



C4: Known unknowns and unknown unknowns:
what are our models missing, and how much impact lies in the gaps?

Eric Galbraith Catalan Institute for Advanced Research (ICREA) /Universitat Autònoma de Barcelona

Main question:
Our ability to estimate the costs of
climate change

How well are we doing?

Are we getting 90% of climate change impacts?
10%?

Somewhere in between?



ISIMIP

Inter-Sectoral Impact Model
Intercomparison Project



Agriculture Sector

Joshua Elliott [🔗](#) [✉️](#)



Agro-economic Modelling

Hermann Lotze-Campen [🔗](#) [✉️](#)



Biodiversity

Thomas Hickler [🔗](#) [✉️](#)

Christian Hof [🔗](#) [✉️](#)



Permafrost



Coastal Infrastructure

Jochen Hinkel [🔗](#) [✉️](#)



Health

Kristie Ebi [🔗](#) [✉️](#)

Veronika Huber (water-borne diseases and thermal stress) [🔗](#) [✉️](#)

Joachim Rocklöv (vector-borne diseases and malnutrition) [🔗](#) [✉️](#)



Lakes

Rafael Marce [🔗](#) [✉️](#)

Don Pierson [🔗](#) [✉️](#)



Management Team

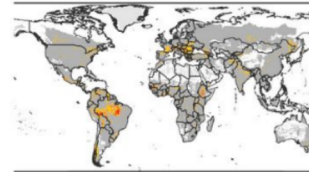
General Enquiries [🔗](#) [✉️](#)

Katja Frieler (Project leader, contact for permafrost, agro-economic modelling, biodiversity and health) [🔗](#) [✉️](#)

Lila Warszawski (Project Manager) [🔗](#) [✉️](#)

Matthias Büchner (Data Manager) [🔗](#) [✉️](#)

Jan Volkholz (Data Manager) [🔗](#) [✉️](#)



Cross-Sectoral Science Team

Jacob Schewe (contact for marine ecosystems and water) [🔗](#) [✉️](#)

Fang Zhao (contact for water) [🔗](#) [✉️](#)

Stefan Lange (contact for climate-input data) [🔗](#) [✉️](#)

Franziska Piontek (contact for energy) [🔗](#) [✉️](#)

Jonas Jägermeyer (contact for agriculture and lakes) [🔗](#) [✉️](#)

Christopher Reyer (contact for forests and biomes) [🔗](#) [✉️](#)



Water (global)

Simon Gosling [🔗](#) [✉️](#)

Hannes Müller Schmied [🔗](#) [✉️](#)



Water (regional)

Valentina Krysanova [🔗](#) [✉️](#)

Fred Hattermann [🔗](#) [✉️](#)



Marine Ecosystems & Fisheries

Derek Tittensor (regional & global) [🔗](#) [✉️](#)



Energy Supply & Demand

Ioanna Mouratiadou [🔗](#) [✉️](#)

Michelle van Vliet [🔗](#) [✉️](#)



Regional Forests

Christopher Reyer [🔗](#) [✉️](#)



Global Biomes

Philippe Ciais [🔗](#) [✉️](#)

Christopher Reyer [🔗](#) [✉️](#)

Impact models

Use predictive mathematical relationships to project the effect of different climate futures on things that matter to people

Impact models

Use predictive mathematical relationships to project the effect of different climate futures on things that matter to people

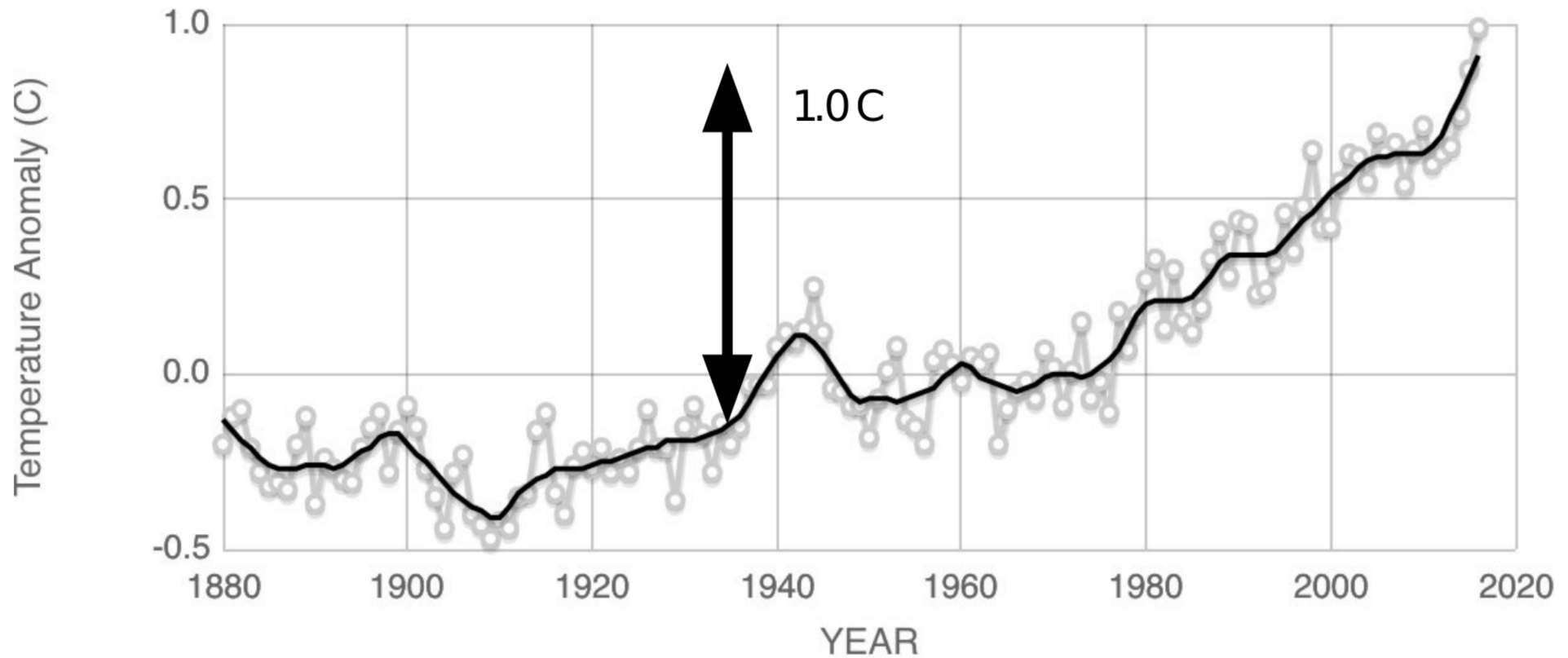
Uncertainties in the mathematical relationships used =
Known Unknowns

