Universitat
de les Illes Balears

DOCTORAL THESIS
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Theoretical and data-driven models in Ecology

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Universitat de les Illes Balears

DOCTORAL THESIS 2024

Doctoral programme in Physics

Theoretical and data-driven models in Ecology

Àlex Giménez Romero

Thesis Supervisor: Manuel A. Matías
Thesis Tutor: Cristóbal López Sánchez

Doctor by the Universitat de les Illes Balears

Supervisors:
Manuel Matías

A en Manuel Miranda
pel seu suport i ajuda
durant tots aquests anys.
Sempre estaràs amb mi.
i recordare sempre
el que em vas ensenyar.

Dr Manuel A. Matías of the Consejo Superior de Investigaciones Científicas (CSIC)

I DECLARE:

That the thesis title *Theoretical and data-driven models in Ecology*, presented by Àlex Giménez Romero to obtain a doctoral degree, has been completed under my supervision and meets the requirements to opt for an International Doctorate.

For all intents and purposes, I hereby sign this document.

Signature

Dr. Manuel A. Matías
Thesis Supervisor

Palma de Mallorca, July 2024

Acknowledgements

Acknowledgements go here.

Resum

El resum va aquí.

Resumen

El resumen va aquí.

Abstract

Abstract goes here.

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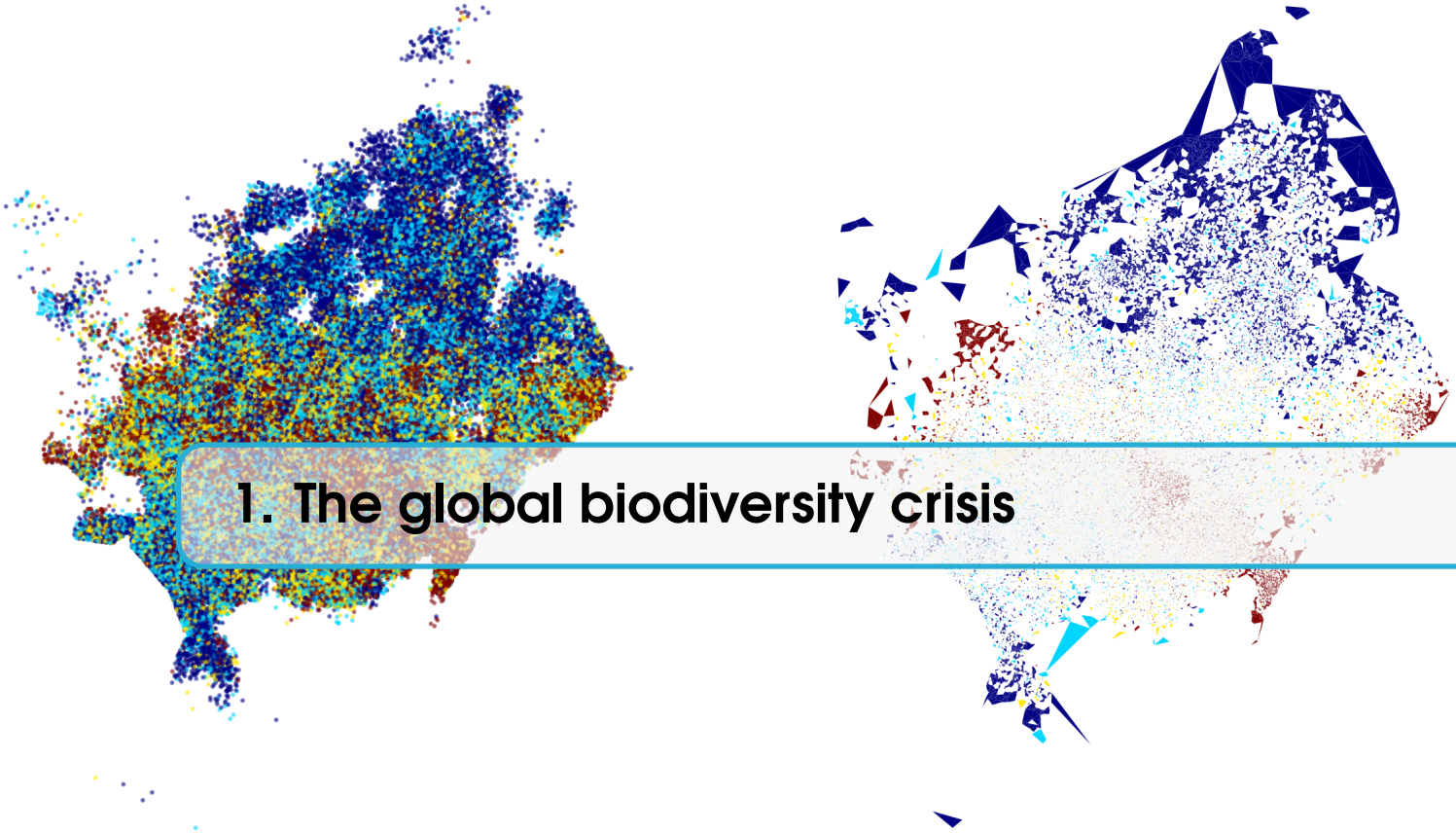
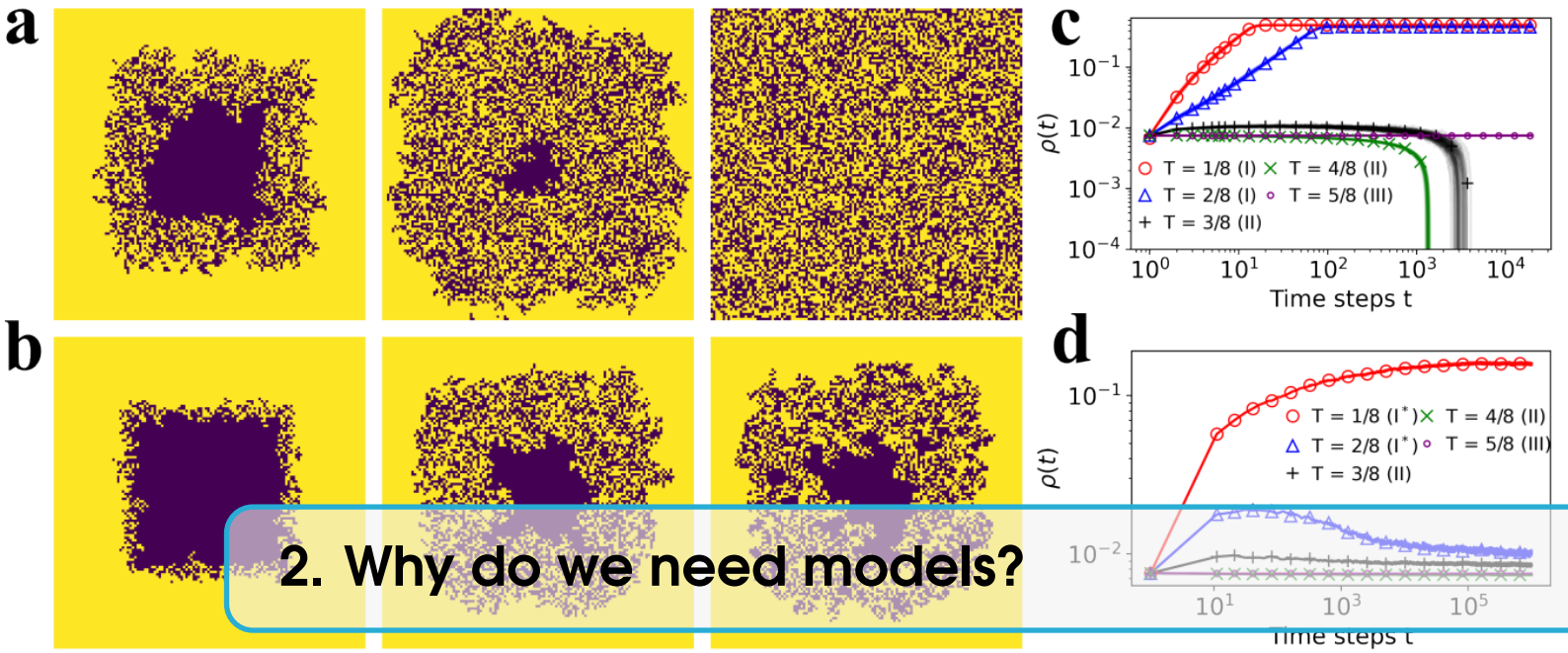
List of publications

