



La crisi climatica e le foreste

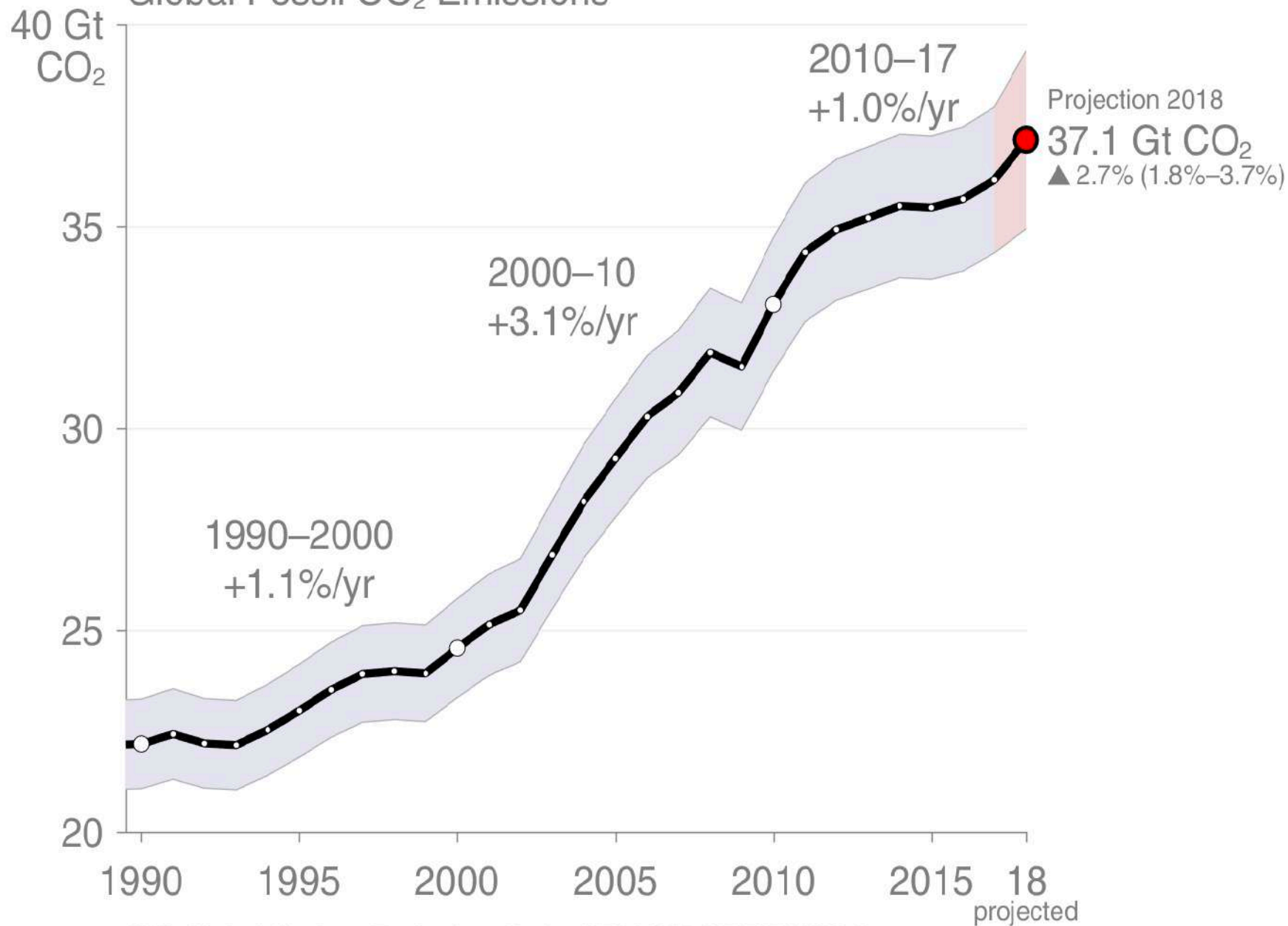
Giorgio Vacchiano

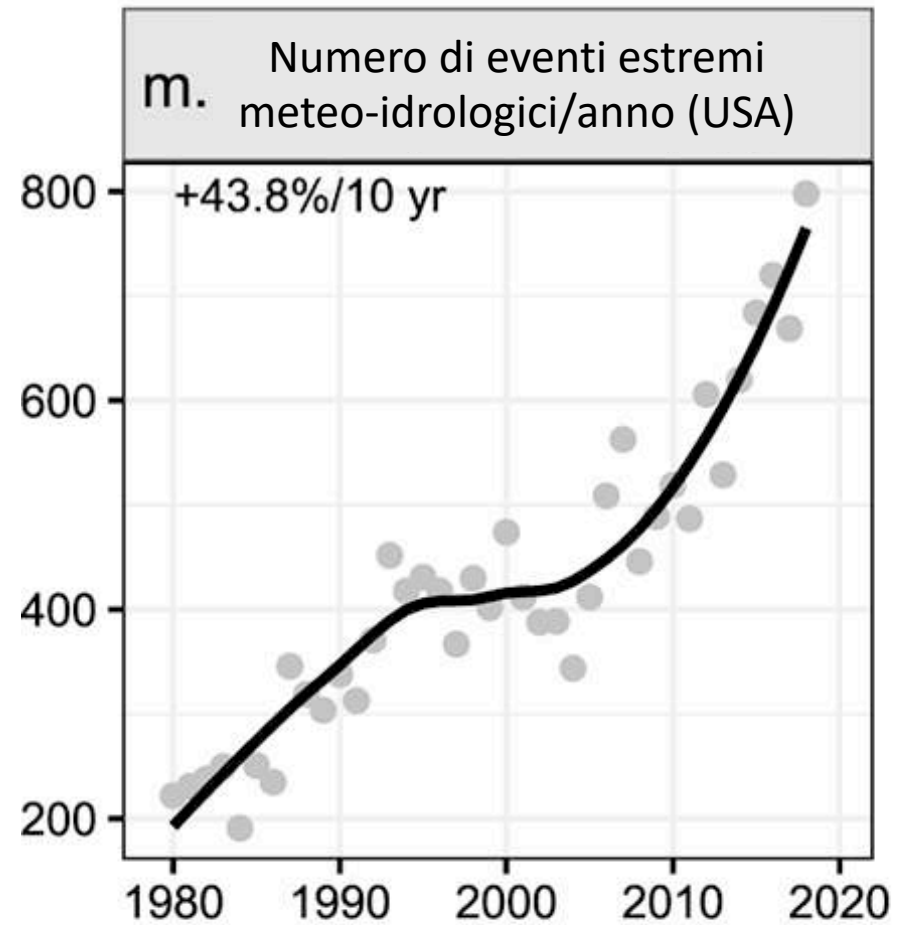
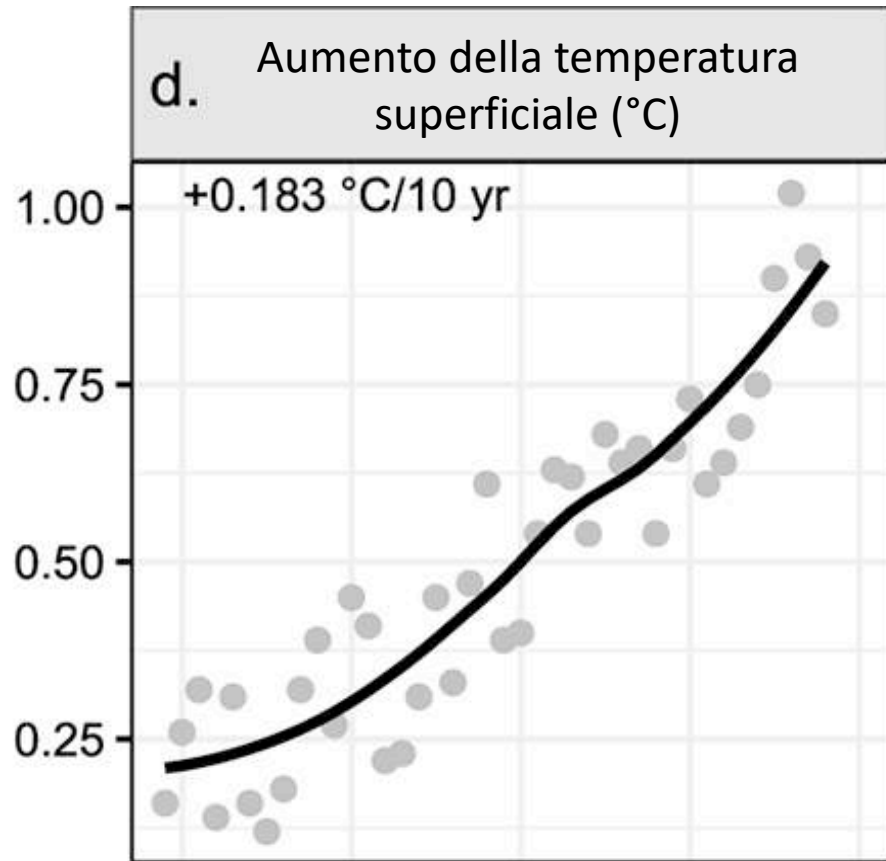
Università Statale di Milano

