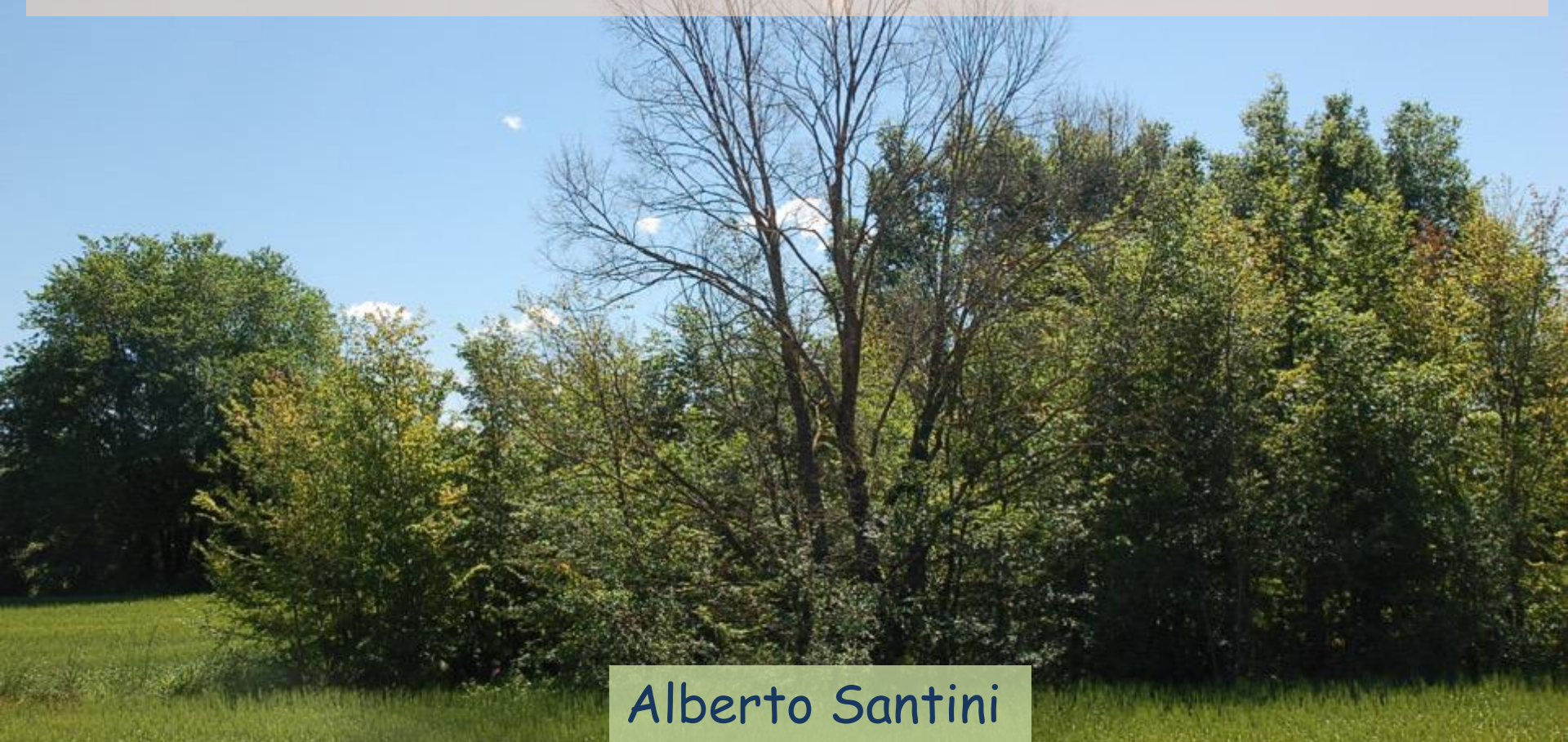


Patogeni e rischi per gli ecosistemi forestali



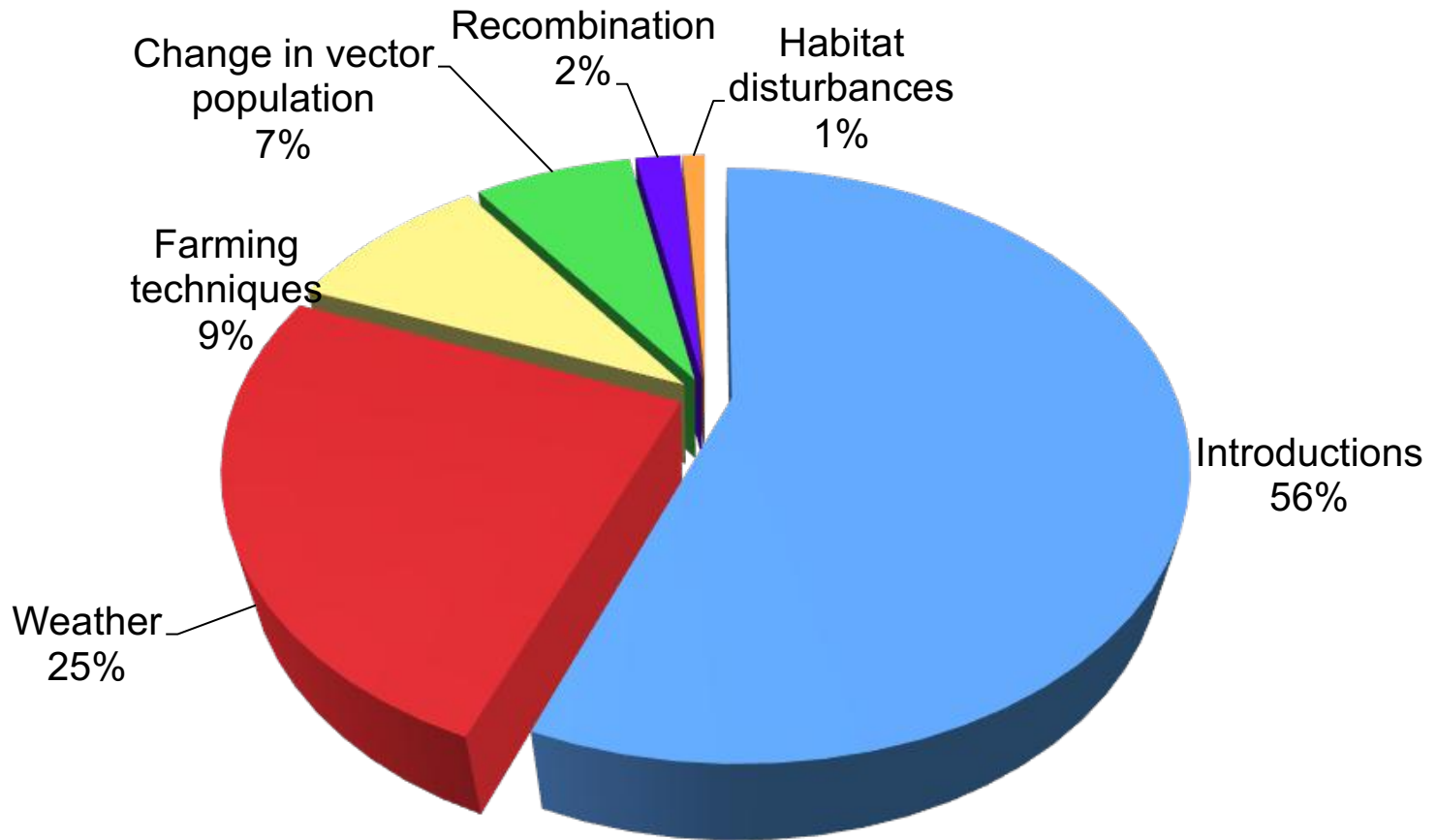
Alberto Santini



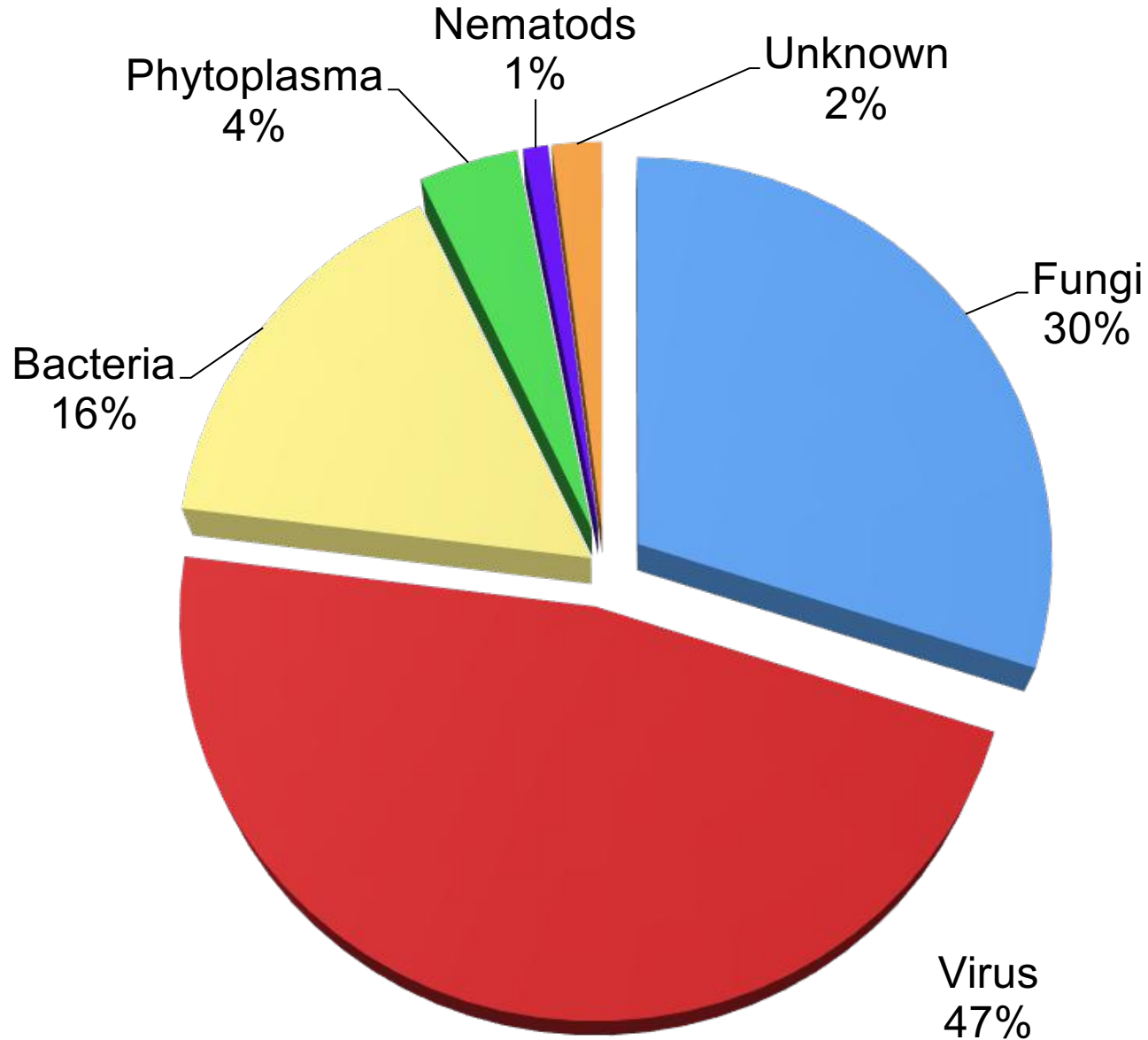
Istituto per la Protezione Sostenibile delle Piante
