Safe Landing Climates

SSG Paris, May 2025

https://www.wcrp-climate.org/safe-landing-climates

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Structure

Steven Sherwood Gabi Hegerl

Understanding High-Risk Events	Perturbed Carbon Cycle	Water Resources	Sea Level Rise	Safe Landing Pathways
Bette Otto-Bliesner **Gabi Hegerl**	**Pierre Friedlingstein** **Chris Jones**	**Paulo Nobre**	**Molly Mitchell** **Elisabeth Holland**	**Lisa Miller** **Neil Harris**
Hannah Liddy Thomas Lontzek Izidine Pinto Ryan Sriver Laura Suarez-Gutierrez	Ana Bastos Jamie Collins Roland Séférian Gyami Shrestha Sophie Szopa	Ramia Al Bakain Cristiano Chiessi Benjamin Keenan Nathalie Philippon Kazuyoshi Suzuki	Benjamin Hamlington Svetlana Jevrejeva Christopher Little Roshin P. Raj Swapna Panickal	Peter Alexander Marco J. Cabrerizo Felix Donkor Luke Harrington

Advisory Group

➢ Steering Group

WG Affiliate members

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Ongoing Activities

Sherwood, Hegerl, Braconnot, Friedlingstein, Goelzer, Harris, Holland, Kim, Mitchell, Naish, Nobre, Otto-Bliesner, Reed, Renwick and van der Wel (2024), **Uncertain Pathways to a Future Safe Climate**, *Earths Future*.

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Ongoing Activities

Tipping Point Discussion Series

- Joint initiative with the Analysis, Integration and Modeling of the Earth System (AIMES) Project and the Earth Commission of Future Earth, started in 2021.
- 31 events as of most recent event (Defining Tipping, 25 March), total of ~5000 live participants.
- Next event: AMOC+policy implications (25 May)
- *https://tippingpointsseries.confetti.events*

Climate Pathways Discussion Series

- Five events so far

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Plans for 25/26 and collaborative links

High-risk Cascading Shocks

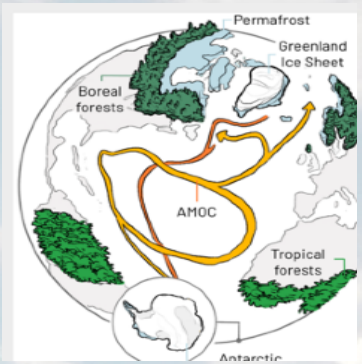
Successful workshop in November; plan for a review paper and continuation of activity

Links to EPESC (Fischer); My climate risk (Rodriguez) and links to core projects (eg water availability; need to be strengthened; also to extremes platform)

Linking Global Climate Risk to Economic Modelling

Meeting November in Geneva involving S&P Global, economists, climate scientists; NY Climate Week

Follow-on activities planned – targeted webinars, white paper, and a workshop in early 2026

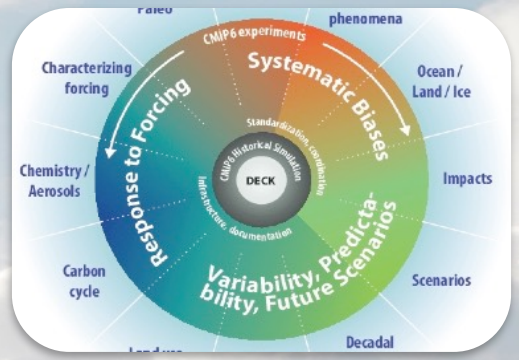


Thresholds, Irreversibility and Tipping Assessment

Writing meeting in New york in May; 1st draft coming together

Coordinating with IPCC

To be submitted ‘26



CMIP for Climate Risks, Whatifmip

Whatifmip explores consequences of breaching a tipping point, and has been integrated into TipMIP. very much CMIP focus.

In close contact with CMIP and ESMO

Most relevant work finished

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Plans going forward

TCRE assessment

Transient Climate Response to cumulative Emissions

Workshops held in 2024 and 2025

Goal to submit assessment manuscript in 2026

Water variability impacts

Activity planned for COP; some involved in tipping point paper

Signposts for sea level rise

Has focused on strategies to inform decisionmakers.

Potentially addresses a gap left by Sea Level GC.