gvacchiano@gmail.com



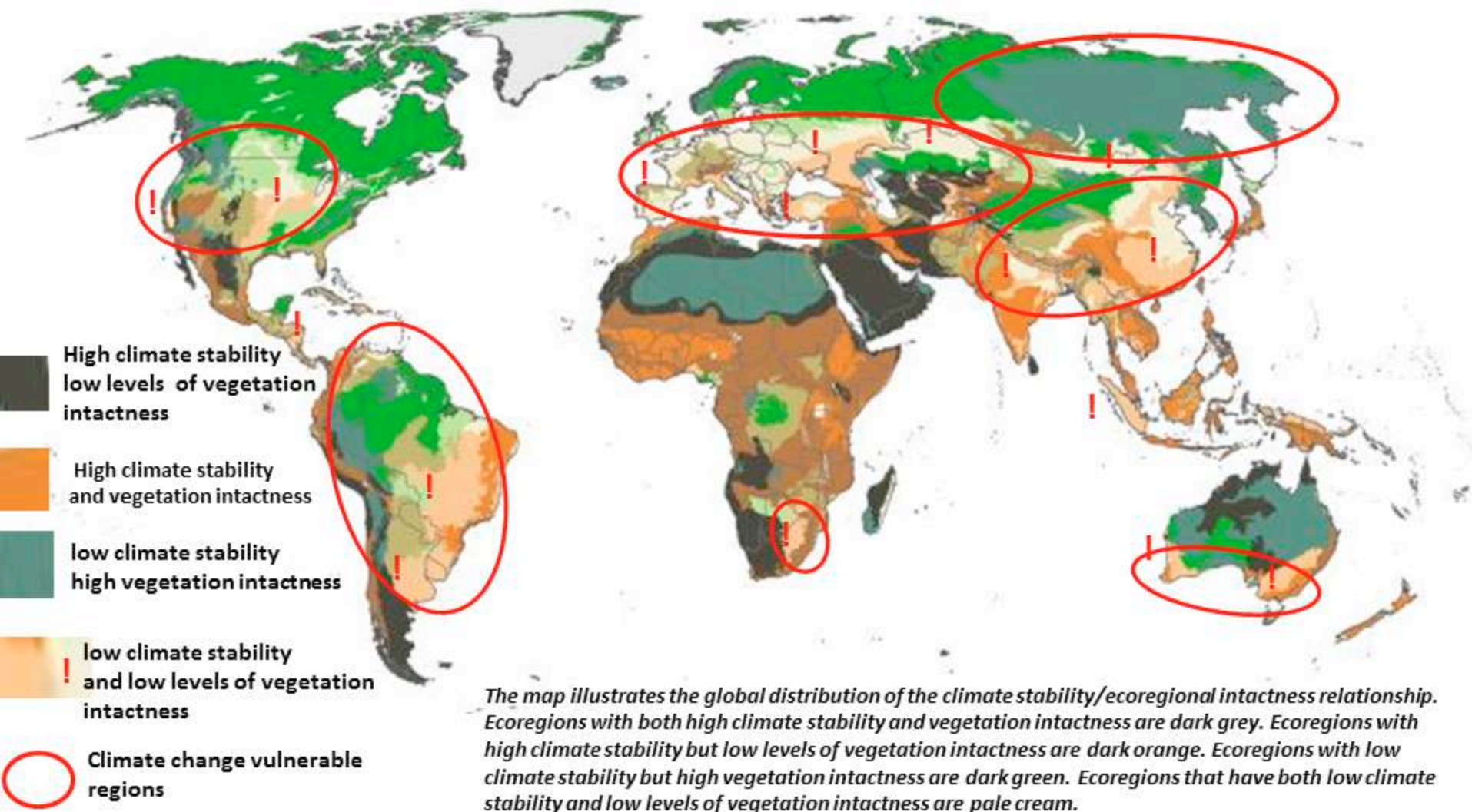
Global Fossil CO₂ Emissions



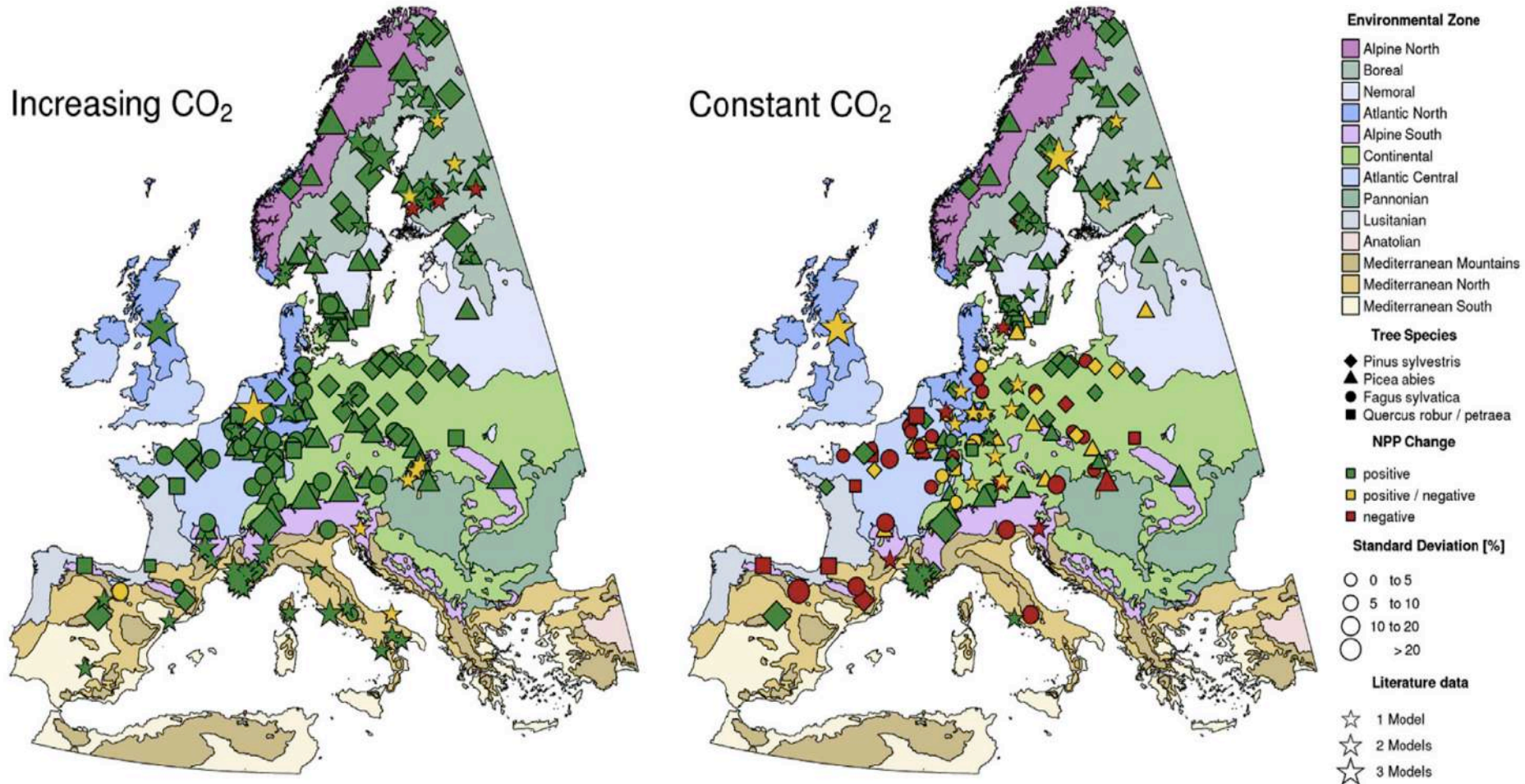


Ecosystem climate change vulnerability and conservation

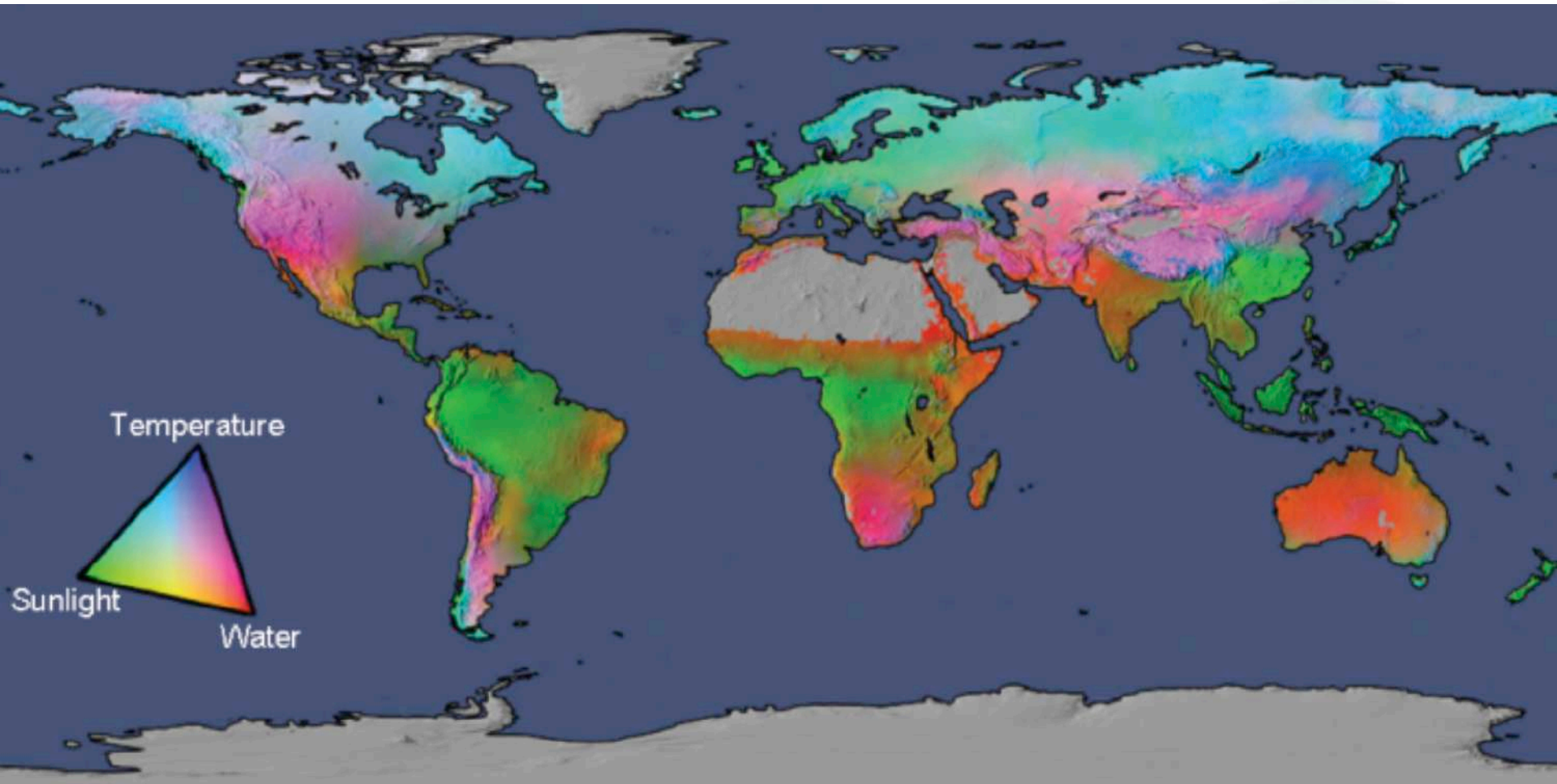
Mapping vulnerability and conservation adaptation strategies under climate change James E. M. Watson, Nature Climate Change September 2013



Effetto sulla produttività primaria delle foreste

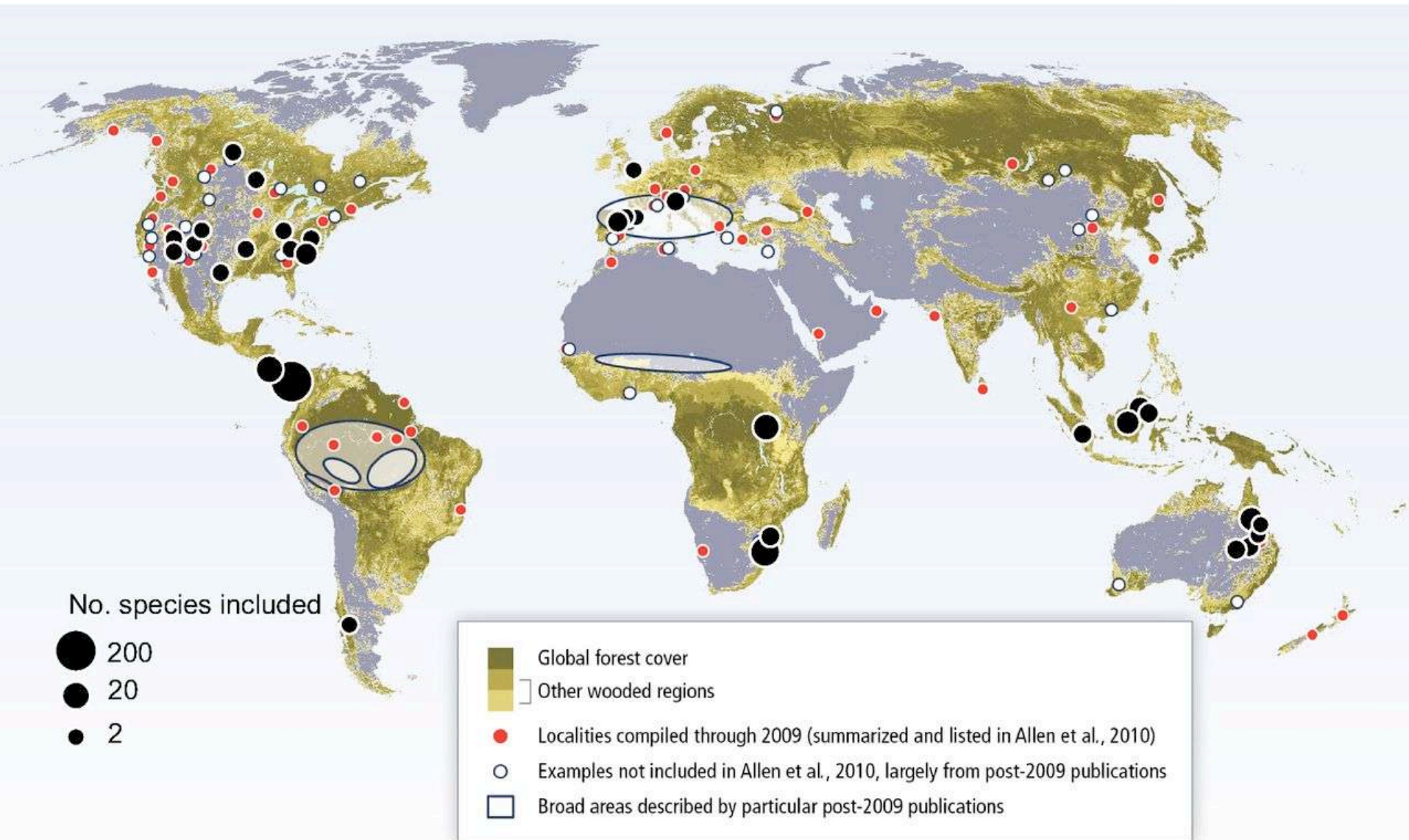


Limiti fisici e climatici alla produttività primaria

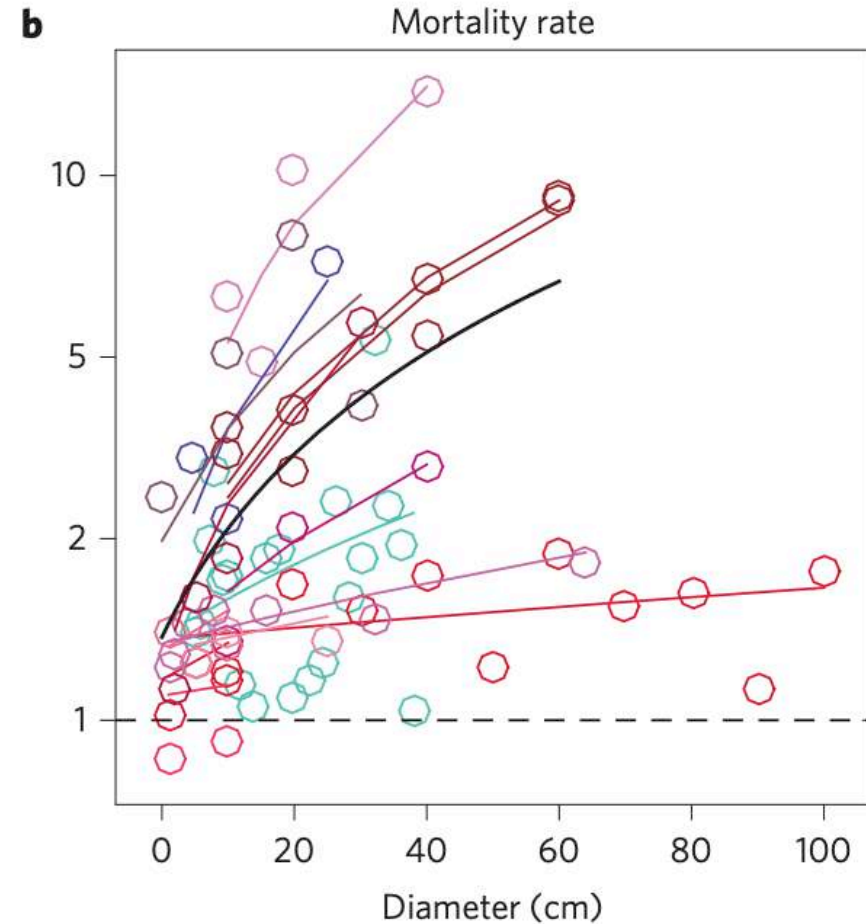
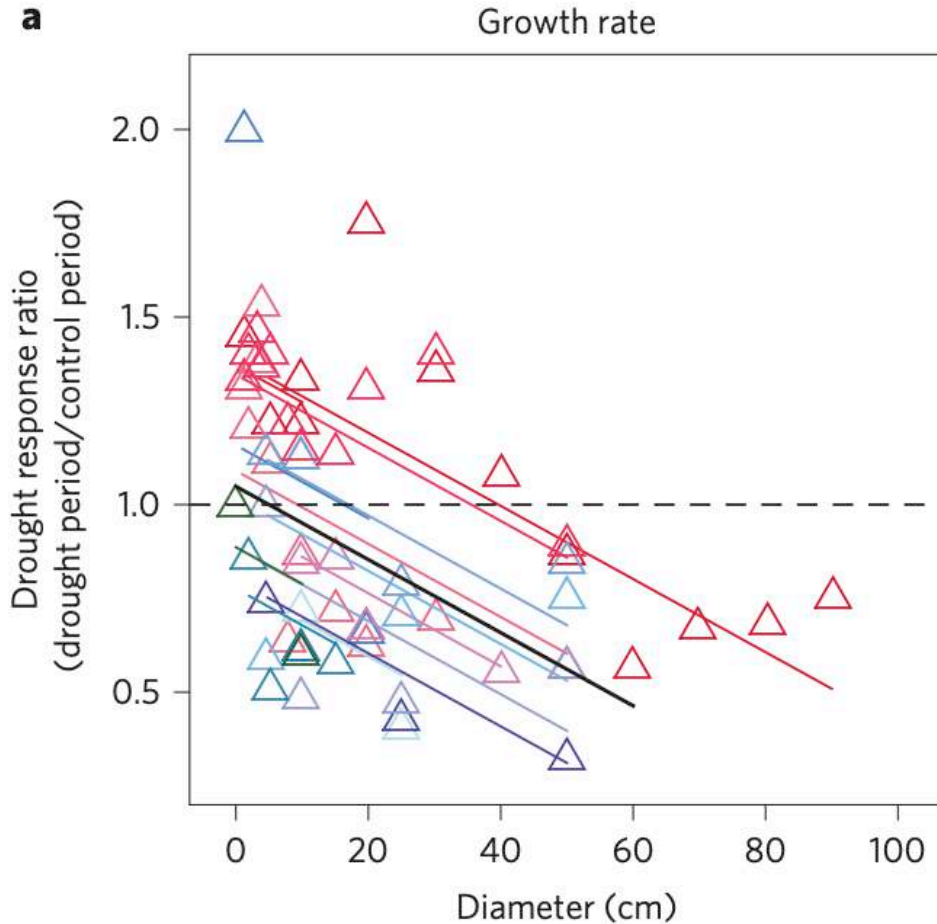


<https://onlinelibrary.wiley.com/doi/10.1111/j.1365-2486.2006.01134.x>

Episodi di deperimento da siccità



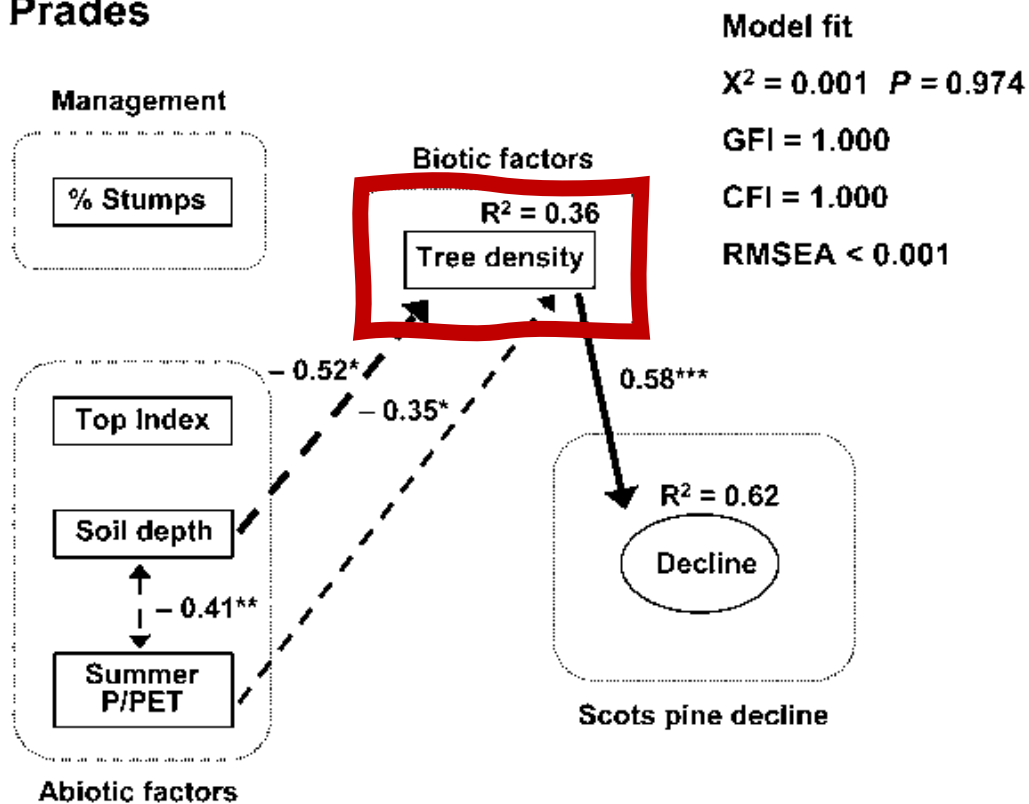
Effetto differenziato per dimensione degli alberi