Consiglio Nazionale delle Ricerche



Drivers of Emerging Infective Diseases (EIDs) of Plants



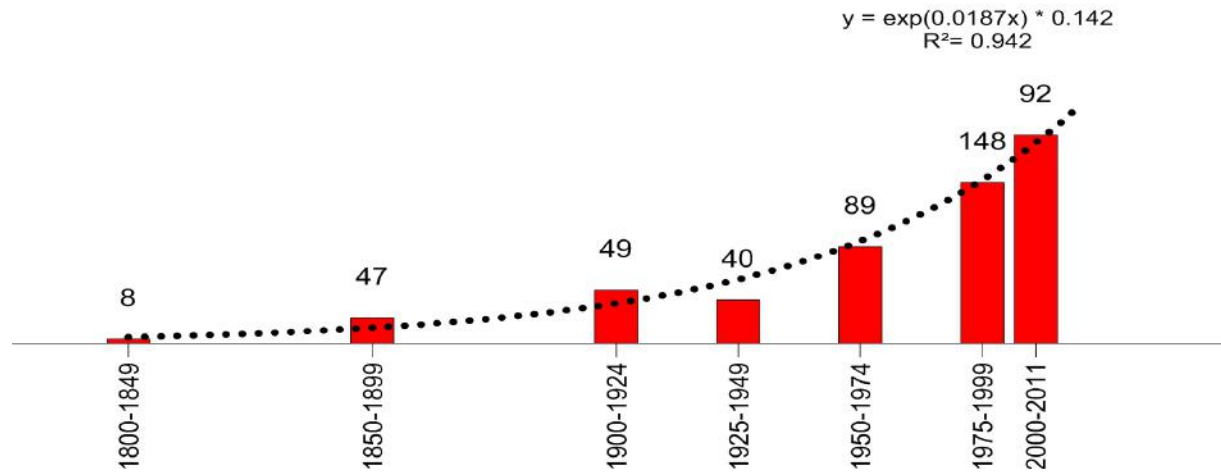
Pathogens causing plant EIDs



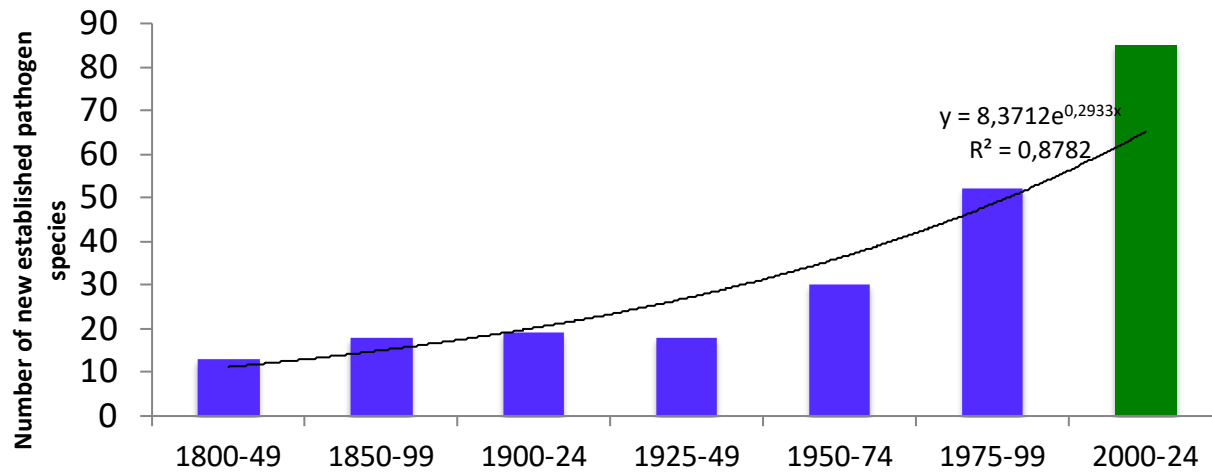
(mod. from Anderson et al., 2004. Trends Ecol Evol. 19: 535-544)

