

Planetary Boundary Initiative Newsletter

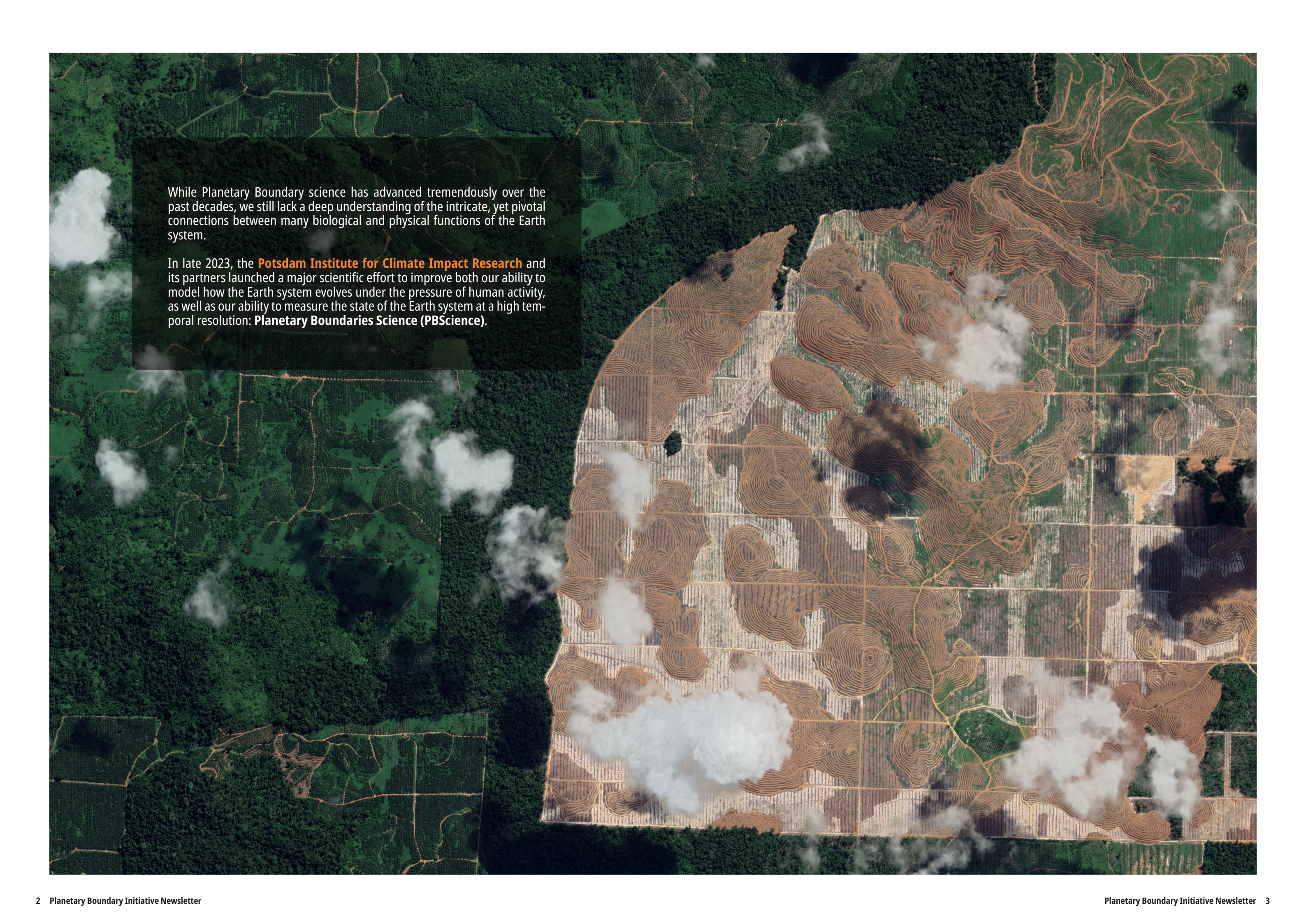
FOURTH EDITION · Q3 2025



Planetary Boundaries
Science



POTSDAM INSTITUTE FOR
CLIMATE IMPACT RESEARCH

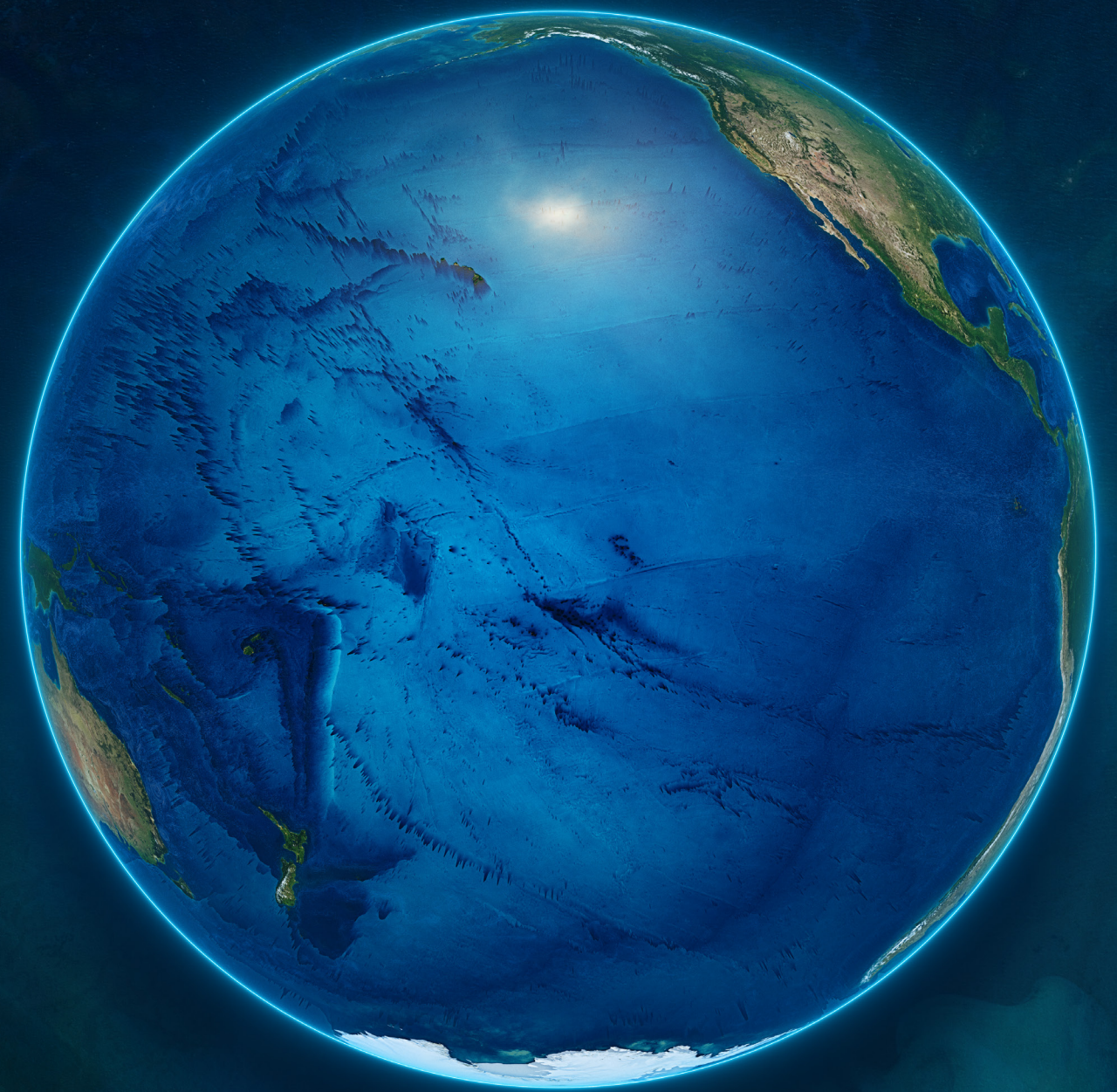


While Planetary Boundary science has advanced tremendously over the past decades, we still lack a deep understanding of the intricate, yet pivotal connections between many biological and physical functions of the Earth system.

In late 2023, the **Potsdam Institute for Climate Impact Research** and its partners launched a major scientific effort to improve both our ability to model how the Earth system evolves under the pressure of human activity, as well as our ability to measure the state of the Earth system at a high temporal resolution: **Planetary Boundaries Science (PBScience)**.

