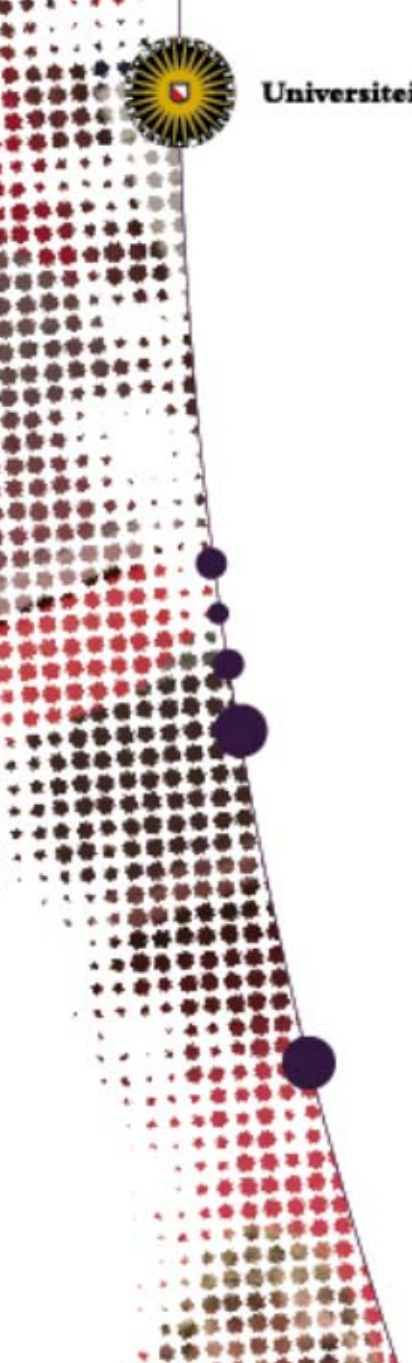


Universiteit Utrecht

PM Health Effects: New Directions

Bert Brunekreef, PhD

Institute for Risk Assessment Sciences

First, let's count our blessings (1)

In the last 10 years, our understanding of PM health effects has greatly improved

- We've come to appreciate the role of ultrafines
- We're able to separate health effects of coarse and fine PM, both toxicologically and epidemiologically
- We've been able to quantify the health impacts of PM in Europe

First, let's count our blessings (2)

In the last 10 years, our understanding of PM health effects has greatly improved

- The role of traffic pollution is now much better understood
- This has opened a whole new arena of more localized policy options & measures
- The role of non-exhaust PM is being appreciated

First, let's count our blessings (3)

In the last 10 years, our understanding of PM health effects has greatly improved

- Mechanisms and importance of effects of PM on cardiovascular system have been elucidated
- Particle concentrators have been developed and have greatly helped to single out effect of PM from other components in the mix
- Accountabiltiy research frameworks have been developed and are being filled in

New or re-emerging issues

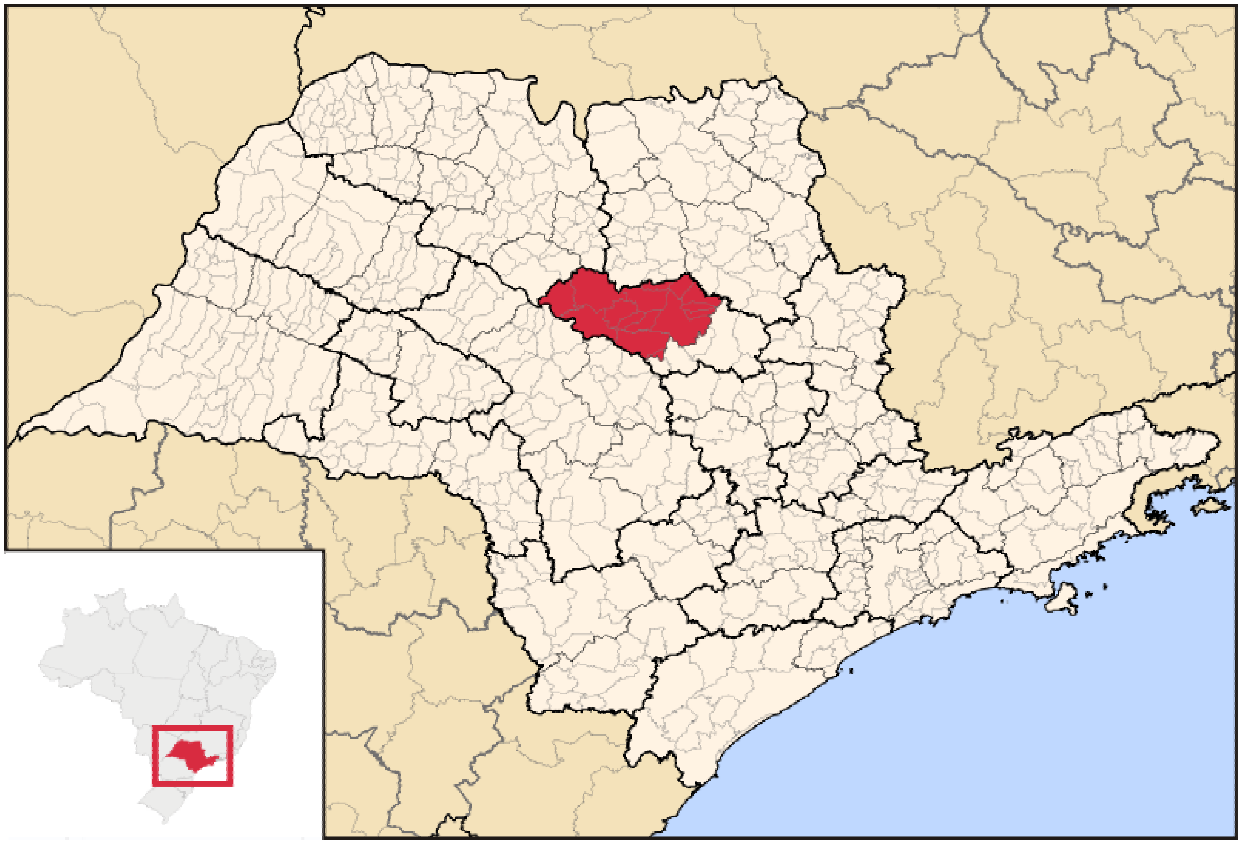
- Biomass burning
- Shipping emissions
- Non-exhaust traffic emissions
- Wind-blown dust
- Stabilising PM levels
- Qualification & quantification of long-term effects