Exponential increase in the establishment of alien forest pests and pathogens in Europe

Roques, 2010, NZ JF, updated



Santini et al., 2013 New Phyt. updated



Historical milestones



Cristoforo Colombo's voyages



Migrations of modern Homo sapiens



Main drivers of the increase in arrivals of alien pests and pathogens

1819 First steamboat crossed Atlantic ocean



SS. Savannah

Main drivers of the increase in arrivals of alien pathogens



1945 End of WWII and rise in trade between North America, Europe, and Asia

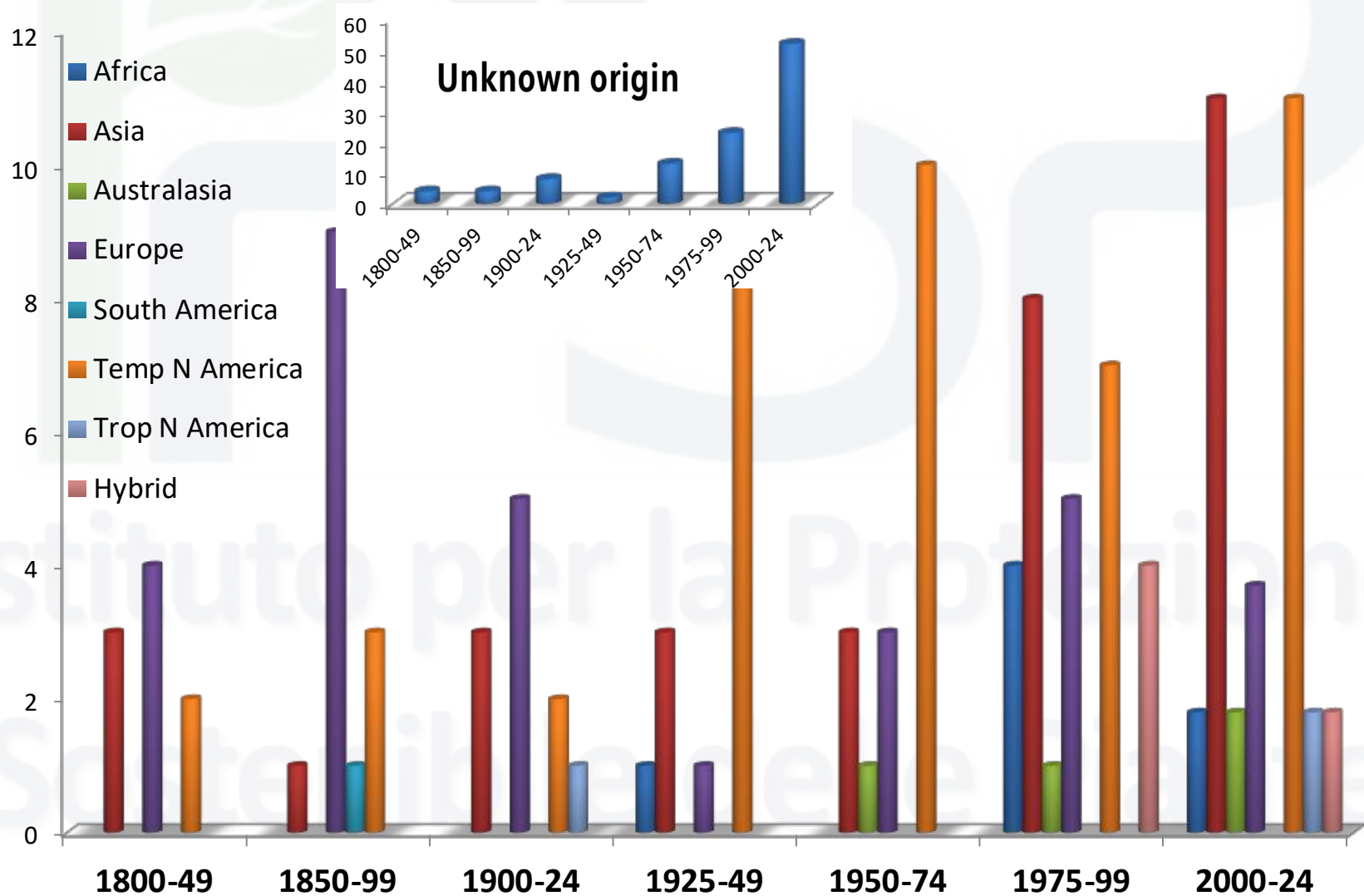
Yalta Conference, February 4-11, 1945

Main drivers of the increase in arrivals of alien pests and pathogens

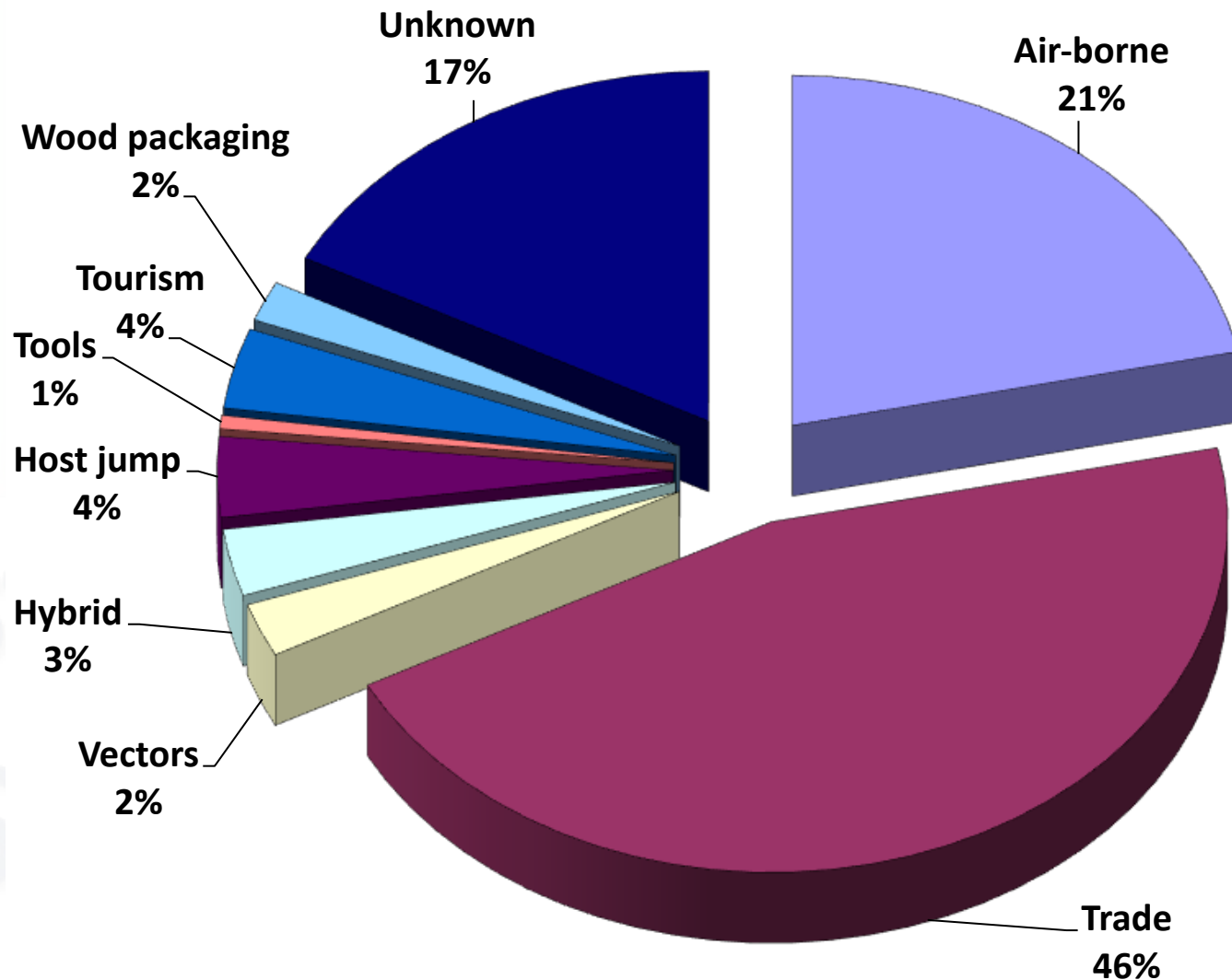
1989 Fall of Berlin wall and onset of globalisation era