Gaming and decision/scenario exploration

Participated in SRI in Chicago

Paper in preparation

Cascading shocks and economic risk workshops

High-risk cascading shocks

Connecting across the IAM-GCM-impact hierarchy

November 2024

Cascading Shocks

Heat Index	Risk Level	Protective Measures
Less than 91°F	Lower (Caution)	Basic heat safety and planning
91° to 103°F	Moderate	Implement precautions and heighten awareness
103° to 115°F	High	Additional precautions to protect workers
Greater than 115°F	Very High to Extreme	Triggers even more aggressive protective measures

Global Economic Risk

Objective:

To understand Cascading Shocks by bringing together communities working on high-risk large-scale extreme events and systemic risks and applying state-of-the-art methodologies and tools across different sectors and disciplines.

Objective:

To explore, better understand and move toward evaluating methods currently being used by the finance community, including regulators, to quantify global macroeconomic physical climate risks, and to identify ways that these methods could be improved, may be biased or may be incomplete.

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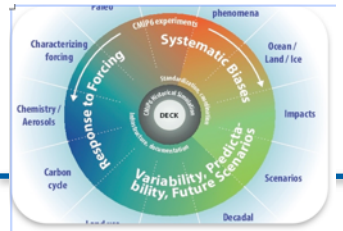
"Tipping" assessment

We have begun a community assessment: **High impact climate events, tipping points and irreversible regional impacts: how robust is our understanding?**

- Tipping points will be important in IPCC AR7.
- The research community is split on their importance, and even their definition. Consensus building is needed on terminology, level of scientific understanding, predictability, and how to represent across working groups.
- Other related phenomena—threshold crossing, irreversibility, climate surprises, and the role of extreme events in triggering these—also need attention.
- This assessment will reach across scientific camps and IPCC working groups, timed to feed into AR7 (target to finish in late 2026). Led by Gabi and Peter Abbott.
- The scope includes nonlinear physical hazards and anticipated adaptation limits (but not "social tipping")

WhatIfMIP – CMIP7 Community MIP



CMIP for climate risks

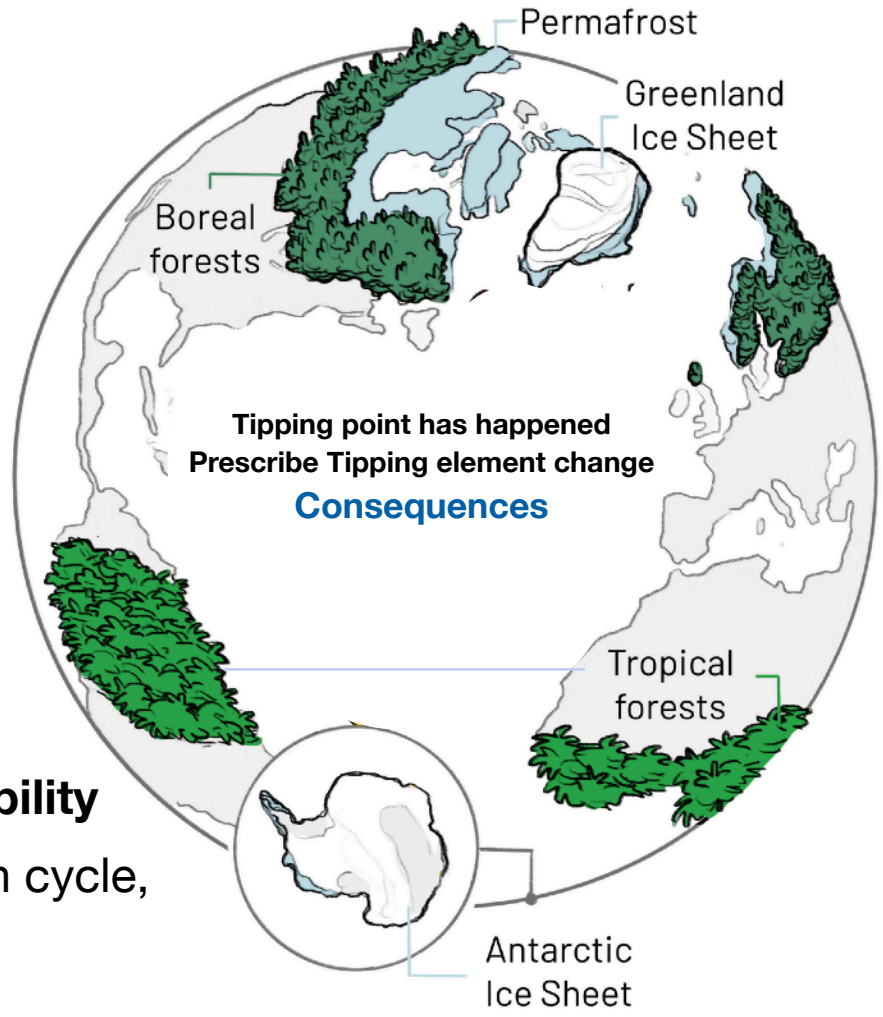
- Identify storylines of extreme outcomes in the future
- **Design CMIP7 experiments assuming definitive tipping of a subset of these Earth system components -> It has happened**
- **Multi-model CMIP7 ensemble with AOGCM models**