Sugar cane burning in Southern Brazil

Air pollution from biomass burning and asthma hospital admissions in a sugar cane plantation area in Brazil

Marcos Abdo Arbex, Lourdes Conceição Martins, Regiani Carvalho de Oliveira, Luiz Alberto Amador Pereira, Flávio Ferlin Arbex, José Eduardo Delfini Cançado, Paulo Hilário Nascimento Saldiva, Alfésio Luís Ferreira Braga

J Epidemiol Community Health 2007;**61**:395–400. doi: 10.1136/jech.2005.044743



Institute for Risk Assessment Sciences

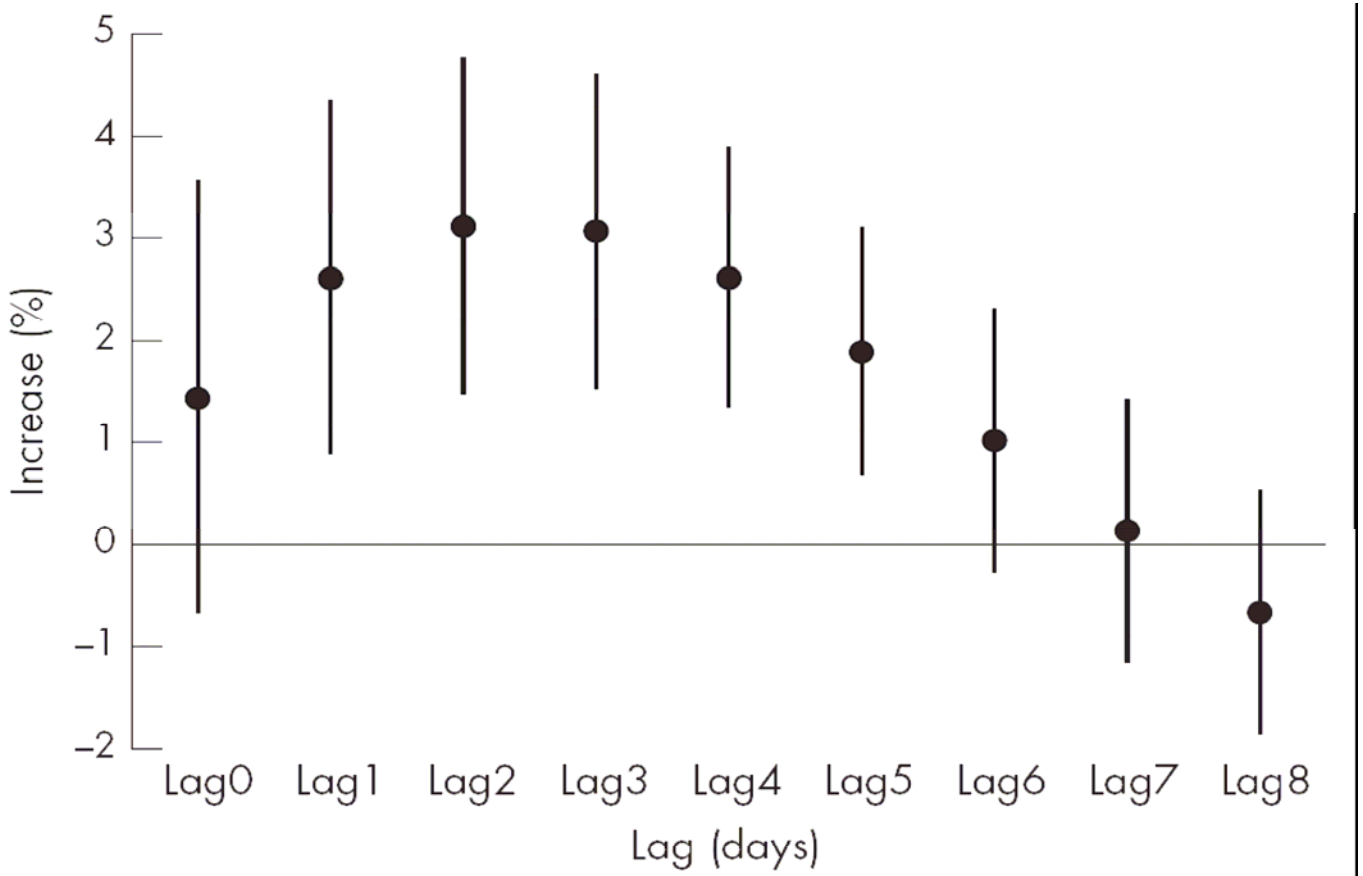


Figure 2 Percentage increases and 95% CI in asthma hospital admissions in the concurrent and six subsequent days following a 10 $\mu g/m^3$ increase in total suspended particle concentrations.