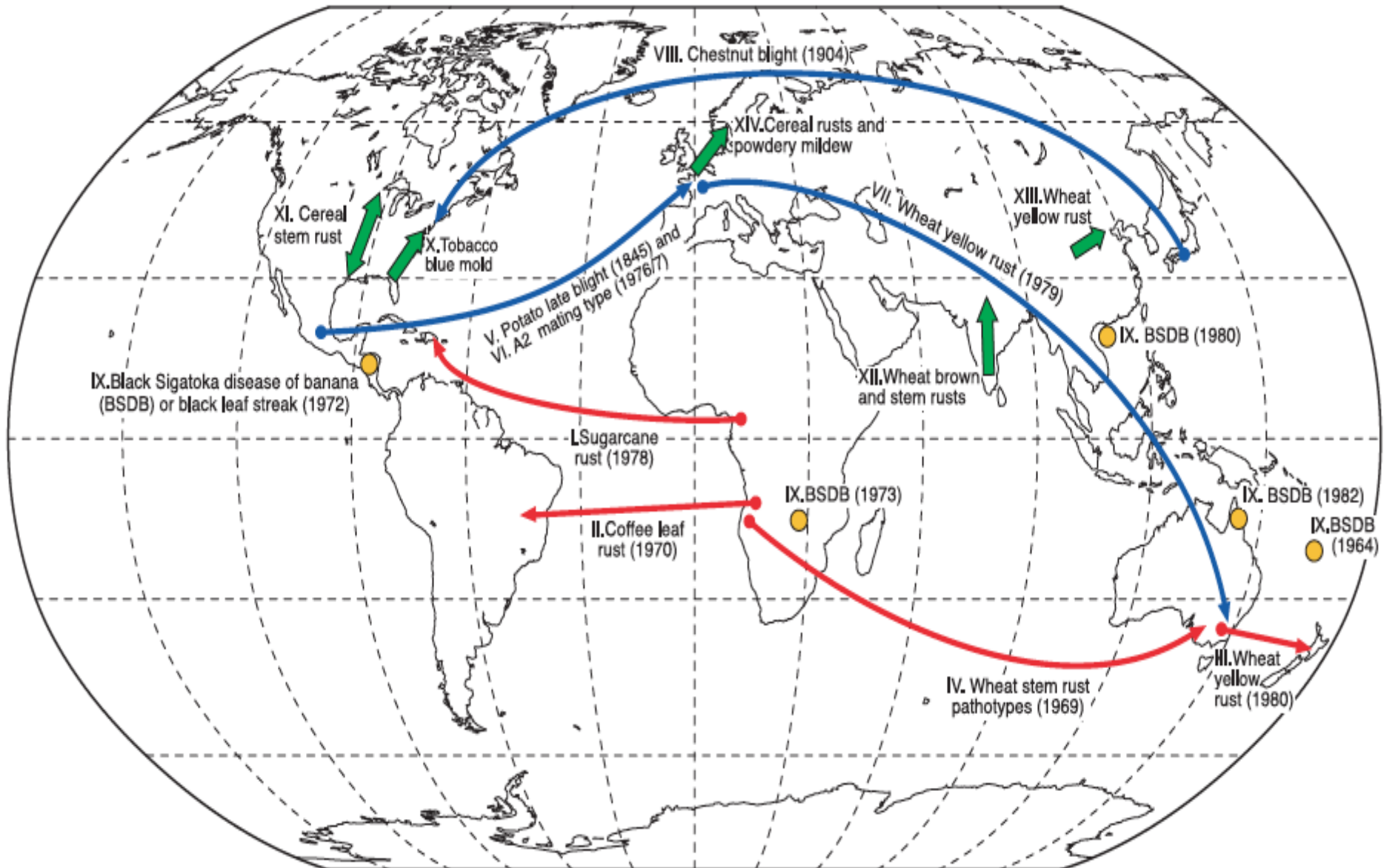
Temporal changes in origin of forest pathogens established in Europe



