3rd European Conference on
Xylella fastidiosa and XF-ACTORS final meeting

Risk of establishment of Pierce's disease in main wine-producer regions worldwide

Alex Giménez-Romero[1], Javier Galván[1], Marina Montesinos[2], Joan Bauzà[3], Martin Godefroid[4], Alberto Fereres[4], Jose J. Ramasco[1], Manuel A. Matias[1], Eduardo Moralejo[2]

[1] Instituto de Física Interdisciplinar y Sistemas Complejos IFISC (CSIC-UIB), Campus UIB, Palma de Mallorca, Spain.
[2] Tragsa, Passatge Cala Figuera, nº 6; Palma, Mallorca, Balearic Islands, Spain.
[3] Departament de Geografia de la Universitat de les Illes Balears, Campus UIB, Palma de Mallorca, Spain
[4] Instituto de Ciencias Agrarias, Consejo Superior de Investigaciones Científicas, ICA-CSIC, 28006 Madrid, Spain.

INTRODUCTION

- Pierce's disease (PD) is considered one of the main threats to winegrowers worldwide

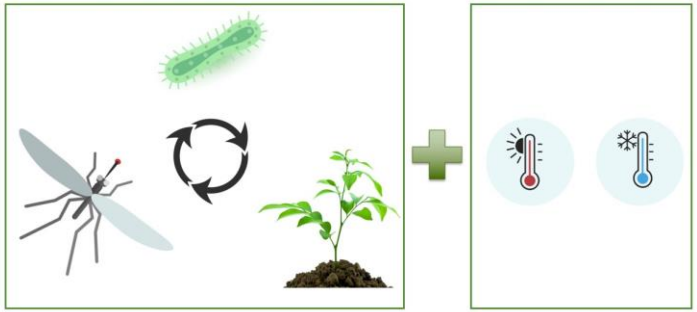
  → *The annual economic cost in California alone has been estimated at more than $100 million*

- Correct epidemic risk assessment is crucial to minimise economic losses, both by avoiding over and under estimations

- PD is led by vector-host-pathogen interactions modulated by climatic variables

  → The whole system should be integrated in a single framework for proper risk assessment

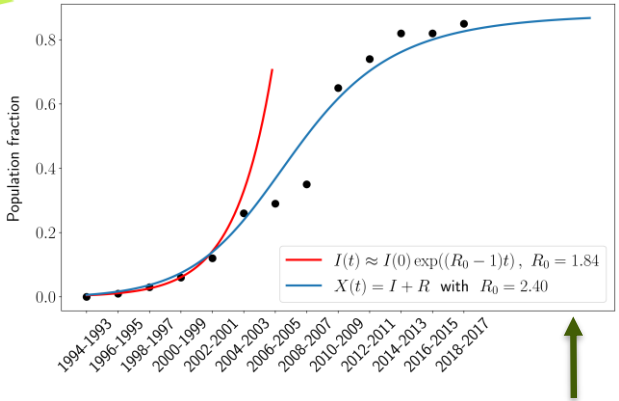
- We consider these interactions in a *two layer model* to assess the risk of PD establishment worldwide



Transmission layer **Climatic layer**

Images from Freepik.com

THE MODEL



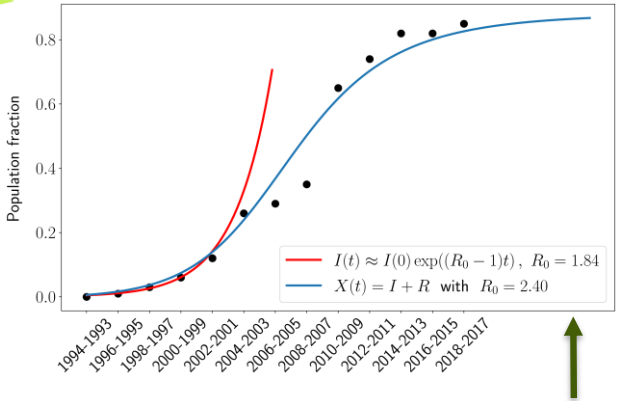
Fit of R_0 in optimal climatic conditions.