1. **Abella-2022**
2. **Abella-2022-AME**
3. Aging in Symmetrical Threshold Models
4. Idealista model for complex systems housing
5. Idealista spatial segmentation of the real state market

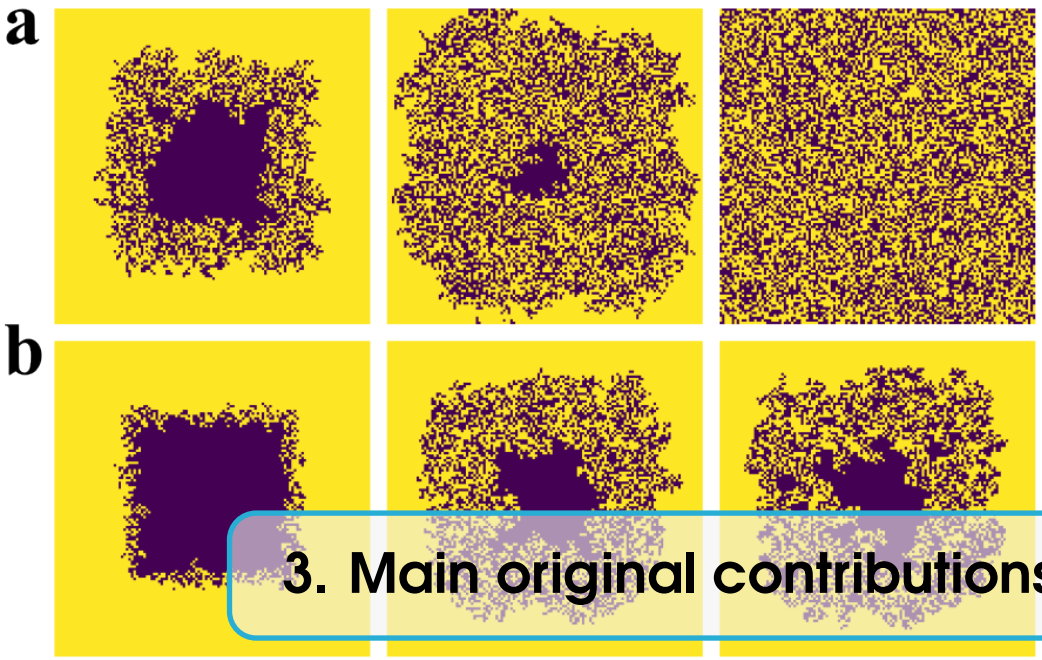
Introduction

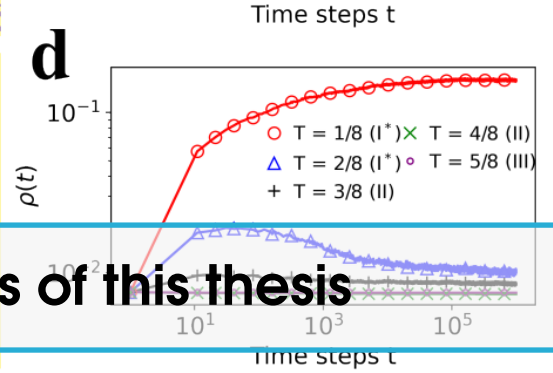


1. The global biodiversity crisis



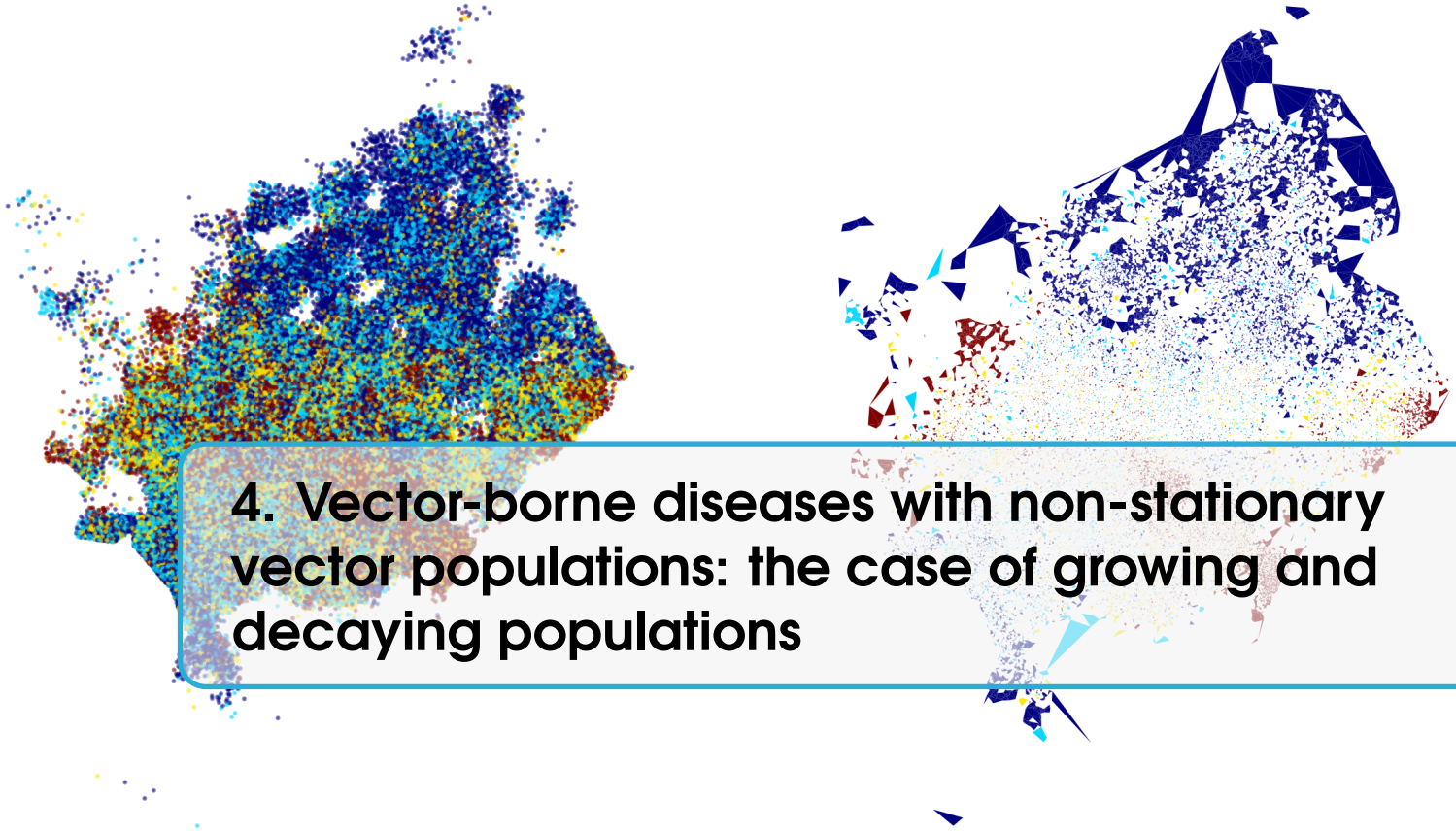
2. Why do we need models?