The future is unpredictable

$$2100 = 2017 + 83$$

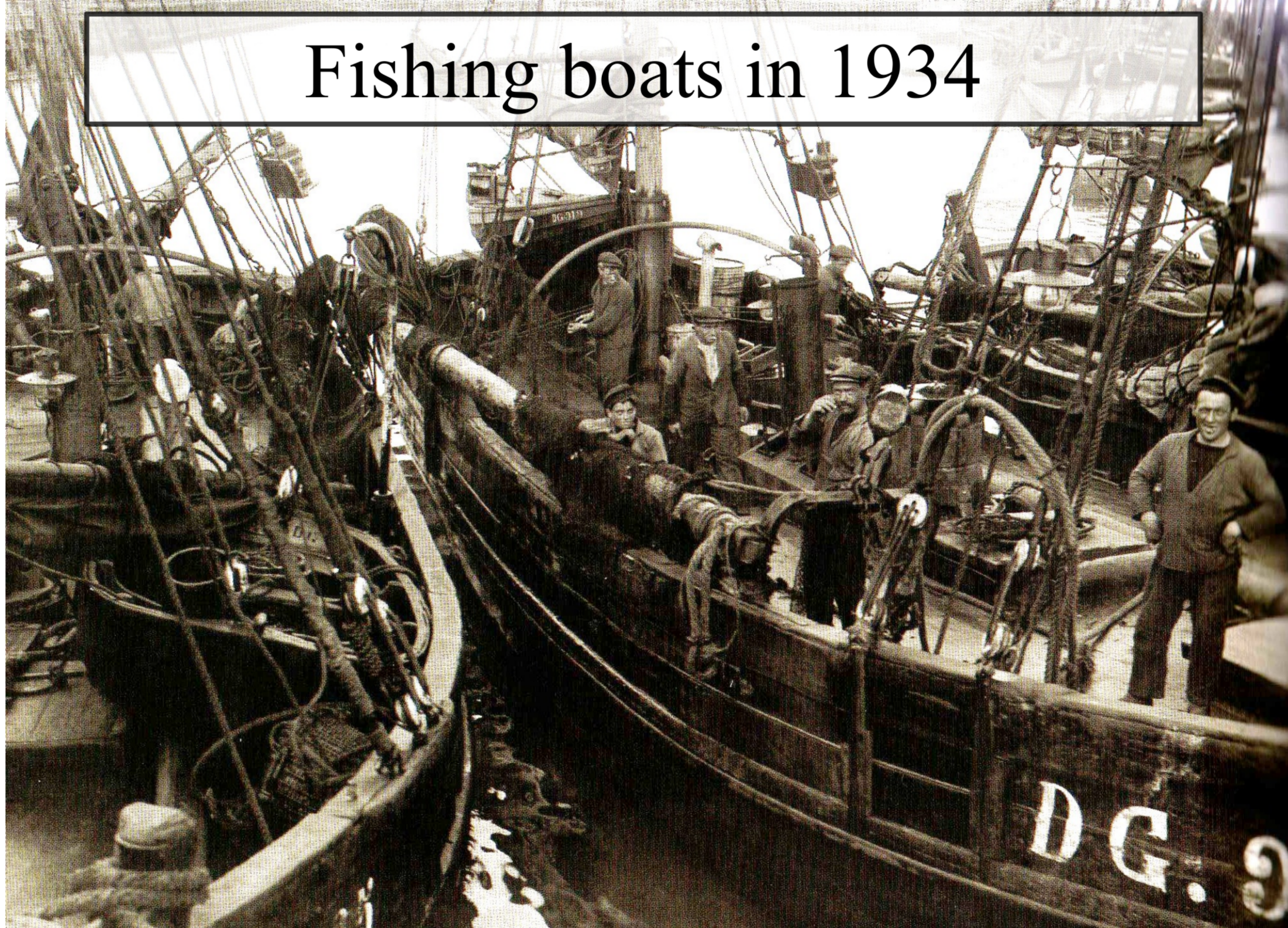
$$2017 - 83 = 1934$$

Global air temperature

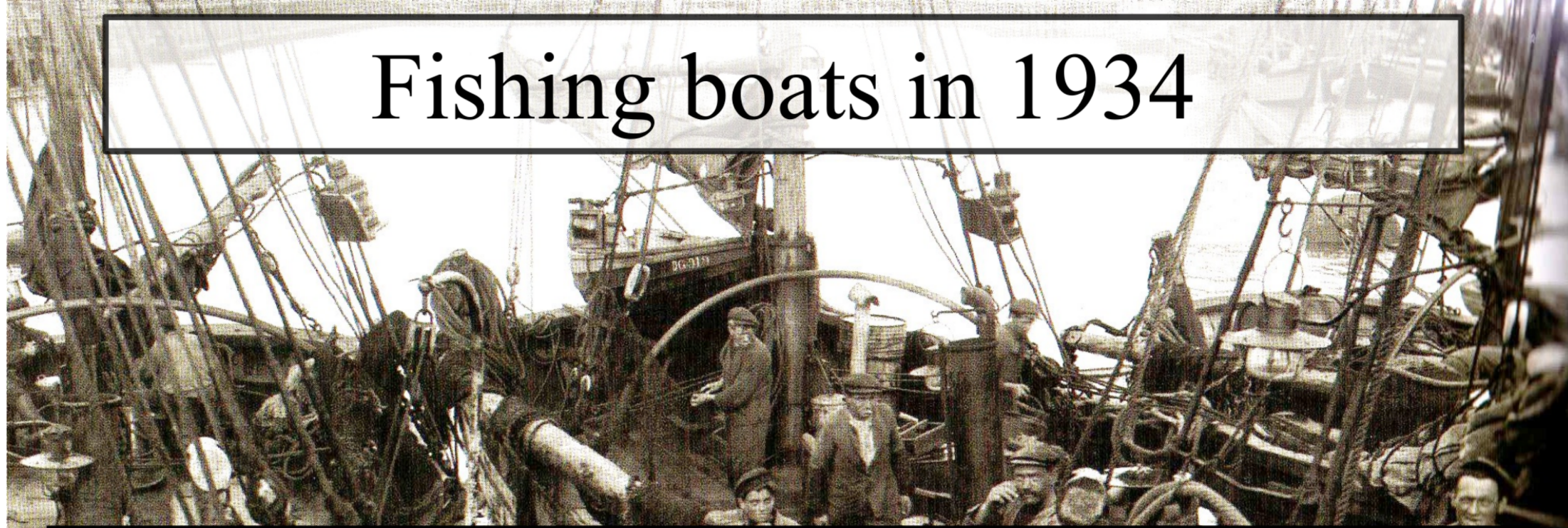


Source: climate.nasa.gov