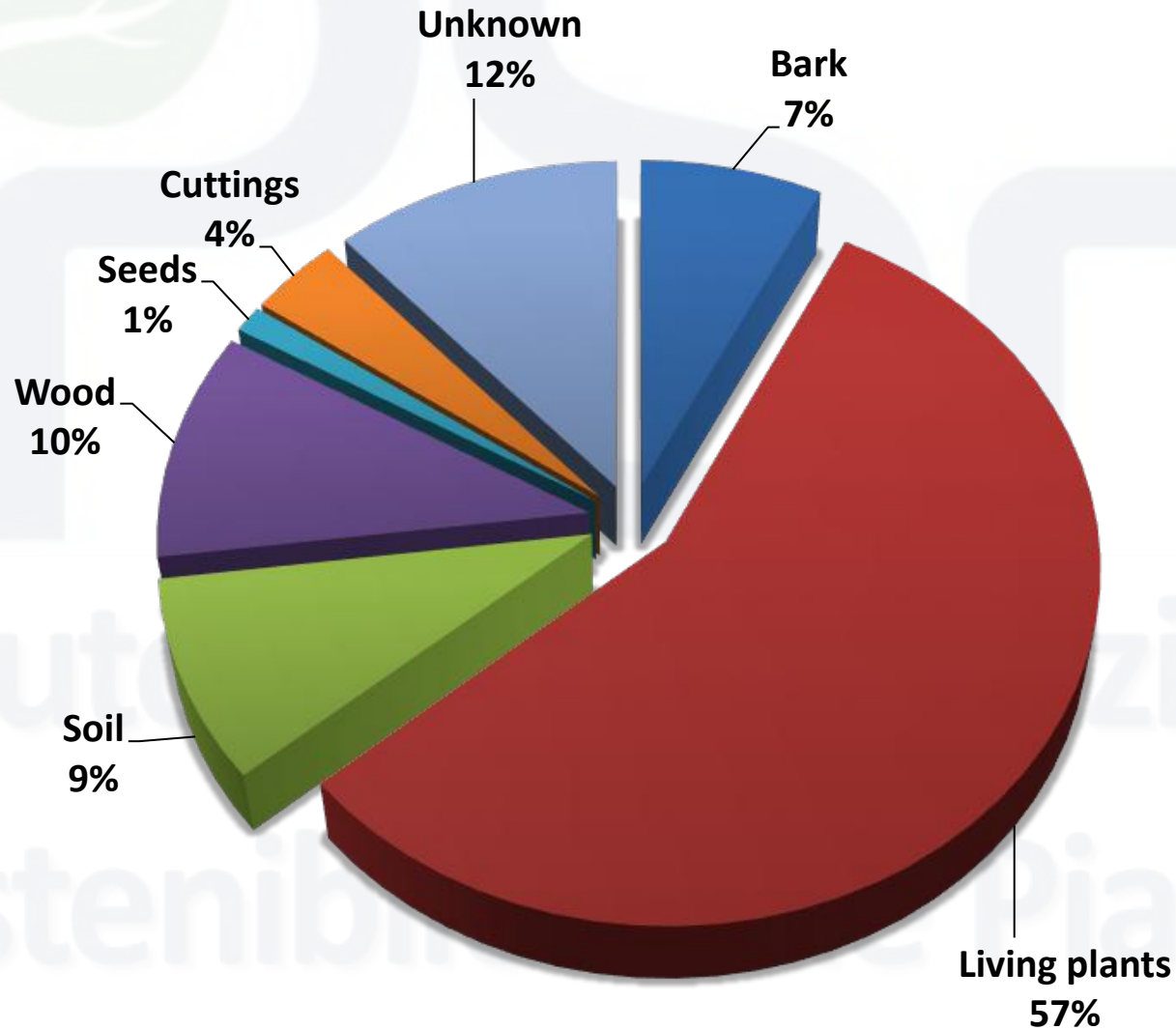
Most-likely pathways of introduction of forest pathogens into Europe



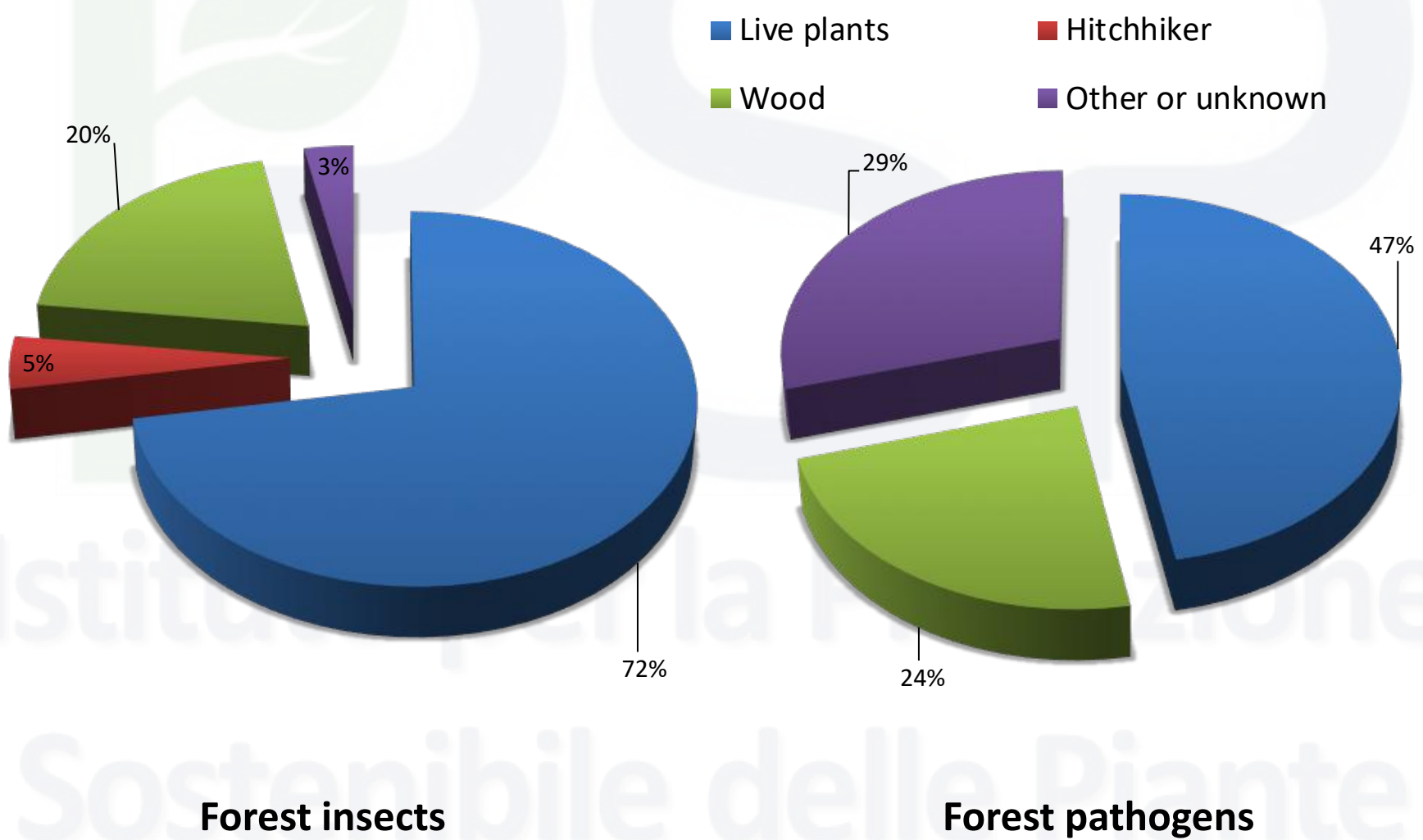
Aerial dispersal of Pathogens (Long-Distance Dispersal, LDD)

