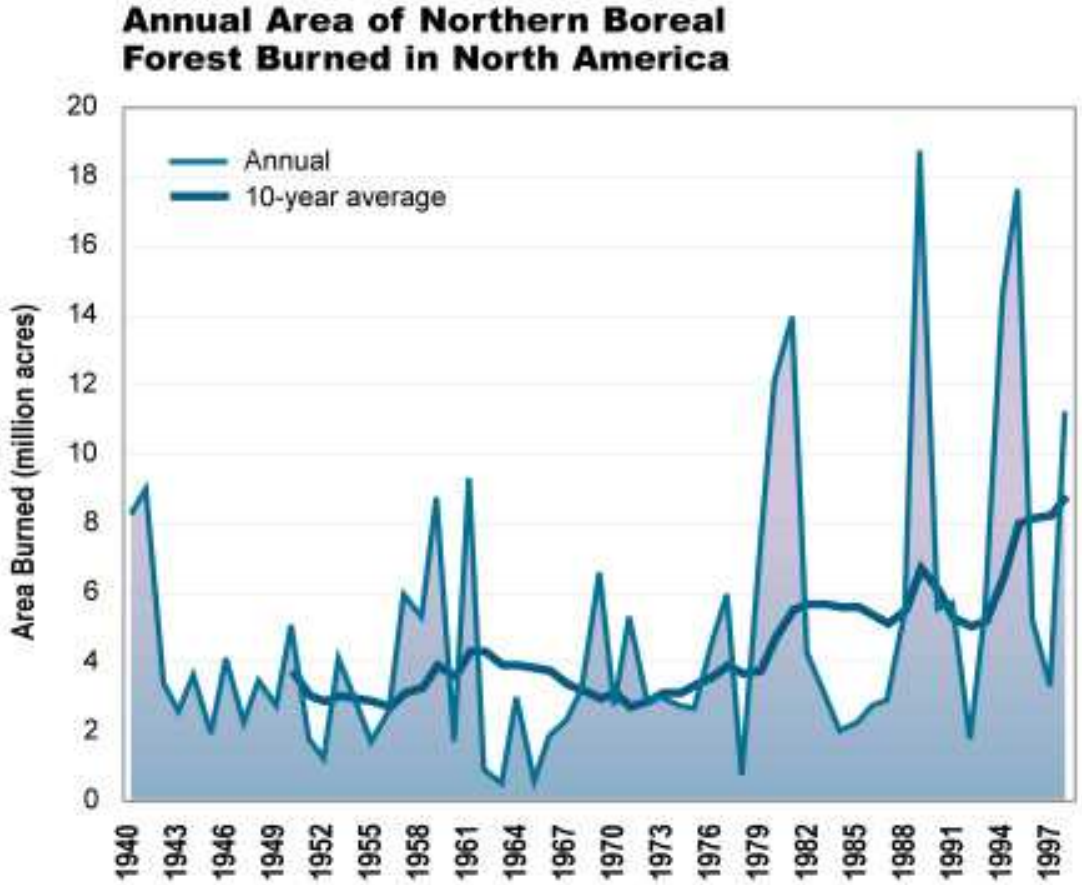
Burnt areas (ha)	PORTUGAL	SPAIN	FRANCE	ITALY	GREECE(*)	TOTAL
2008	17,244	39,895	6,001	66,329	29,152	158,621
% of total in 2008	11%	25%	4%	42%	18%	100%
Average 1980-1989	73,484	244,788	39,157	147,150	52,417	556,995
Average 1990-1999	102,203	161,319	22,735	118,573	44,108	448,938
Average 2000-2008	157,066	125,687	22,935	85,047	50,782	441,517
Average 1980-2008	109,327	179,043	28,460	118,022	49,044	483,896
TOTAL (1980-2008)	3,170,470	5,192,248	825,332	3,422,650	1,422,282	14,032,982

(*) Provisional data for 2008.

North American researchers reported that the incidence and severity of fires "will increase dramatically" with global warming.