Benefits:

- **Allows climate models to run experiments, even if do not have these components as interactive**
- **Proposing 100-200 year simulation lengths (carbon friendly)**

Outcomes:

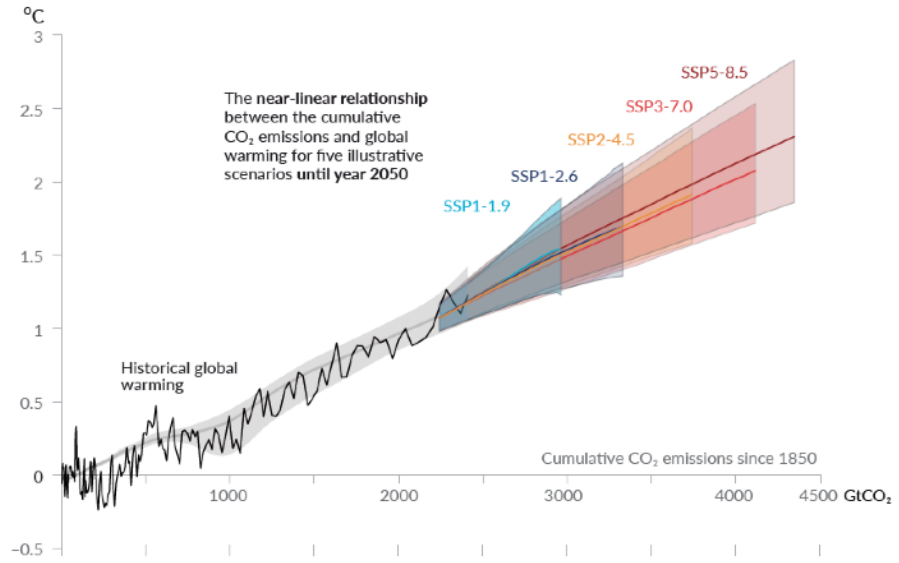
- Policy relevant for assessing local, regional **adaptation and vulnerability**
- Potential **far-field impacts** (e.g. ENSO) and **global risks** (e.g. carbon cycle, wildfire aerosols).
- Information for **Climate Services** and all 3 **IPCC WGs**



Transient Climate Response to cumulative Emissions (TCRE) and Zero Emissions Commitment (ZEC) Assessment

TCRE assessment

AR6 assessed TCRE *likely* range is **0.27°C to 0.63°C** per 1000 $GtCO_2$ emitted, with a remaining carbon budget for 1.5°C *likely* range of **300 to 900** $GtCO_2$.



Objective:
Produce a TCRE/ZEC assessment in time for IPCC AR7, following the Sherwood et al., approach for ECS

TCRE and ZEC Workshop, January 2024, Bristol
Organized by C. Jones, P. Friedlingstein, T. Ilyina, R. Seferian
Hybrid workshop, 50 participants

https://www.wcrp-climate.org/slc-events-opportunities/tcre-2024

Joint project with ESMO

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Issues going forward

- Turnover of WG leads; need new leadership in Water WG.
- We are steadily adding Affiliate Members and encouraging the WGs to engage them
- Varying activity level in working groups, focusing now on identified activities. Some making excellent progress and some may wind down if not making significant progress.
- We need to keep abreast of new Climate Intervention LHA, ESMO and DE LHA.
- Secretariat support is critical for us to be doing anything!

Thank you

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