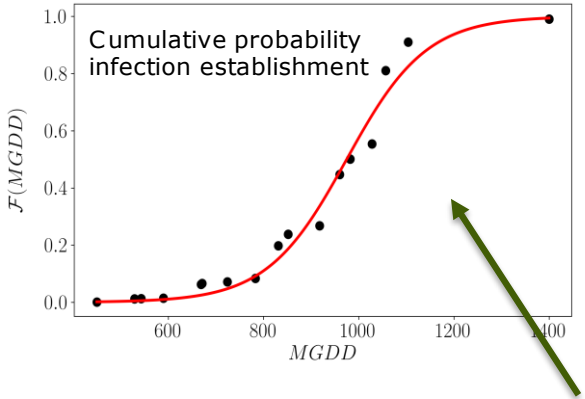
Transmission layer governed by R_0

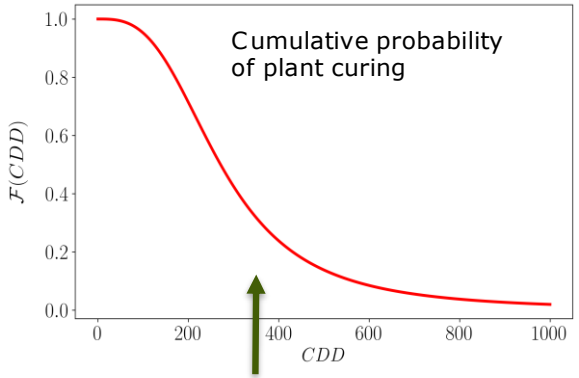
Vector layer directly influences R_0

THE MODEL

- *MGDD* → Relates Xf growth rate with temperature
- *CDD* → Relates the winter curing effect with temperature







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Climatic layer based on experimental and observational data.

Temperature data from ERA5-Land reanalysis dataset (1981-2020)

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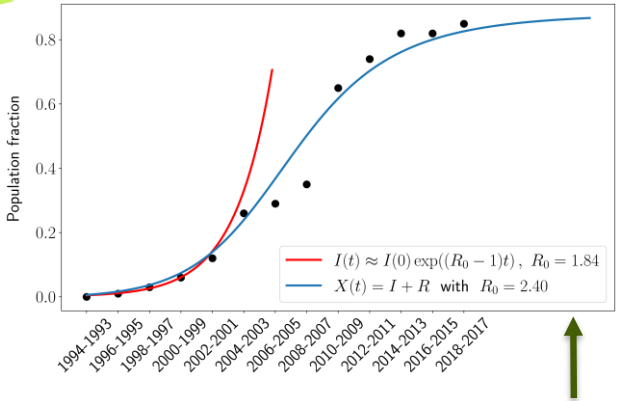

