



Agenzia nazionale per le nuove tecnologie,
l'energia e lo sviluppo economico sostenibile

Impatto dell'inquinamento da ozono e del cambiamento climatico sulle foreste

29 settembre 2020

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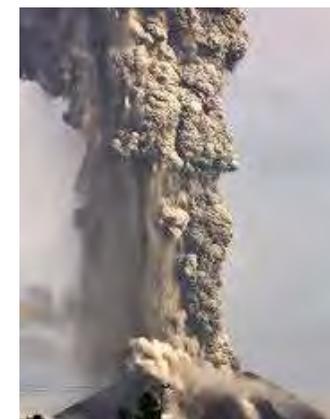
Le sorgenti naturali



sabbie sahariane



spray marino



eruzioni vulcaniche,



incendi

alberi



fulmini

Le sorgenti antropiche



Agricoltura ed allevamenti



Traffico e trasporti

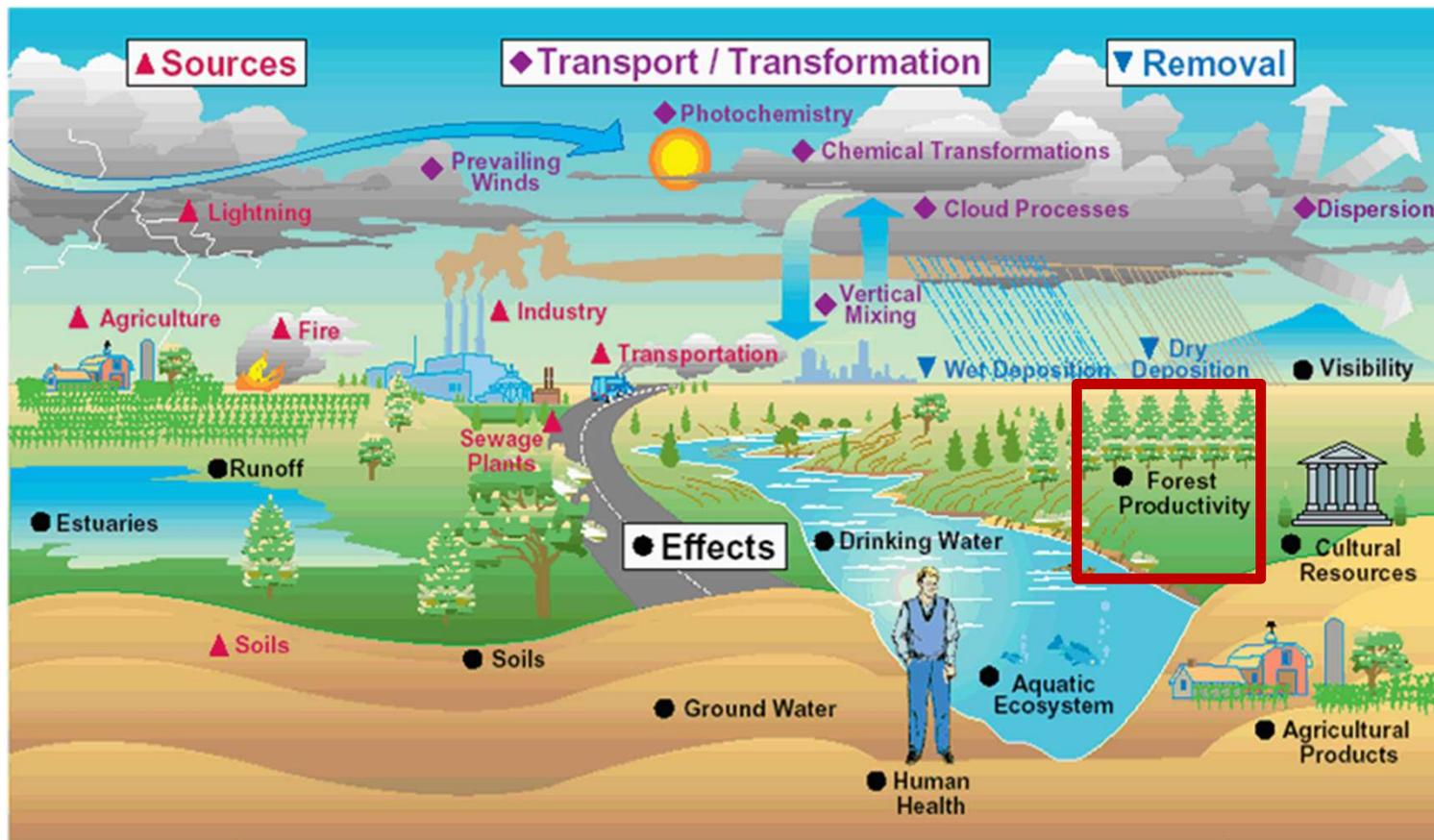


BBQ e camini



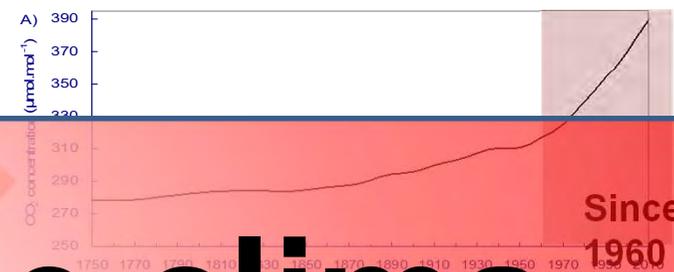
Industria

Le sorgenti e gli effetti degli inquinanti





Contributing to rising CO₂ in atmosphere



Since 1960

FAO, 2010

Warming Drought

Inquinamento e clima sono collegati fra loro

AIR POLLUTION

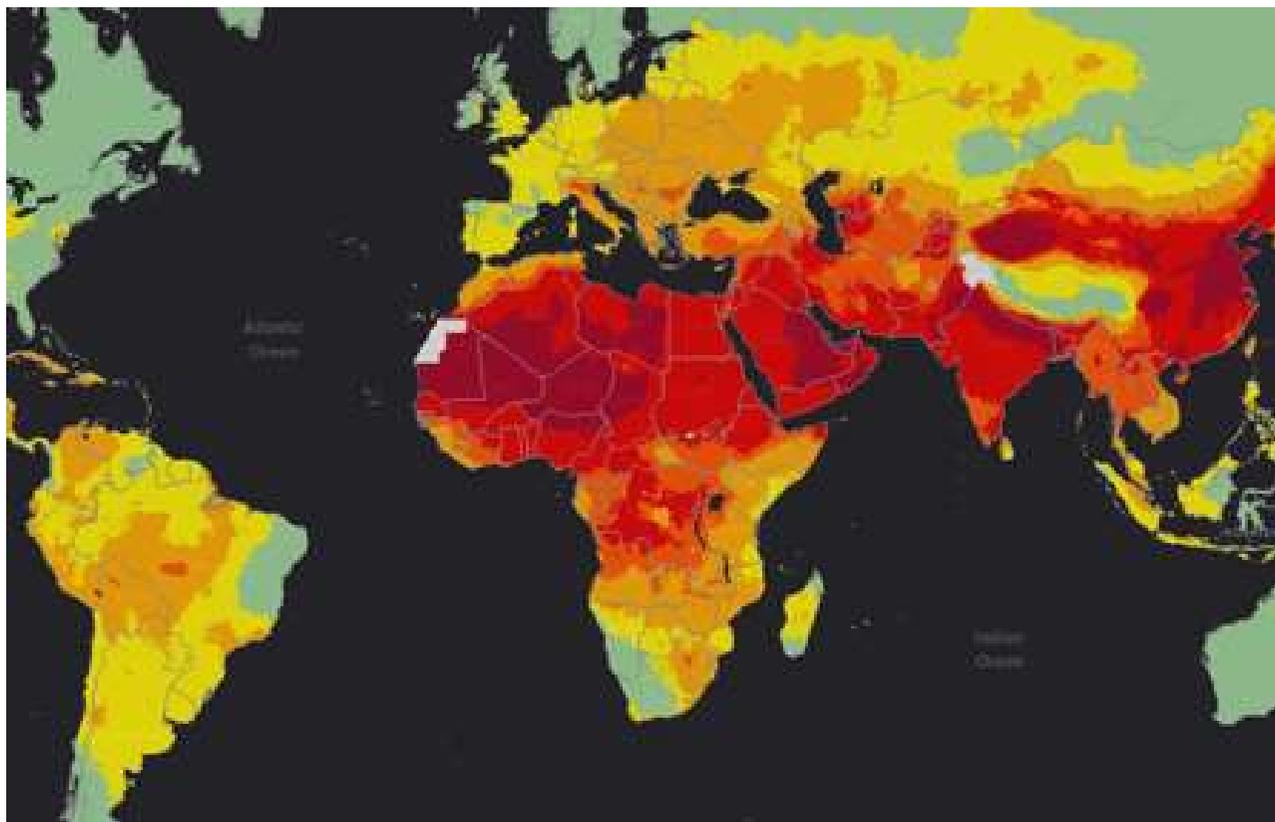


(mm day⁻¹) IPCC, 2007

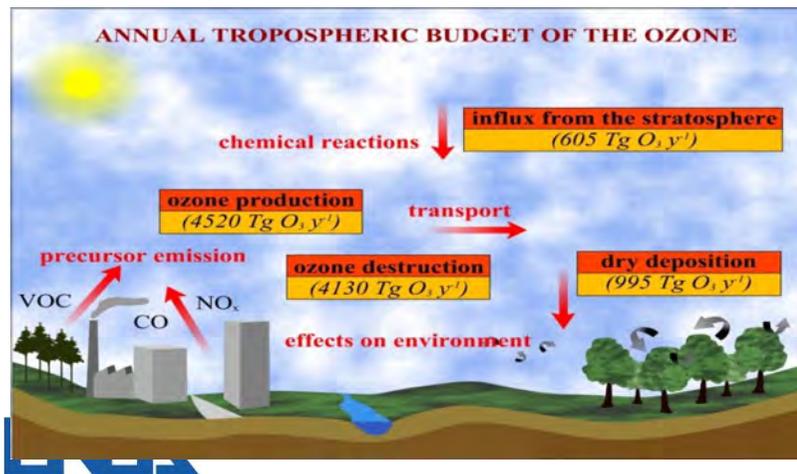