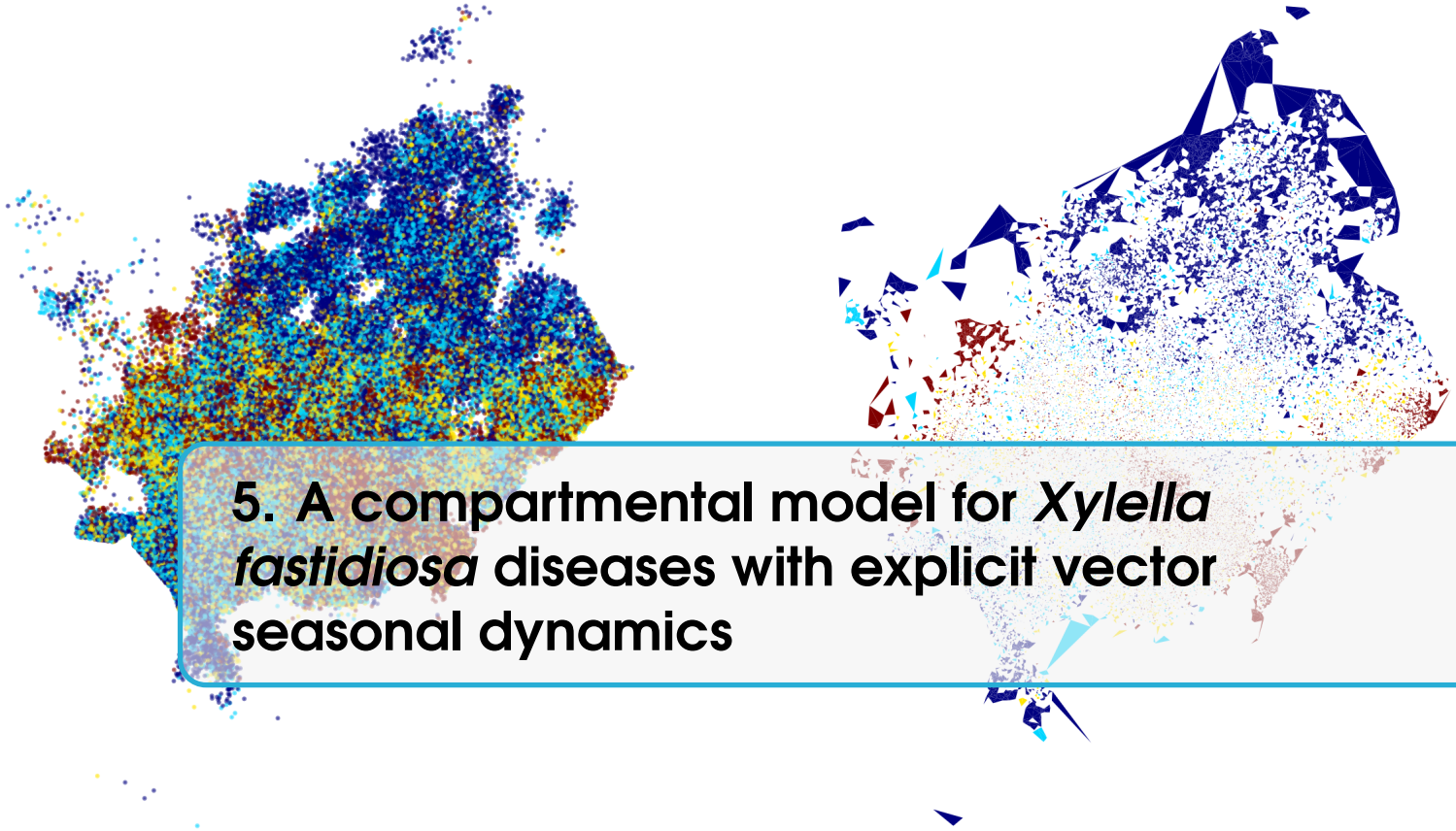


3. Main original contributions of this thesis

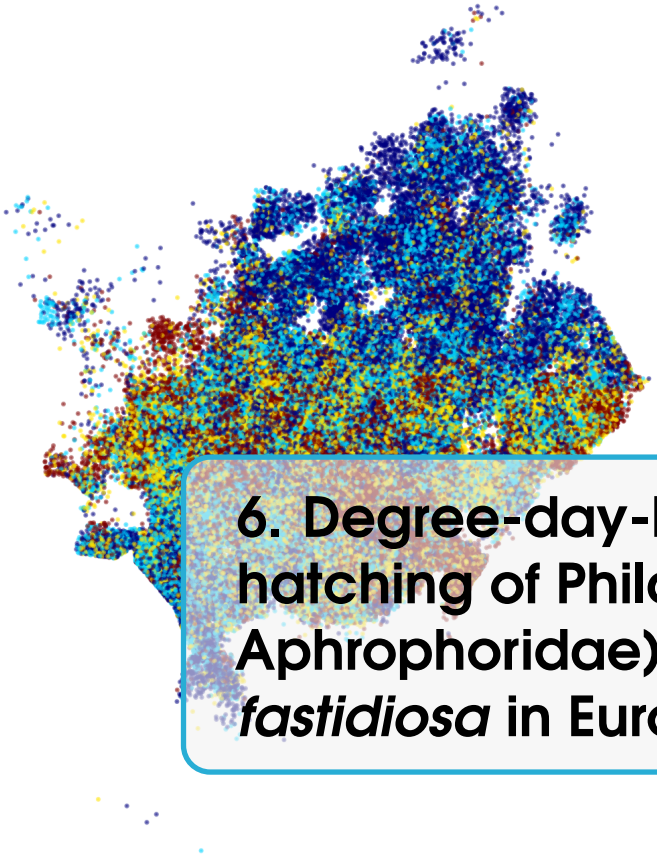
II Realistic models for vector-borne plant diseases