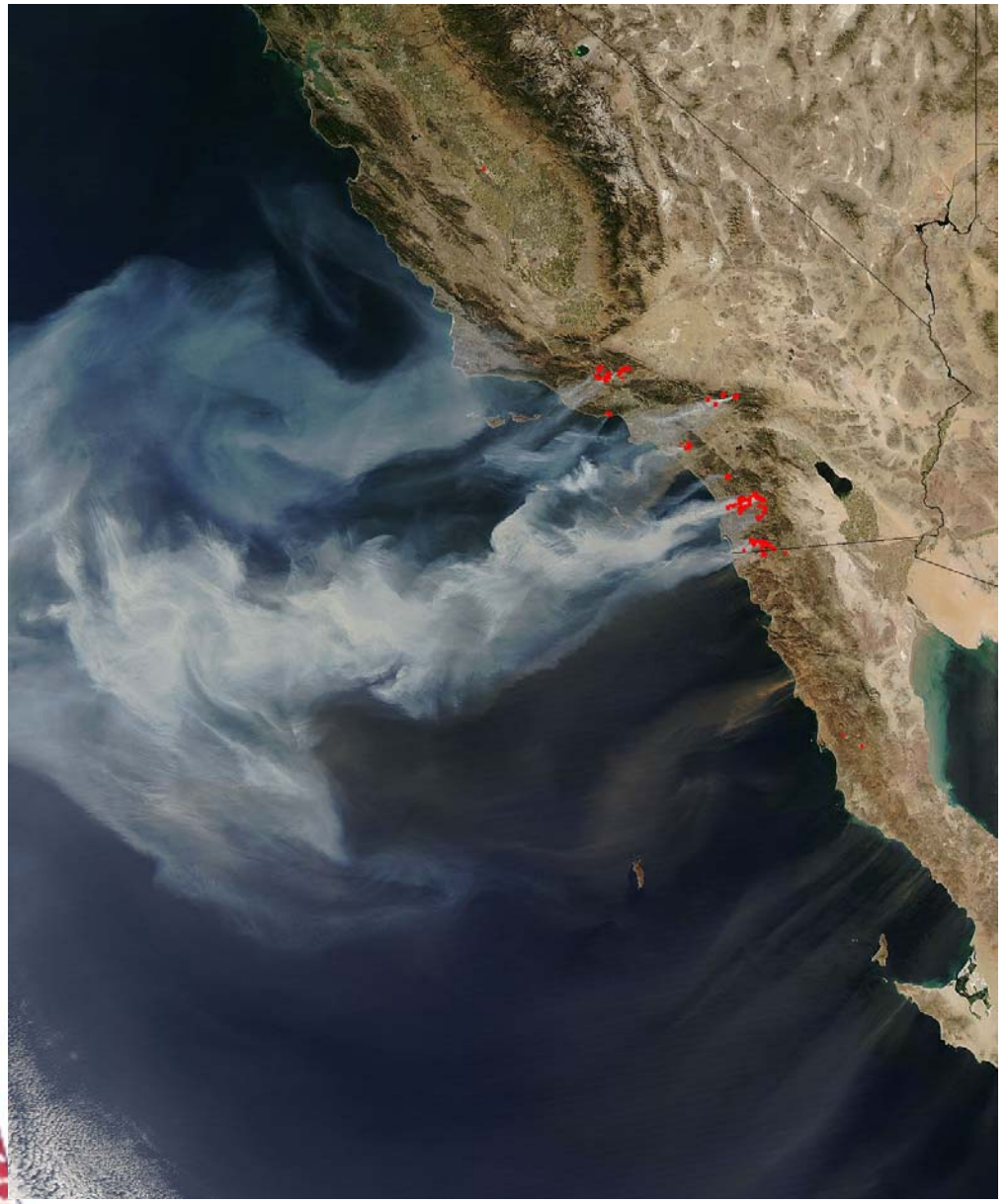
Louisiana Sugarcane Burning

Why is the sugarcane industry important to Louisiana?

Why do farmers burn sugarcane in the first place?

Farmers burn sugarcane to reduce the amount of leafy extraneous material, including stalk tops, delivered with the cane to the factories for processing.

