

Safe Landing Lighthouse

44th Session of the WCRP Joint Scientific Committee

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May 2022, Climate Center, Brussels, Belgium



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Research themes

Theme 1: Understanding High Risk Events: tipping points, large scale high risk events across earth system and Earth/human system

Theme 2: Perturbed Carbon Cycle: Carbon feedbacks, overshoot scenarios, reversibility, risks from negative emission scenarios

Theme 3: Water Resources: Focus on Amazon and its teleconnections

Theme 4: Sea Level Rise: identifying limits to habitability, engagement with user communities;

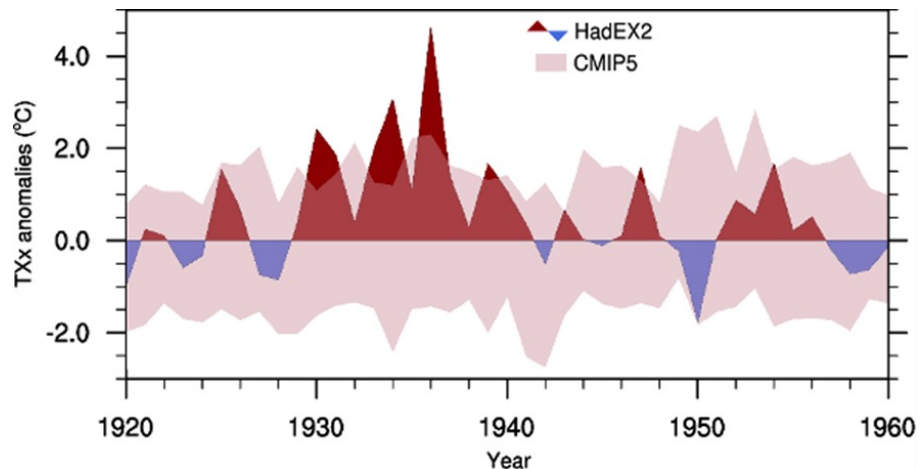
Theme 5: Safe Landing Pathways: identifying risks on way to mitigated climate => gaming approaches, collaboration with industry

Structure

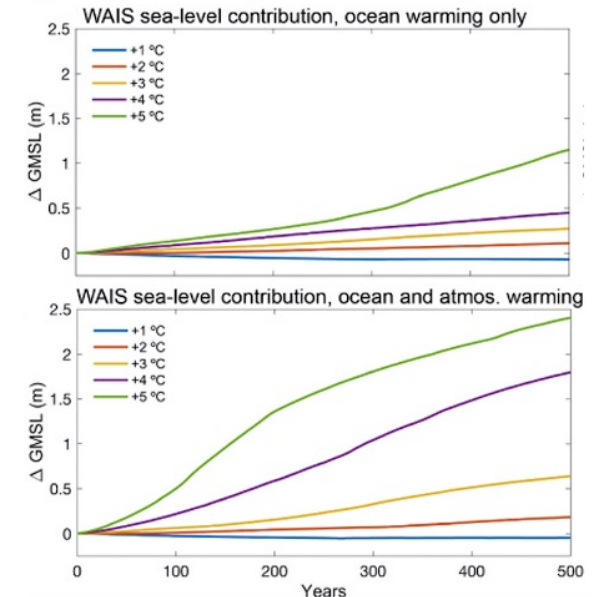
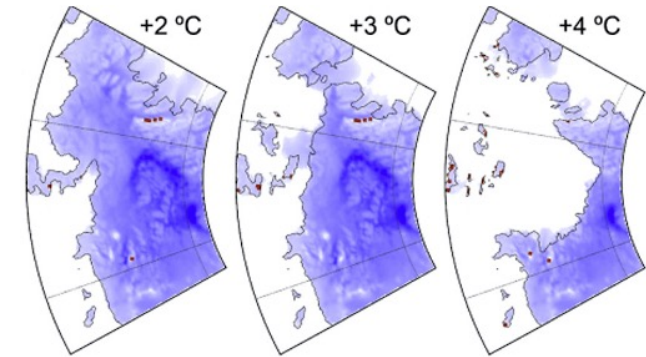
Understanding High-Risk Events	Perturbed Carbon Cycle	Water Resources	Sea Level Rise	Safe Landing Pathways	Advisory Group
Bette Otto-Bliesner Gabi Hegerl	Pierre Friedlingstein Neil Harris	Hyungjun Kim Paulo Nobre	Molly Mitchell Elisabeth Holland	Neil Harris Kevin Reed	➤ Steering Group
Hannah Liddy Thomas Lontzek Izidine Pinto Ryan Sriver Laura Suare-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	
WG Affiliate members	WG Affiliate members	WG Affiliate members	WG Affiliate members	WG Affiliate members	