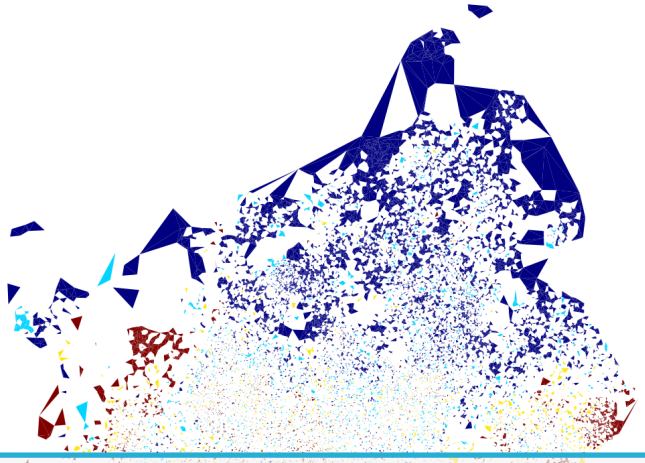


4. Vector-borne diseases with non-stationary vector populations: the case of growing and decaying populations



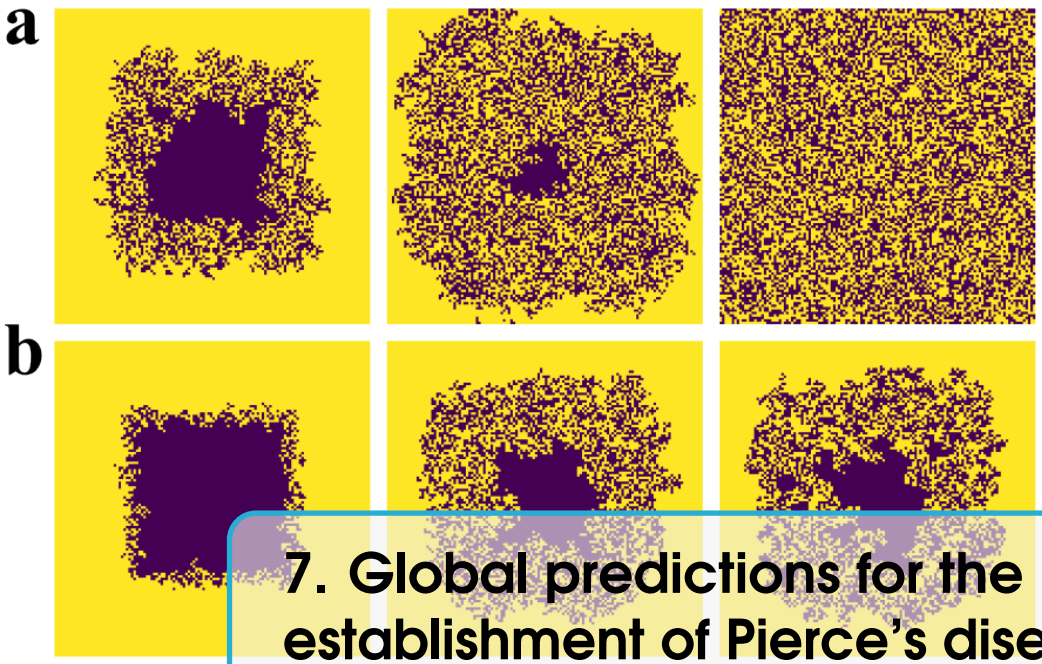
5. A compartmental model for *Xylella fastidiosa* diseases with explicit vector seasonal dynamics

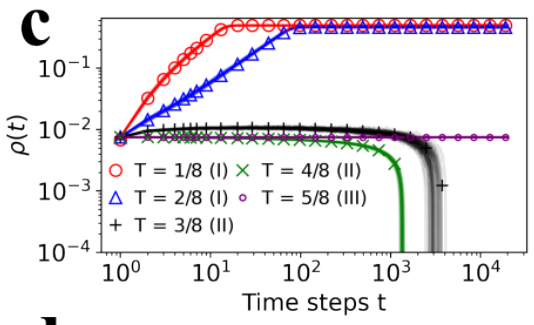


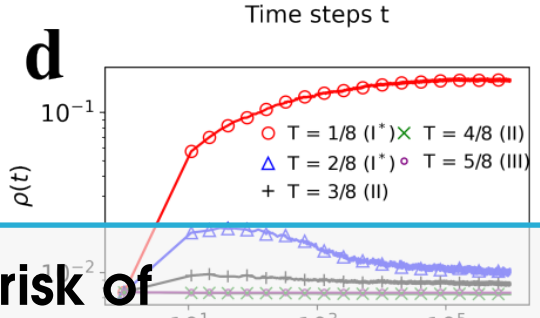


6. Degree-day-based model to predict egg hatching of Philaenus spumarius (Hemiptera: Aphrophoridae), the main vector of *Xylella fastidiosa* in Europe