Fishing boats in 1934



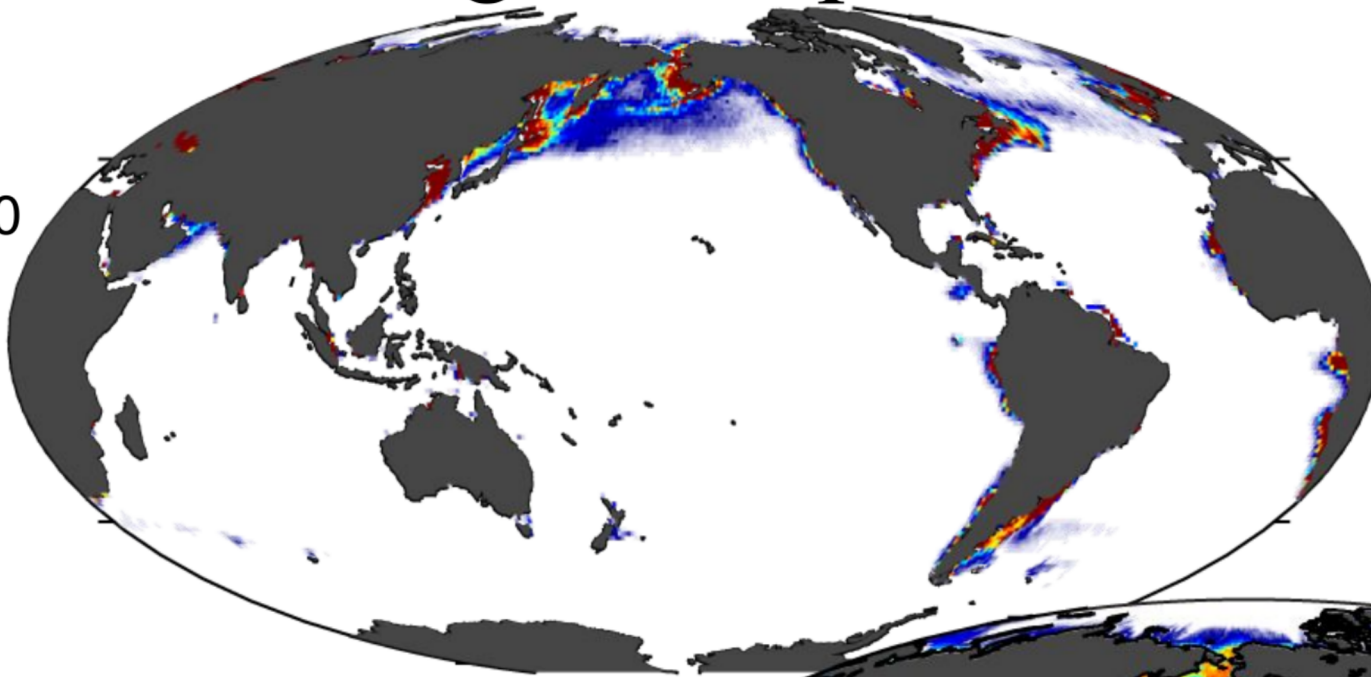
Fishing boats in 1934



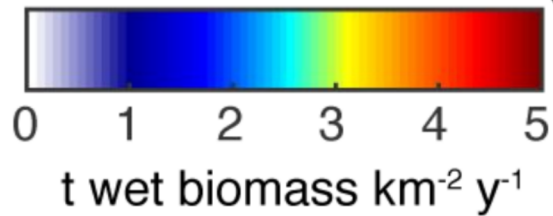
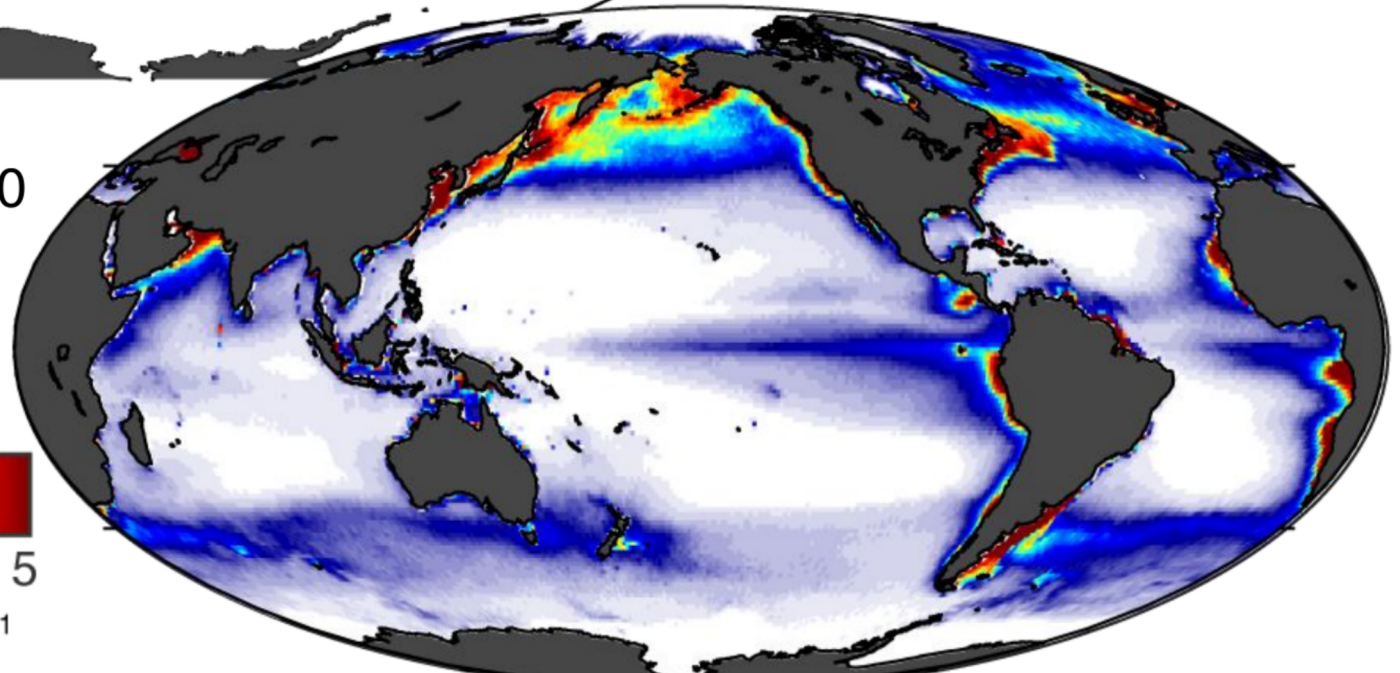
Fishing boats today