Progress and achievements over the last year

- Submission of LHA position paper to Nature Climate Change, 1/23, on motivation, purpose, and aims of the lighthouse, including key questions:
 - Q1: what potential high-impact climate hazards, surprises, or irreversible changes should we be genuinely worried about and how do we usefully quantify and communicate the associated risks?
 - Q2: what do achievable, internally consistent, and safe pathways to a future climate to meet broader human needs look like?



Adapted from Cowan et al. (2020)



Coupled ice/ocean model predicts West Antarctic Ice Sheet collapse around +3°C, but not an uncoupled ocean model. (adapted Scambos et al., 2017)

Risks to the biosphere and limits to tolerance

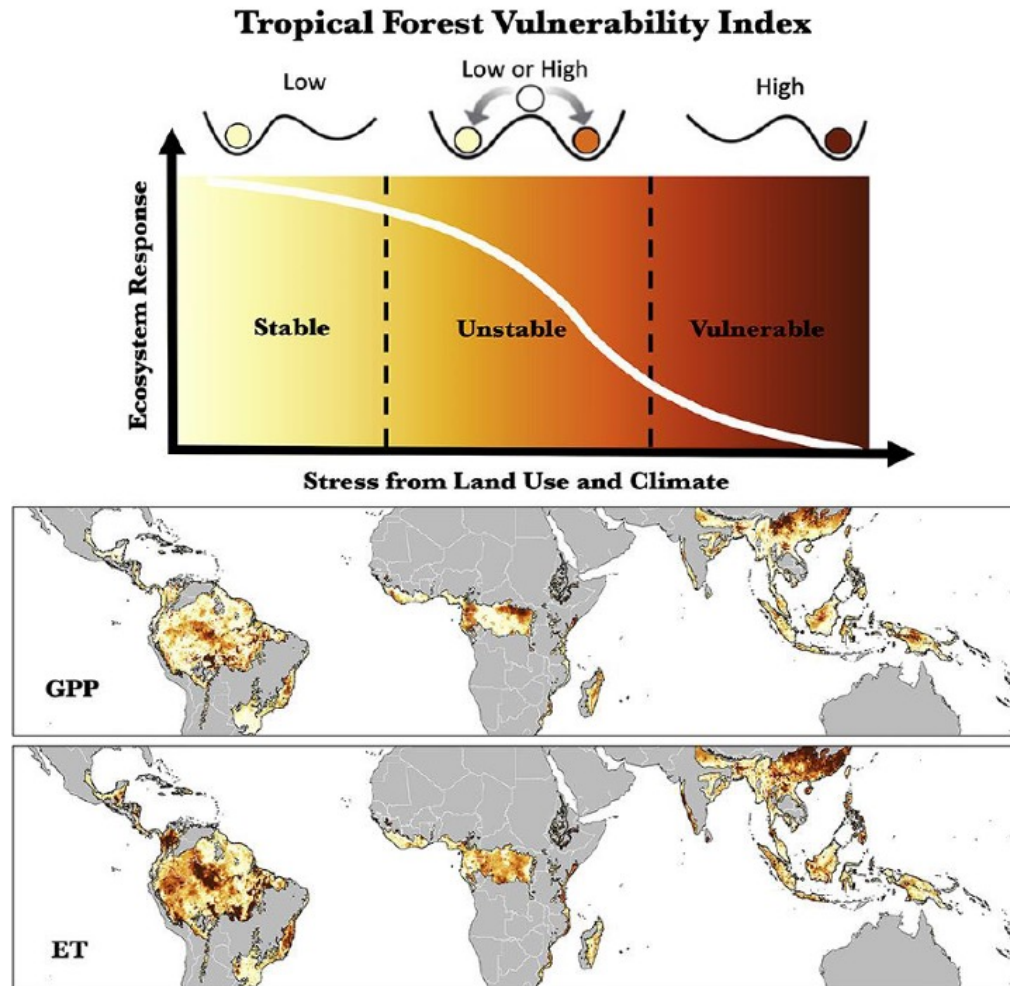
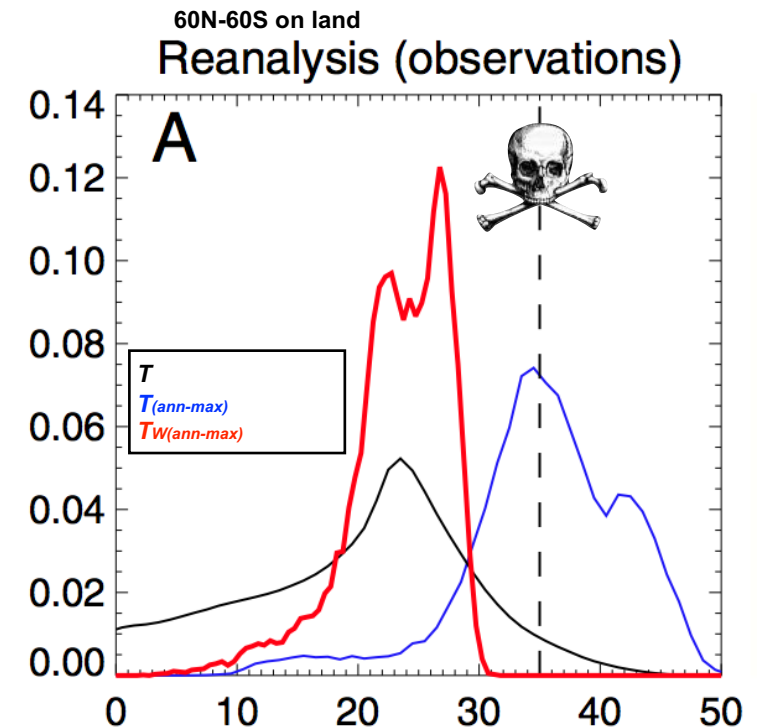