WELCOME TO THIS FOURTH NEWSLETTER OF THE **PLANETARY BOUNDARY INITIATIVE (PBI)**.

Here, you find updates on **Planetary Boundaries Science** and related research efforts conducted at the Potsdam Institute for Climate Impact Research (PIK) and beyond. Read on for news on our steadily growing science initiative, cutting-edge Planetary Boundaries (PB) research results, and exclusive insights into the PBScience effort.



PLANETARY HEALTH CHECK REPORT 2025 LAUNCHED!

Text: Levke Caesar, Bruce Phillips | Visuals: Climate Acceptance Studios/Planetary Guardians

On 24th of September 2025, the **Planetary Health Check report 2025** was launched to the world’s press and public in New York in collaboration with our partners the Planetary Guardians. This received significant media attention, with over one hundred and twenty newspaper, TV and radio outlets publishing stories on the Planetary Boundaries, including the Guardian, Wall Street Journal, France24, Republica, Euronews, El Mundo, CBC, and Reuters, to name a few.

Levke Caesar, Co-lead of the PB Science Lab, was there and had the following to say:

“New York Climate Week this year was an unforgettable milestone for our team. We launched our second Planetary Health Check – the latest scientific assessment of the state of the planet – against the vibrant yet urgent backdrop of global climate discussions.

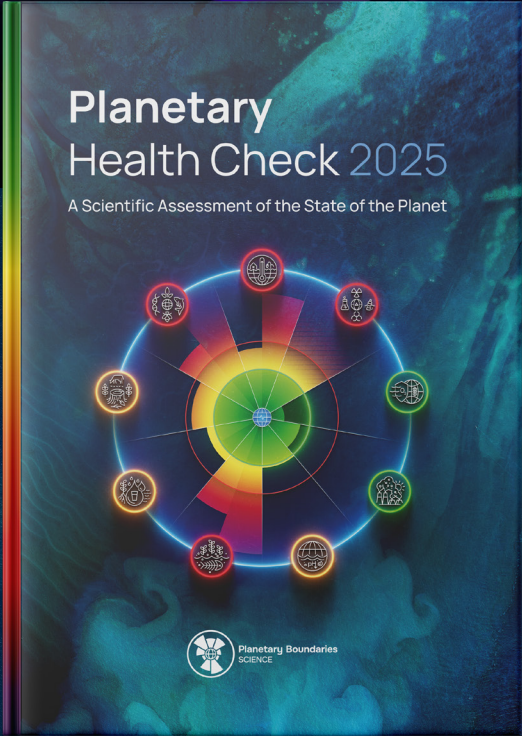
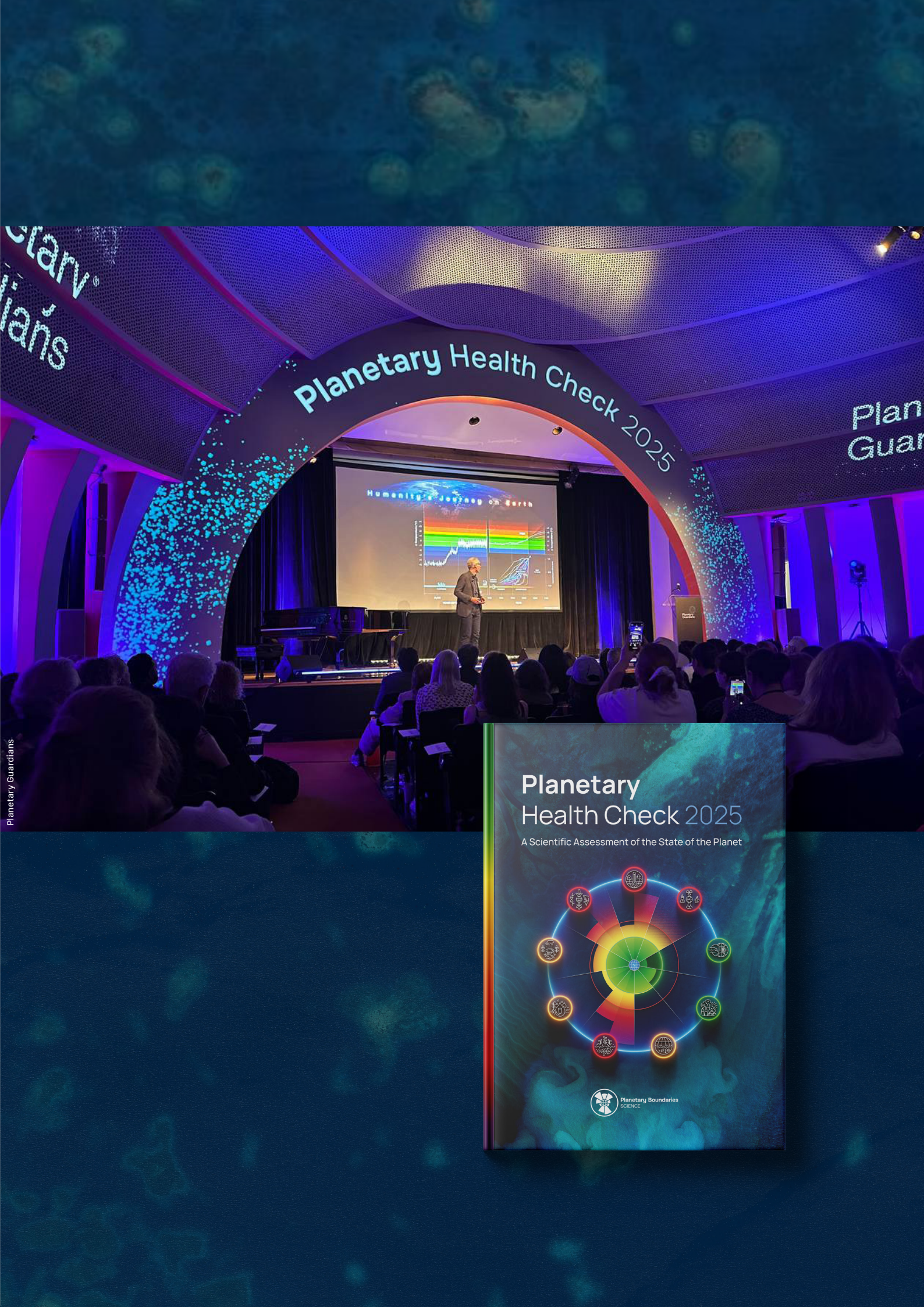
*The day began early with a press briefing at the Virgin Hotels, where Johan Rockström and I presented the new findings to international media. **Among the most sobering results was the confirmation that the ocean acidification boundary has now been breached – a signal that the ocean, one of Earth’s greatest stabilizing systems, is under unprecedented stress.** The questions and discussions that followed were deeply engaged, reflecting a shared concern but also a growing recognition of solutions that interconnect across the Planetary Boundaries.*