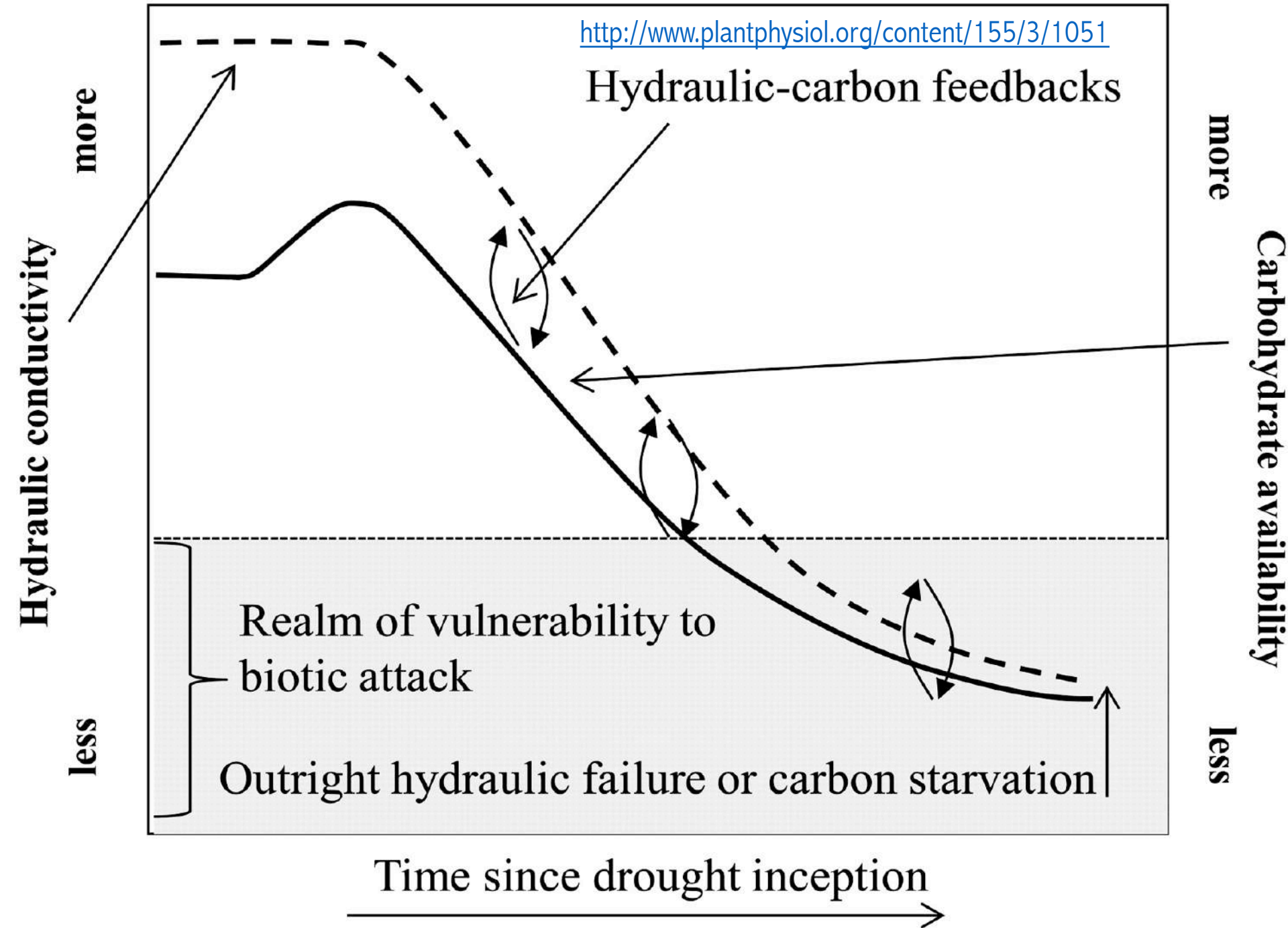


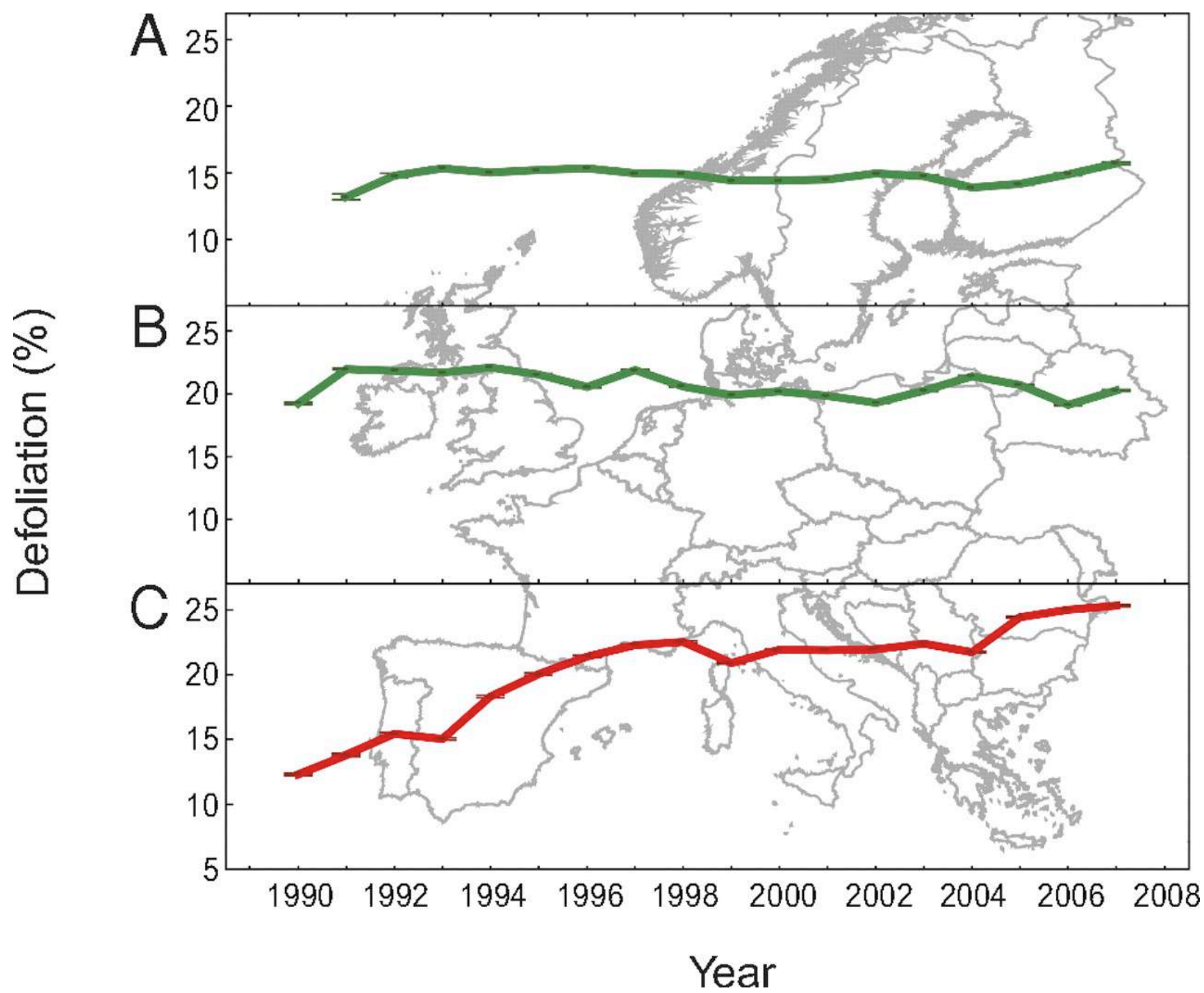
<https://www.nature.com/articles/nplants2015139>

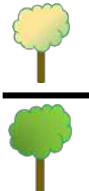
Interazioni con la densità del bosco

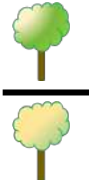
A Prades

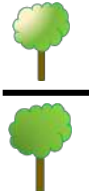


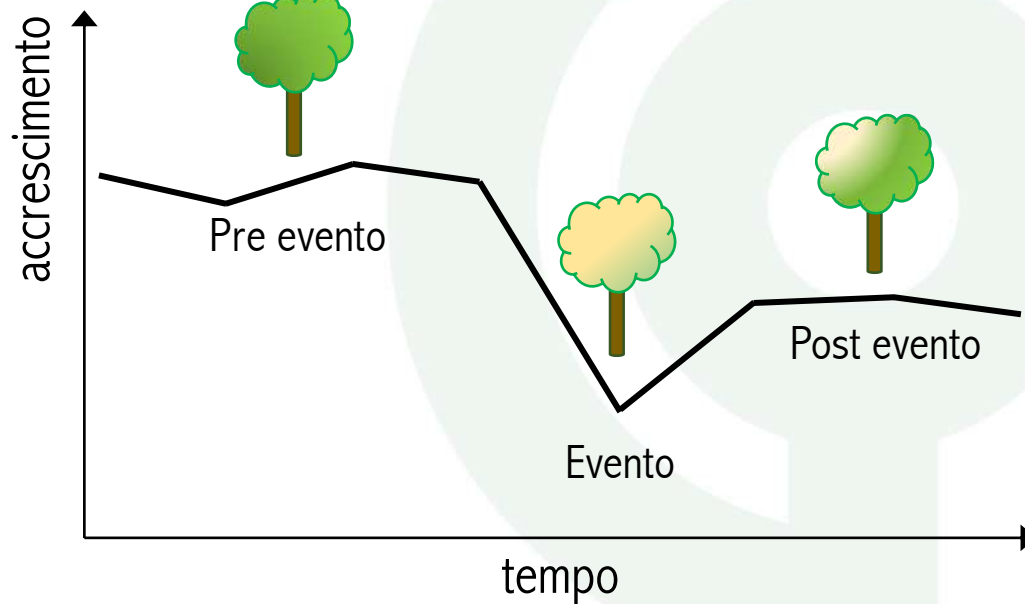


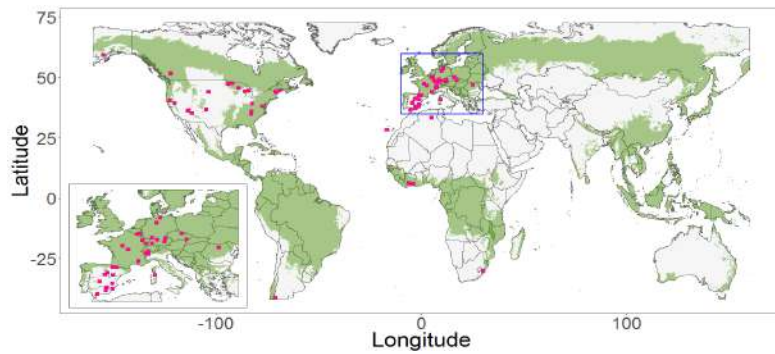


$$\text{Resistenza} = \frac{\text{Evento}}{\text{Pre}}$$


$$\text{Ripresa} = \frac{\text{Post}}{\text{Evento}}$$


$$\text{Resilienza} = \frac{\text{Post}}{\text{Pre}}$$


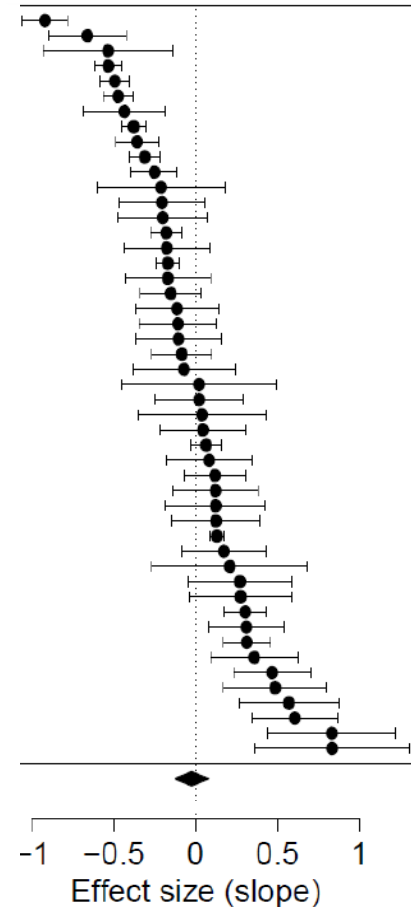
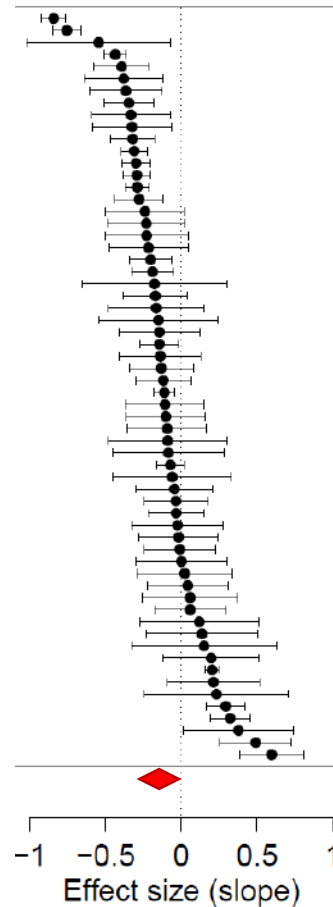




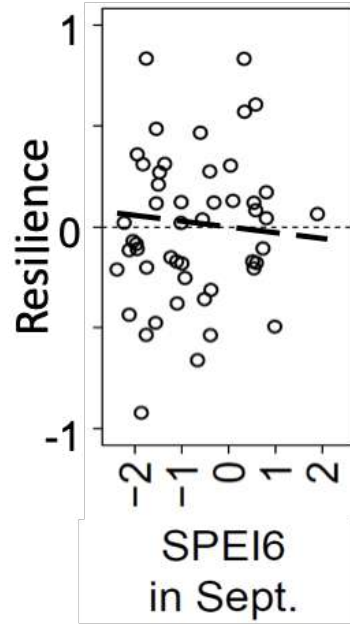
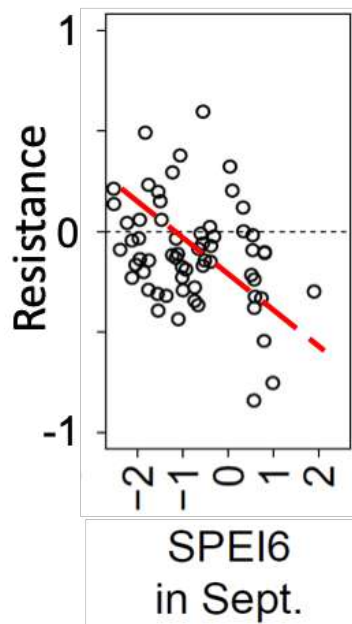
Effetto della competizione
(area basimetrica)