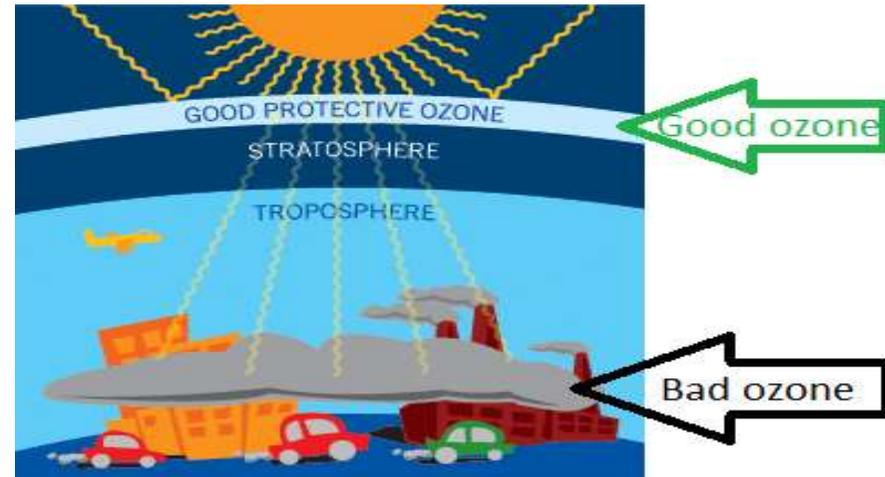
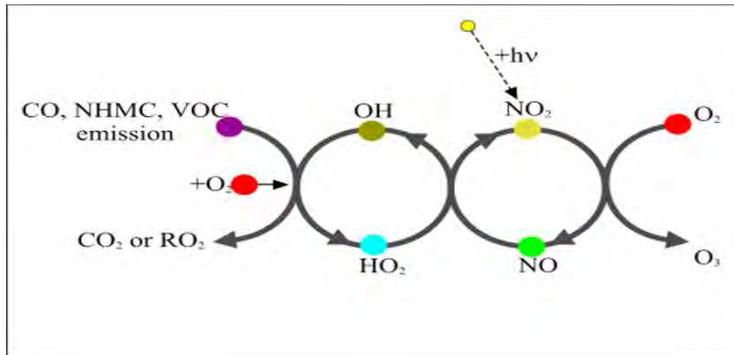


Mappa del WHO con le aree più a rischio per la salute a causa dell'inquinamento atmosferico

- 92% della popolazione vive in aree critiche per la protezione della salute



Qual è l'inquinante più nocivo sulla vegetazione? Parliamo di ozono troposferico



L'ozono troposferico è solo il 10% dell'ozono totale contenuto in una colonna verticale di atmosfera.