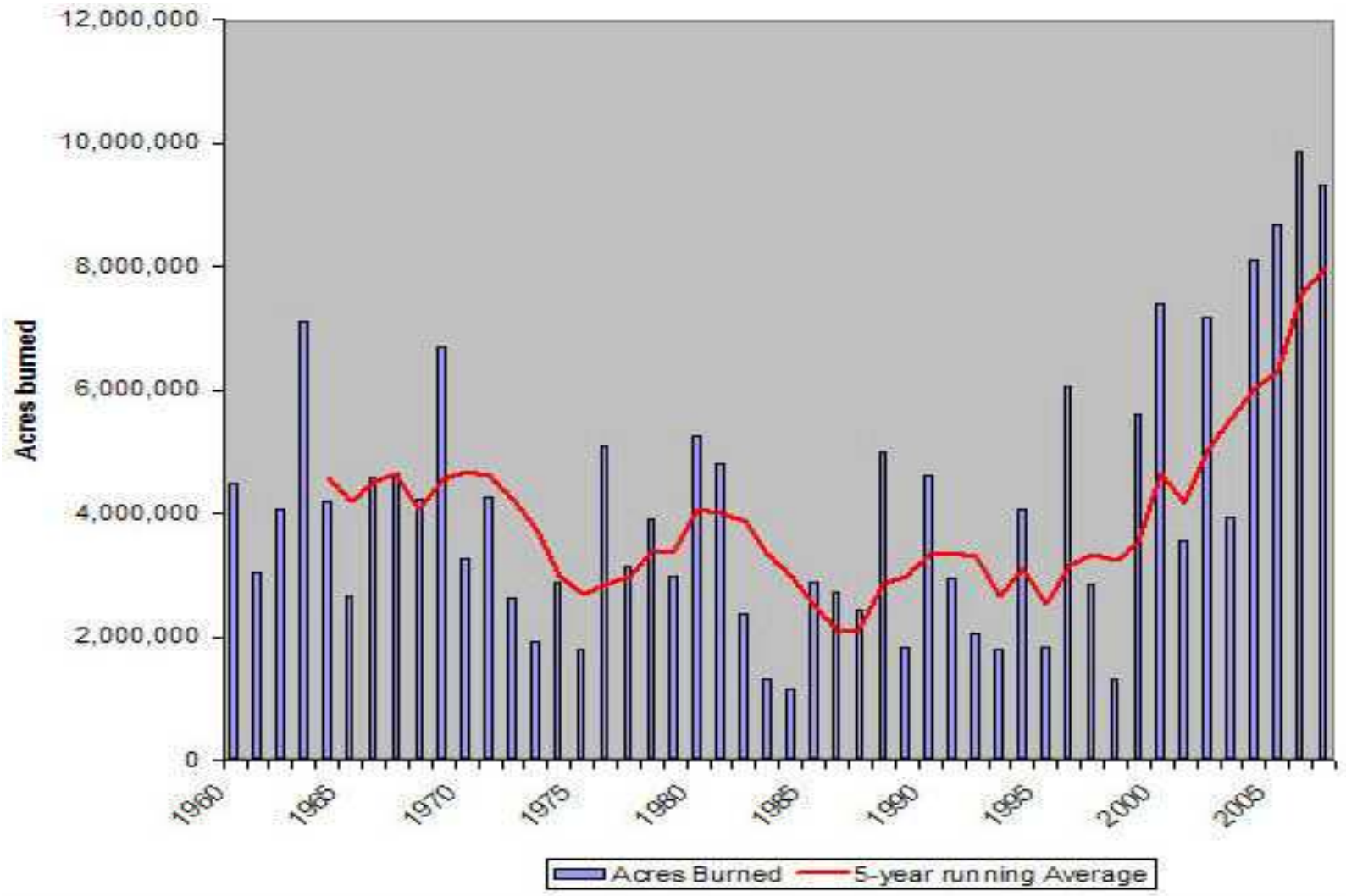


Climate Change Impacts on the United States
The Potential Consequences of Climate Variability and Change
Overview: Alaska
By the National Assessment Synthesis Team, US Global Change Research Program
Published in 2000