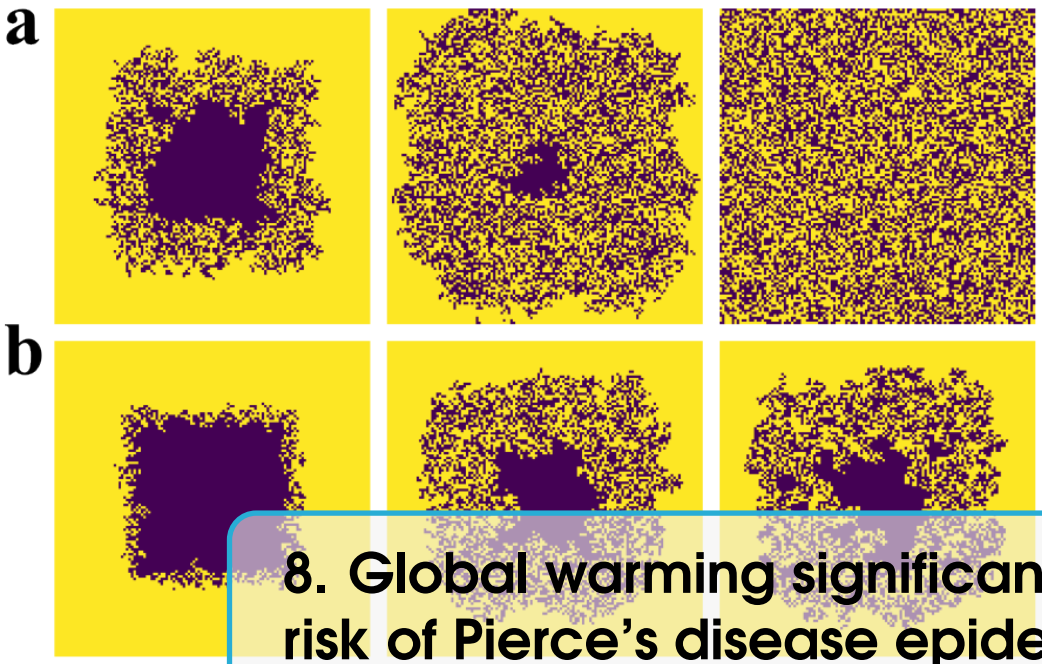
III Modelling the risk of vector-borne plant diseases

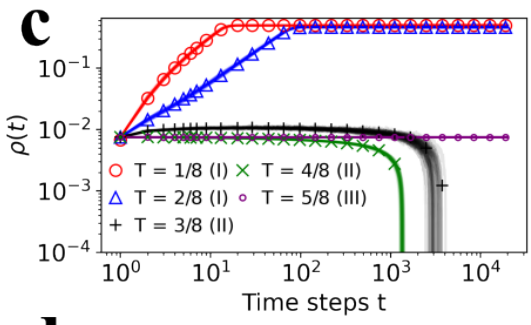


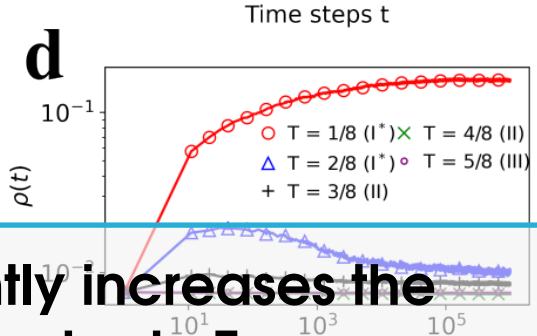




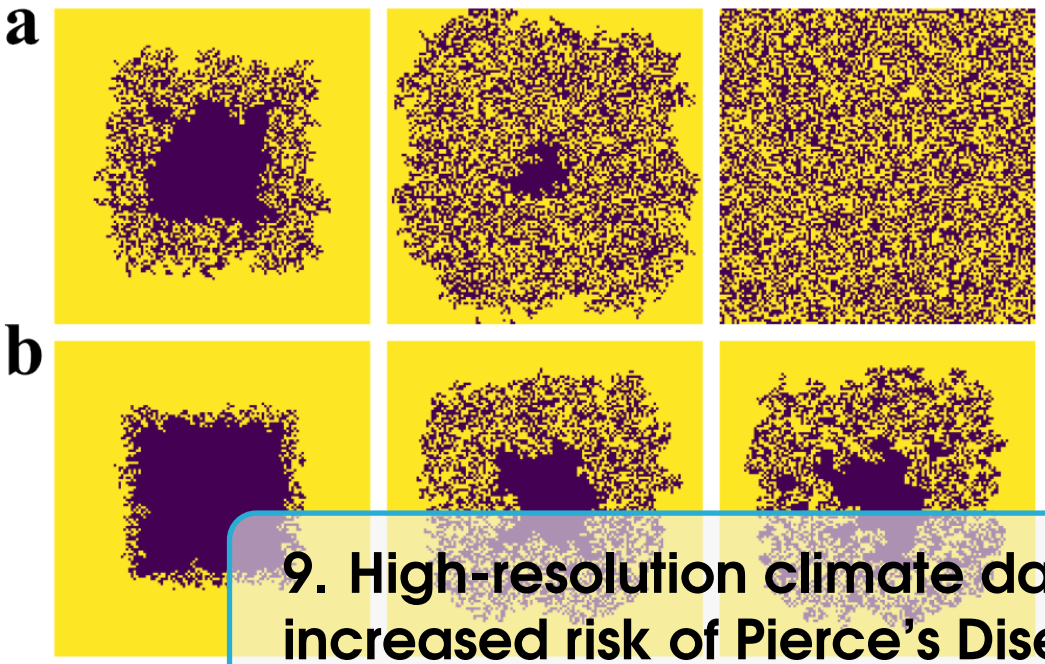
7. Global predictions for the risk of establishment of Pierce's disease of grapevines