L'ozono è un inquinante secondario



NOx



VOC

+

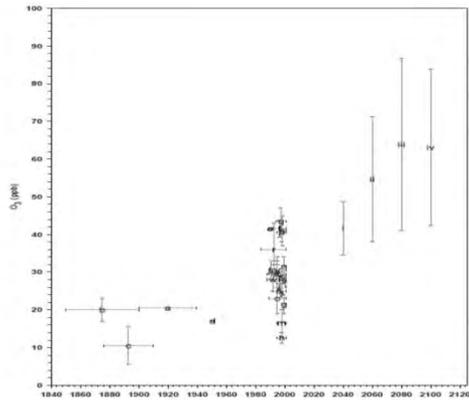


= O₃

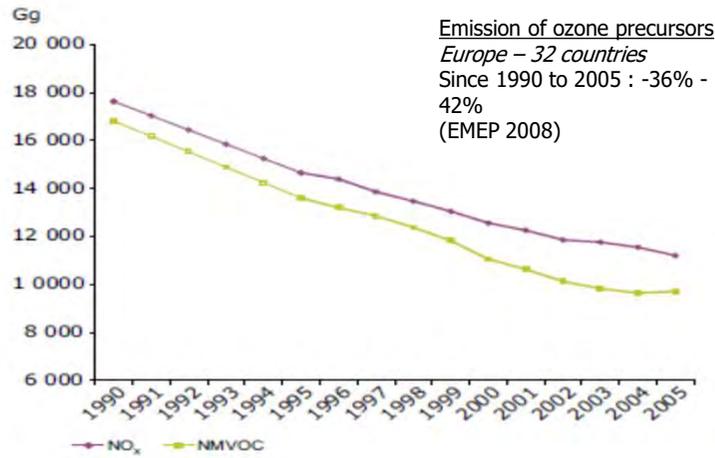


L'ozono è in aumento

- ...nonostante la diminuzione dei precursori!

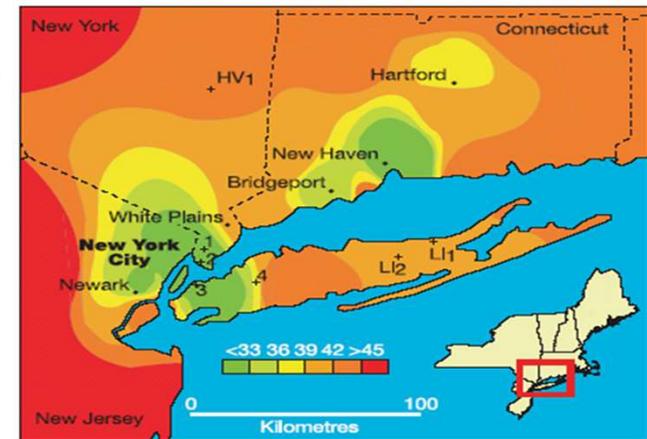


Ozone concentrations
Northern Hemisphere
Since 1874 to 2000: +100%
Present annual rate: +0.5-2%
(Paoletti 2007 PAVSNNR)



Emission of ozone precursors
Europe - 32 countries
Since 1990 to 2005 : -36% - 42%
(EMEP 2008)

L'ozono è un problema maggiore per le aree rurali perché in città viene inattivato dagli Nox presenti



Source: Gregg et al. 2003



Impatti dell'ozono sulla vegetazione

Figure 2.13 The impact of local air pollution on the growth of wheat in suburban Lahore, Pakistan

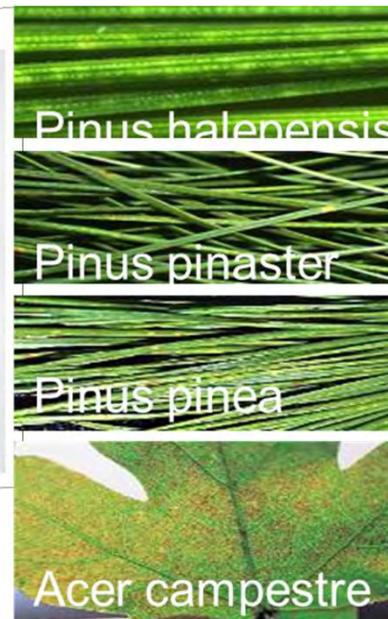
Figure 2.13 The impact of local air pollution on the growth of wheat in suburban Lahore, Pakistan



Note: The plants in the centre and on the right were both grown in local air, while the plant on the left was grown in filtered air. The effect of filtering the polluted air increased grain yield by about 40 per cent.