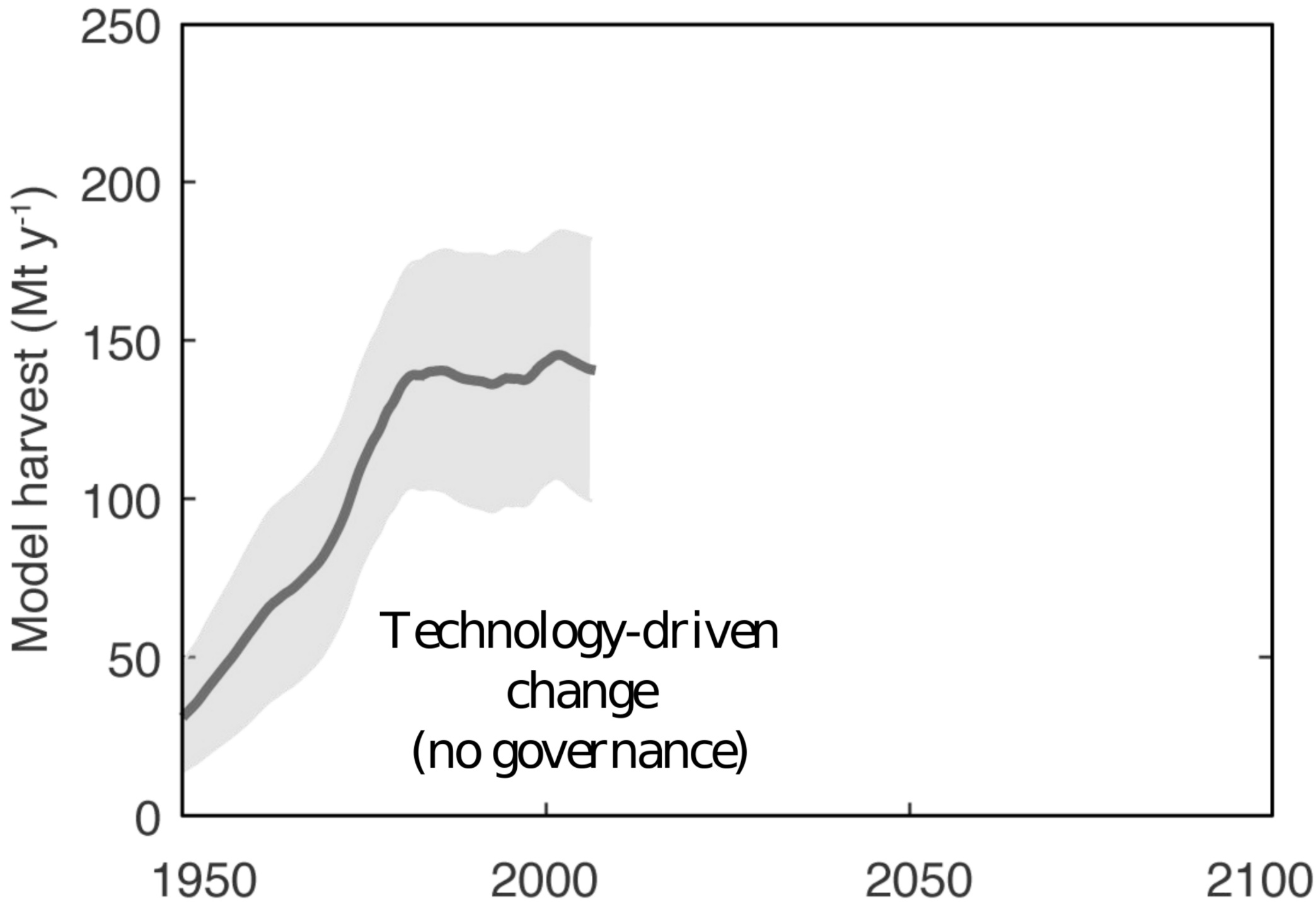
Physics-based fish model (BOATS) + technological improvement in fishing