Summer 2007; wildfires in Greece

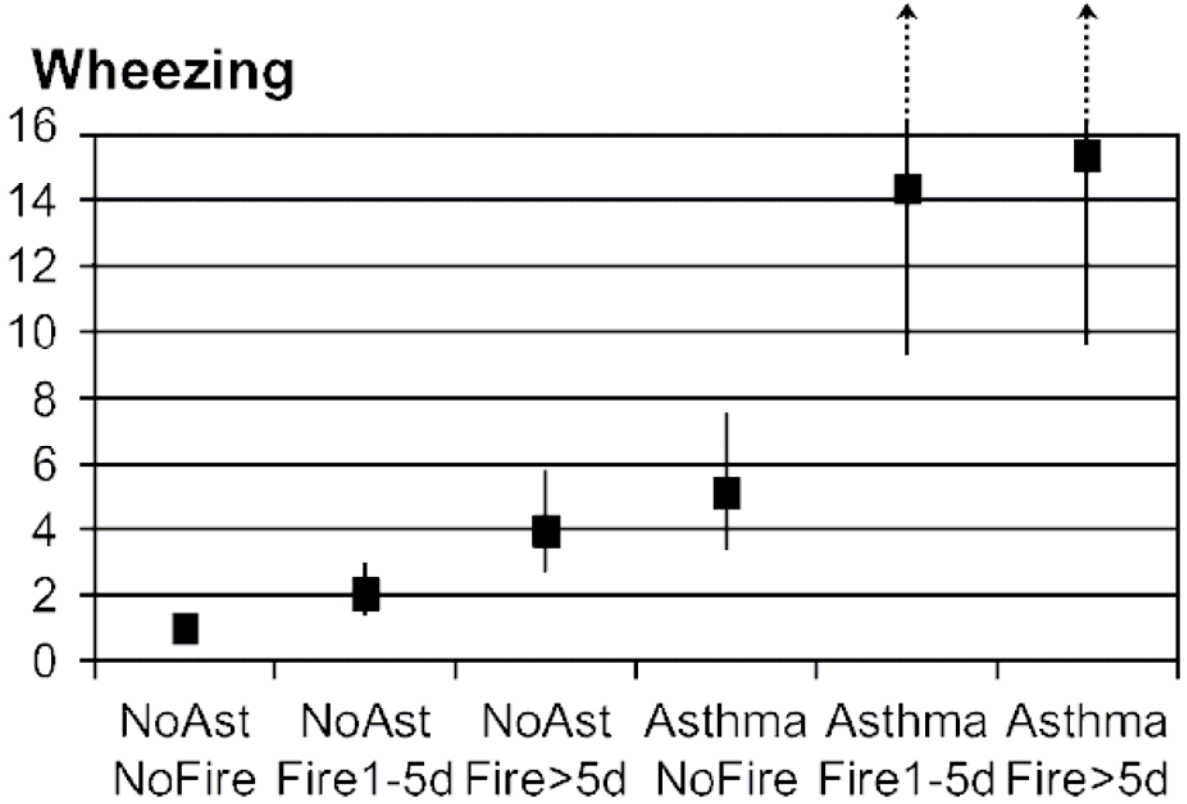


California,
22/10/2007

Health Effects of the 2003 Southern California Wildfires on Children

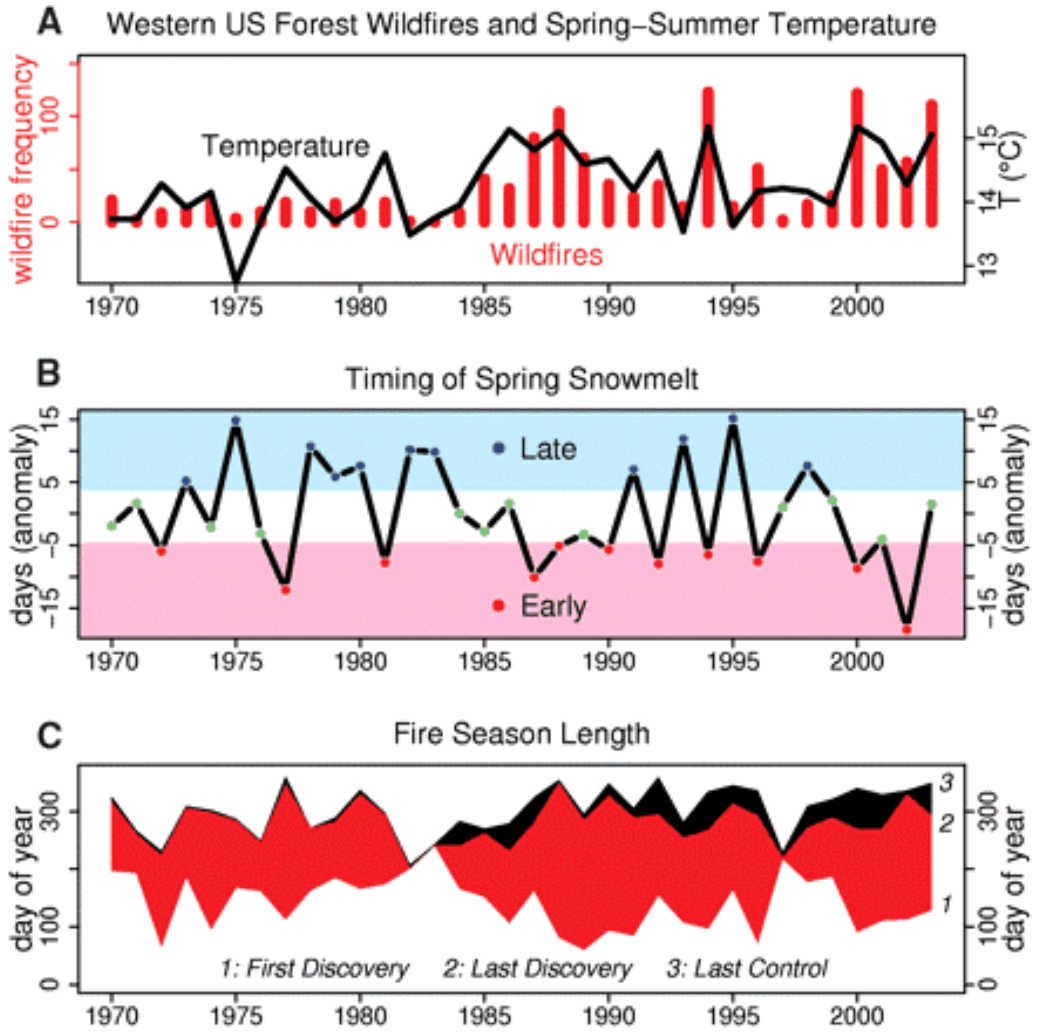
Nino Künzli, Ed Avol, Jun Wu, W. James Gauderman, Ed Rappaport, Joshua Millstein, Jonathan Bennion, Rob McConnell, Frank D. Gilliland, Kiros Berhane, Fred Lurmann, Arthur Winer, and John M. Peters