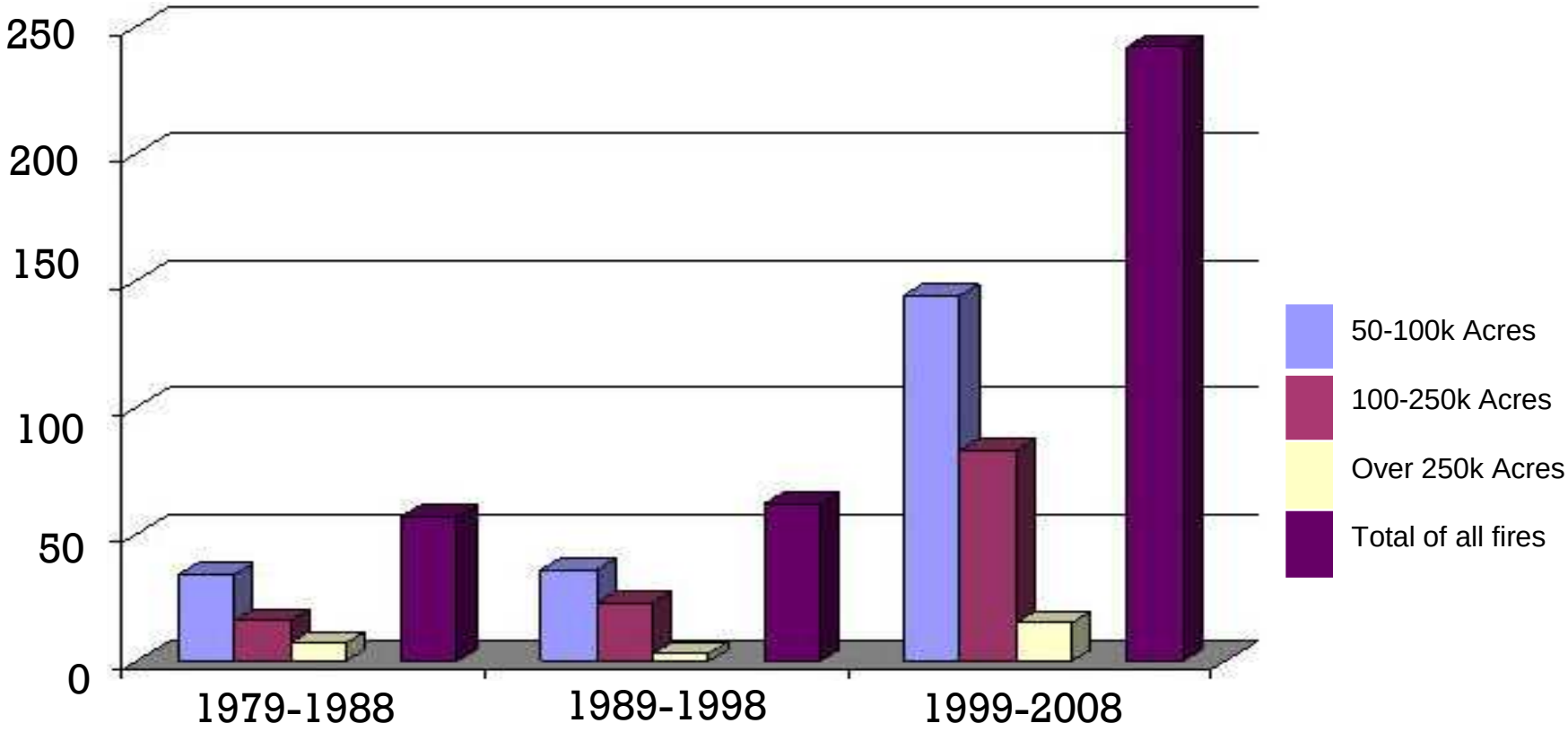


The Alaskan boreal forest is a small part of an enormous forest that extends continuously across the northern part of North America. The average area of this forest burned annually has more than doubled since 1970.

Increasing number of WILDFIRE ACRES BURNED (State, Tribal, Federal Lands 1960-2008)



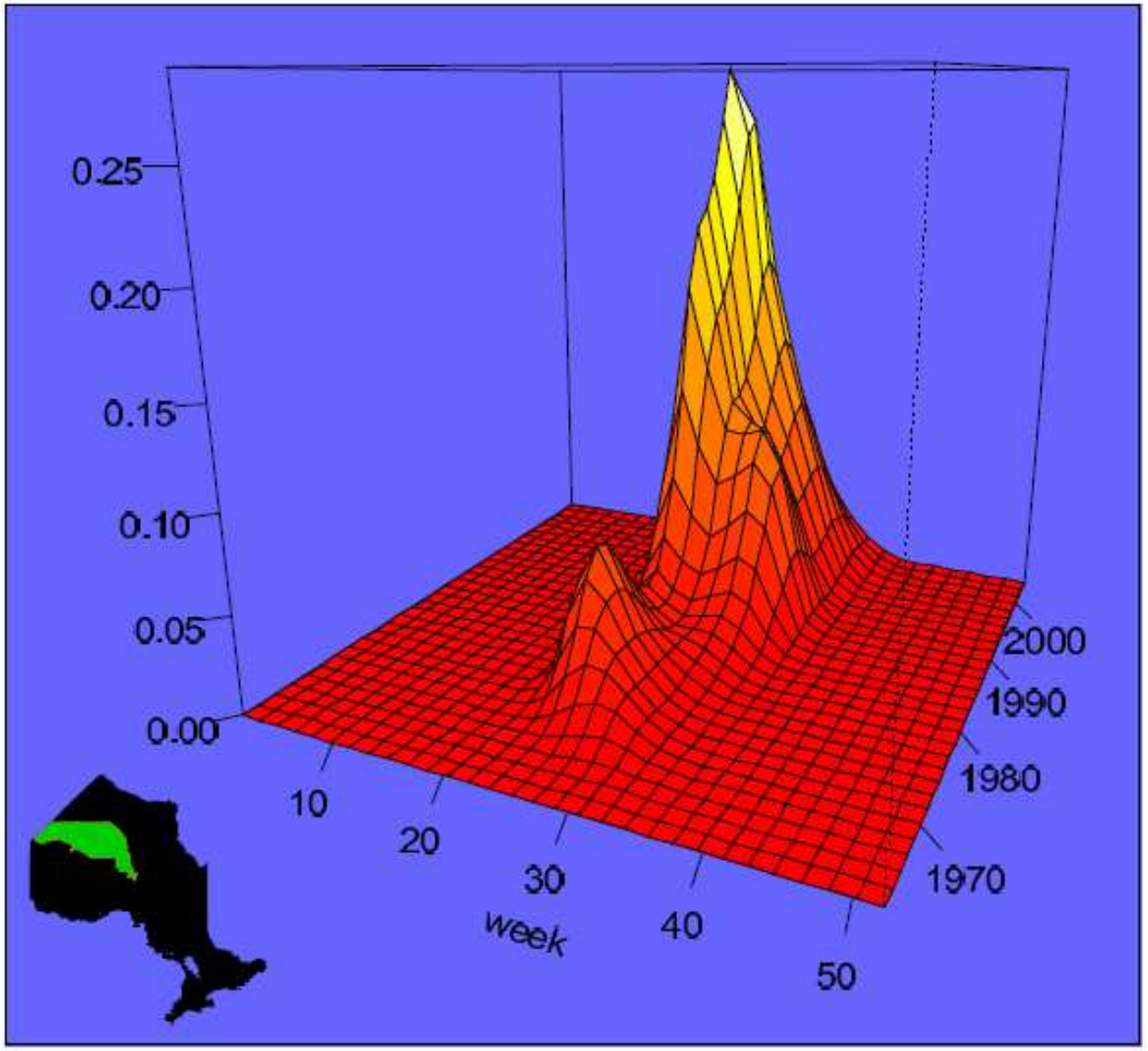
MORE LARGE FIRES
FEDERAL LARGE WILDFIRES 1979-2008



Over the past several decades, the area of Canadian boreal forest affected by fire and insects has doubled. Although there are complex factors involved, the greatest increases so far have been in the regions of greatest warming. Continued warming will produce greater seasonal contrasts which, combined with an expected 44% increase in lightning strikes, is expected to increase the area burned by 78% in the next 50 years.