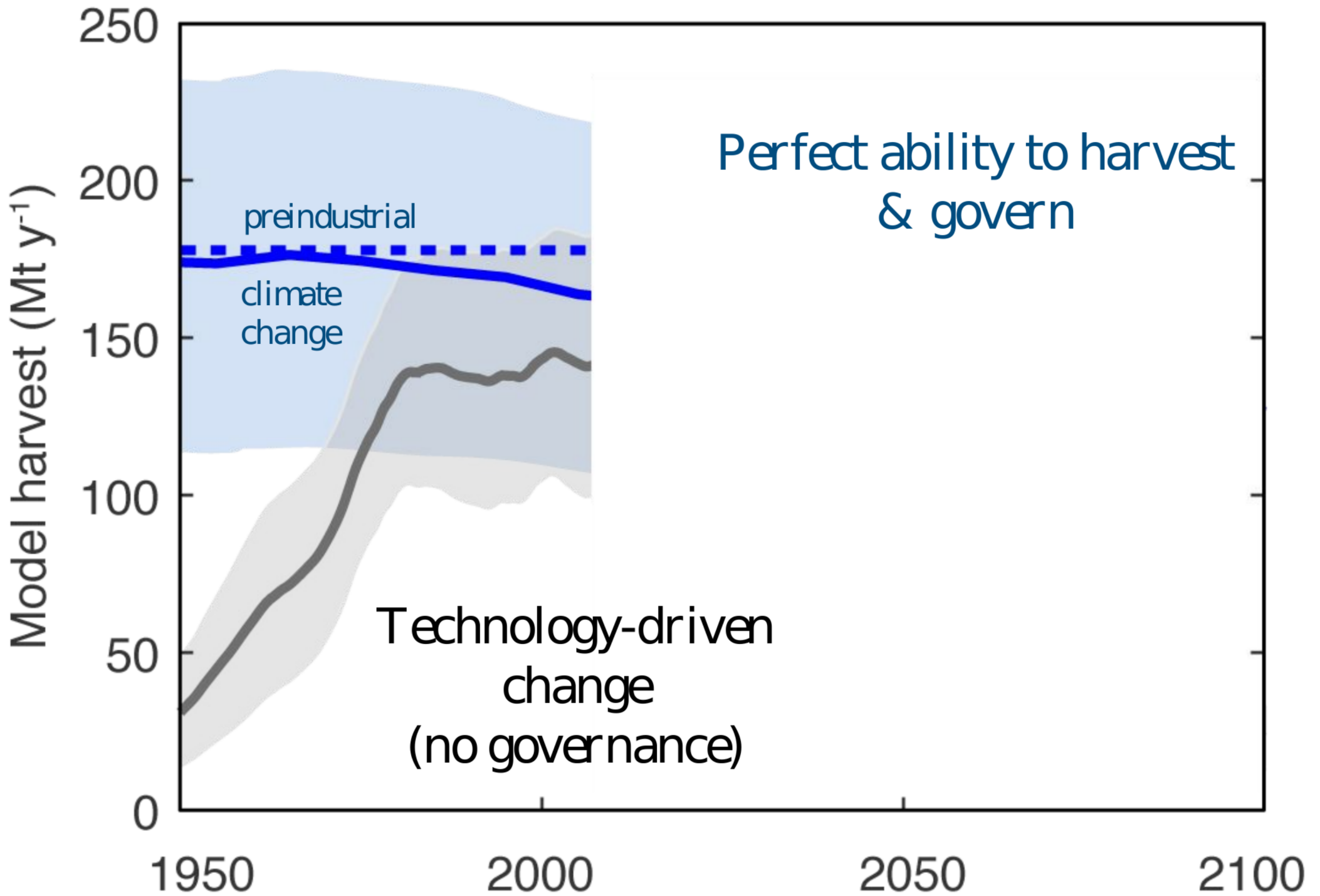
1950

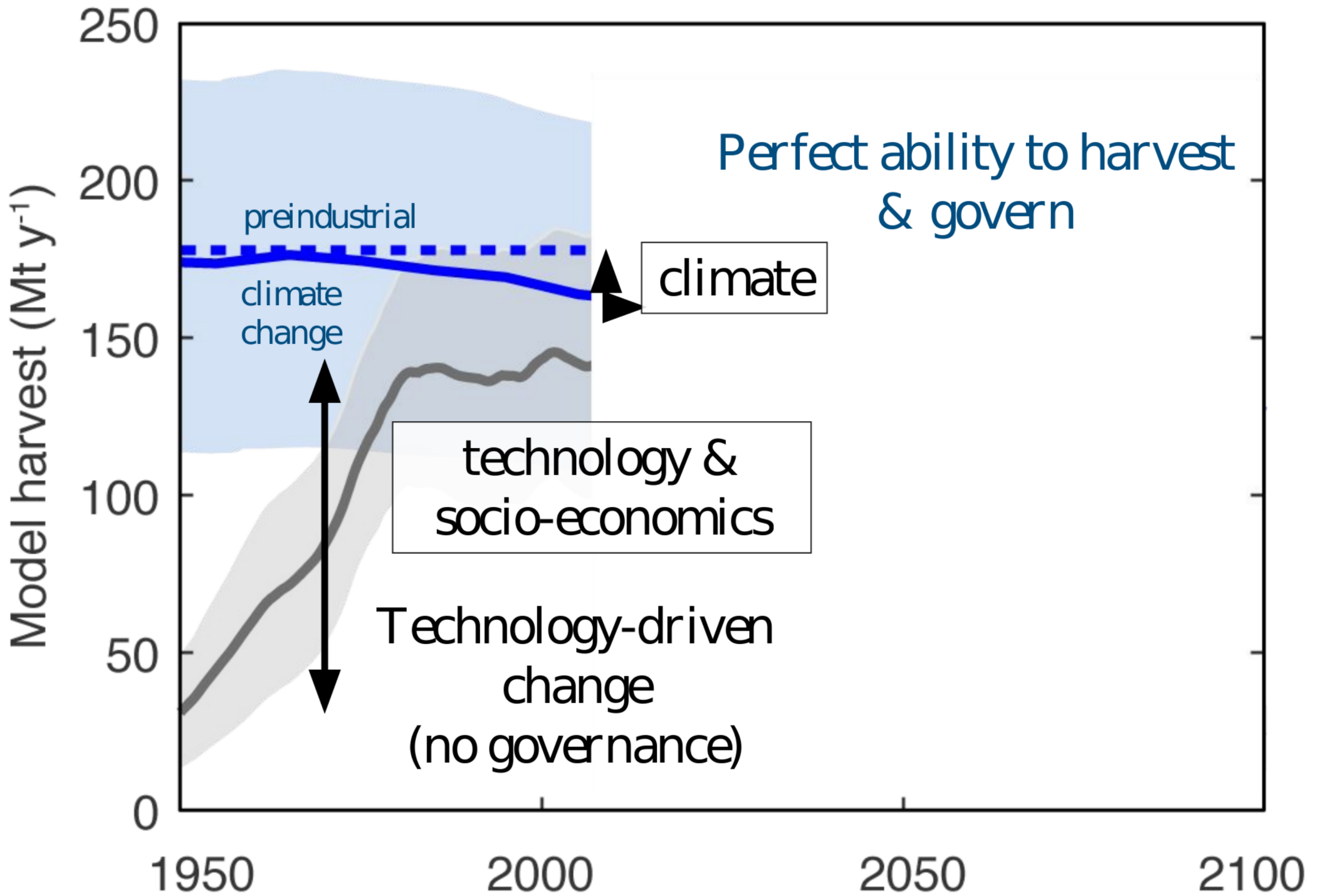


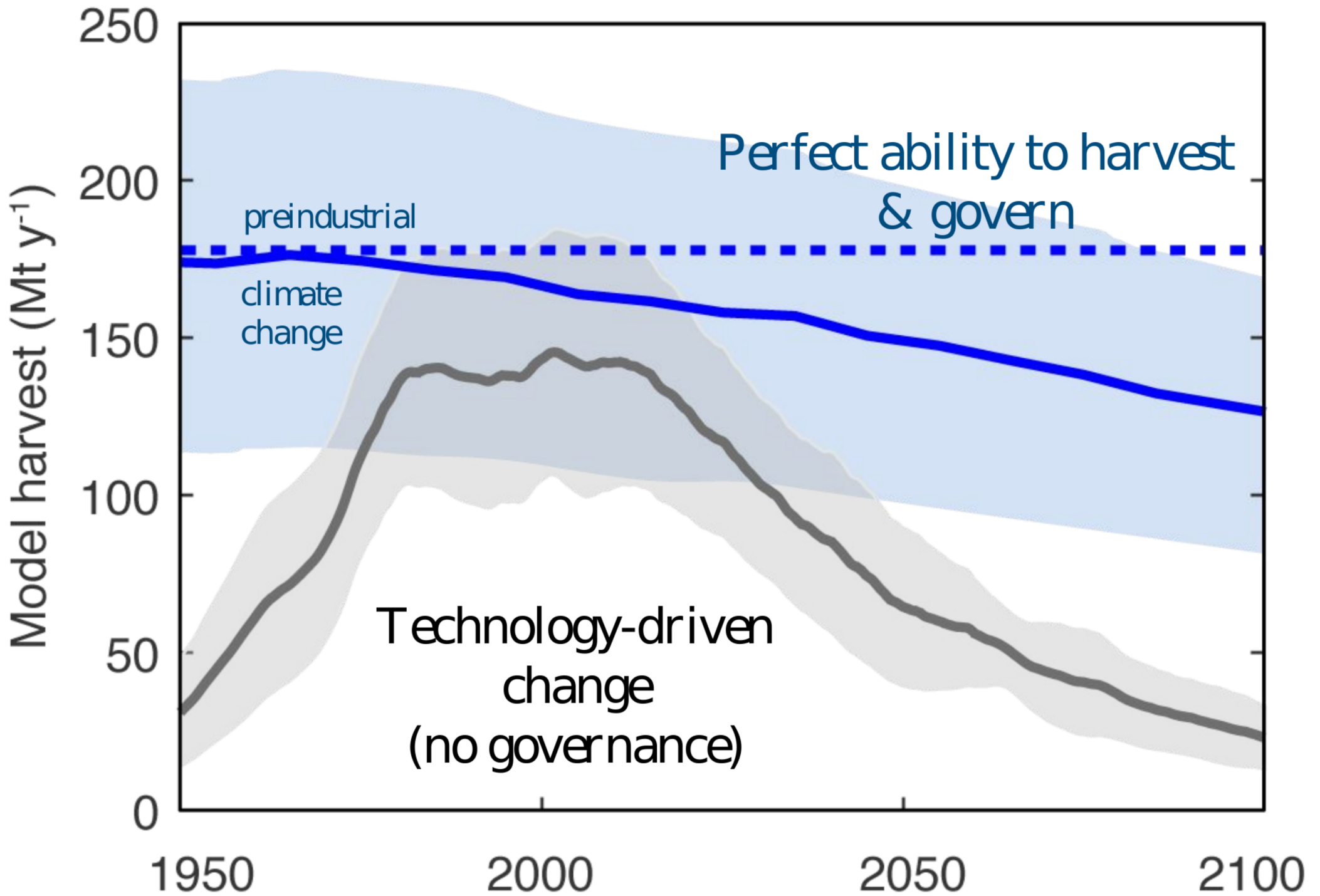
2000

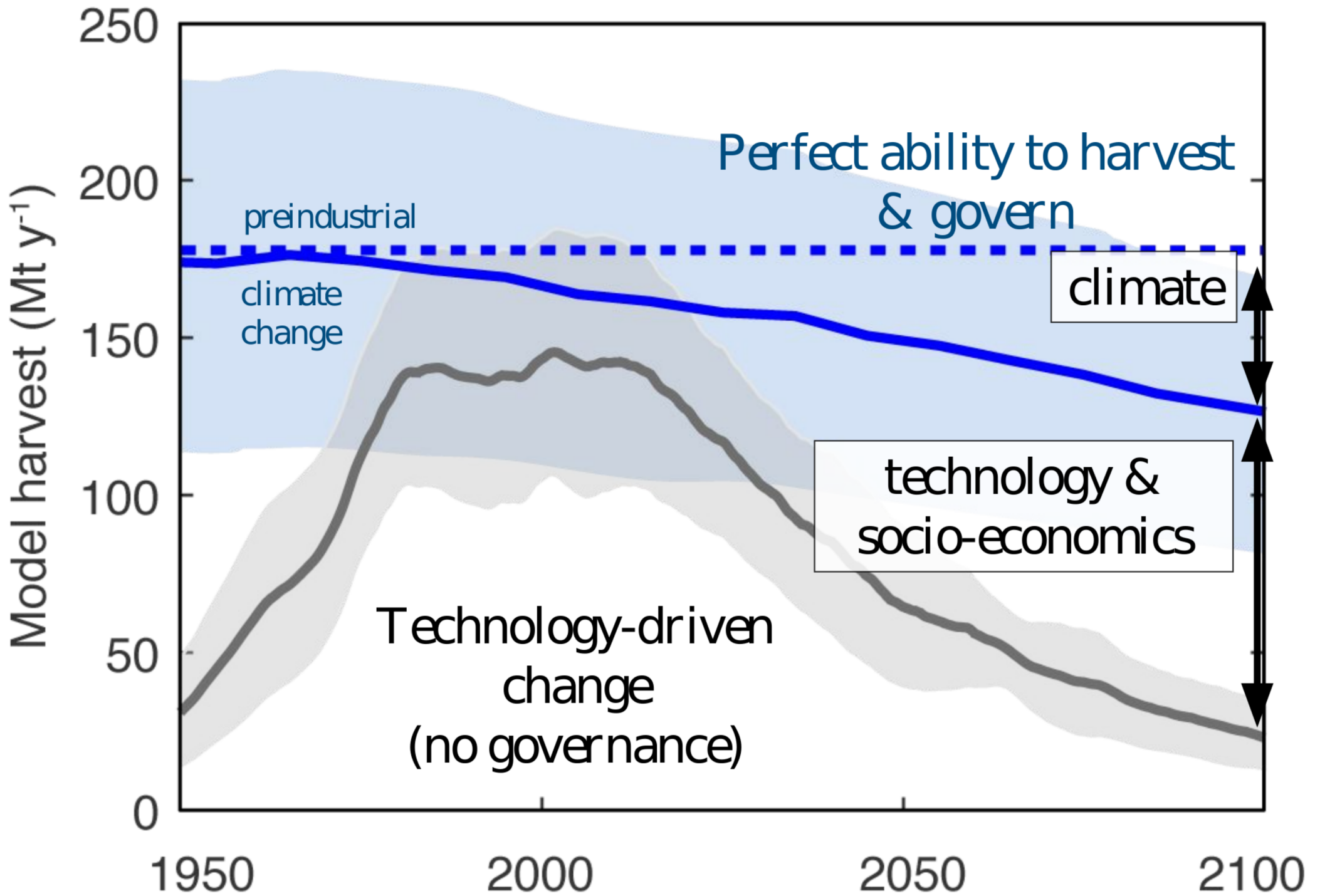












Climate change is one of many moving parts

- Other factors (social, economic, technological) will probably dominate the next 83 years of history