Resistenza

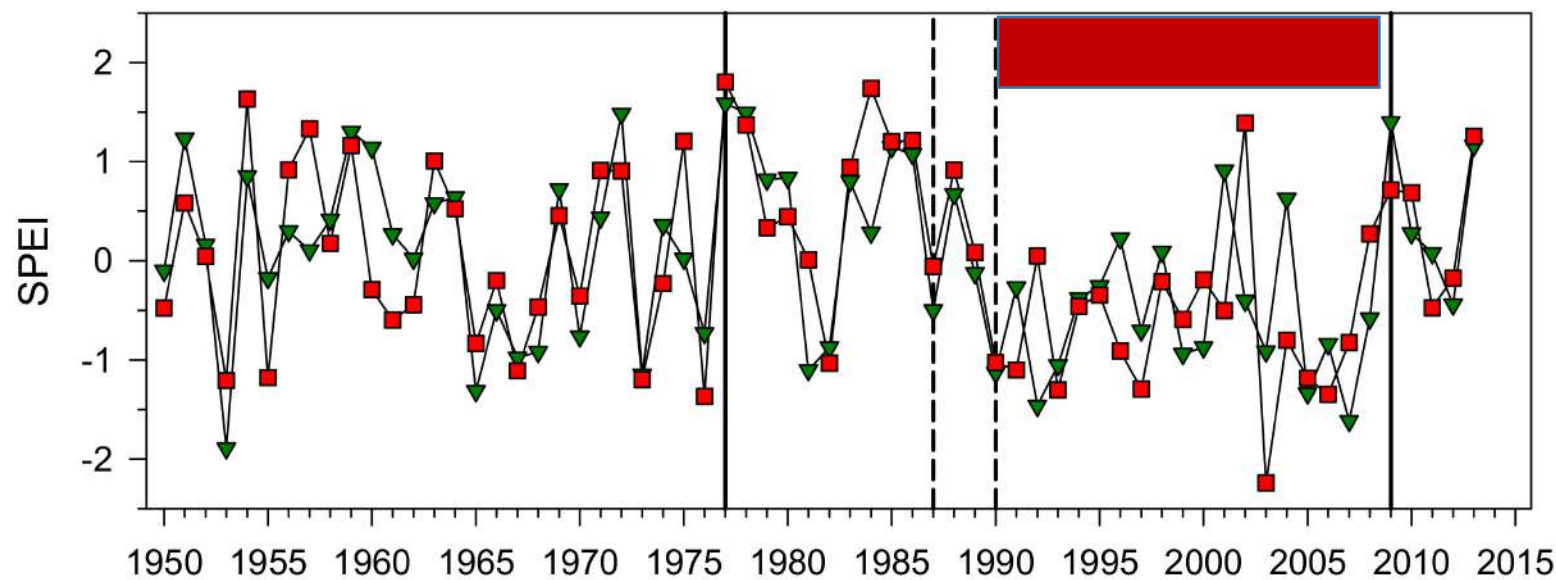
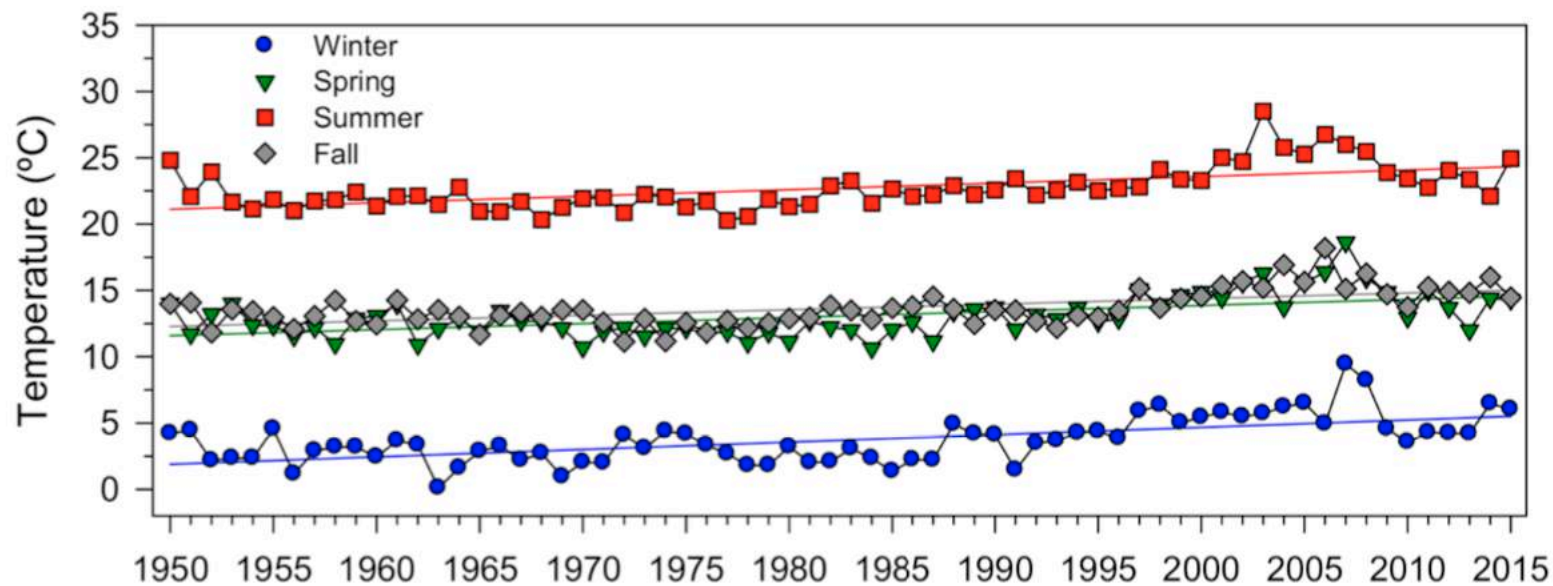
Resilienza



Effetto della siccità (SPEI)



5/16

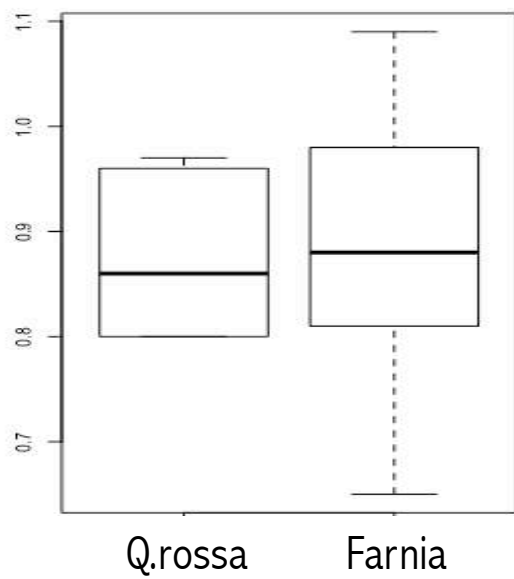




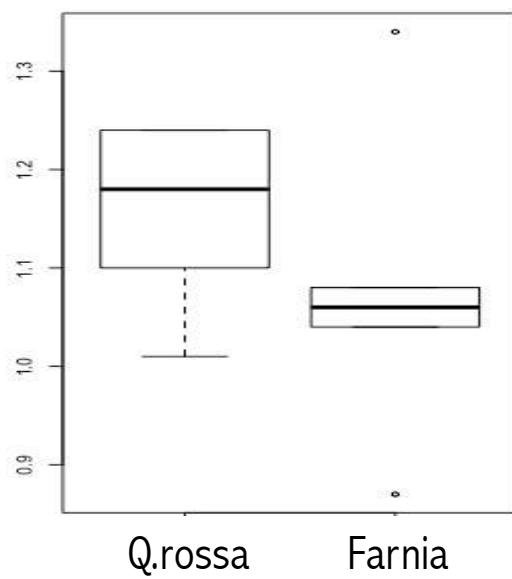
VS.



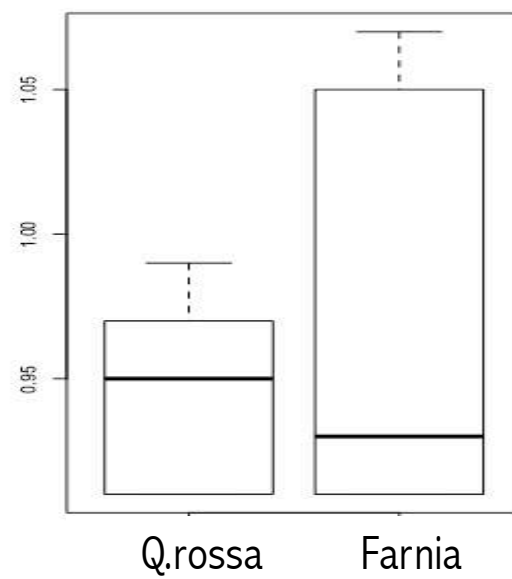
Resistenza

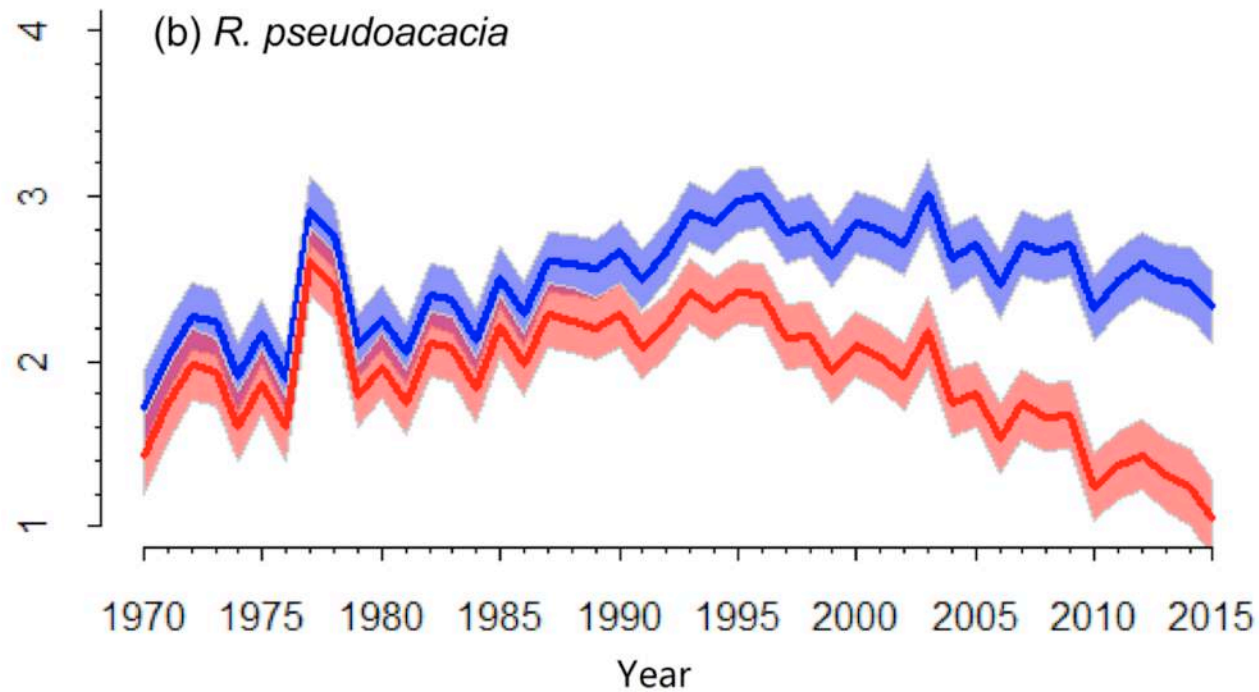
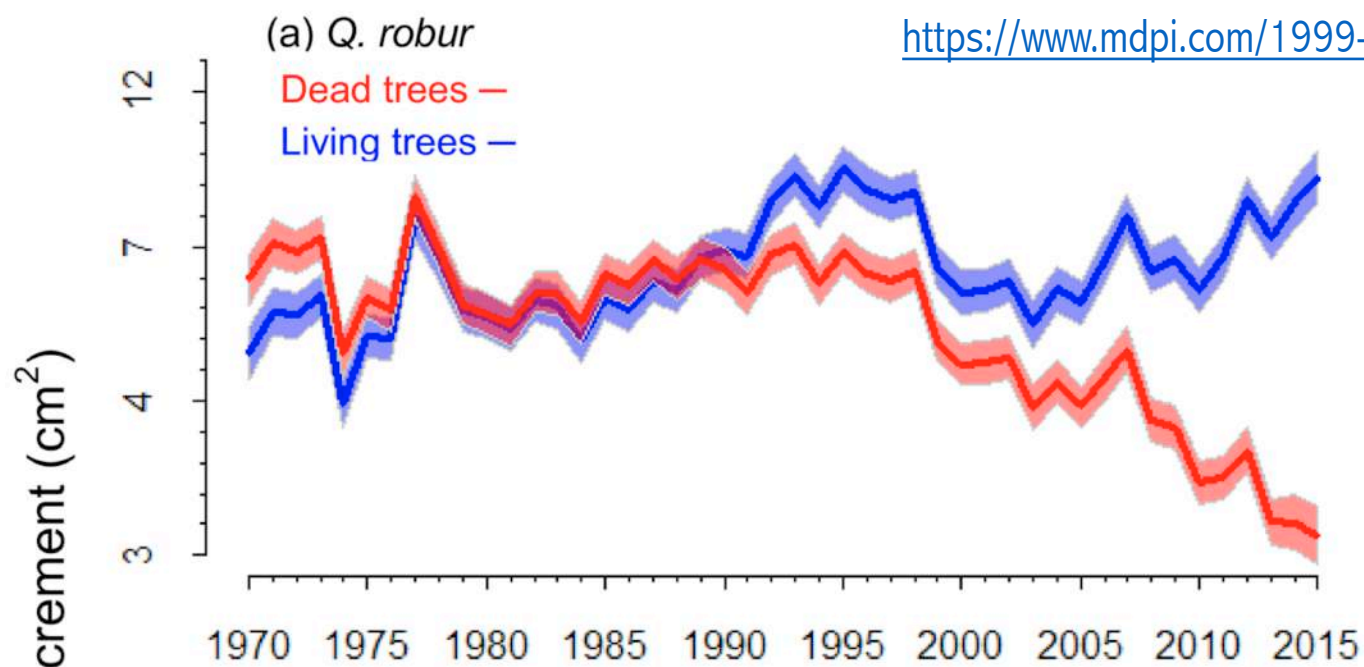


