

# Safe Landing Climates

45th Session of the WCRP Joint Scientific Committee

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



International  
Science Council



**WCRP**  
World Climate Research Programme

# 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 Neil Harris	Hyungjun Kim Paulo Nobre	Molly Mitchell Elisabeth Holland	Neil Harris Kevin Reed
Hannah Liddy Thomas Lontzek Izidine Pinto Ryan Sriver Laura Suarez-Gutierrez	Ana Bastos Jamie Collins Chris Jones Roland Séférian Gyami Shrestha Sophie Szopa	Ramia Al Bakain Cristiano Chiessi Benjamin Keenan Nathalie Philippon Marion Saint-Lu Kazuyoshi Suzuki	Benjamin Hamlington Svetlana Jevrejeva Christopher Little Roshin P. Raj Swapna Panickal	Peter Alexander Marco J. Cabrerizo Felix Donkor Luke Harrington Lisa Miller

Advisory Group

➤ Steering Group

WG Affiliate members

WG Affiliate members

WG Affiliate members

WG Affiliate members

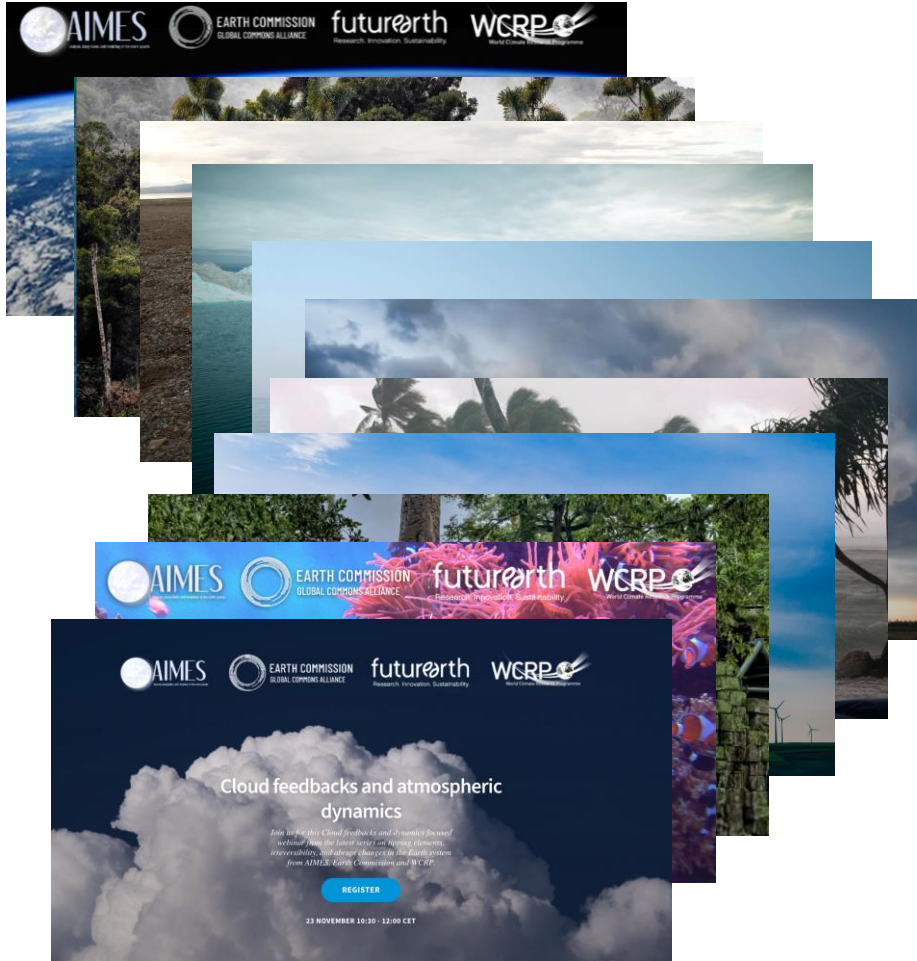
WG Affiliate members



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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.
- 26 events as of most recent event (Food Systems, 16 May), total of 3985 live participants.
- Next event: **Tipping Cascades (19 June, 14:30 CET)**
- <https://tippingpointsseries.confetti.events>

## Climate Pathways Discussion Series

- Four events as of most recent (Cascading Risks for Ecosystems, 23 May)
- Upcoming events on cascading risks and economic impact modelling