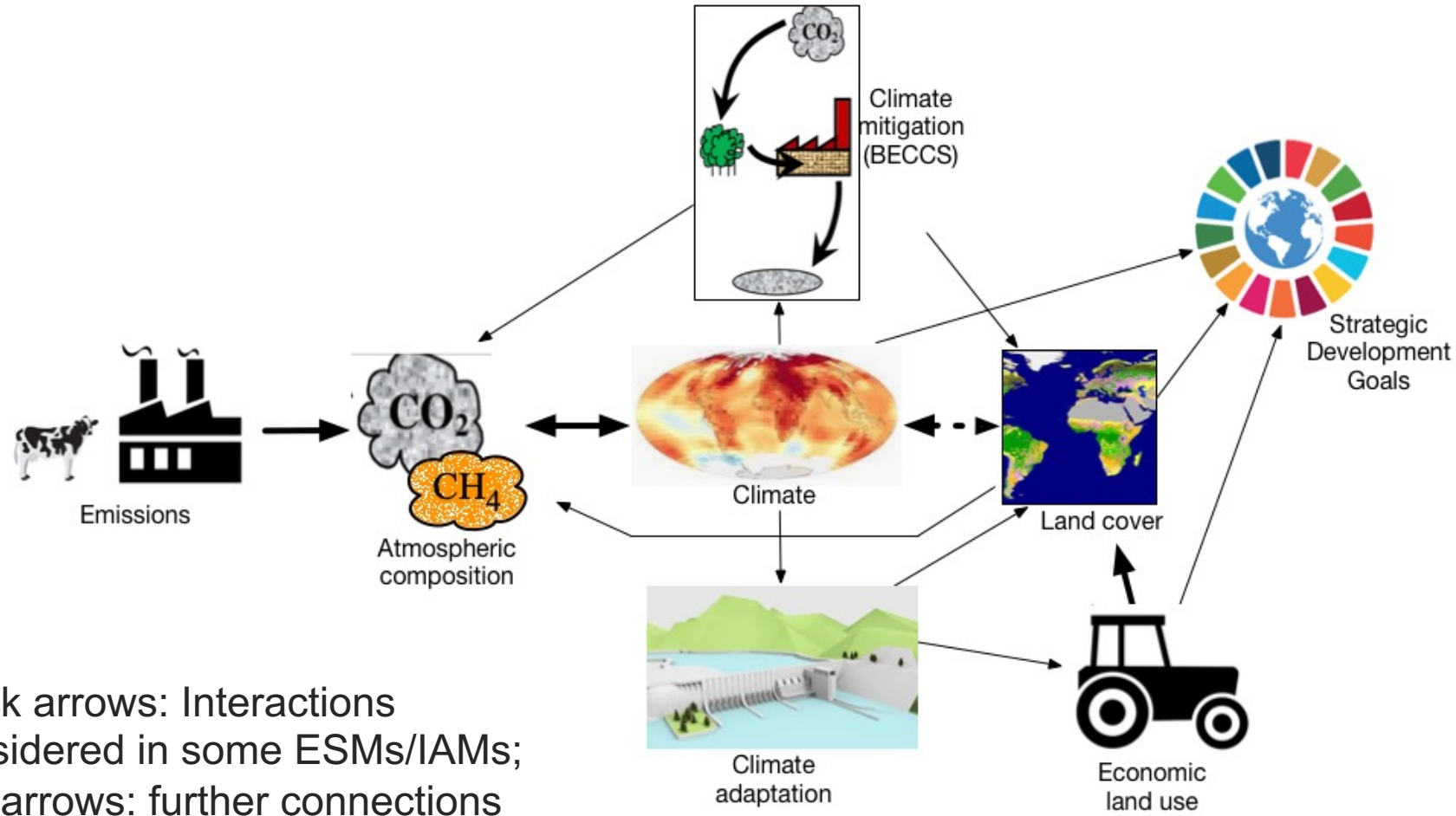
Figure 4. Maps of vulnerability of humid tropical gross primary productivity (GPP) and evapotranspiration (ET).
Source: Saatchi et al., 2021.

Saatchi et al. (2021)