Ripresa



Resilienza





Stress idrico estivo

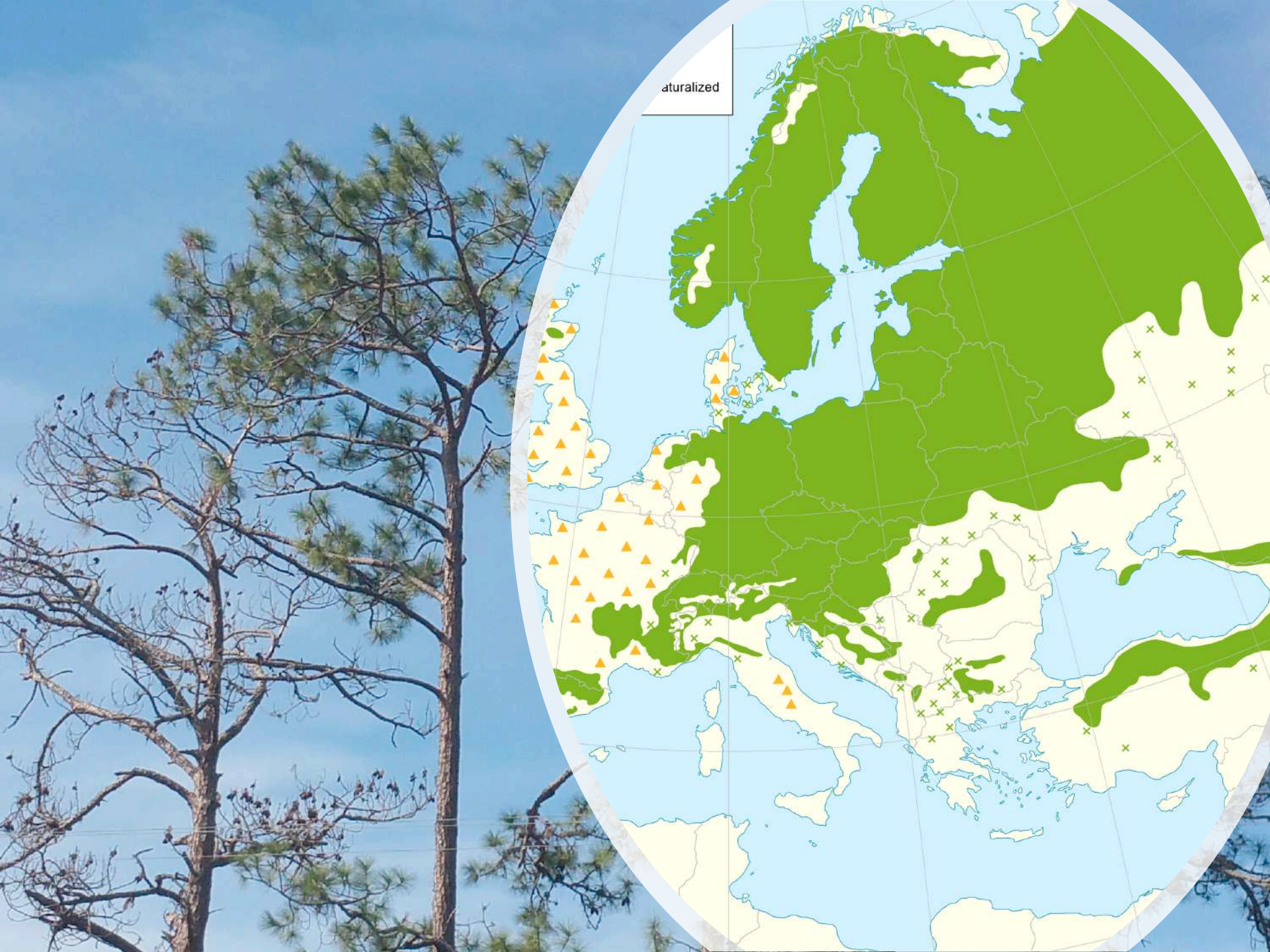
Controllo



Semenzali di pino silvestre sottoposti a stress idrico

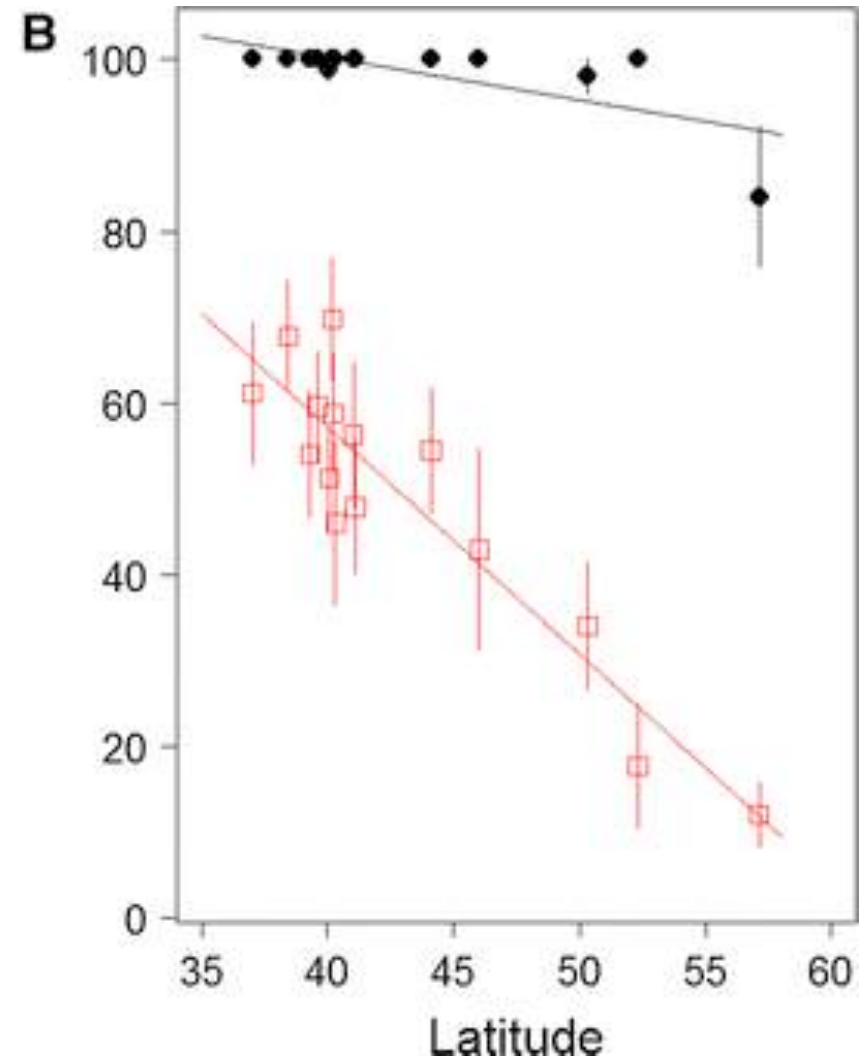
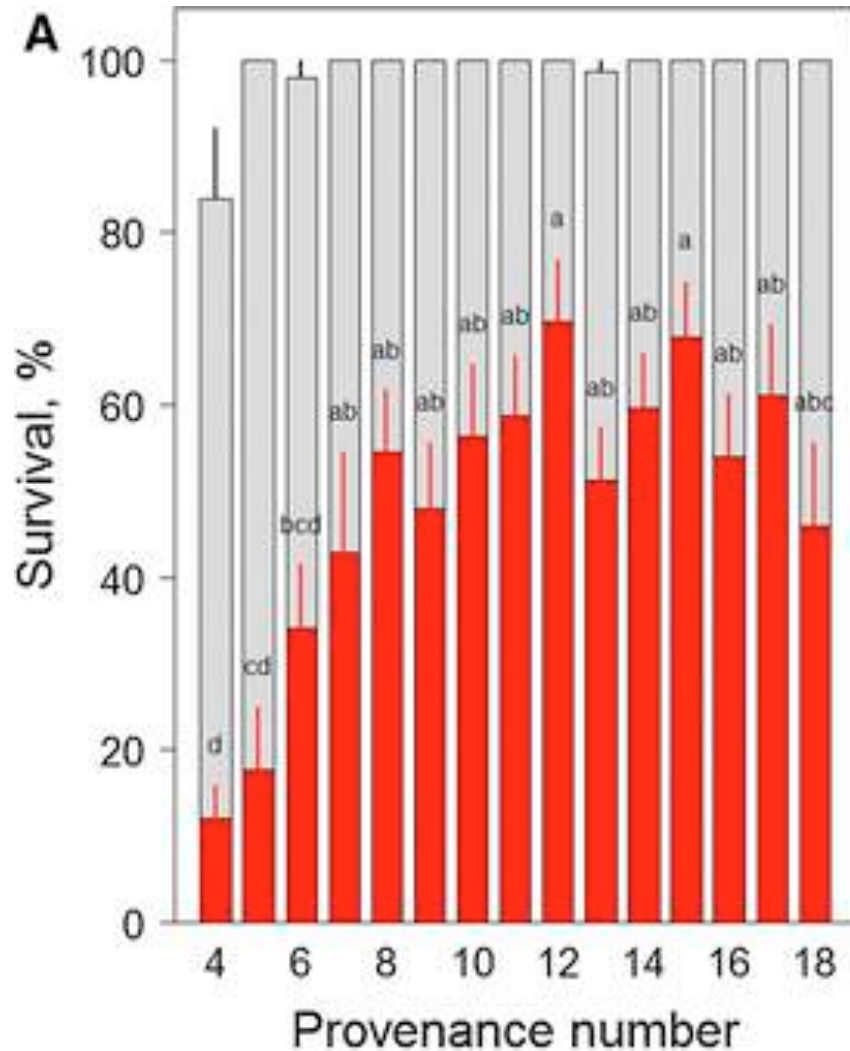
by Christoph Bachofen, WSL

<https://esajournals.onlinelibrary.wiley.com/doi/pdf/10.1002/ecs2.2108>



aturalized

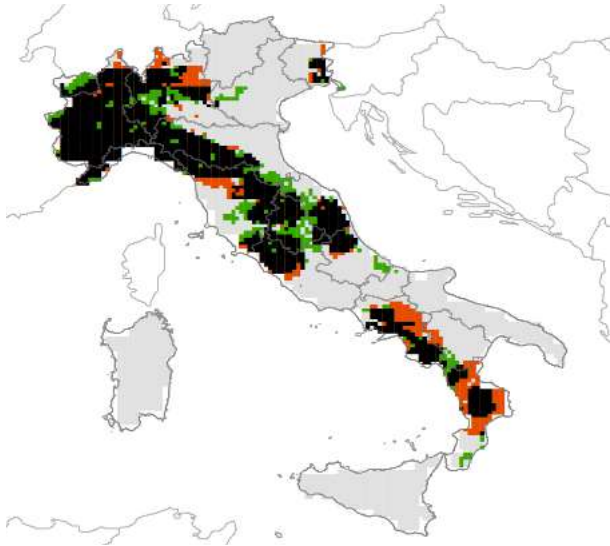
Differenziazione ecotipica (sopravvivenza a stress idrico)