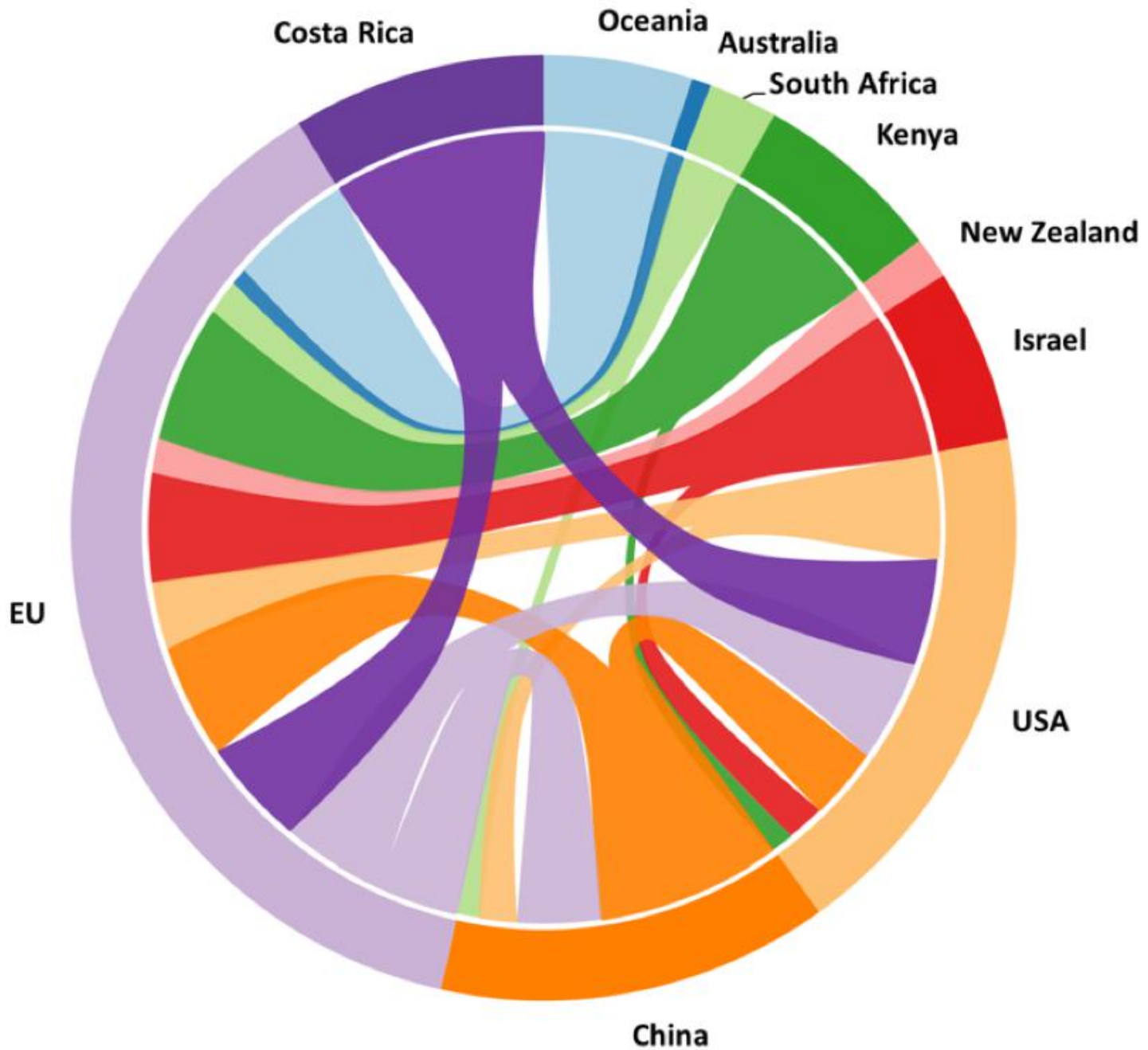


Most likely pathways of alien forest pathogens species in Europe

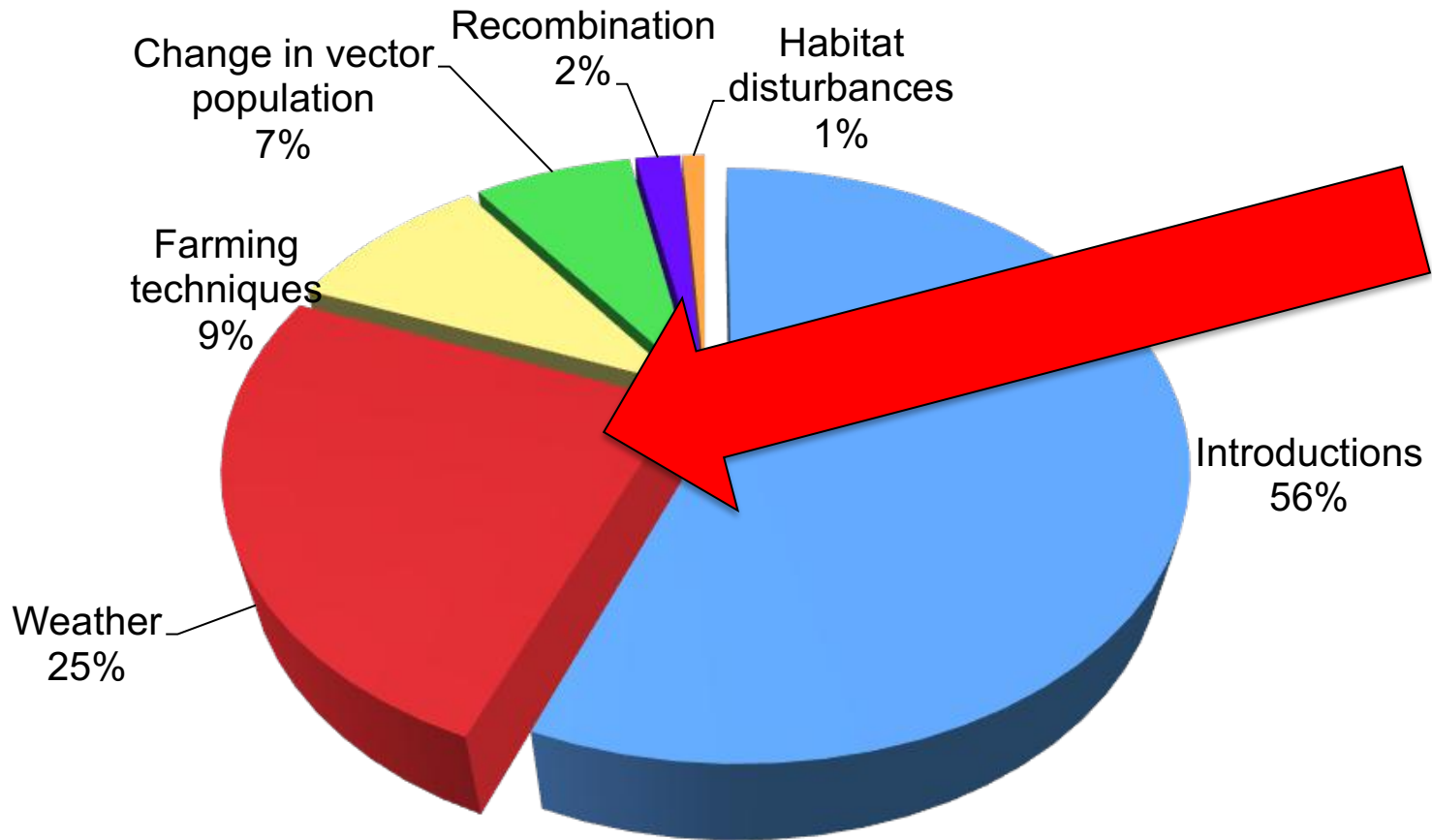


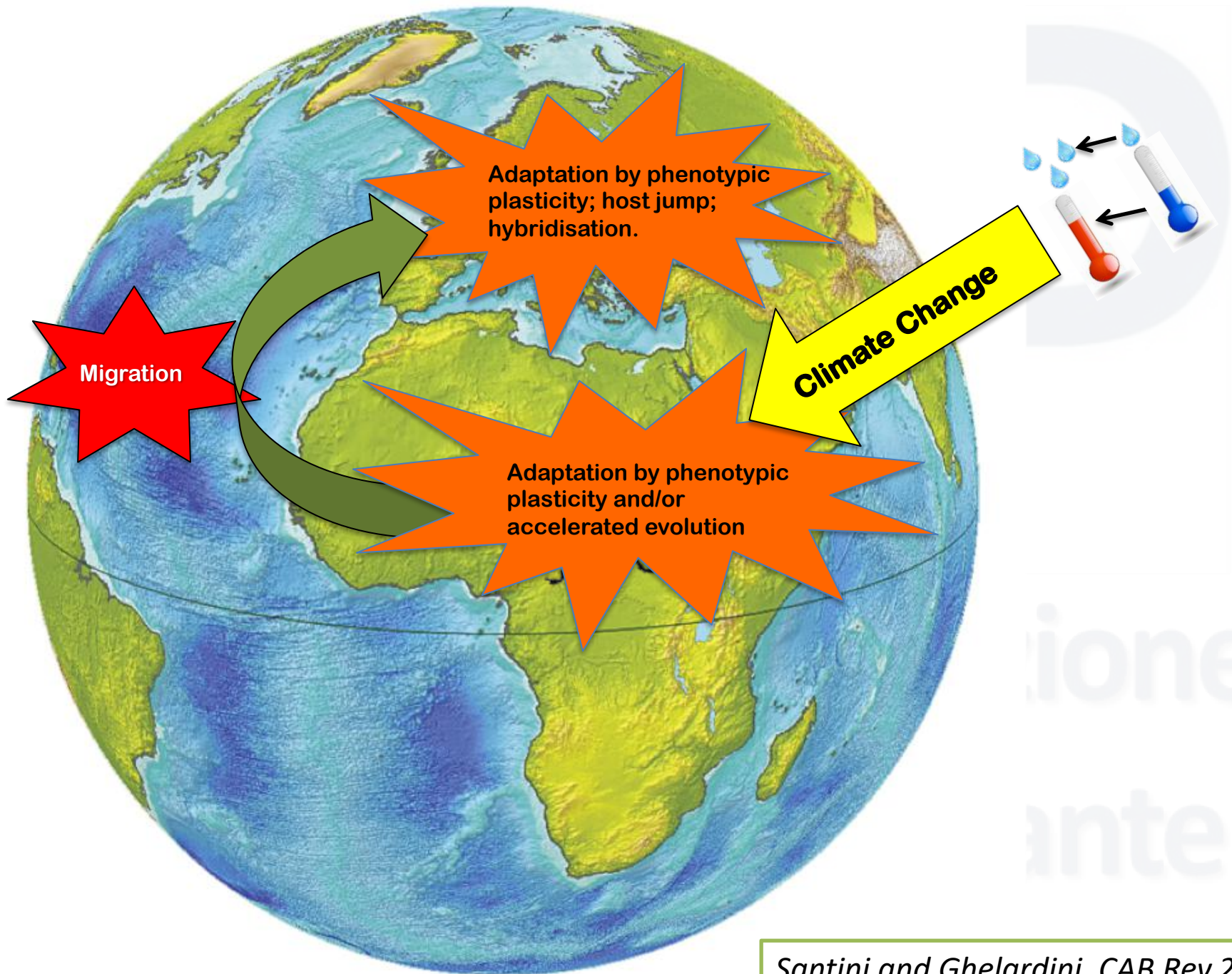
Pathways of invasion for forest insects and pathogens in the US