Climate Change Impacts on Forest Fire Ignitions

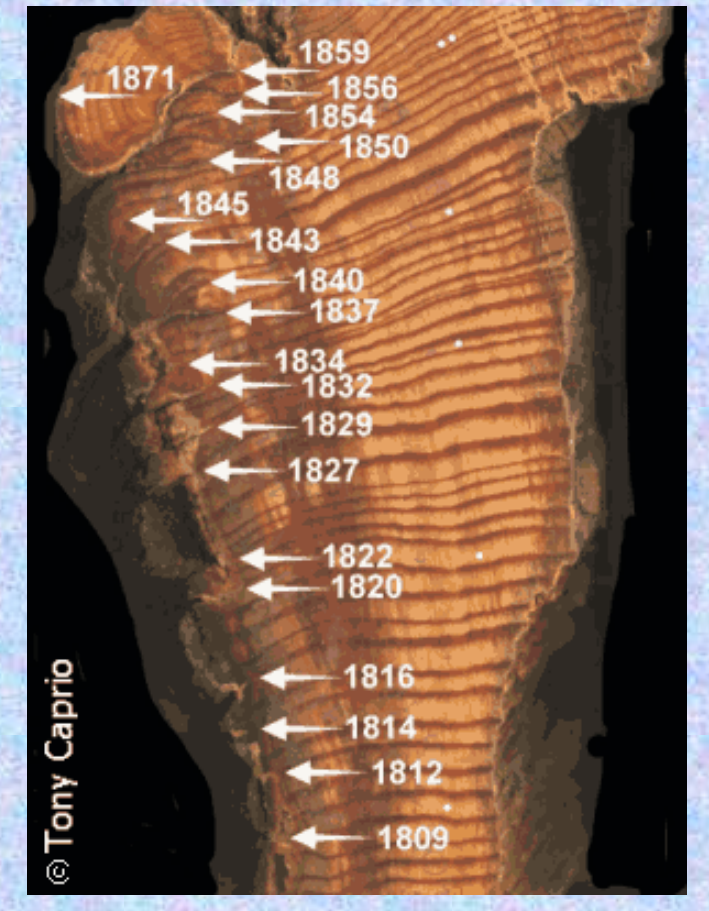
Doug Woolford



Fire regime

Fire regimes are determined by four factors: intensity (how severe fires are), frequency (how often fires occur), season (the time of the year fires occur) and scale (how extensive each fire is and the patchiness of the burnt and unburnt mosaic).