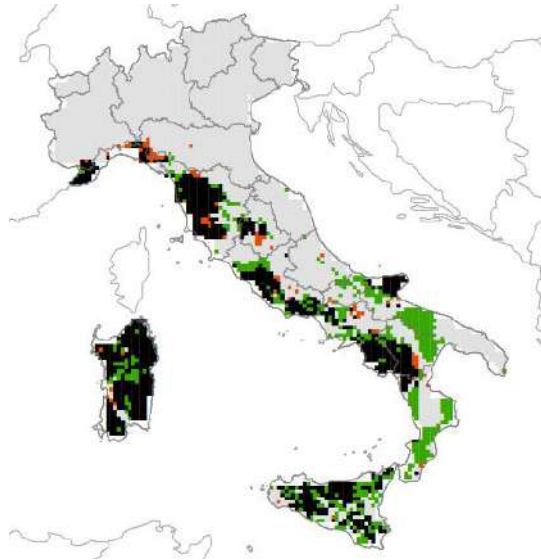
Cambiamento nell'areale delle specie



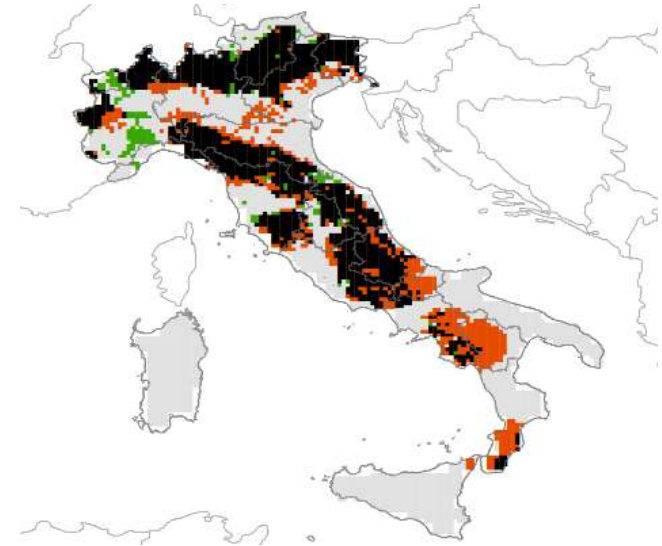
Castanea sativa



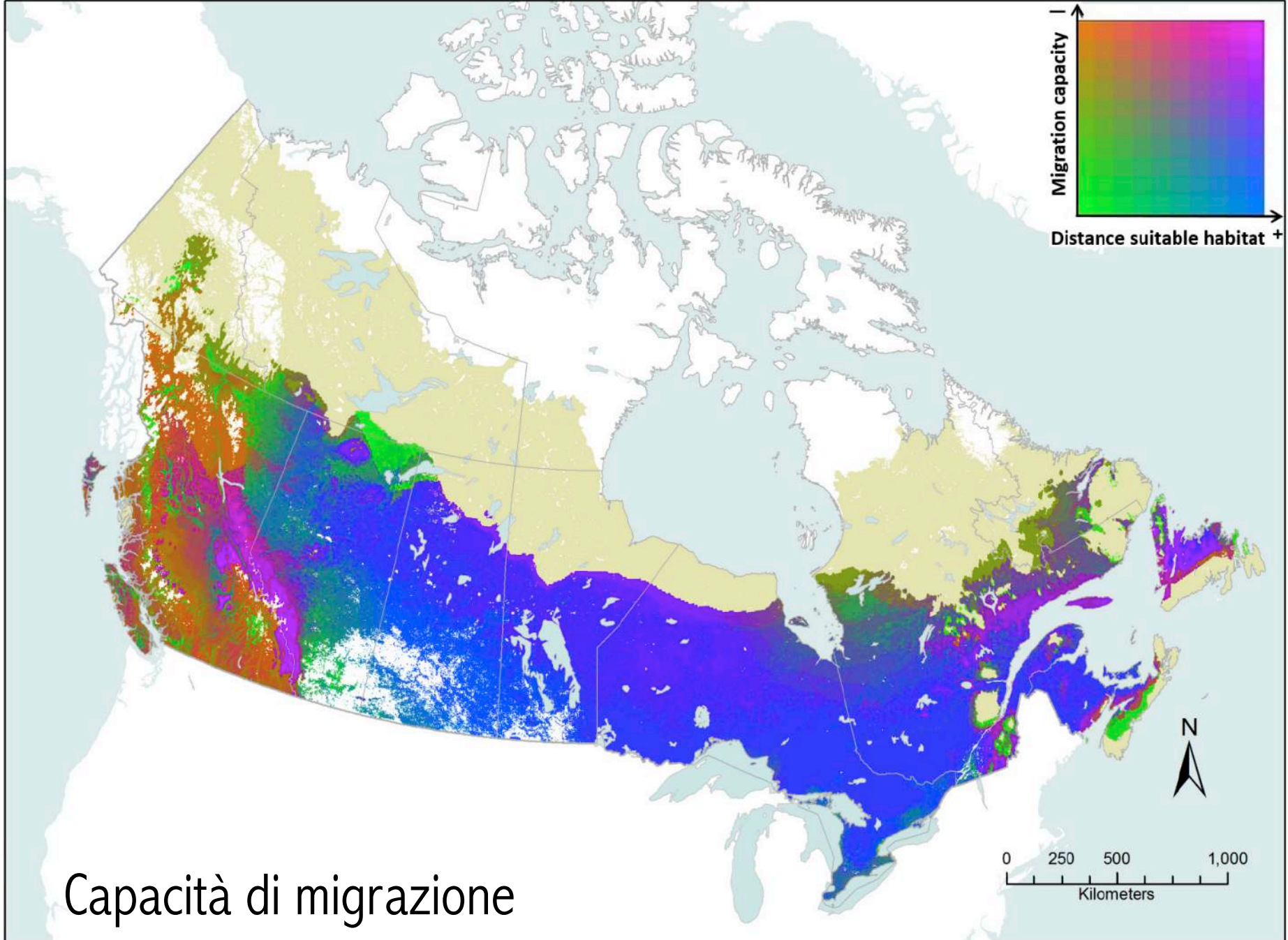
Mediterranean scrub



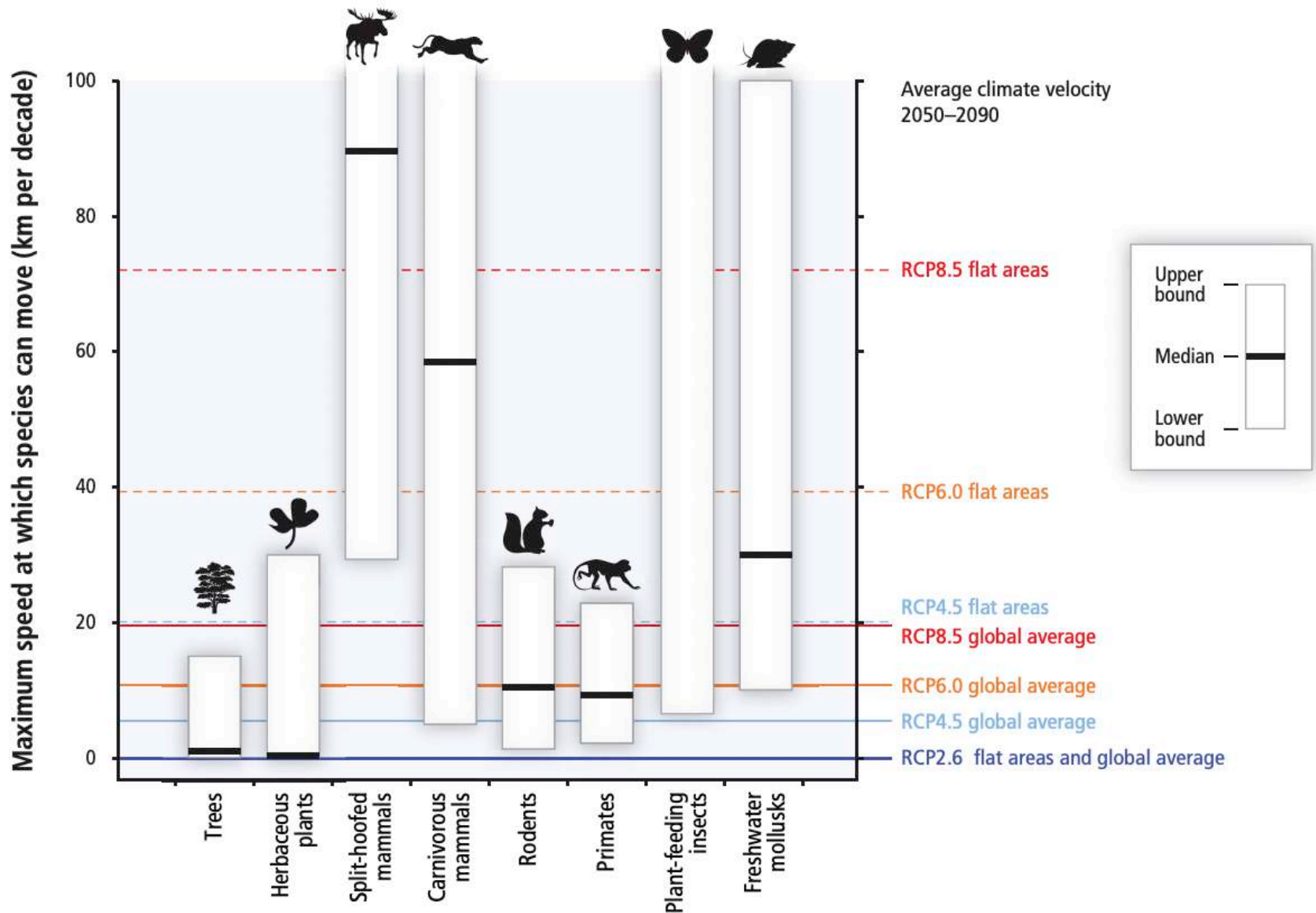
Fagus sylvatica



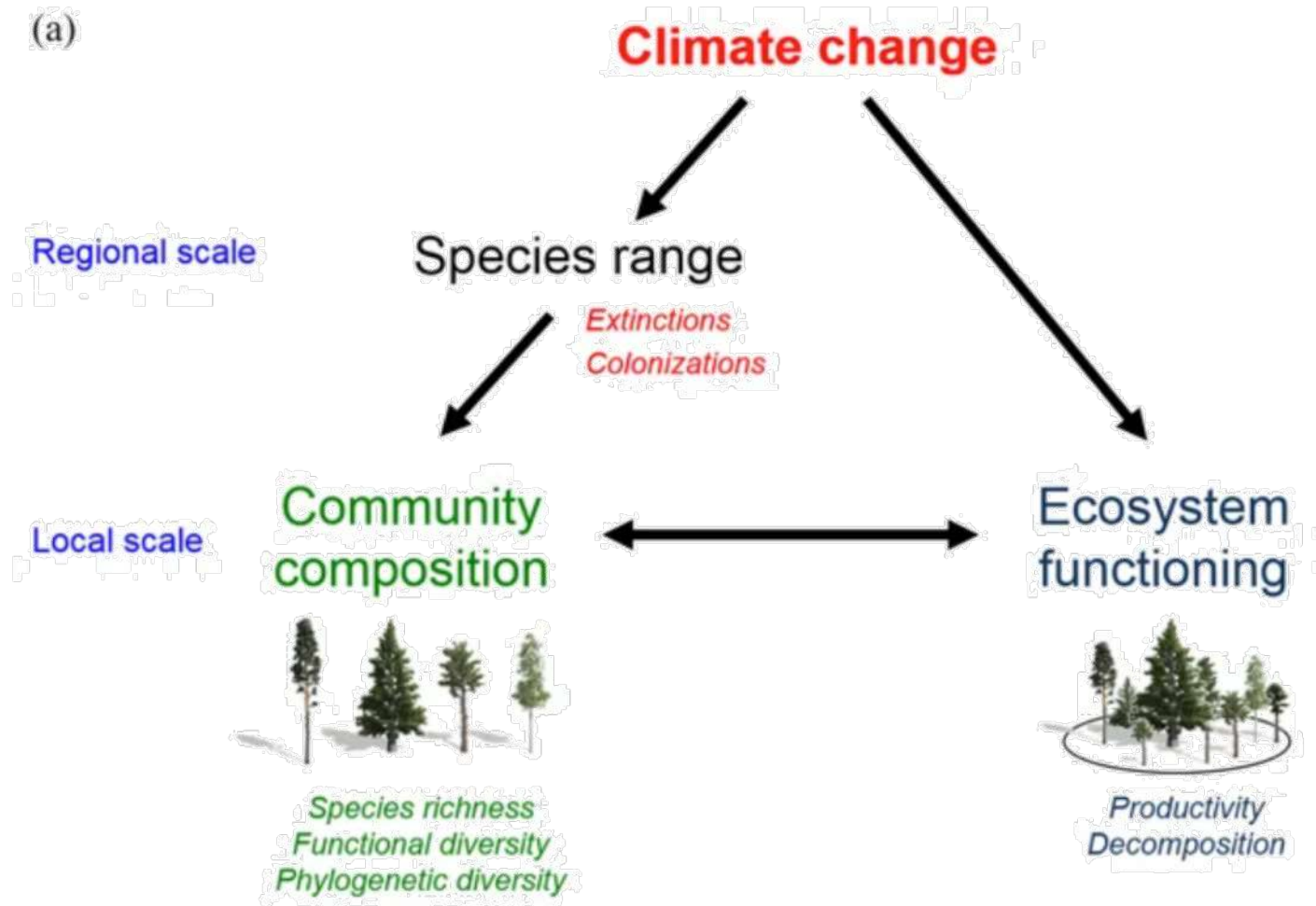
<http://www.minambiente.it/comunicati/ambiente-parte-consultazione-su-piano-nazionale-adattamento-cambiamenti-climatici>



Capacità di migrazione

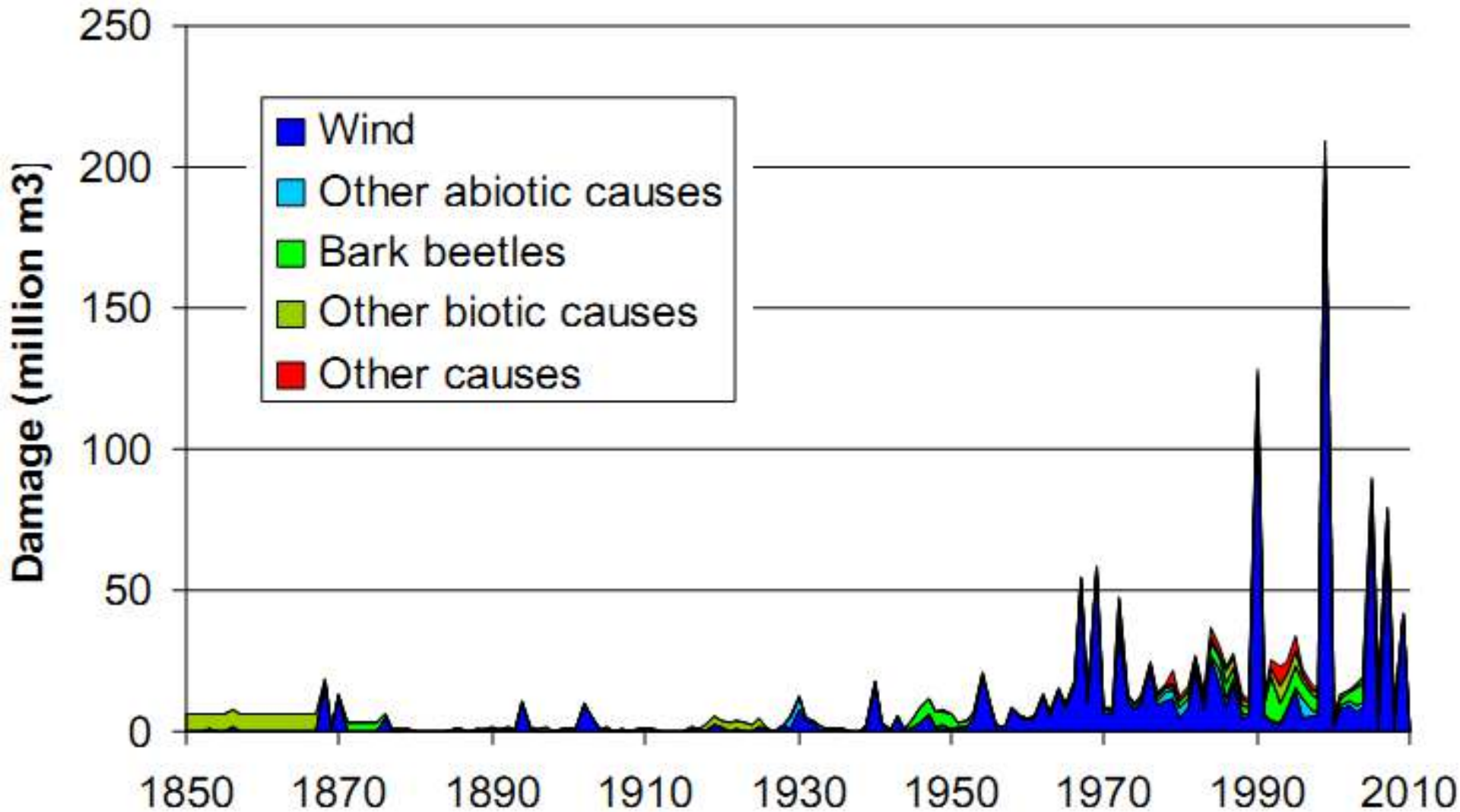


(a)