AJRCCM 2006



Warming and Earlier Spring Increase Western U.S. Forest Wildfire Activity

A. L. Westerling,[1,2*] H. G. Hidalgo,[1] D. R. Cayan,[1,3] T. W. Swetnam[4]



SCIENCE
2006

Institute for Risk Assessment Sciences

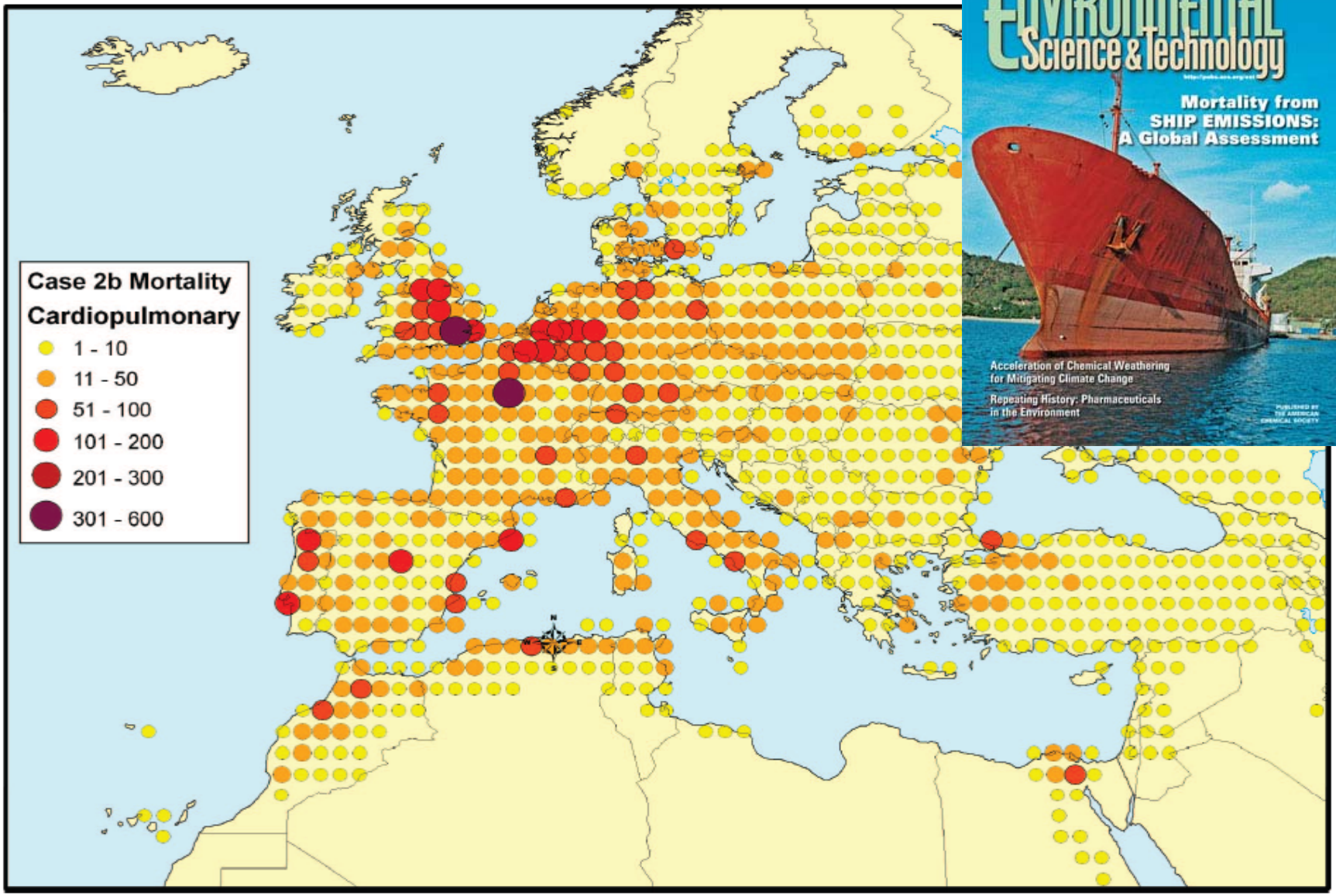


FIGURE 4. Case 2b annual cardiopulmonary mortality attributable to ship $PM_{2.5}$ emissions for Europe/Mediterranean.

European Commission

Quantification of emissions from ships associated with ship movements between ports in the European Community

Final Report

July 2002

Entec UK Limited

Institute for Risk Assessment Sciences

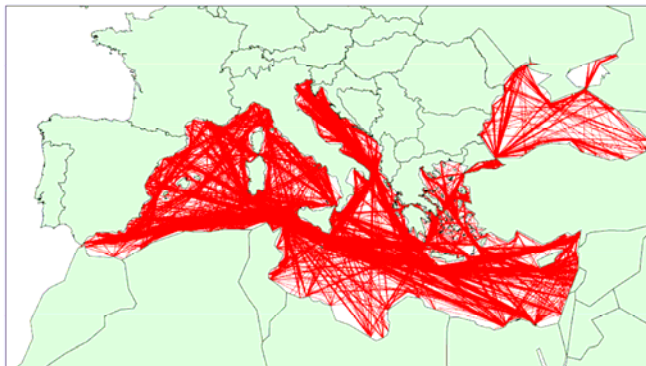


Figure 1: Map of the study area showing plotted shipping routes

Factors affecting non-tailpipe aerosol particle emissions from paved roads: On-road measurements in Stockholm, Sweden

Tareq Hussein[a,b,*], Christer Johansson[a,c], Hans Karlsson[a], Hans-Christen Hansson[a]

Atmospheric Environment 2008

Institute for Risk Assessment Sciences

Estimation and validation of $PM_{2.5}/PM_{10}$ exhaust and non-exhaust emission factors for practical street pollution modelling

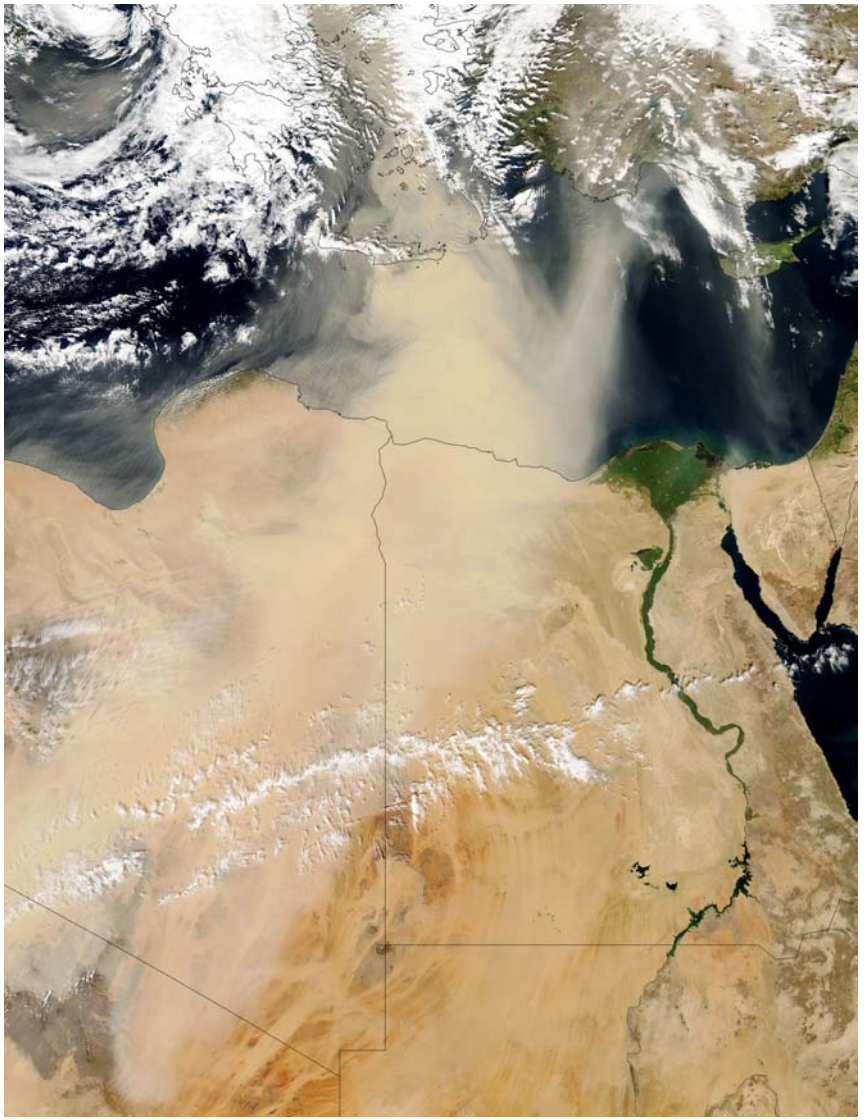
Matthias Ketzel[a,*], Gunnar Omstedt[b], Christer Johansson[c,d], Ingo Düring[e], Mia Pohjola[f], Dietmar Oettl[g], Lars Gidhagen[b], Peter Wåhlin[a], Achim Lohmeyer[e], Mervi Haakana[f], Ruwim Berkowicz[a]