Upper Elevation Red Fir Forest
1829
1874
© Tony Caprio


1871
1859
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1809
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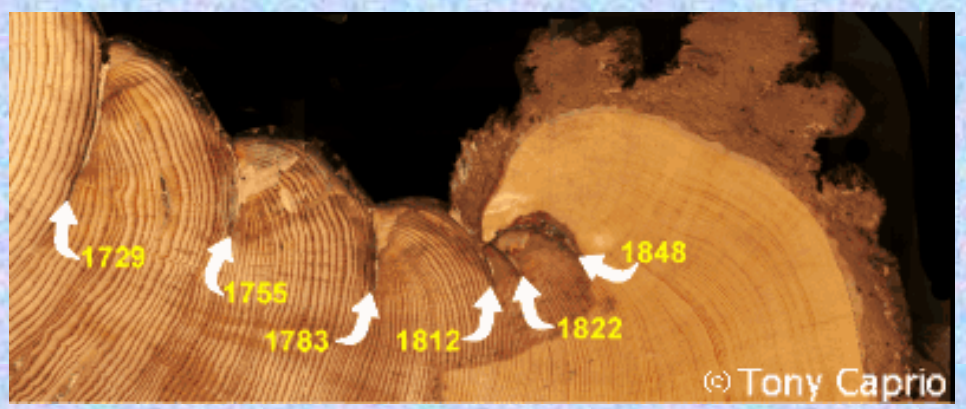
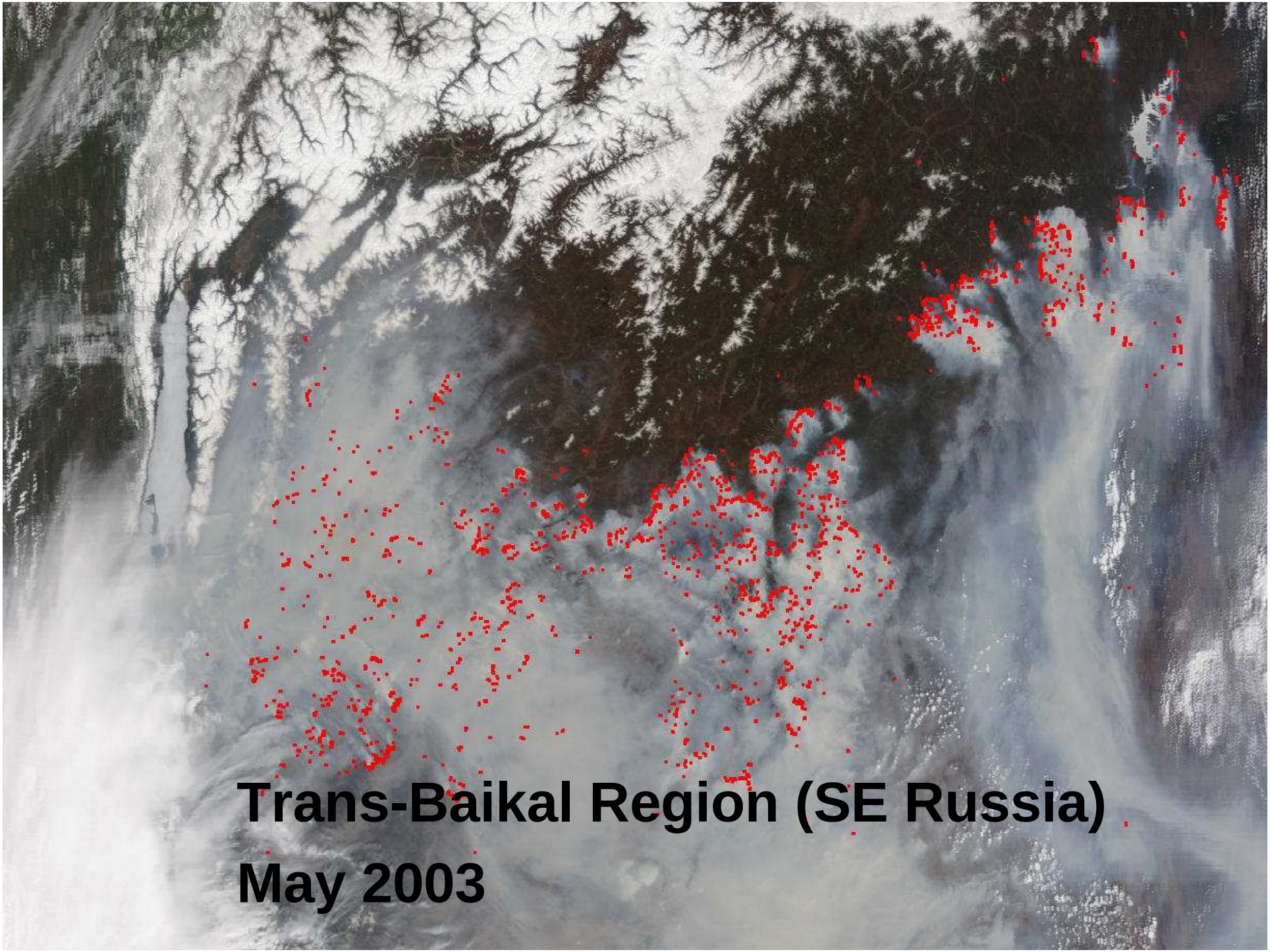

1729
1755
1783
1812
1822
1848
© Tony Caprio

Climate Change Threatens Siberian Forests

ScienceDaily (Aug. 5, 2007)

“Professor Balzter said "Last century a typical forest in Siberia had about 100 years after a fire to recover before it burned again. But new observations by Russian scientist Dr Kharuk have shown that fire now returns more frequently, about every 65 years. At the same time annual temperatures in Siberia have risen by almost two degrees Celsius, about twice as fast as the global average. And since 1990 the warming of Siberia has become even faster than before." “