Credit: A. Vohid

about 40 per cent.



Pinus halepensis

Pinus pinaster

Pinus pinea

Acer campestre



Pistacia
lentiscus



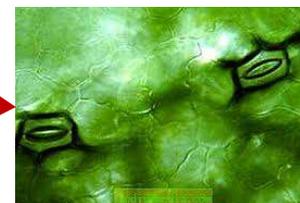
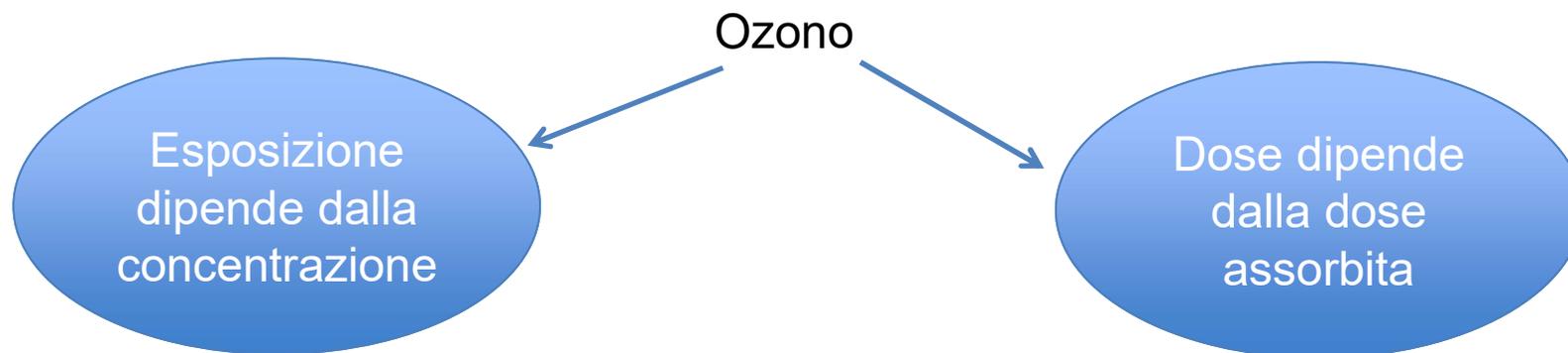
P. terebinthus



Arbutus unedo

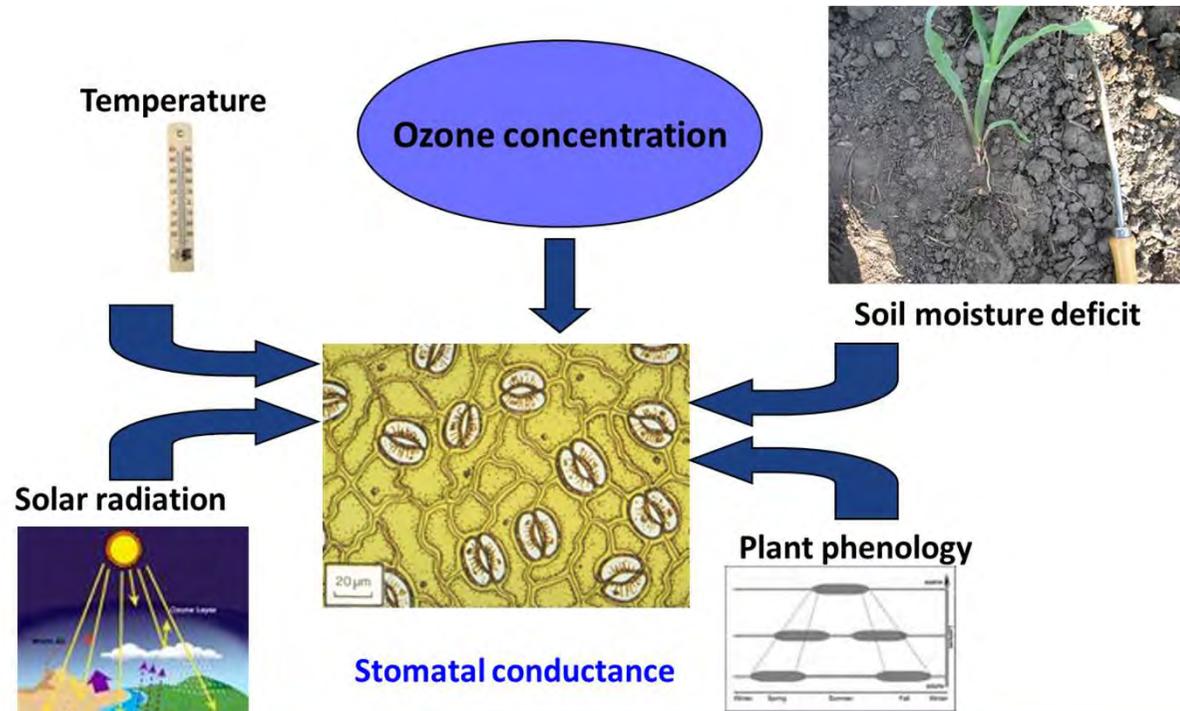
<http://www.gva.es/ceam/ICP-forests/> (photo: MJ Sanz)