At midday, the launch event at The New School brought together an inspiring array of voices - from President Santos, Mary Robinson, and Hindou Oumarou Ibrahim to Sylvia Earle, Paul Polman, and many others. I joined Johan, Sam Myers, and Naoko Ishii for a short conversation on how planetary health connects human and Earth system resilience.

*One of the most moving moments for me personally was seeing Planetary Guardian **Jane Goodall** in the audience - a living symbol of planetary care and wisdom. Her presence added a quiet gravity to the occasion; knowing that she passed away just days later makes that moment even more meaningful.*

*The event closed with a beautiful musical tribute by Emeli Sandé, dedicated to the memory of late Planetary Guardian **Robert Redford**. Walking out of the auditorium, I felt both the weight implied by our scientific findings and the hope nevertheless carried by the people in the room.”*

The new report is available in full from www.planetaryhealthcheck.org and includes the latest assessments on each of the Planetary Boundaries, with Ocean Acidification now assessed to be transgressed. The report also includes three “Spotlight” chapters: One on the Oceans, one on Extreme event attribution, and one on the various policy and governance initiatives that have been developed based on the Planetary Boundaries.





WINNER OF THE IEEE IGARSS GEOPITCH CONTEST 2025

Text: Kasra Rafiezadeh Shahi | Visuals: Kasra Rafiezadeh Shahi

In early August, the PBScience Lab's AI and remote sensing expert **Kasra Rafiezadeh Shahi** attended the IEEE International Geoscience and Remote Sensing Symposium (IGARSS) 2025 in Brisbane, Australia.