<https://www.nature.com/articles/s41598-018-23763-y>

Aumento dei disturbi biotici e abiotici

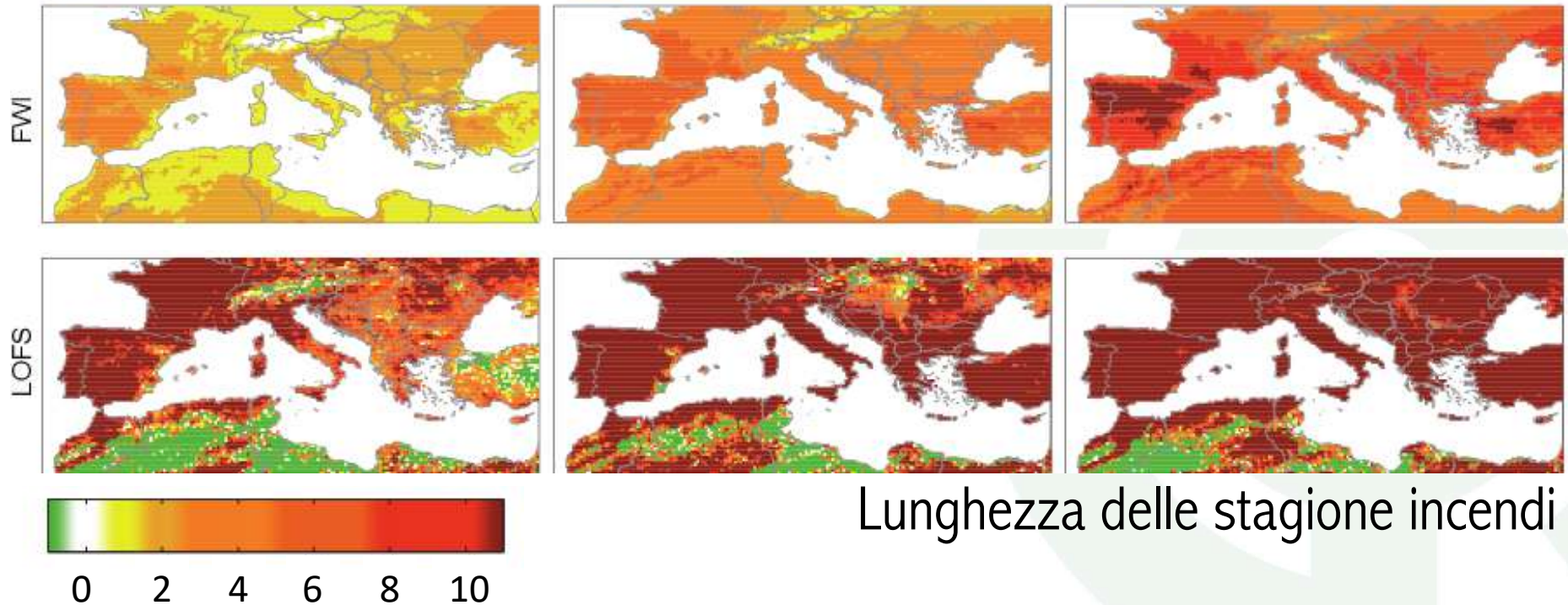


Fire Weather Index

2011-2040

2041-2070

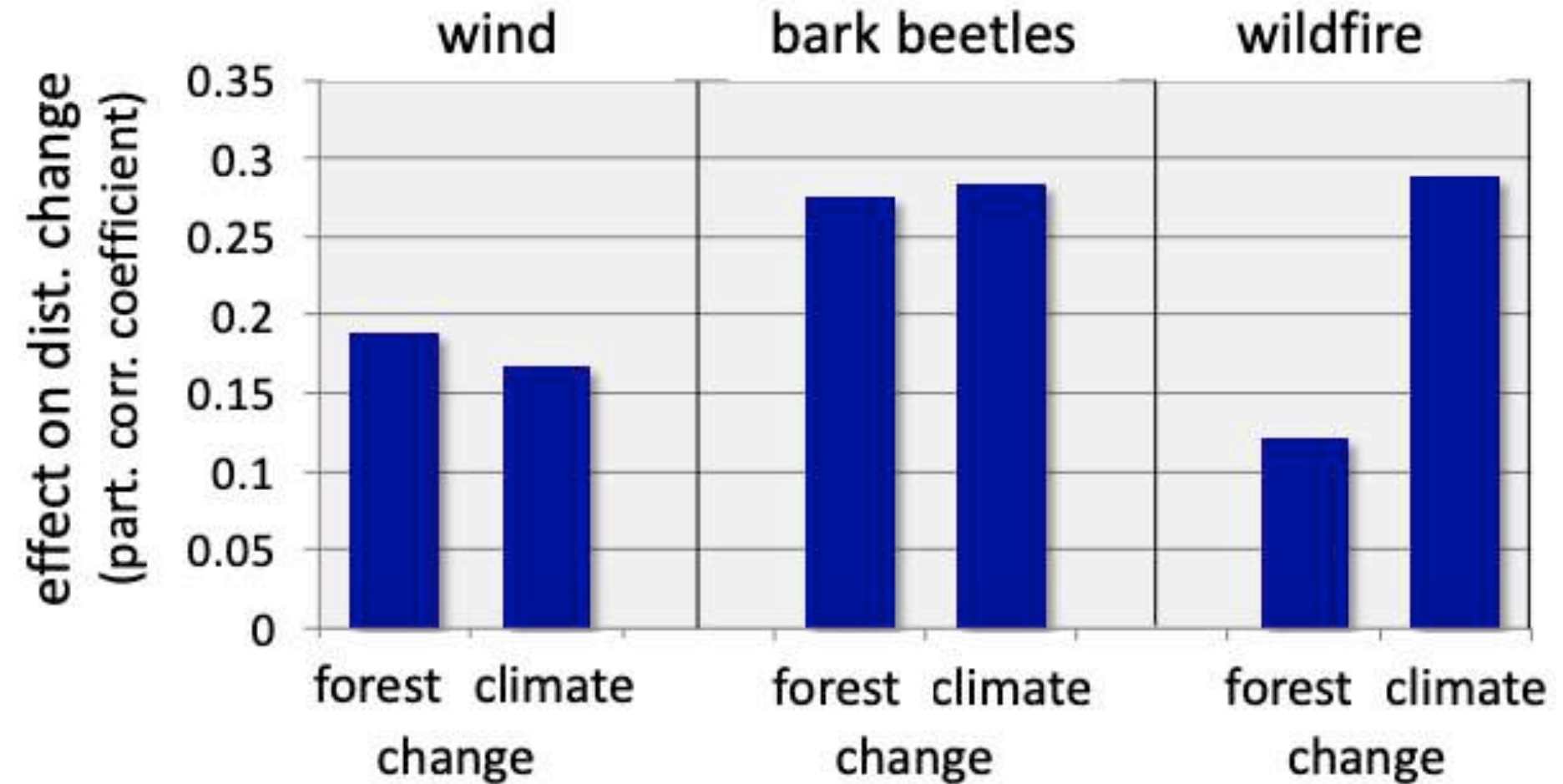
2071-2100



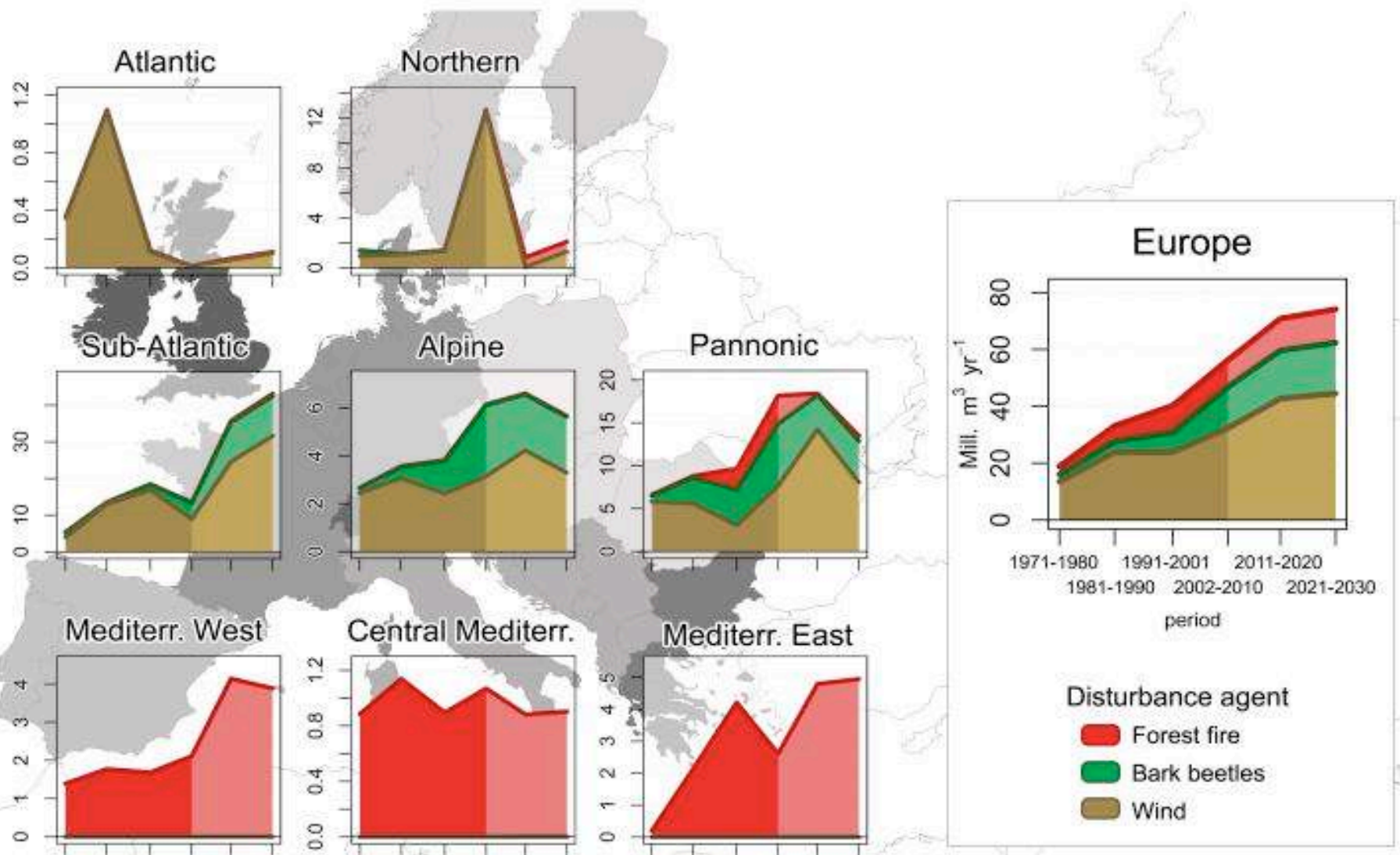
Lunghezza delle stagione incendi

<https://link.springer.com/article/10.1007/s10584-013-1005-z>

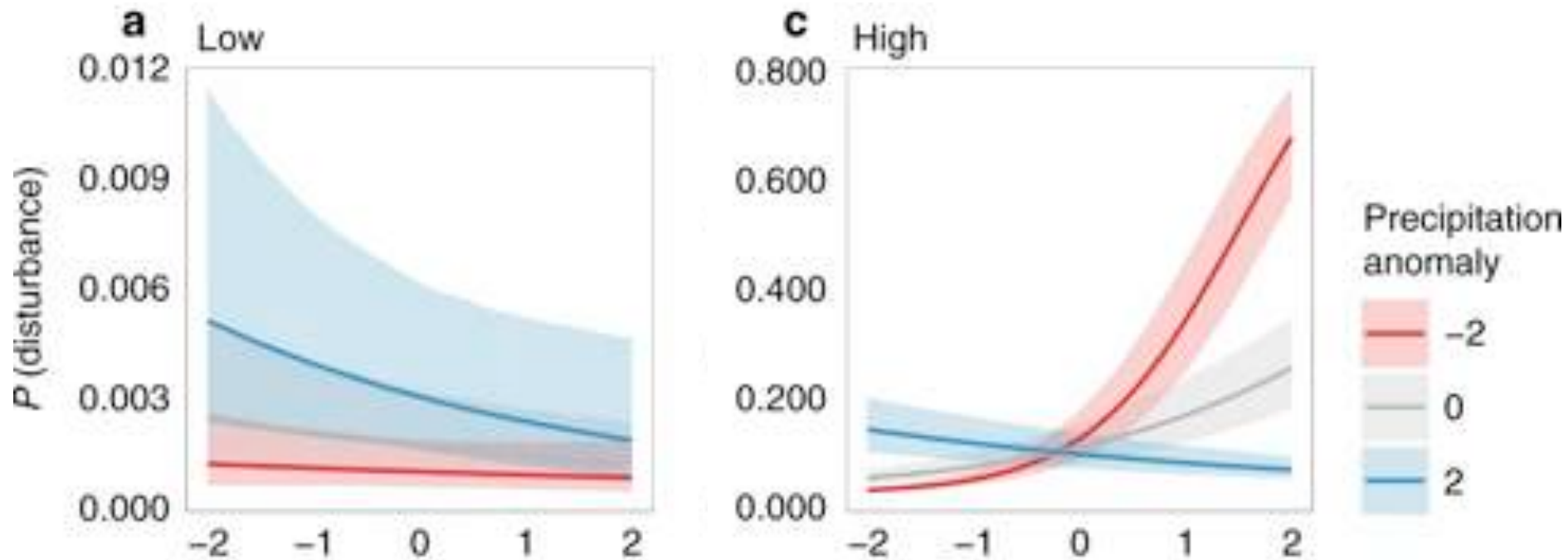
Aumento dei disturbi biotici e abiotici



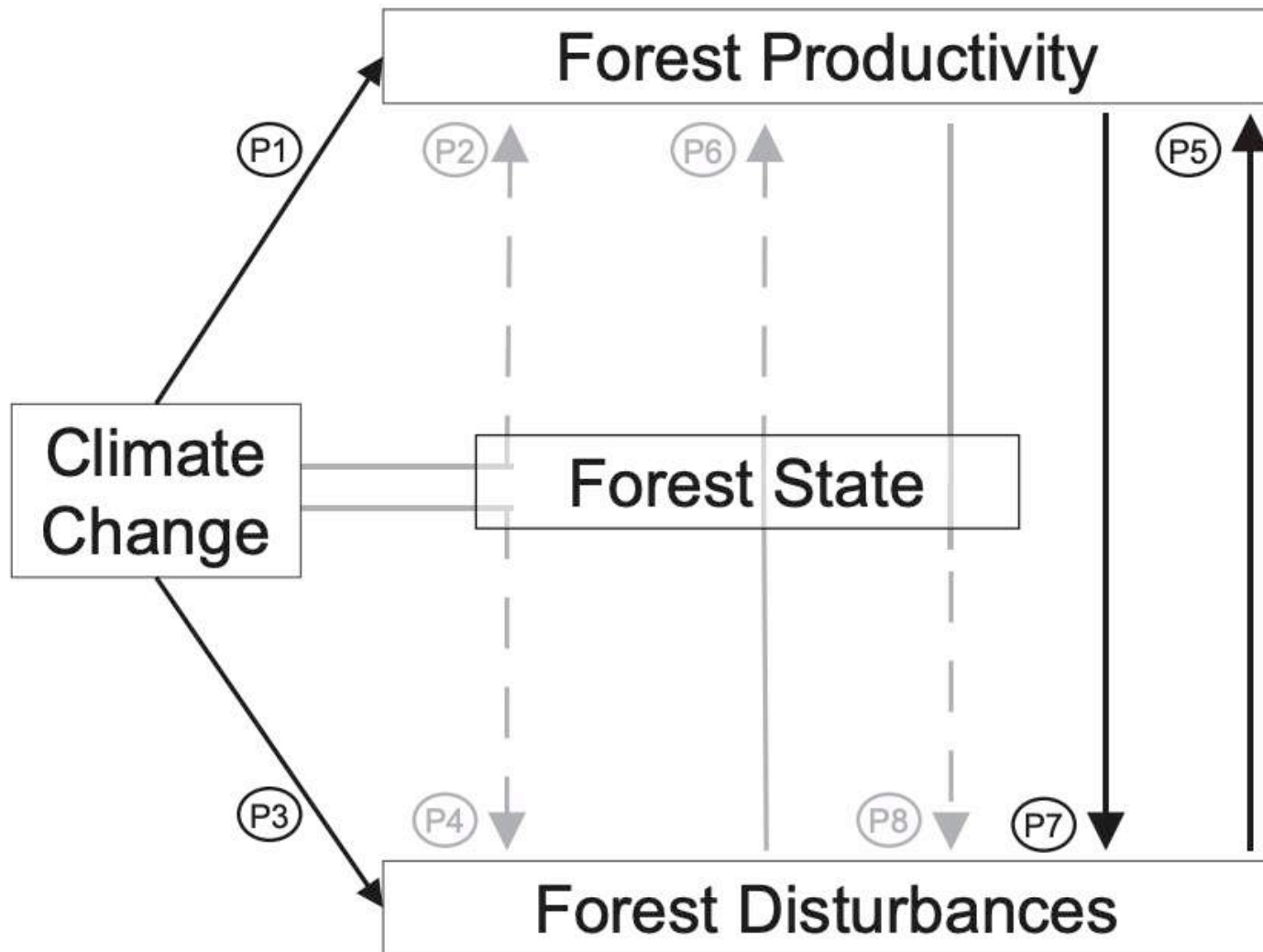
Aumento dei disturbi biotici e abiotici



Aumento dei disturbi biotici e abiotici

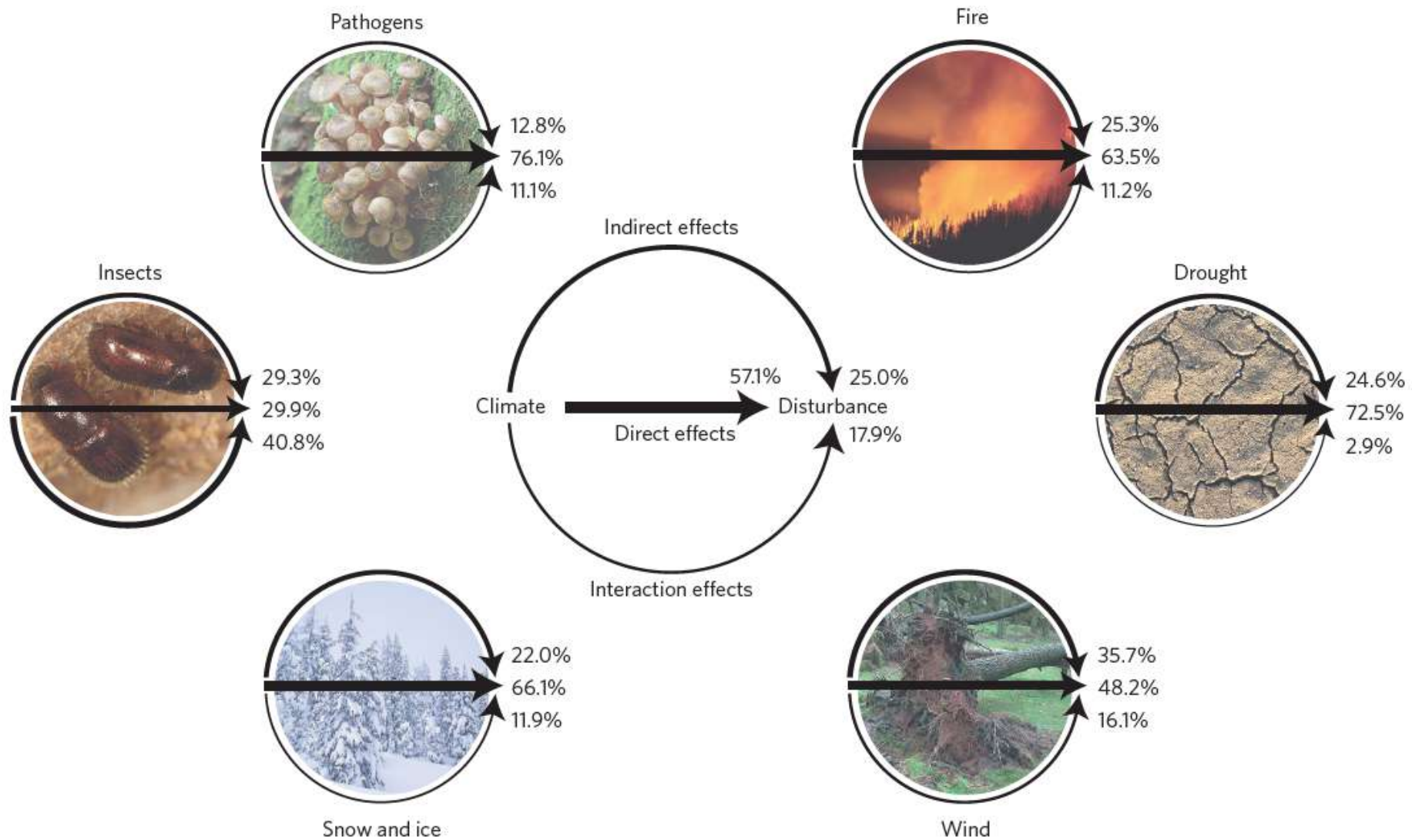


Relazione tra probabilità di disturbo e cambiamento di temperatura media

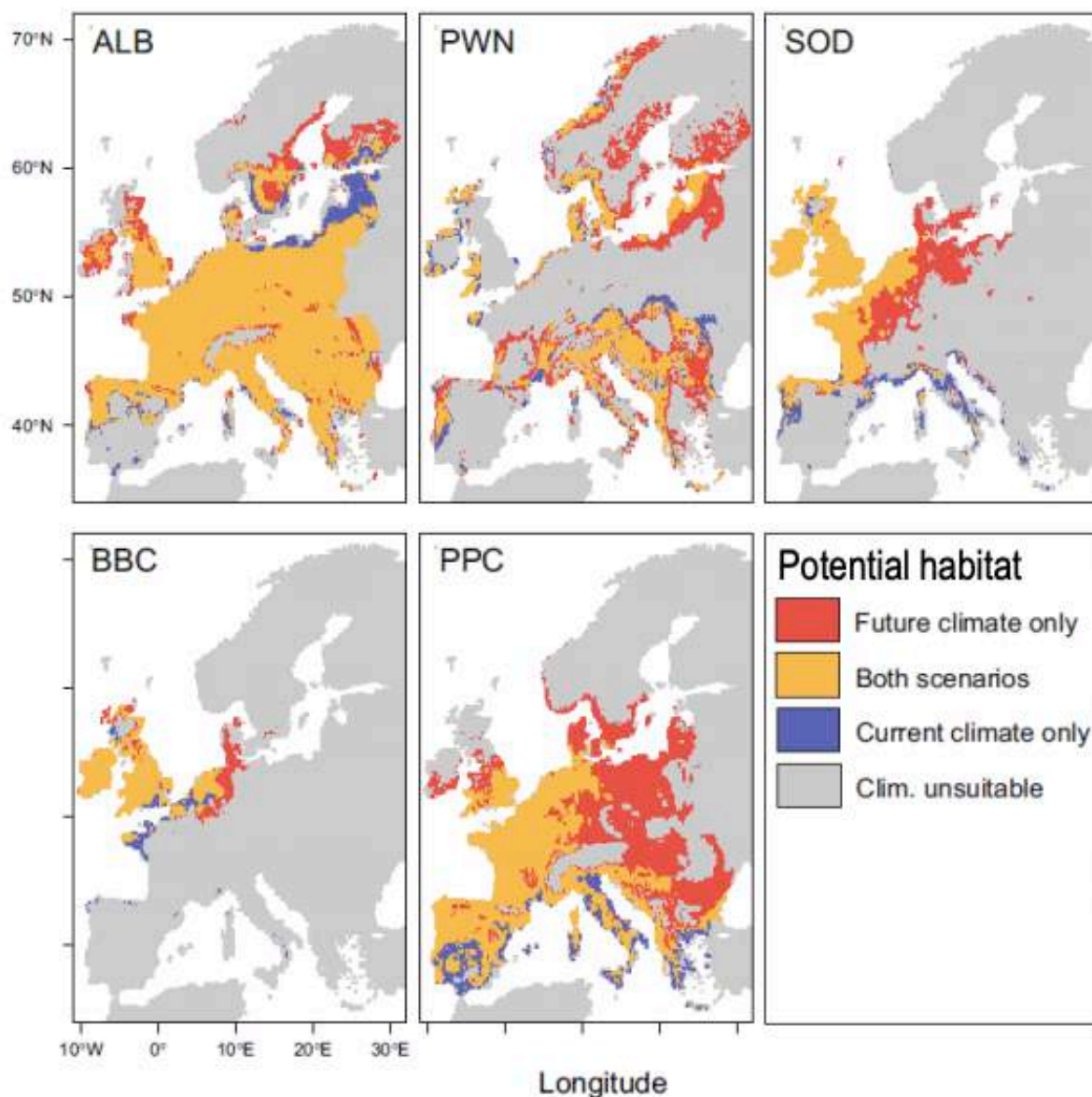


<https://iopscience.iop.org/article/10.1088/1748-9326/aa5ef1/meta>