Atmospheric Environment 2007

Street name	Country	Average emission exhaust PM ($mg\,(veh\,km)^{-1}$)	Average total[c] emission PM_{10} ($mg\,(veh\,km)^{-1}$)	Average total[c] emission $PM_{2.5}$ ($mg\,(veh\,km)^{-1}$)
Jagtvej/Copenhagen	DK	45[d]	91	–
H.C. Andersens Blvd./ Copenhagen	DK	50[d]	158	54
Hornsgatan/Stockholm	SE	28[f]	226[g]	67[g]
Lützner Str./Leipzig	DE	23[h]	90	–
Frankfurter Allee/Berlin	DE	23[h]	80	–
Merseburger Strasse/	DE	20[h]	86	29
Runebergkatu/Helsinki	FI	31[i]	152	33
Völkermarkterstrasse/ Klagenfurt	AU	36[h]	145	–

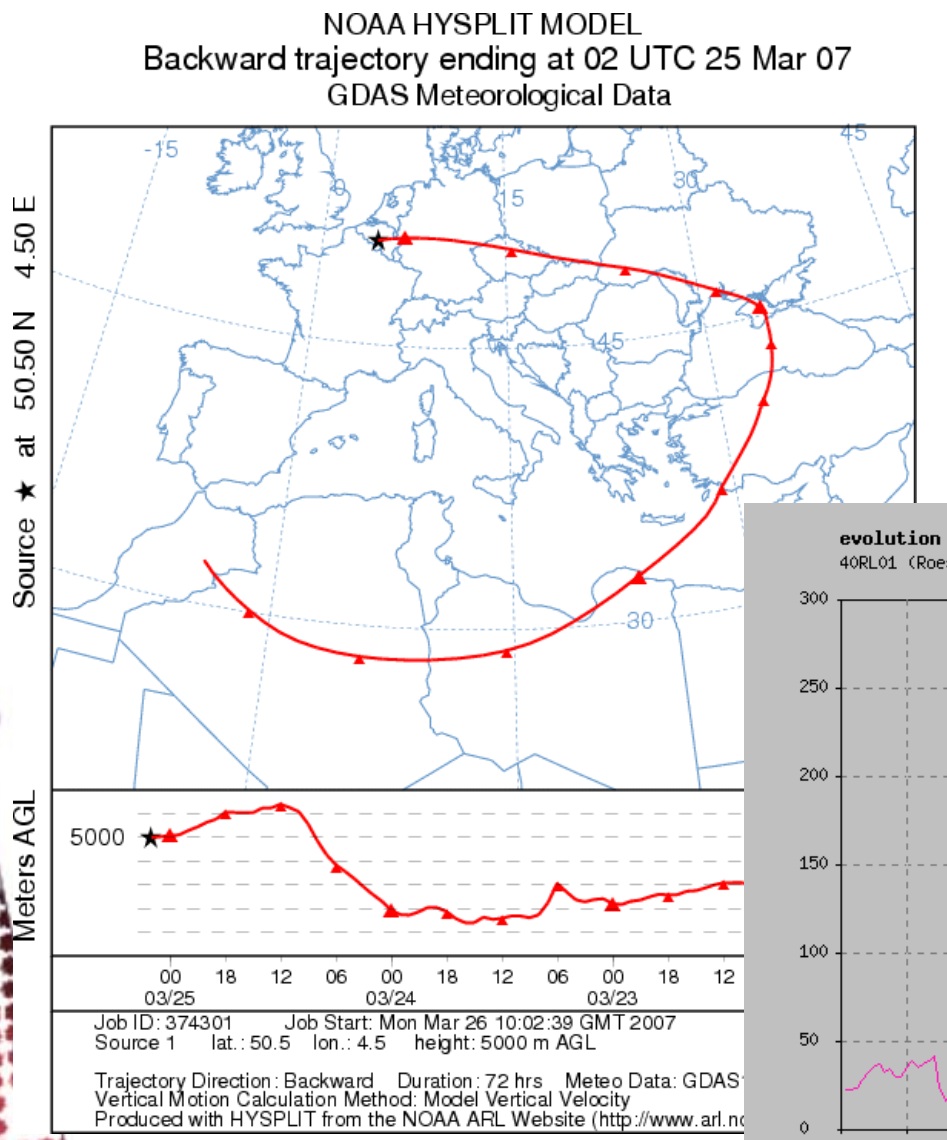
Institute for Risk Assessment Sciences

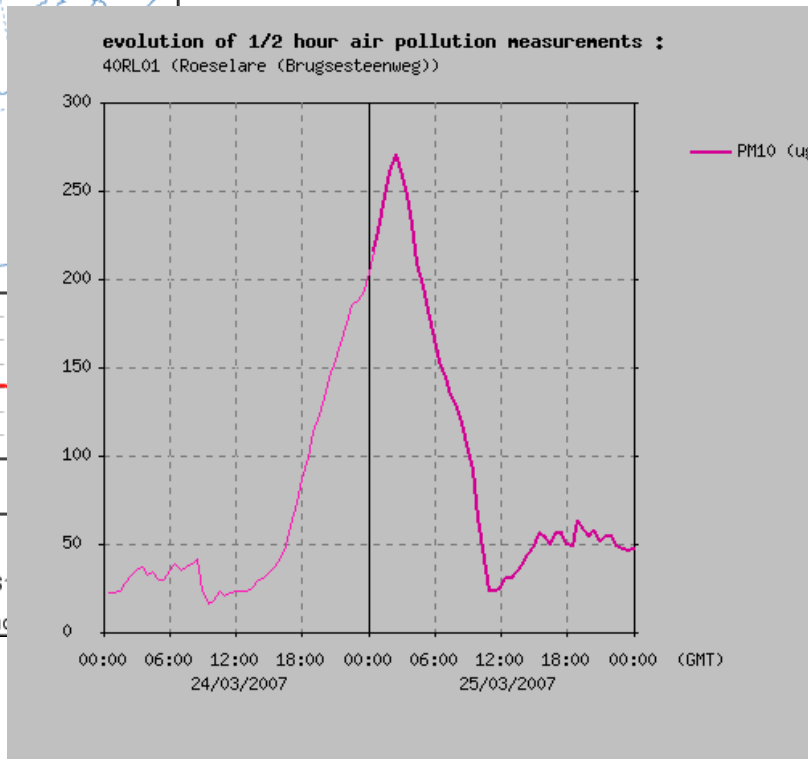
‘Natural’ PM?