# Ongoing Activities

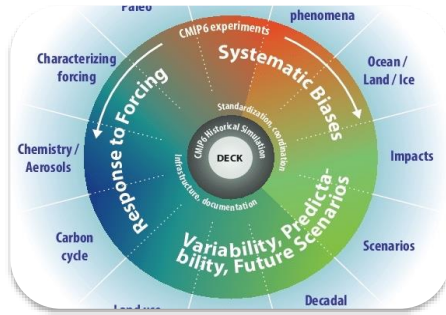
Sherwood, Hegerl,  
Braconnot, Friedlingstein,  
Goelzer, Harris, Holland,  
Kim, Mitchell, Naish,  
Nobre, Otto-Bliesner,  
Reed, Renwick and van  
der Wel (2024), **Uncertain  
Pathways to a Future  
Safe Climate**, *Earths  
Future*, In press.

To be featured in EOS  
Research Spotlight



# New Activities

(now in various stages of development)



**CMIP for  
climate risks**



**High-risk cascading  
shocks**



**Connecting across  
the IAM-GCM-impact  
hierarchy**



**Gaming and  
decision/scenario  
exploration**

TCRE = Transient  
Climate Response to  
cumulative Emissions



**TCRE assessment**



**Water variability  
impacts**



**Signposts for sea  
level rise**

# WhatIfMIP – CMIP7 Community MIP



## CMIP for climate risks

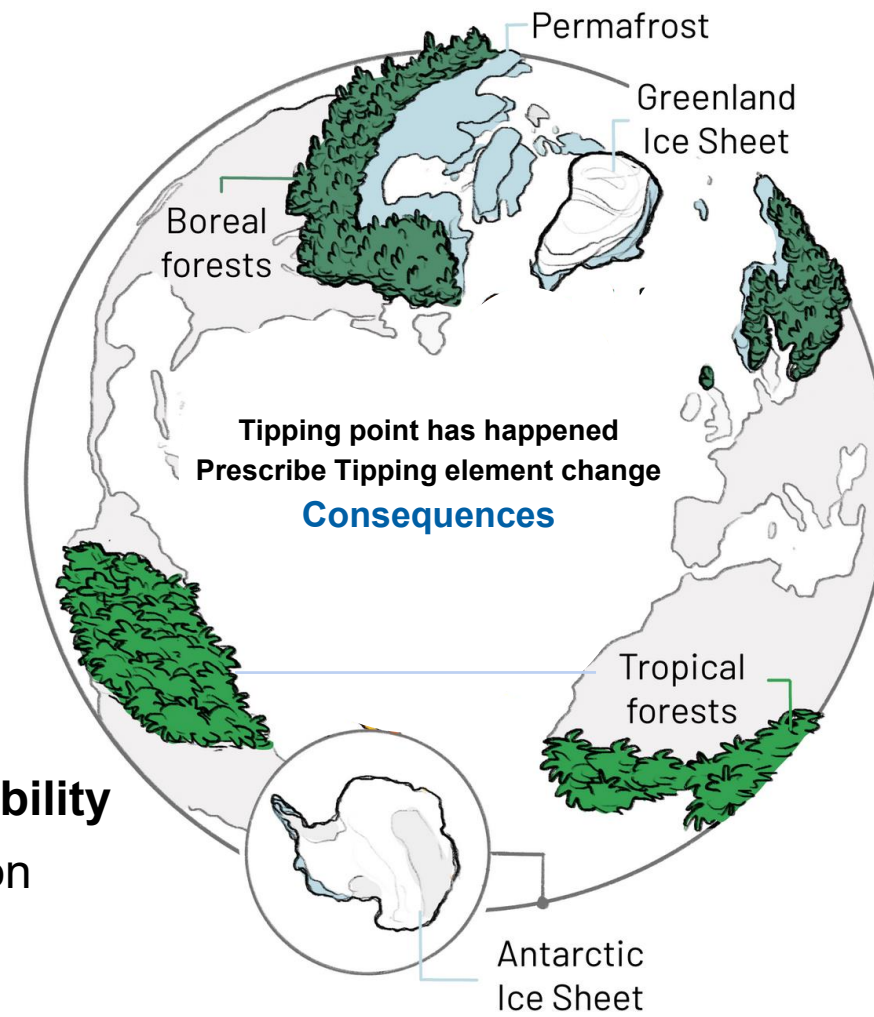
- Identify storylines of extreme outcomes in the future
- **Design CMIP7 experiments assuming definitive tipping of a subset of these Earth system components -> It has happened**
- **Multi-model CMIP7 ensemble with AOGCM models**