Da cosa dipende il danno da ozono



Aperture stomatiche

L'ozono entra nelle foglie attraverso gli stomi



$$PODY = \int_{i=1}^{n} \max((F_{st} - Y), 0).dt$$

dove $Y = 0$ or 1 mmol m^{-2}

$$g_{sw} = g_{max} * f_{phen} * f_{light} * \max\{f_{min}, (f_{temp} * f_{VPD} * f_{SWC})\}$$

calculated over the growing season, when global radiation > 0 W m^{-2} (Launiainen et al., 2013; Elhaddad et al., 2014).

Che succede passando dall'esposizione al flusso stomatico su una mappa di rischio da ozono?...

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A. De Marco et al. / Atmospheric Environment 120 (2015) 182–190

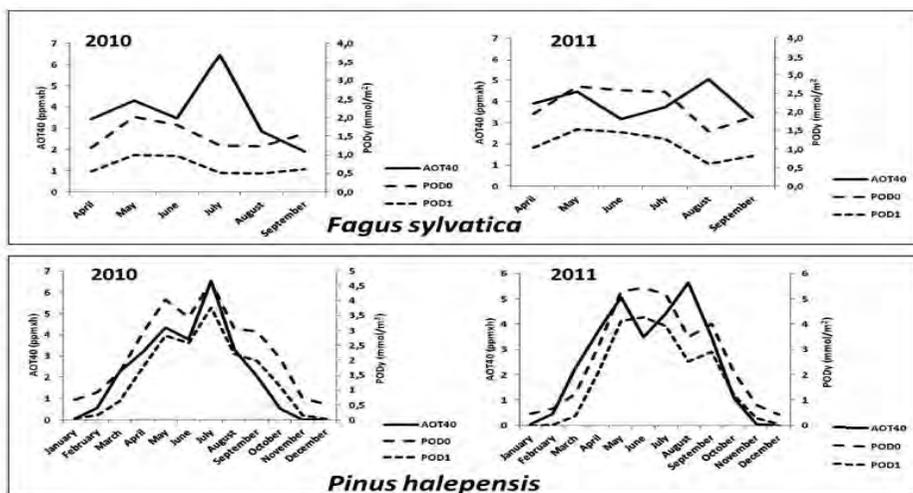
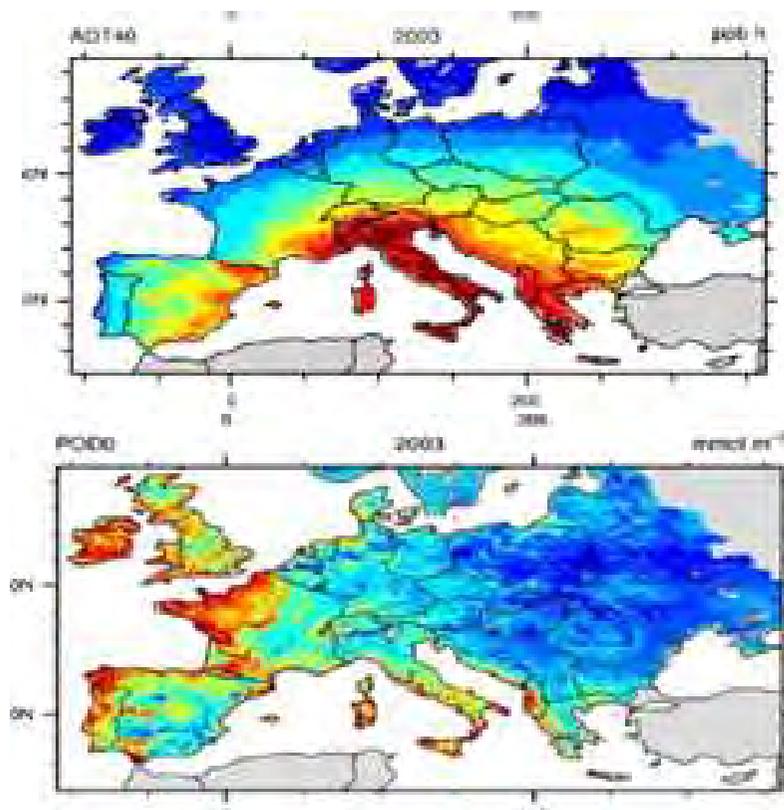