Sahara
Dust storm

Sahara Dust in Belgium, March 24-25, 2007





SUVs Blamed for Boom in Sahara Dust Storms

Friday 20 August 2004

"Toyotarisation is a major cause of dust storms.
If I had my way, I would ban them from driving off-road."
ANDREW GOUDIE, Oxford geography professor

Institute for Risk Assessment Sciences

Sahara dust as observed in Tenerife

Particle Size Distribution of Airborne Microorganisms and Pathogens during an Intense African Dust Event in the Eastern Mediterranean

Paraskevi N. Polymenakou,[1] Manolis Mandalakis,[2] Euripides G. Stephanou,[2] and Anastasios Tselepides[1,3]

[1]Hellenic Centre for Marine Research-Crete, Heraklion, Greece; [2]Environmental Chemical Processes Laboratory, Department of Chemistry, University of Crete, Heraklion, Greece; [3]Department of Maritime Studies, University of Piraeus, Piraeus, Greece

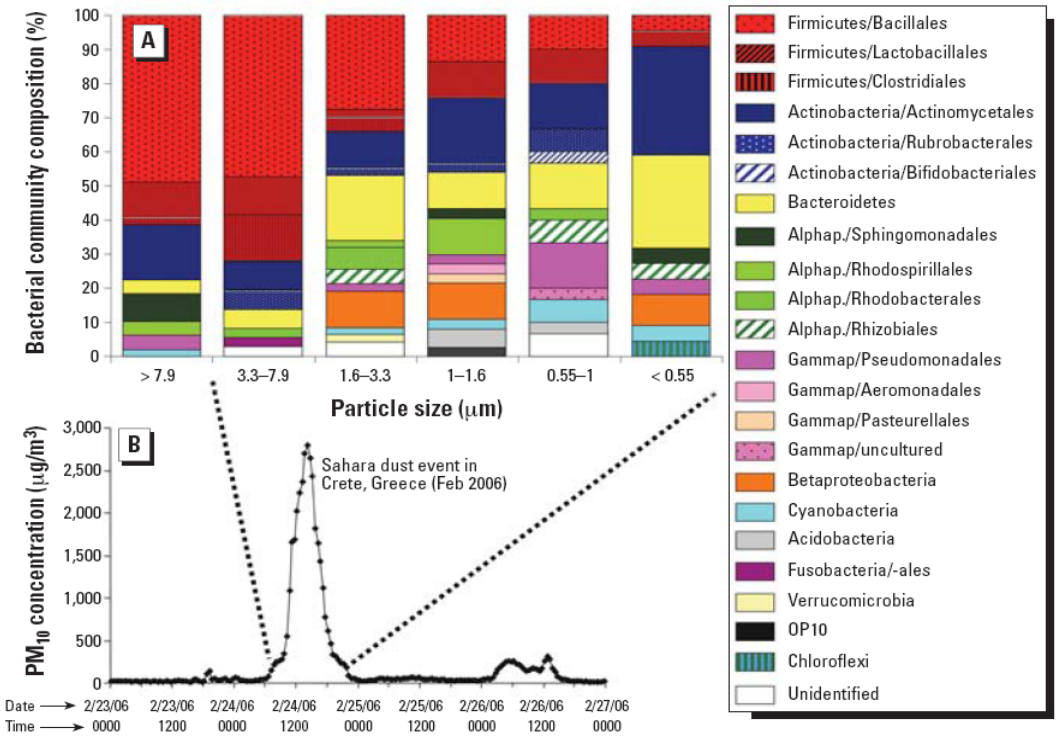


Figure 2. Analysis of dust particles from the Sahara dust event by bacterial community composition and by PM_{10} concentration at different time points. (*A*) Bacterial community composition in particles of different sizes. (*B*) PM_{10} concentrations during the Sahara dust event. Abbreviations: Alphap., Alphaproteobacteria; Gammap, Gammaproteobacteria.

EHP 2008

Institute for Risk Assessment Sciences

ELSEVIER

NEW DIRECTIONS

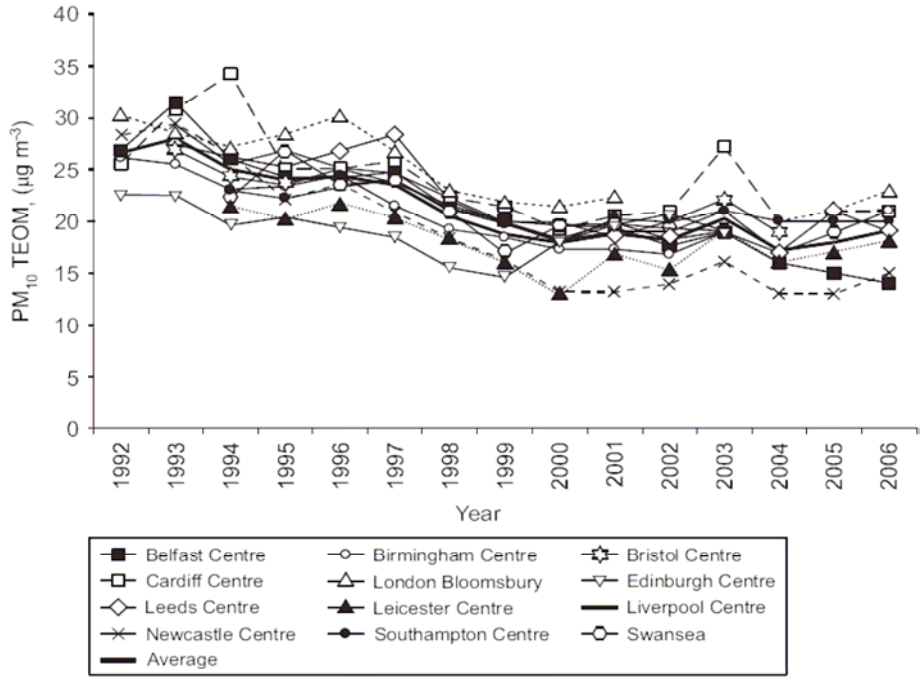
Atmospheric Environment 42 (2008) 603–606