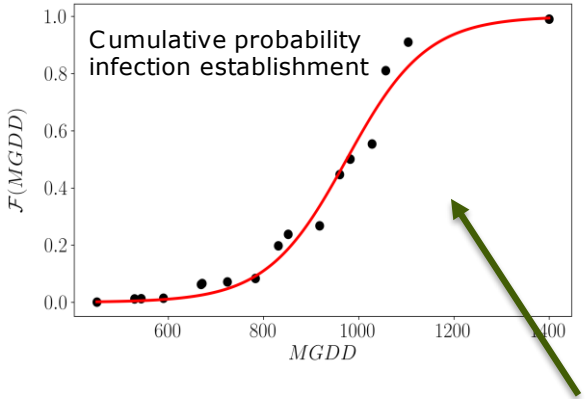

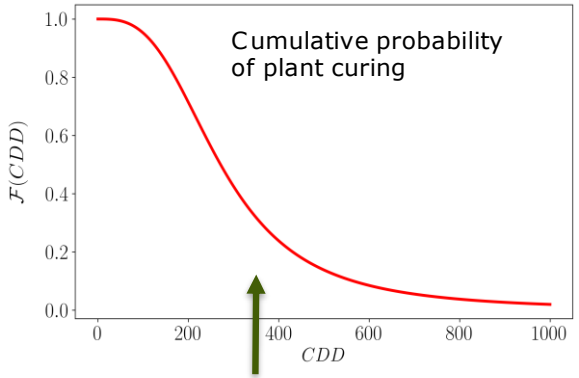

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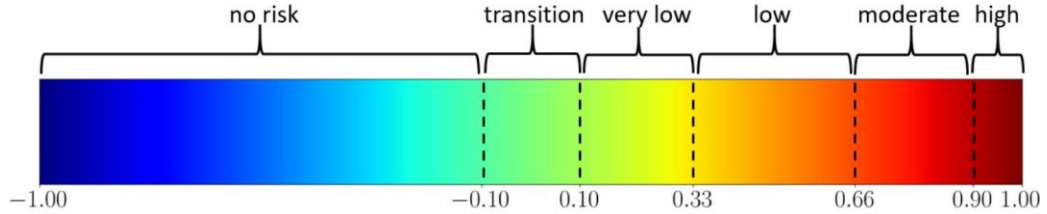
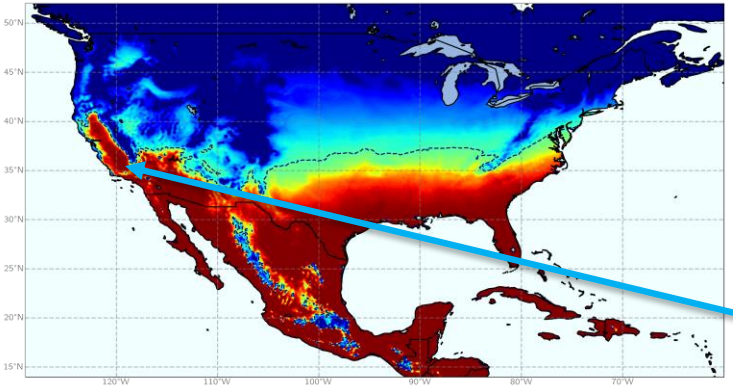
Evolution equation for the infected population

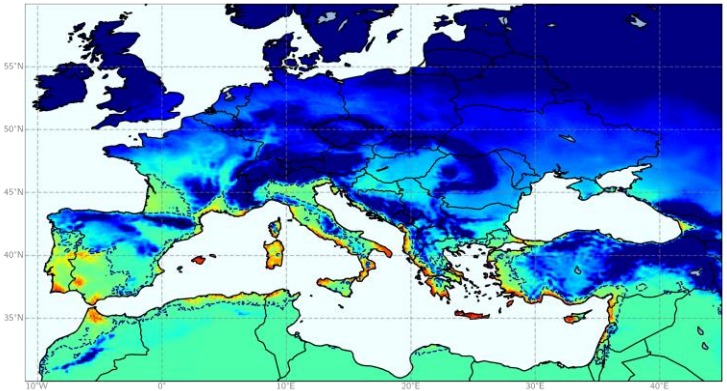
$$I(t) = I(t-1) \cdot \exp((R_0 - 1)) \cdot \mathcal{F}(MGDD(t)) \cdot \mathcal{F}(CDD(t))$$

VALIDATION

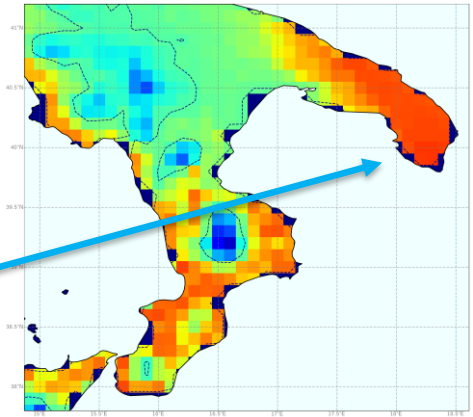


* dashed lines in maps indicate transition zones



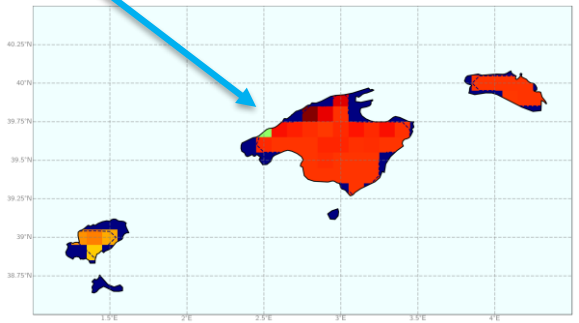


Validation with spatio-temporal collected data in the USA (~ 90% accuracy)