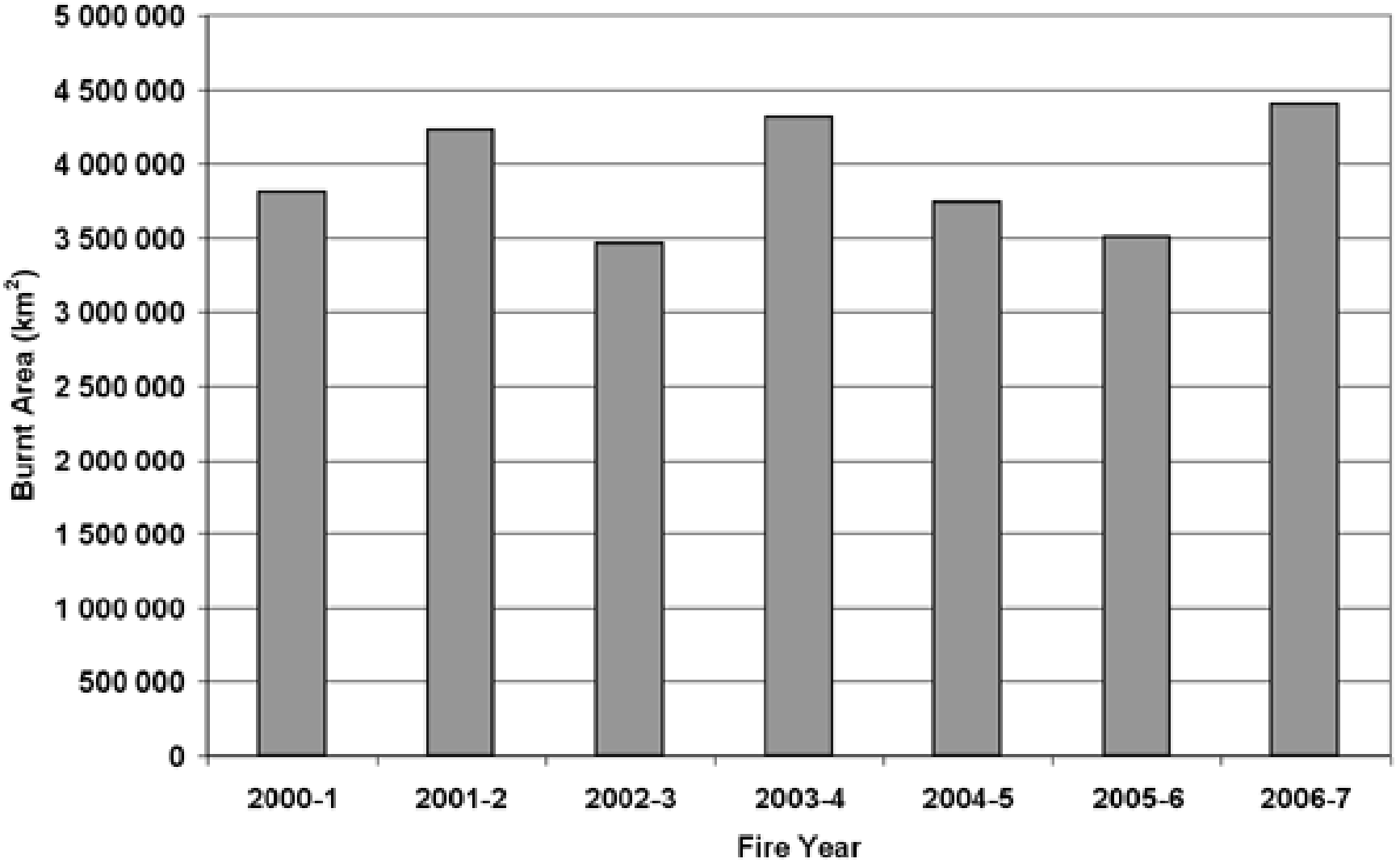

Trans-Baikal Region (SE Russia)
May 2003

8 May 2003

Smoke from fires in the Transbaikal Region, extending to Sakhalin, Japan, Alaska and Europe

11 March 2008
Smoke from fires in the Transbaikal Region, extending to Sakhalin, Japan and Alaska

Burnt area in the World

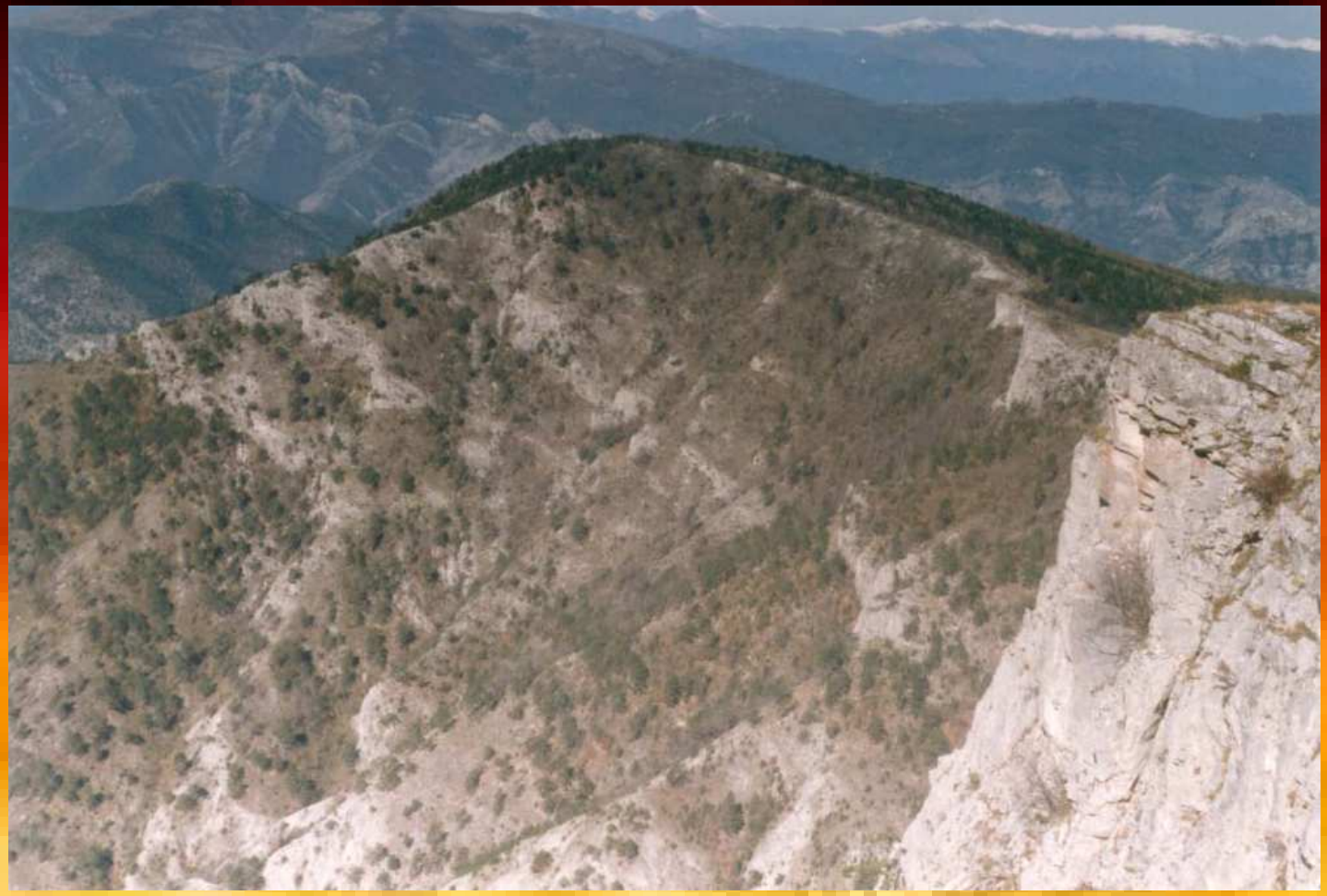


Impact of the forest fires :