- It is likely that some social, economic and technological changes will **interact** with climate change impacts to make them less/more severe

Workshop outline

- Short talk from Joshua Elliott (AgMIP)
- Discussion 1: Dirty Laundry
- Discussion 2: Here Be Dragons

Joshua Elliot

DARPA / University of Chicago

Dirty Laundry

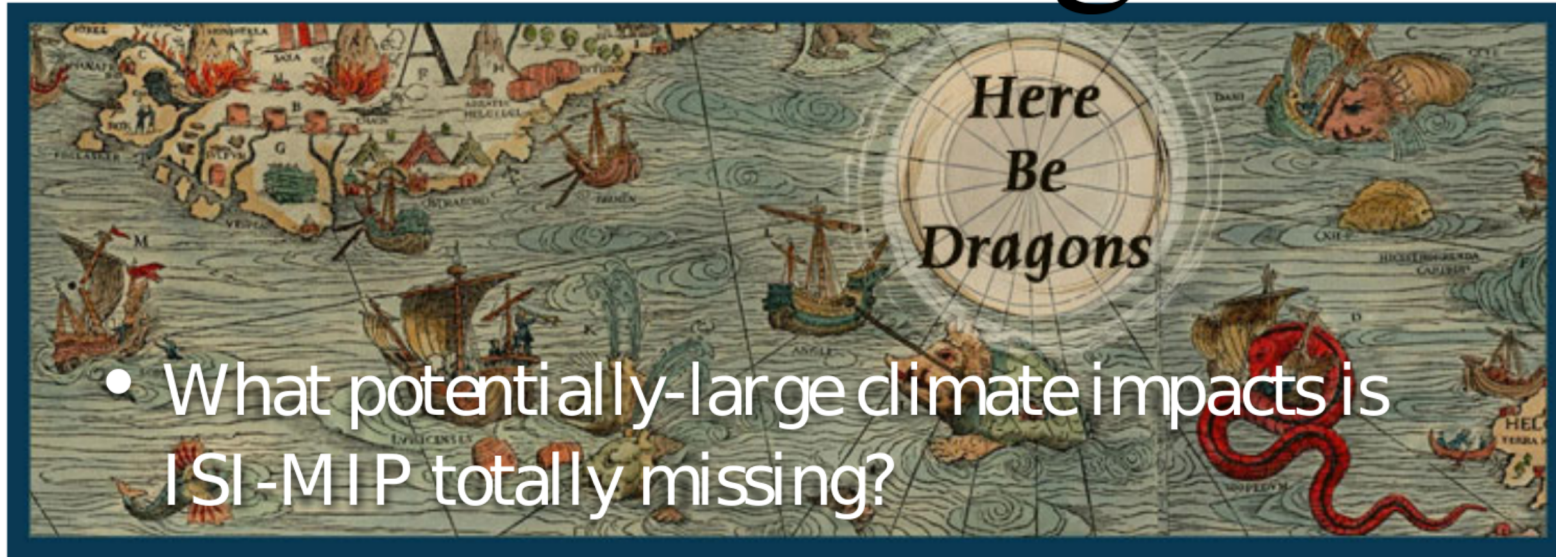


- How much confidence is there in each sector's ability to model impacts?
- What are the biggest uncertainties?

[Google document](https://docs.google.com/document/d/1ECCttlZKNB1i862gbKoywxptVjNqhmTPgnzSNgYkqO8/edit)

<https://docs.google.com/document/d/1ECCttlZKNB1i862gbKoywxptVjNqhmTPgnzSNgYkqO8/edit>

Here be Dragons



- What potentially-large climate impacts is ISI-MIP totally missing?

Permafrost

Global biomes

Health

Biodiversity

Lakes

Regional forests

Energy supply & demand

Water

Agro-economics

Agriculture

Marine ecosystems
& fisheries

Coastal infrastructure