Interazione tra disturbi



Potential spread of invasive alien pests

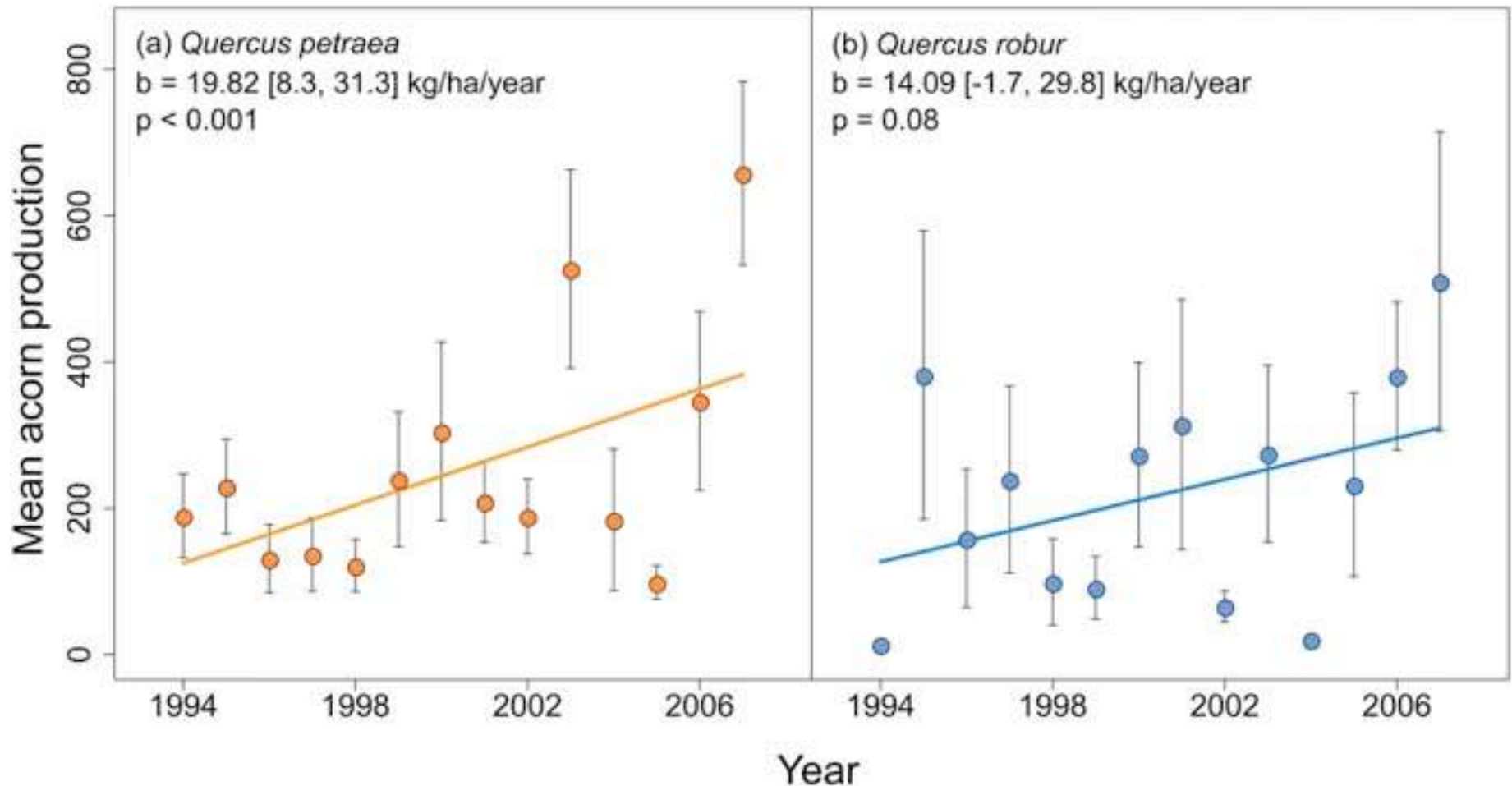


Asian long-horned beetle (ALB), pinewood nematode (PWN) and pitch pine canker (PPC) could establish on > 1 Mill. km² already under current climate

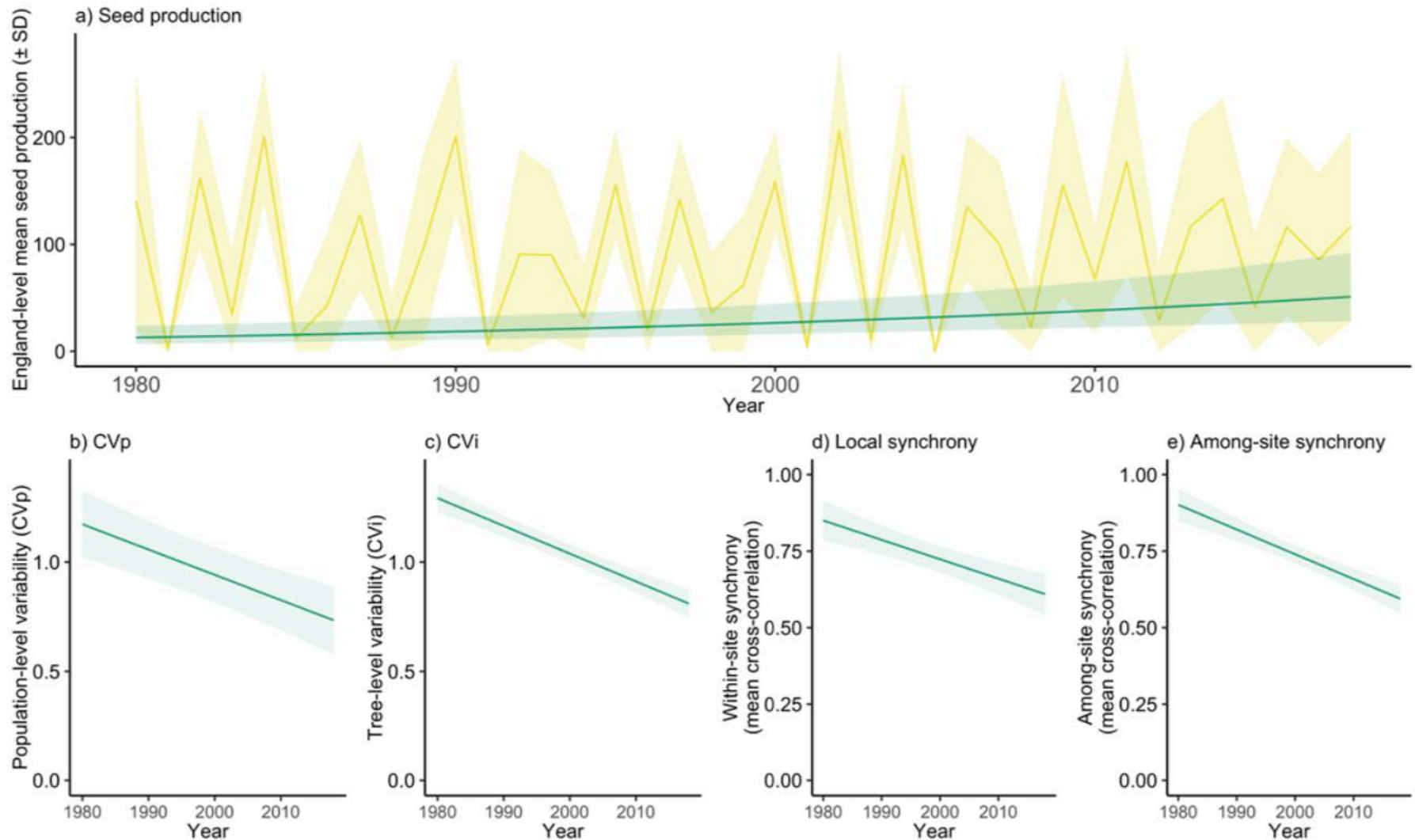
Climate change until 2050 will increase the potential range of pine pests (PWN and PPC) by ~50%

Effetti sulla produzione di seme

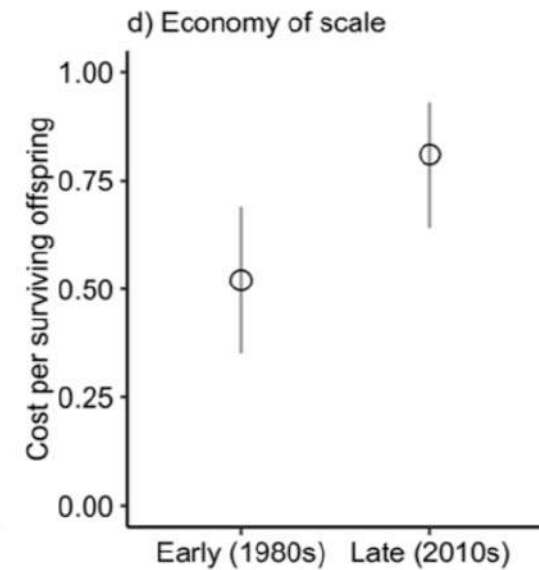
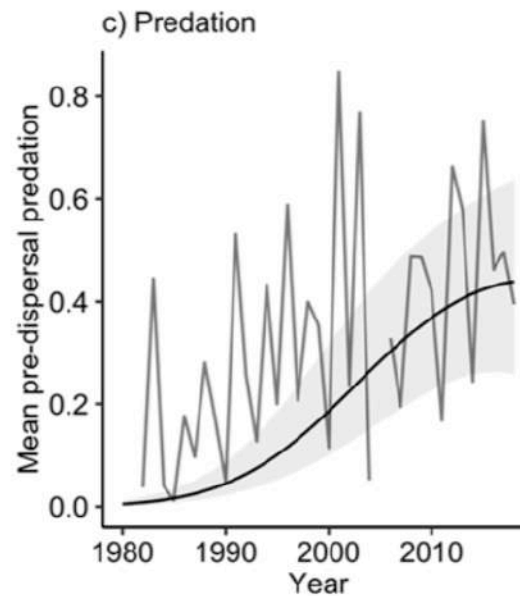
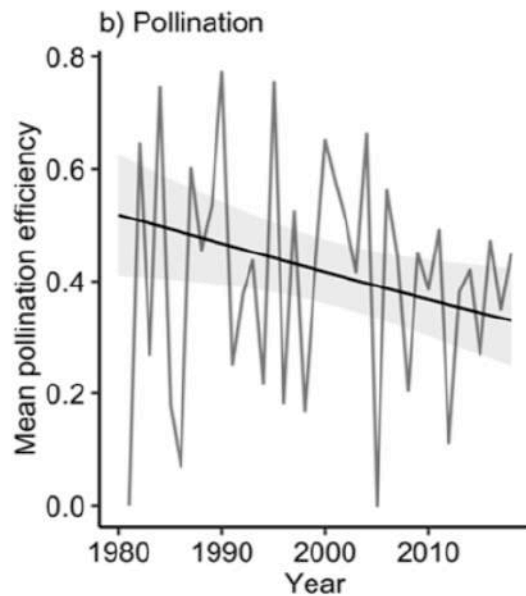
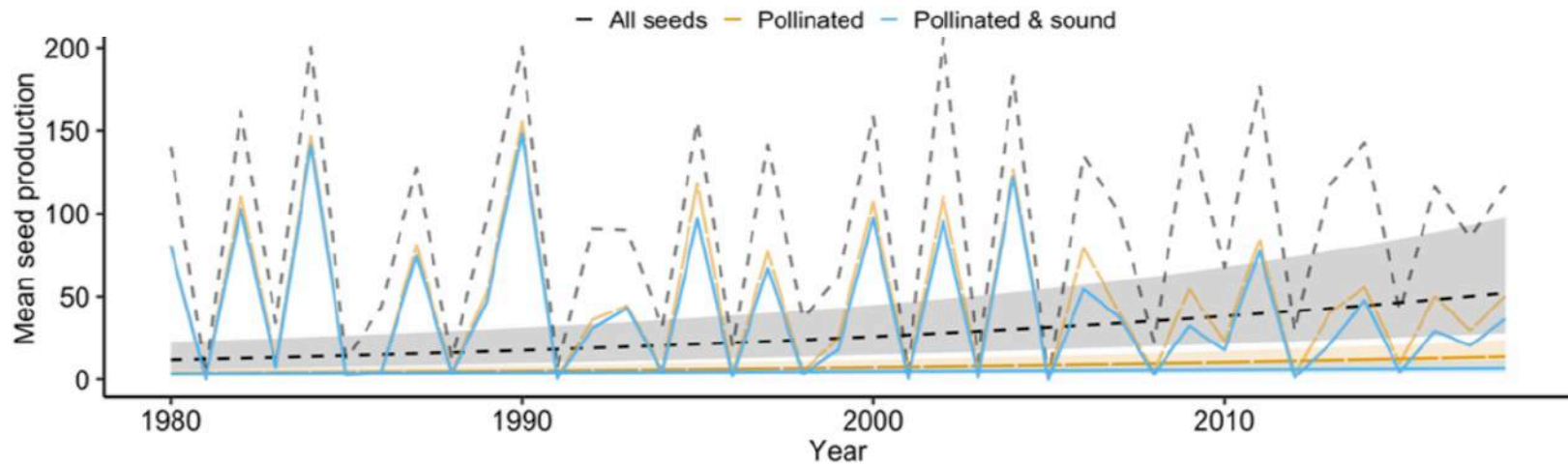
Aumento della produzione media, ma...



...diminuzione della variabilità e della sincronizzazione



...diminuzione della germinazione





Grazie per l'attenzione

Giorgio Vacchiano

Università Statale di Milano

gvacchiano@gmail.com