- **Degradation**
- **Deforestation**
- **Soil erosion**

} **Soil water regime and floods**

- **Appearance of insects**
- **Decrease of biodiversity**
- **Human health**
- **Economy**
- **Carbon's (CO_2,CO) and other gases emission**



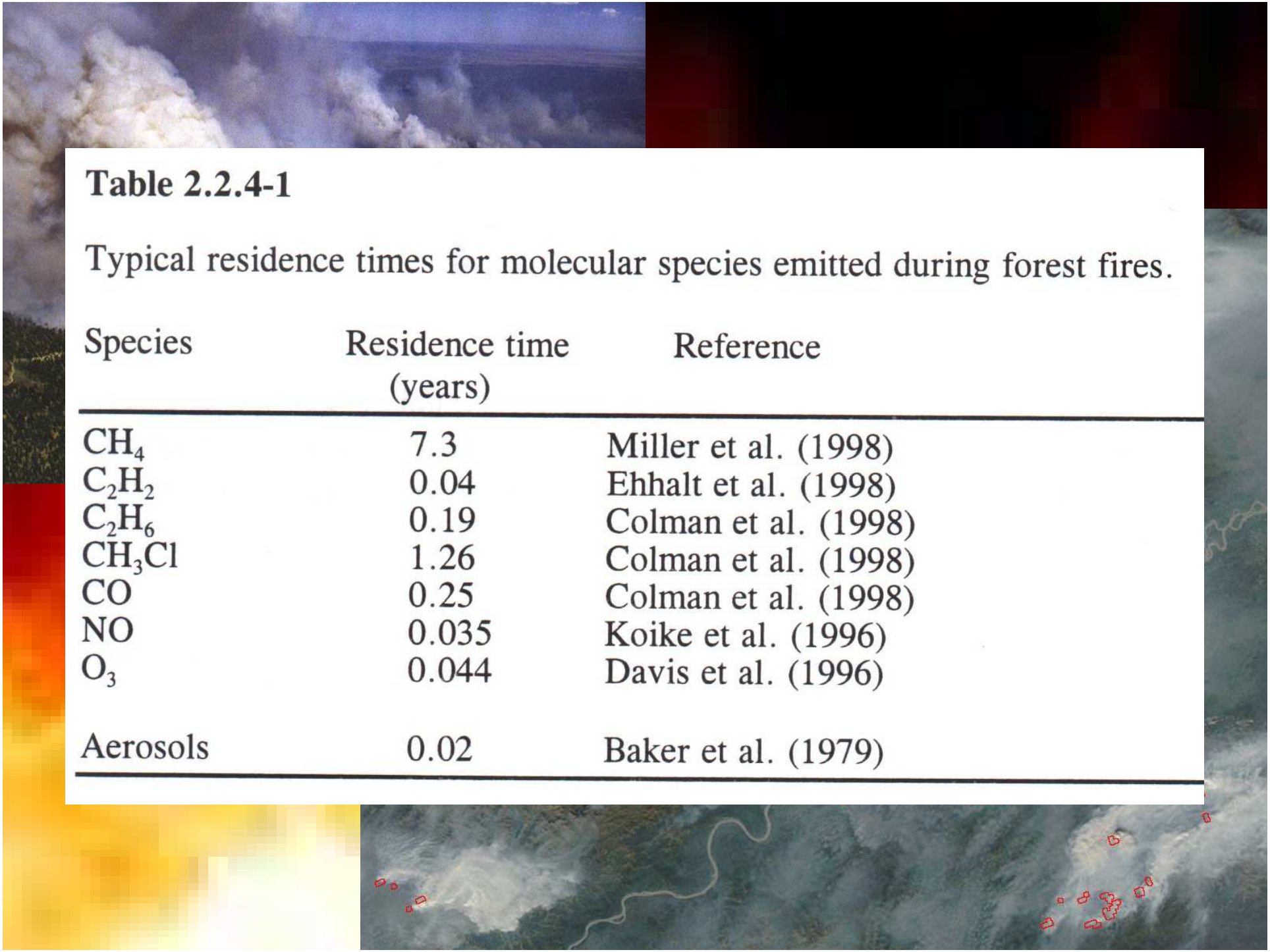


Table 2.2.4-1

Typical residence times for molecular species emitted during forest fires.