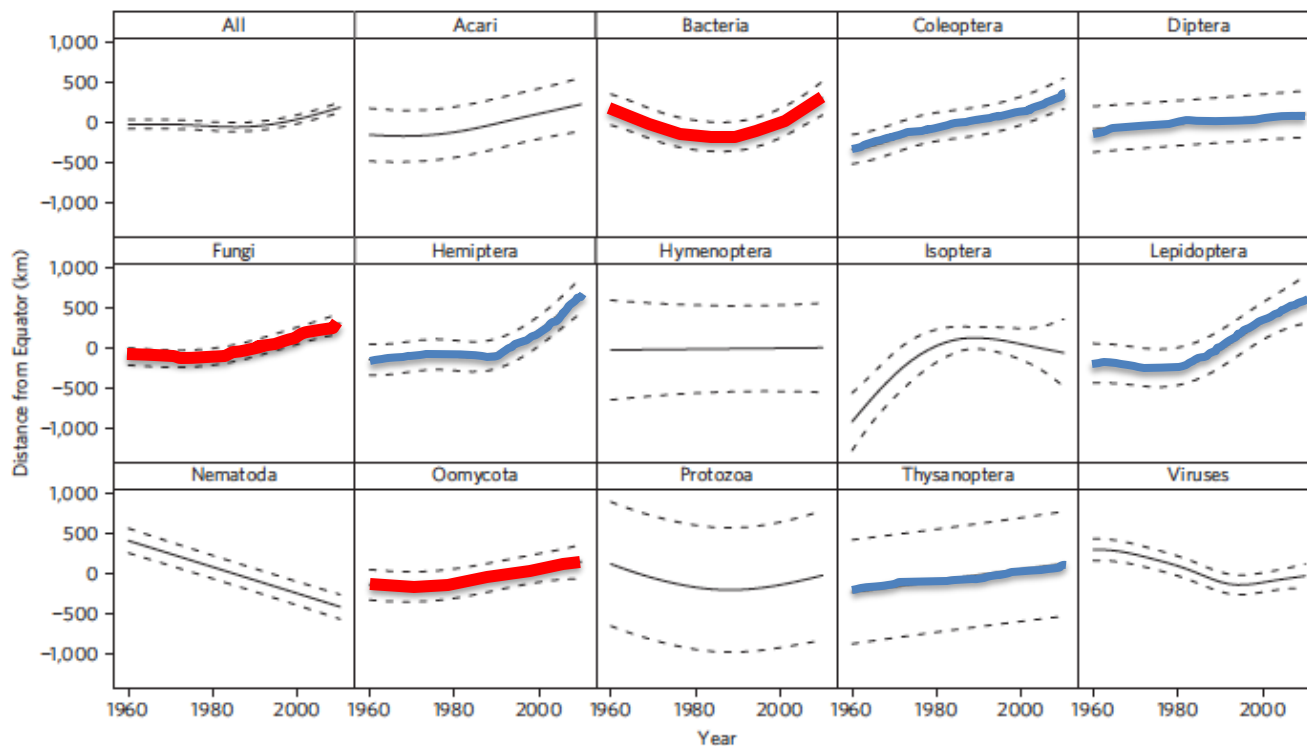
Drivers of plant EIDs emergence





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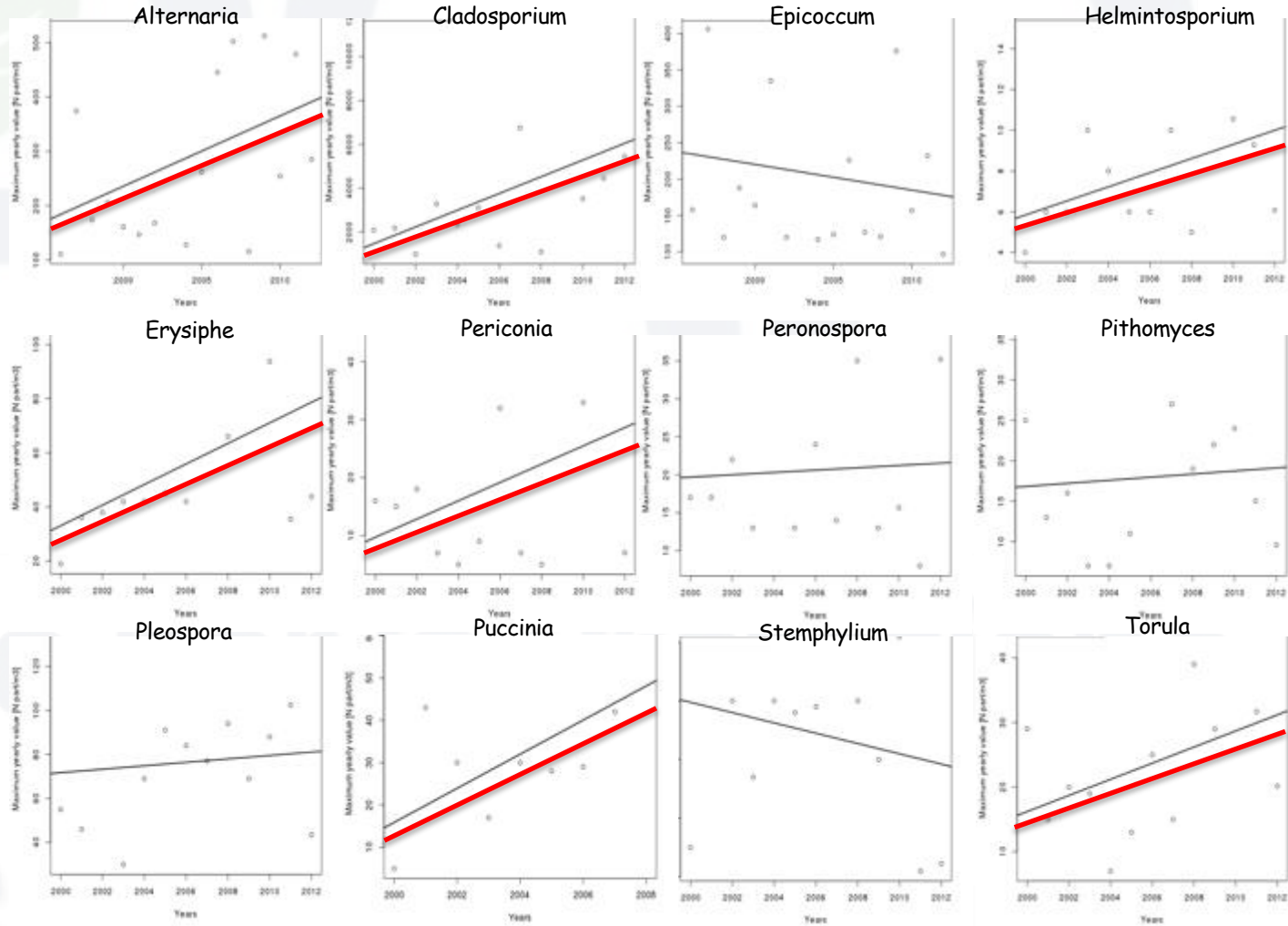
Crop pests and pathogens move polewards in a warming world

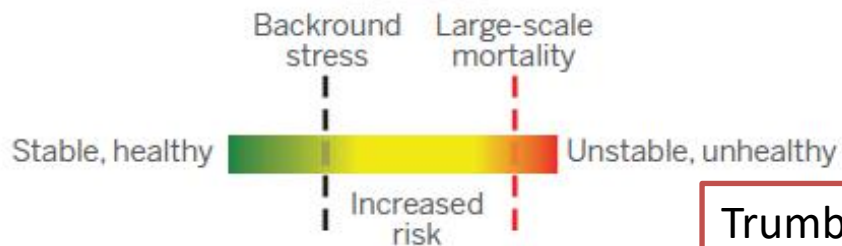
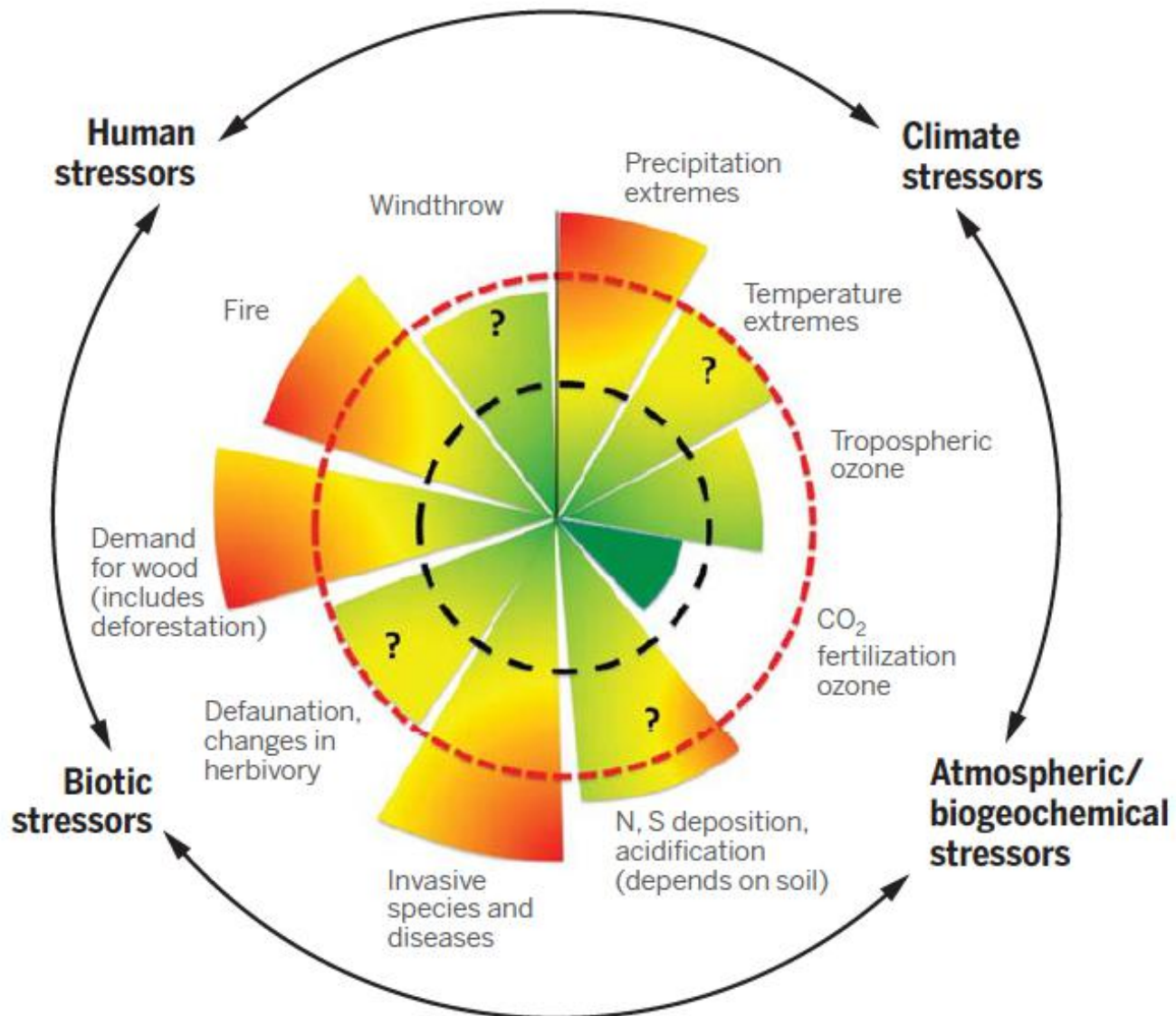


Bebber et al., 2013. Nature Climate change

Time Series of Maximum Spore Production

Source: ARPAT





To survive global change,
plants must adapt – and fast



How can plants adapt to climate change? Unlike animals that can migrate to new locations when climate becomes too hostile, plants must adapt their biological functions – or perish.

Mônica Favre, *Frontiers in Plant Science*, 08/2016

An aerial night view of Florence, Italy, showing the city's architecture and the Duomo di Firenze. The word "GRAZIE" is written in a white box with a red border in the center of the image. The background features a sunset sky and the city lights.

GRAZIE

Sostenibile delle Piante