ATMOSPHERIC ENVIRONMENT

www.elsevier.com/locate/atmosenv

Atmospheric Science Perspectives Special Series

New Directions: Why are PM_{10} concentrations in Europe not falling?☆

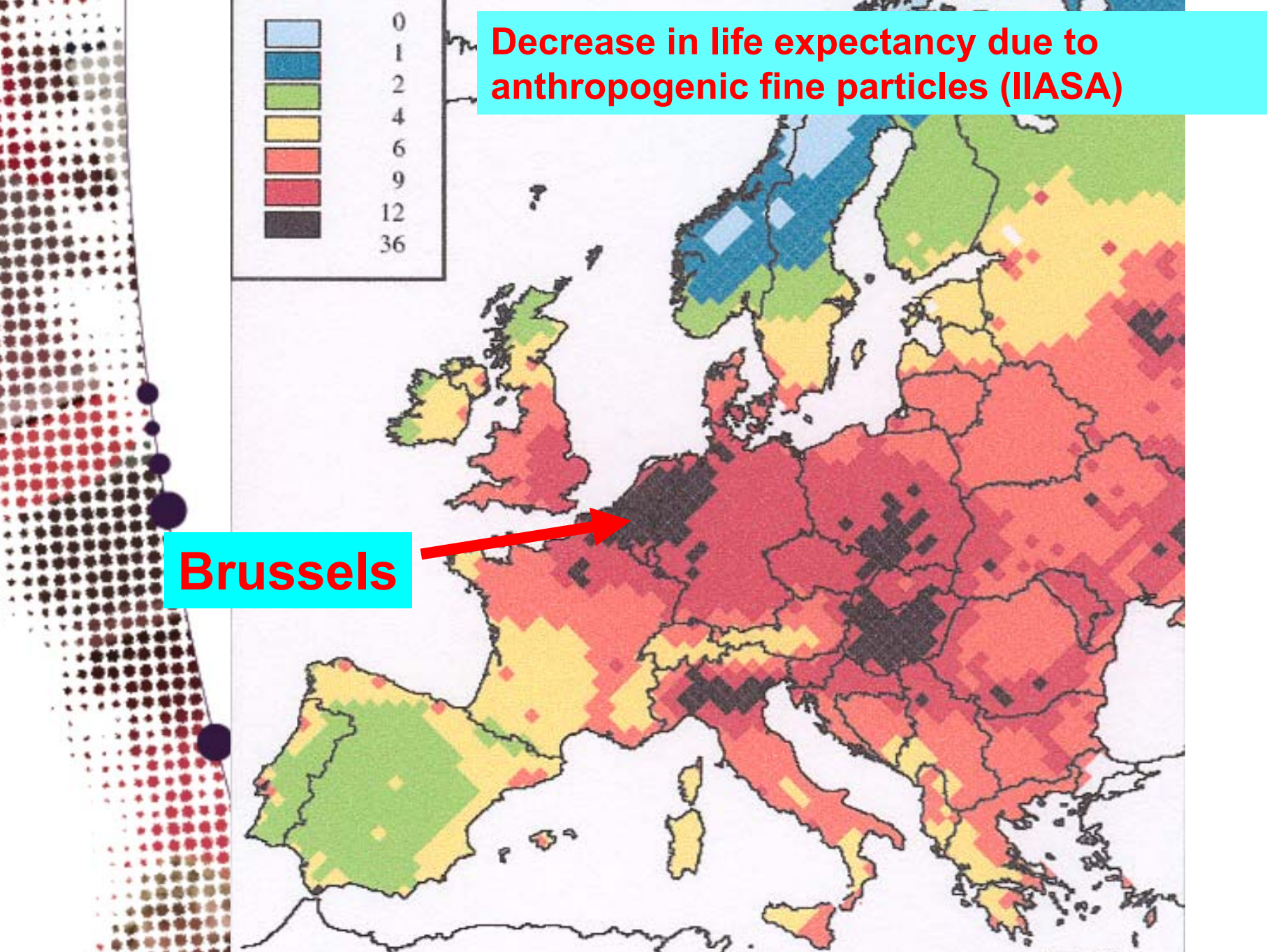


Roy M. Harrison[1]
Division of Environmental Health & Risk Management, School of Geography, Earth & Environmental Sciences, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK
E-mail address: r.m.harrison@bham.ac.uk

John Stedman[2]
AEA Energy & Environment, The Gemini Building, Fermi Avenue, Harwell, Didcot, Oxfordshire OX11 0QR, UK

Dick Derwent[3]
rdscientific, Newbury, Berkshire RG14 6LH, UK

Institute for Risk Assessment Sciences


0
1
2
4
6
9
12
36
Decrease in life expectancy due to anthropogenic fine particles (IIASA)
Brussels

Research questions on (outdoor) air pollution and health

- E-R functions for long term effects (HIA & Policy)
- Independent role of coarse PM
- Non-exhaust traffic PM
- Growing importance of wood smoke, wild fires (relation with climate & land use change)
- CNS effects
- Relative toxicity of local and background PM
- Toxicity evaluation of new technology
- Effect modification by SES, nutrition etc
- Vulnerability markers
- Validation of exposure models
- Changing composition of roadside air pollution mixtures & potential consequences for NO2 LV

Research questions on (outdoor) air pollution and health

- Accountability studies: effects of abatement measures on air pollution levels
- Accountability studies: effects of changes in pollution on health
- Transport & health: effects of participation in traffic on health; subway/public transport environments; zoning questions; noise & air pollution; spatial planning issues & physical exercise/obesity; urban cycling & air quality, accidents; air quality impacts near airports; role of shipping emissions (new impact estimates published, 'loading' of Sahara dust moving across Mediterranean???)

E S C A P E

*E*uropean *S*tudy of *C*ohorts for *A*ir *P*ollution *E*ffects

Institute for Risk Assessment Sciences

E S C A P E

- ~ 30 existing cohorts
- Birth and pregnancy outcomes
- Respiratory morbidity
- Cardiovascular morbidity
- Cancer & mortality
- PM2.5 & NOx monitoring & modeling in ~ 40 EU areas