Kasra took first place in this year's IEEE GeoPitch Contest, a TED talk-style competition spotlighting groundbreaking ideas at the intersection of geoscience, remote sensing, Earth system science, and climate change. His winning talk, *"Where We Stand: Revisiting the Role of Satellite-Based Remote Sensing within the Planetary Boundaries Framework"*, drew on our ongoing research to harness multimodal remote sensing data and geospatial foundation models for near-real-time monitoring of Planetary Boundaries (PBs). Kasra also shared the Lab's progress in translating these insights into actionable intelligence to inform policy and decision-making.

In a thought-provoking panel discussion themed *"Leveraging Satellite Data and AI for Climate Change Mitigation and Adaptation"*, Kasra joined other experts as a panelist to explore how Earth Observation (EO) data and AI can address pressing challenges such as how scalable,

generalizable, and crucially, trustworthy AI-generated insights are, and how well we can explain the results an AI comes up with. He emphasized the importance of advancing responsible and ethical AI, particularly in applications for natural hazard response, climate action, and EO at large. Kasra equally highlighted the need for system-level insights, for instance by working towards observing multiple Planetary Boundaries and their interactions with one another all at once.

Moreover, Kasra both chaired and presented in the session *"Remote Sensing for Societal Impact"*, delivering a talk about the PBScience Lab's work, entitled *"Harnessing Satellite-Based EO for Monitoring Planetary Boundaries: Opportunities and Challenges"*. He discussed strategies for identifying EO missions and products best suited for PB assessment and outlined our vision for a scalable, on-demand data pipeline to support continuous PB monitoring.