Fig. 1. Monthly averages of AOT40 (O_3 concentrations accumulated above 40 ppb hourly average), POD0 and POD1 (stomatal O_3 uptake without and with a threshold, respectively) for the years 2010 and 2011 in *Fagus sylvatica* and *Pinus halepensis* forests of South-eastern France and North-western Italy.

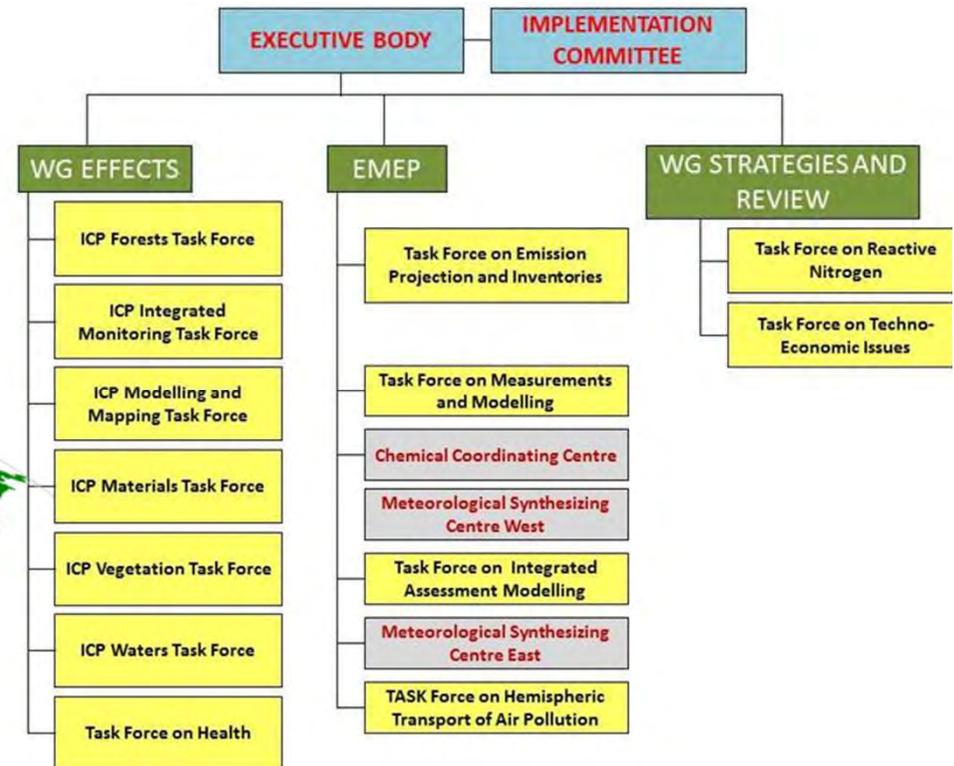


La differenza tra concentrazione e dose è sia a livello spaziale sia temporale



Chi studia gli impatti sulle foreste a livello internazionale?

CLRTAP Convention on Long Range Transboundary Air Pollution



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Titolo della presentazione - Luogo e data