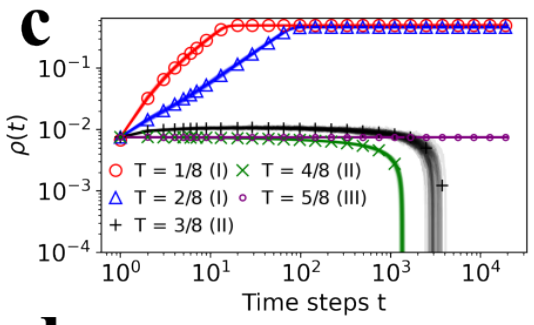


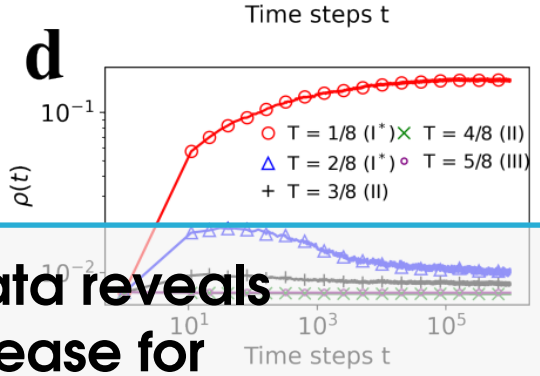




8. Global warming significantly increases the risk of Pierce's disease epidemics in European vineyards







9. High-resolution climate data reveals increased risk of Pierce's Disease for grapevines worldwide

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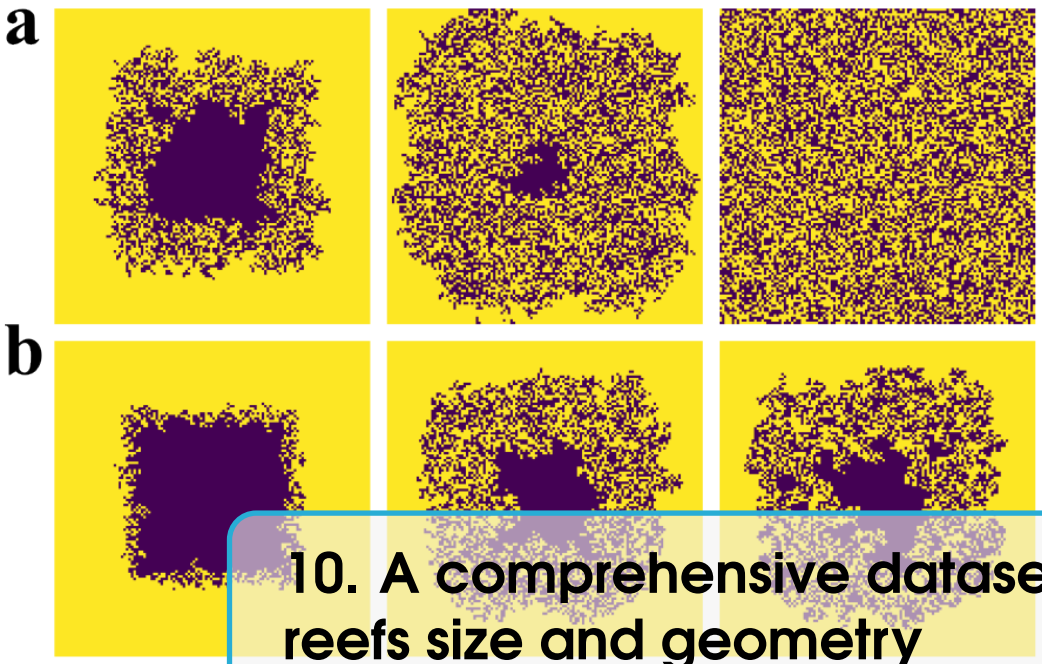
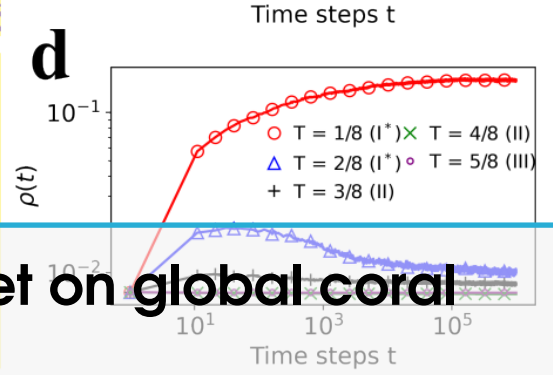
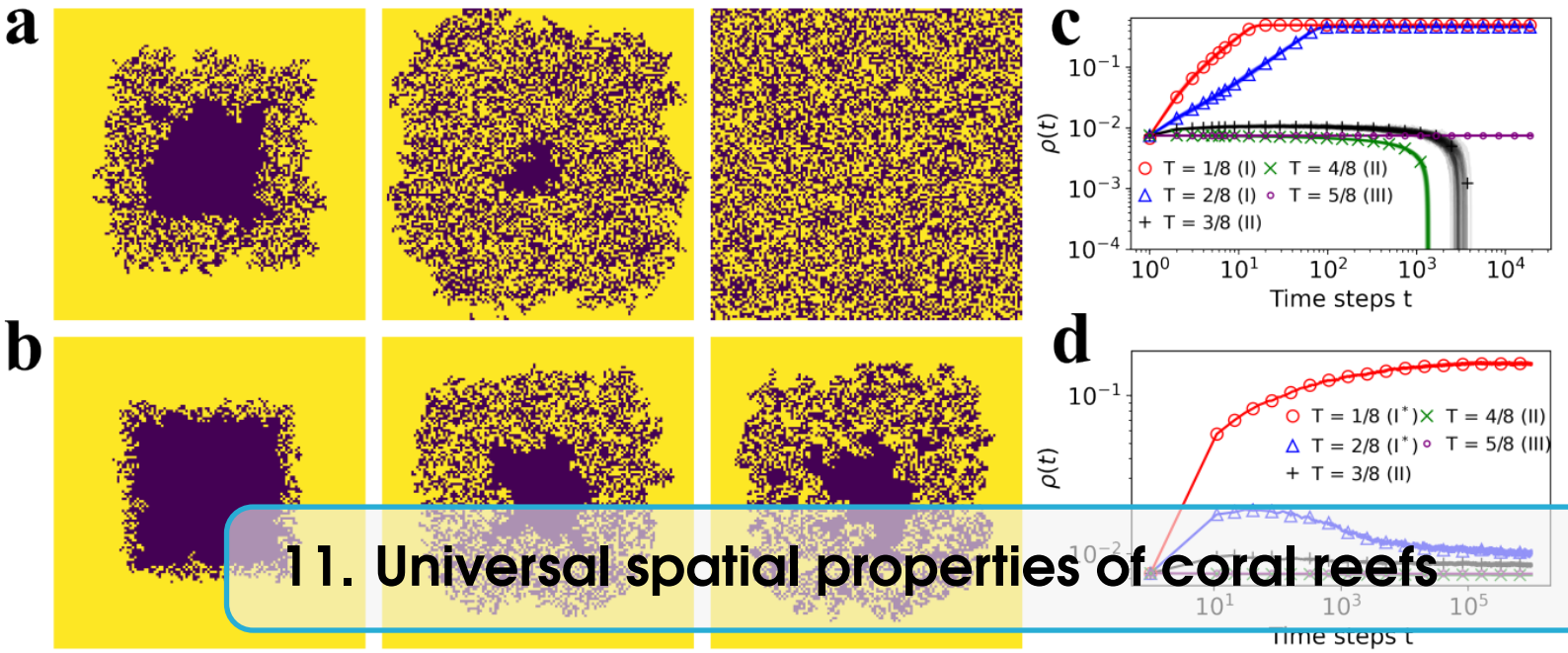