Risk of deadly heat

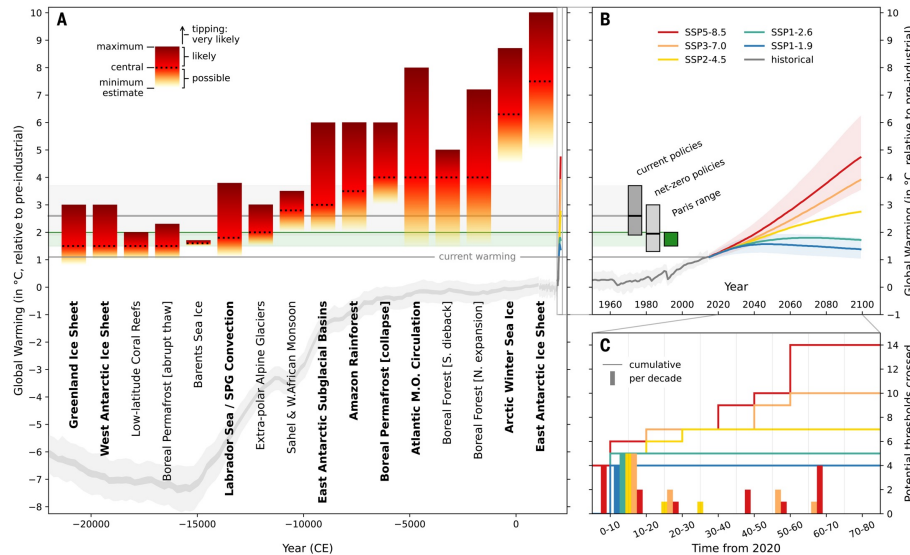
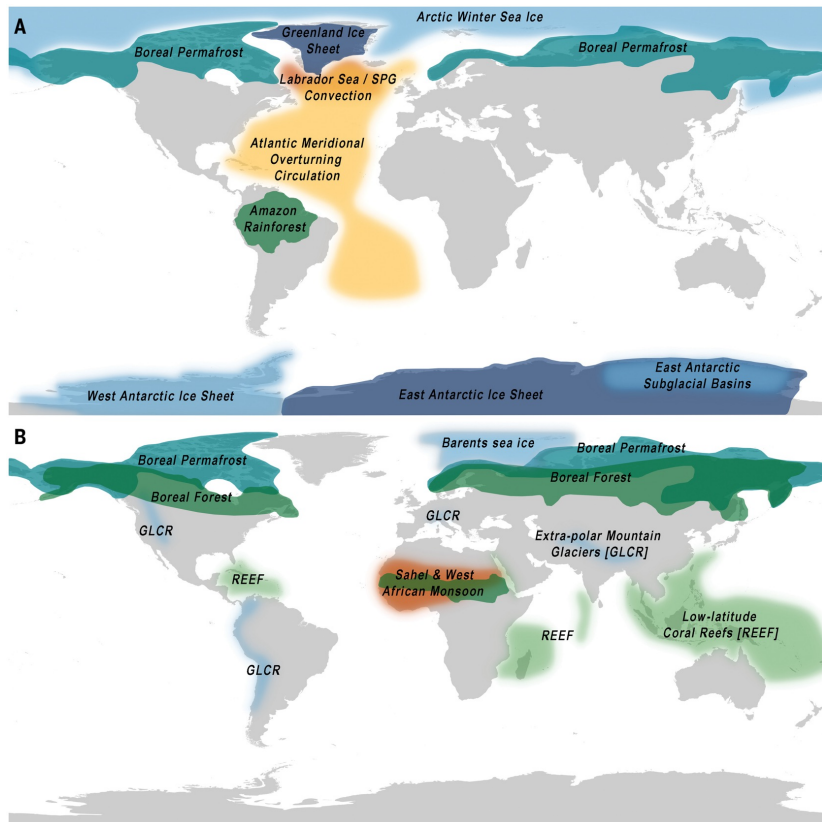