Species	Residence time (years)	Reference
CH_4	7.3	Miller et al. (1998)
C_2H_2	0.04	Ehhalt et al. (1998)
C_2H_6	0.19	Colman et al. (1998)
CH_3Cl	1.26	Colman et al. (1998)
CO	0.25	Colman et al. (1998)
NO	0.035	Koike et al. (1996)
O_3	0.044	Davis et al. (1996)
Aerosols	0.02	Baker et al. (1979)

Burned biomass and emission estimates from forest fires up to 31 August 2007 by country

Emission type	Country emissions (10^3 ton)										
	Albania	Bosnia	Bulgaria	Croatia	Cyprus	France	FYROM	Greece	Italy	Portugal	Spain
CO_2	2052.6	1278.7	558.9	248.4	43.1	52.8	474.7	4500.5	1825.8	194.1	1045.1
CO	82.6	50.3	27.6	10.6	1.9	2.2	22.2	188.1	72.3	7.6	43.0
CH_4	4.3	2.6	1.4	0.5	0.1	0.1	1.1	9.7	3.8	0.4	2.2
PM2.5	8.2	5.0	2.6	1.0	0.2	0.2	2.1	18.6	7.2	0.8	4.3
PM10	9.7	6.0	3.1	1.2	0.2	0.3	2.5	21.9	8.6	0.9	5.0
PM	13.6	8.4	4.2	1.7	0.3	0.4	3.5	30.6	12.0	1.3	7.0
NMHC	3.5	2.2	1.1	0.4	0.1	0.1	0.9	7.9	3.1	0.3	1.8
VOC	4.3	2.6	1.3	0.5	0.1	0.1	1.1	9.6	3.8	0.4	2.2
NOX	5.8	3.5	1.9	0.7	0.1	0.2	1.5	13.1	5.0	0.5	3.0
OC	4.9	3.0	1.5	0.6	0.1	0.1	1.2	11.0	4.3	0.5	2.6
EC	0.6	0.4	0.2	0.1	0.0	0.0	0.1	1.3	0.5	0.1	0.3
Burned Biomass (10^3 ton)	1161.3	752.5	328.1	140.8	26.0	31.8	288.3	2703.1	1095.3	116.4	628.6

CO_2 - Carbon Dioxide
CO - Carbon Monoxide
CH_4 - Methane
PM2.5 - 2.5 micron particulate matter
PM10 - 10 micron particulate matter
PM - total particulate matter
NMHC - non-methane hydrocarbon
VOC - volatile organic compounds
NOX - nitric oxide
OC - organic carbon
EC - elemental carbon

1954

D. Gral. de Montes (1954)

JAÉN.- Parque Natural "Sierras de Cazorla, Segura y Las V
del monte *"María Arnal"* (Santiago-Pontones). Al fondo
donde transcurre la carretera de Pontones a Santiago de la E
Jabalí" (2).

1964

Rosendo García (1964)

ñaperros". Repoblaciones ornamentales en el monte *"Las*
rda, y al fondo, *"Monte Santo"*.

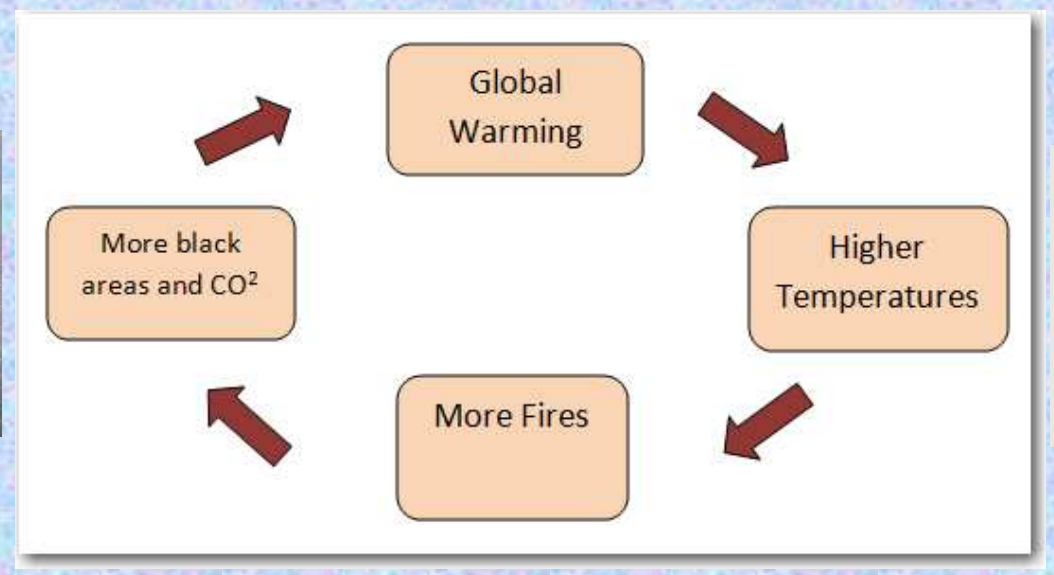
land-use change

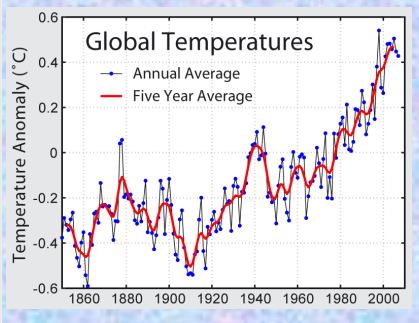
2001

J. González-Cordero (2001)

2001

J. González-Cordero (2001)


Global Warming
Higher Temperatures
More Fires
More black areas and CO2


Global Temperatures
Annual Average
Five Year Average
Temperature Anomaly (°C)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
1860
1880
1900
1920
1940
1960
1980
2000

Conclusion

Climate change will increase the risk of fires in the future !

UNISDR Global Wildland Fire Network

GLOBAL FIRE MONITORING CENTRE (GFMC)

Thank you very much for the attention !

http://www.fire.uni-freiburg.de