10. A comprehensive dataset on global coral reefs size and geometry



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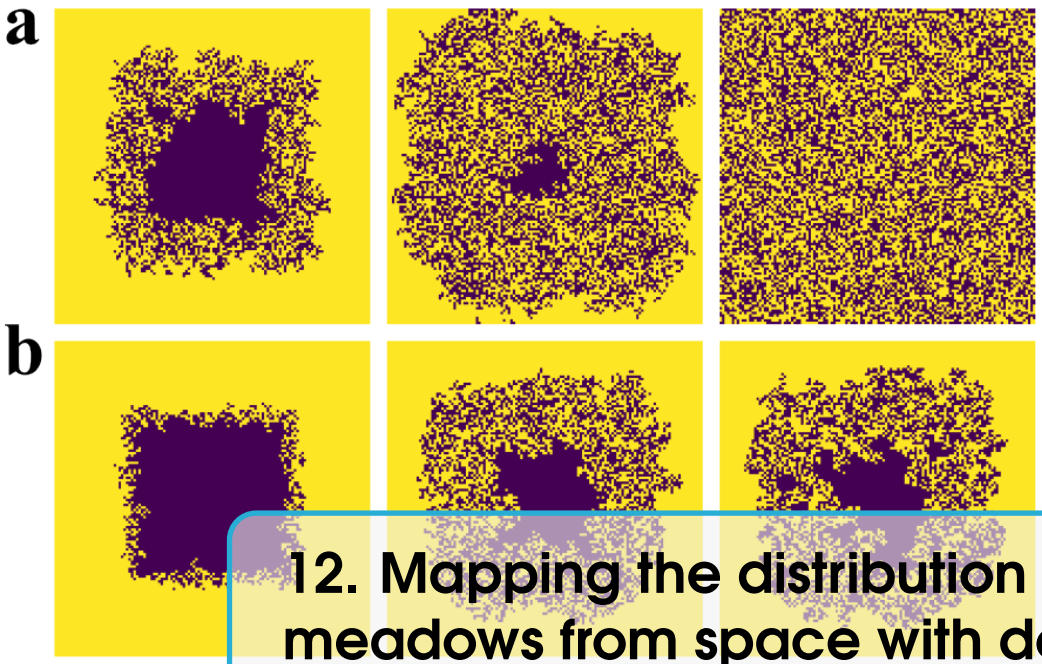

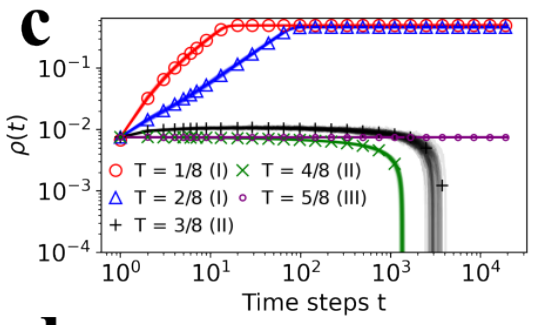

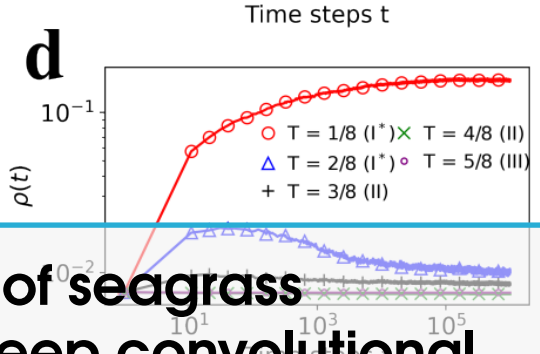

12. Mapping the distribution of seagrass meadows from space with deep convolutional neural networks

Bibliography