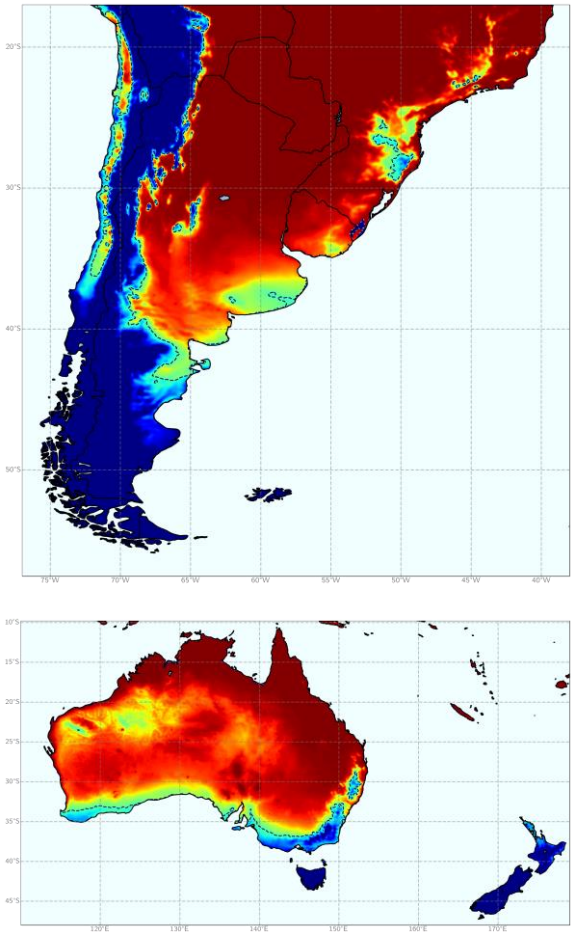
Highest risk predictions in known affected areas:

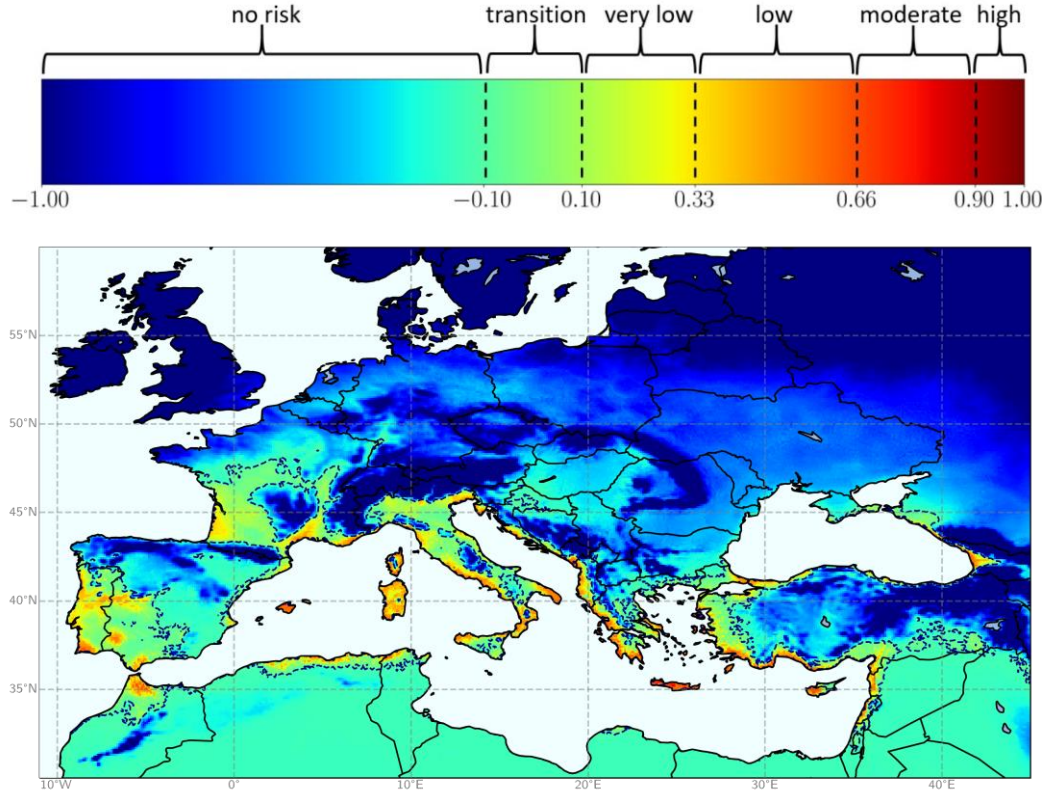
- California
- Apulia
- Balearic Islands



PREDICTIONS

PRESENT RISK OF PD ESTABLISHMENT (2020)





FUTURE RISK OF PD ESTABLISHMENT (2050)

Present and future risk can be assessed worldwide!

UNIT OF EXCELLENCE MARÍA DE MAEZTU

IFISC

Universitat de les Illes Balears

CSIC

efsa European Food Safety Authority

XF ACTORS

3rd European Conference on
Xylella fastidiosa and XF-ACTORS final meeting

THANK YOU

for your attention

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erc European Research Council

LIFE RESILIENCE

Life