## 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**

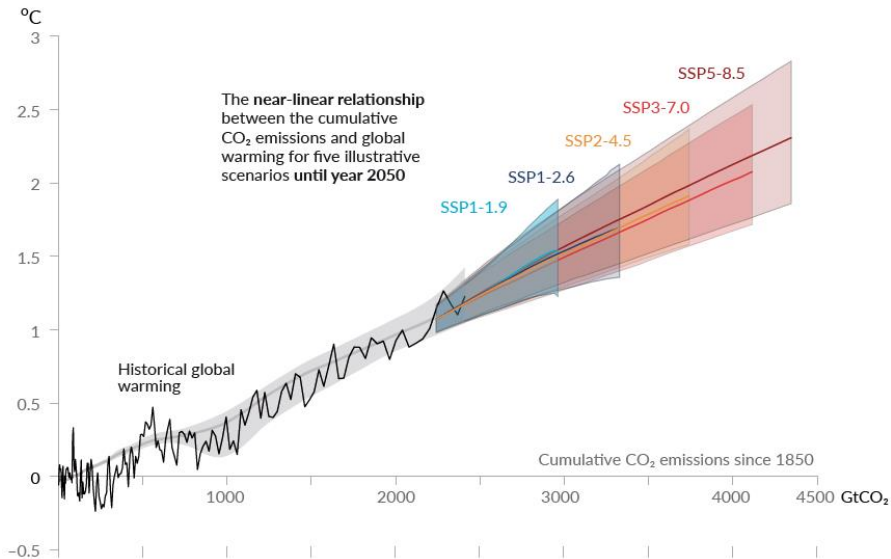




# Transient Climate Response to cumulative Emissions (TCRE) and Zero Emissions Commitment (ZEC) Assessment

## TCRE assessment

AR6 assessed TCRE *likely* range is **0.27°C to 0.63°C** per 1000 GtCO<sub>2</sub> emitted, with a remaining carbon budget for 1.5°C *likely* range of **300 to 900 GtCO<sub>2</sub>**.



**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>

**Funding request (2025-2026): CHF30,000 per year**  
**0.25 FTE PDRA Support (CHF 20,000 per year)**  
Support the organisation and the writing of the assessment paper

**Travel support (CHF 10,000 per year)**  
Funding to convene a small planning/writing group meeting in both 2025 and 2026.



# Cascading shocks and economic risk workshops



High-risk cascading shocks

November 2024

Connecting across the IAM-GCM-impact hierarchy



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.



# Proposed new Assessment

We propose a community assessment of **threshold breaching, irreversibility and tipping points.**

- 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.
- Threshold crossing, irreversibility following severe events and climate surprises also need attention.
- WCRP can help by supporting an authoritative review paper that reaches across the scientific camps, and the three IPCC working groups although focused on physical climate science capabilities.
- The timeline should be starting as soon as possible, with a submission well ahead of the IPCC WG1 publication deadline, anticipated in later 2027.
- A small working group has been formed and is progressing the idea.

# Key linkages to other activities

- **Within WCRP**

- Signposts for Sea Level Rise ⇔ My Climate Risk LHA
- TCRE Assessment ⇔ ESMO
- CMIP for Climate Risks ⇔ WGCM/ESMO
- Cascading Risks ⇔ EPESC (heat extremes)
- WCRP Academy — contribution to cross-WG primers

- **Outside WCRP**

- Tipping point discussion series ⇔ AIMES and Earth Commission
- WhatifMIP ⇔ TIPMIP
- Workshop on economic risk ⇔ S&P Global

# Issues going forward

- Turnover of WG leads; nomination of Chris Jones to co-lead Carbon WG and join our Steering Group.
- 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.
- Still forming our Advisory Committee.
- We need to keep abreast of new Climate Intervention LHA and ESMO.
- We may develop ice sheet/rapid sea level rise activity (TBD)

# Thank you



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# Budget Safe Landing Climates 2023

Budget for 2023 after London Meeting	USD 24,432
TCRE Workshop	10,000
Travel support for Kigali	10,000
Travel support for other meetings	<u>4,432</u>

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Outlook for 2024 – *Additional USD 30,000*

Water workshop – Amazon	10,000
Other?	