Strongly interconnected system requires holistic approach

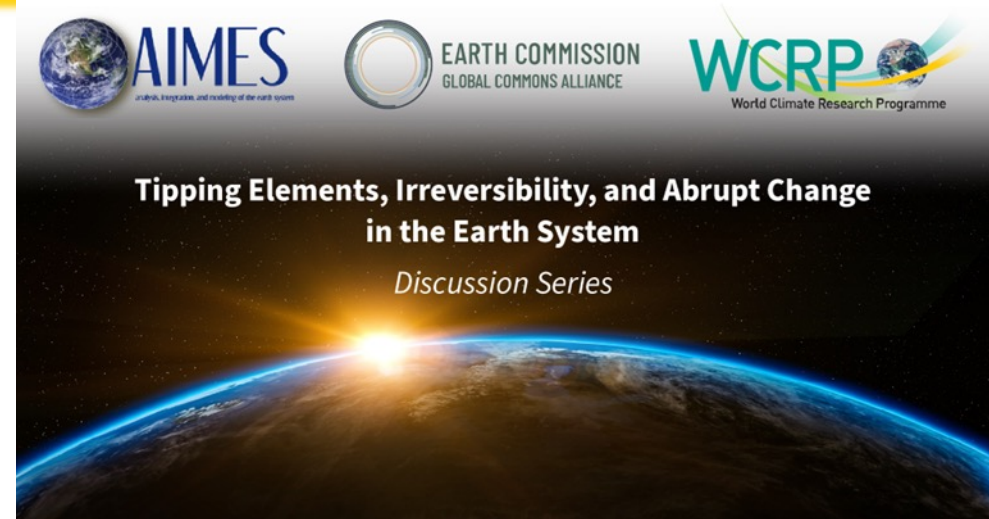


Progress and achievements over the last year

- Continuation of Tipping Point Discussion Series and initiation of Safe Landing Pathways webinar series, well attended.
- Initiation of own webinar series



Armstrong McKay et al. 2022; see also Wang et al., 2023



Progress and achievements over the last year

- Cross-lighthouse webinar series has started and will be populated across working group
- In-person meeting London, Royal Society, March 2023; most Working Group members, plus few other invitees:
 - scientific presentations; members and external experts/links
 - discussions of planned LHA activities,
 - breakfast with members of the local finance community organised by S&P Global Sustainable 1.
- Outcome: better-defined set of LHA activities to be pursued in the coming years:



List of activities developed in London

- **CMIP7** project, to better capture threshold crossing and tipping elements across the Earth System; include new scenarios to represent different pathways (overshoot scenarios); and evaluate selected tipping impacts. *Leads: Bette Otto-Bliesner, (Pierre Friedlingstein), Gabi Hegerl*
- **Gaming and decisions/scenario exploration**, to develop scenarios that are more relevant outside the climate sphere. *Leads: Kevin Reed, Neil Harris*
- **Water variability impacts** to address resilience of water-use sectors, valuation and optimal allocation of water, and 'green finance' in various future scenarios of (greater) water variability. *Leads: Hyungjun Kim, Paulo Nobre*

Plans continued....

- **Signposts for sea level rise:** indicators of change => implications for the future => integrated in communication strategies. *Leads: Beth Holland, Molly Mitchell*
- **High-risk cascading shocks,** including impacts on the carbon cycle and quantification of costs. *Leads: Laura Saurez-Gutierrez, Gabi Hegerl*
- **Connecting across the IAM-GCM-impact hierarchy,** to better represent hazards in the coupled Earth/Human system. Possible joint project with ESMO. *Leads: Hannah Liddy, Steve Sherwood*
- **Transient Climate Response to cumulative emissions (TCRE)** community Assessment (similar to Sherwood et al. (2020) for ECS). *Leads: Chris Jones, Pierre Friedlingstein, Tatiana Ilyina & Roland Séférian*

Emerging issues

- **Some of working groups meet in Kigali at WCRP OSC**
- **second, pan-LHA in-person meeting planned for 2025**
 - Recruiting additional Working Group members for Pathways and Perturbed Carbon Cycle WGs.
 - Forming our Advisory Committee - representatives of other WCRP activities as needed.
 - Periodical survey of members and affiliate members, anticipating some Affiliate Members being added and replaced
 - Some activities or Working Groups may wind down if not making significant progress
 - We request to be kept in the loop on any WCRP activities on climate intervention, as there may be synergies with SLC.
 - We may develop ice sheet/rapid sea level rise activity (TBD)

Linkages with Core Projects, Lighthouse Activities etc.

- CliC link: open – depending on cryosphere plans
- CLIVAR – Kevin, Paulo
- ESMO – Pierre (WGCM), Bette; we plan to propose a cross-model-hierarchy initiative on integrated assessment modelling with AIMES and ESMO
- GEWEX – Hyungjun; with water variability and impacts initiative conducted with GEWEX involvement
- RfS – Gabi through extremes project
- SPARC – Neil
- [EPESC: links to activity on heat and drought developing](#)
- [My Climate Risk: possibly South Pacific hub](#)
- [WCRP Academy: training on IAM for both bring physical/social scientists](#)
- [AIMES and Earth Commission: Pierre; Tipping Points Discussion Series](#)

Thank you



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