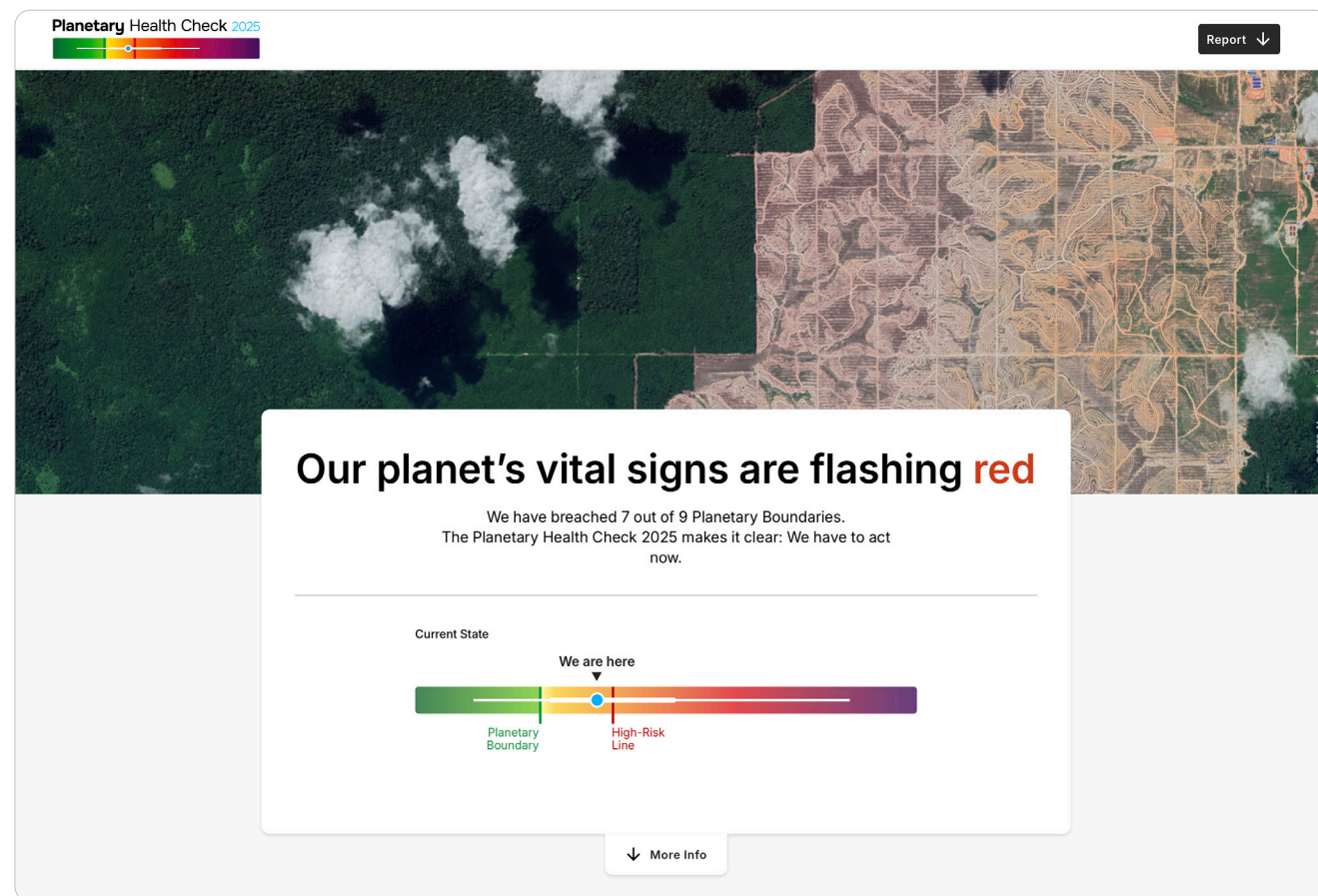
GLOBAL TIPPING POINTS CONFERENCE

Text: Sina Loriani | Visuals: Sina Loriani/TIPMIP

The 2025 Global Tipping Points Conference, held from 30 June to 3 July in Exeter, was convened as a call to action for scientists, policymakers, and business leaders to confront the mounting risks and opportunities presented by tipping points across scale. The program spanned both Earth system tipping points — thresholds that, once crossed, can trigger abrupt and potentially irreversible damage in the Earth system — and so-called **"positive tipping points"** — leverage points where well-targeted interventions could catalyze self-reinforcing beneficial transformation. Topics included governance, early-warning systems, finance, human rights, climate justice, and the interface between theory and practice at local, regional and global scales.

The conference was co-hosted by the University of Exeter's Global Systems Institute, the Potsdam Institute for Climate Impact Research, and the Max-Planck Institute of Geoanthropology.

The international speaker lineup included Túlio Andrade (COP30 Strategy and Alignment Officer), Jemilah Mahmood (Executive Director of the Sunway Centre for Planetary Health), Sandrine Dixon-Decleve (President of the Club of Rome), Kate Raworth, George Monbiot, and Paul Polman, among others.



LAUNCH OF THE REDESIGNED PLANETARY HEALTH CHECK WEBSITE

Text: Bruce Phillips & Clara Nicolai | Visuals: Planetary Health Check website

It has been a particularly exciting time of year as we welcomed the brand new design and layout of the **Planetary Health Check** website, initially available as a basic version and soon a fully updated version with new interactivity, current news, and learning materials plus deep dives into key sections such as tipping points. This will allow visitors to choose their own route and become better acquainted with the Planetary Boundaries, the Planetary Health Check, and what they represent for our planet.

You can expect the full version of the website to come online by the beginning of November, with additional features to be added until the end of the year. The website now also includes the option to sign up for our public newsletter as well as a new feedback feature, which has been used extensively since the launch of the latest Planetary Health Check report by individuals and organizations alike. This direct feedback has been particularly encouraging to read, since it shows that the interest in the Planetary Boundaries far transcends the academic community.



REPURPOSING OLD HARDWARE FOR A NEW ERA OF RESEARCH

Text: Hannes Rauhe | Visuals: Jonas Kaiser

The PBScience Lab has taken a significant step toward sustainability and efficiency by repurposing old servers from the institute's high-performance computing cluster. Instead of letting this valuable equipment become e-waste, we have given it a new purpose: powering the **Planetary Boundaries Analyzer**, our internal AI project.

This project, which helps us maintain datasets, run computations, and conduct literature reviews, now operates on a server that was previously part of a larger cluster. By breathing new life into this hardware – including two perfectly functional GPUs in a blade server – we are avoiding the purchase of new equipment, reducing our environmental impact, and saving costs.

This was made possible thanks to our interdisciplinary team, which includes not only earth scientists but also computer scientists with hands-on experience in hardware. We had the unique opportunity to work directly in our data center, a truly interdisciplinary experience, personally handling the equipment as shown in the accompanying photo. This approach highlights the value of leveraging in-house expertise to find creative and sustainable solutions for our research needs.



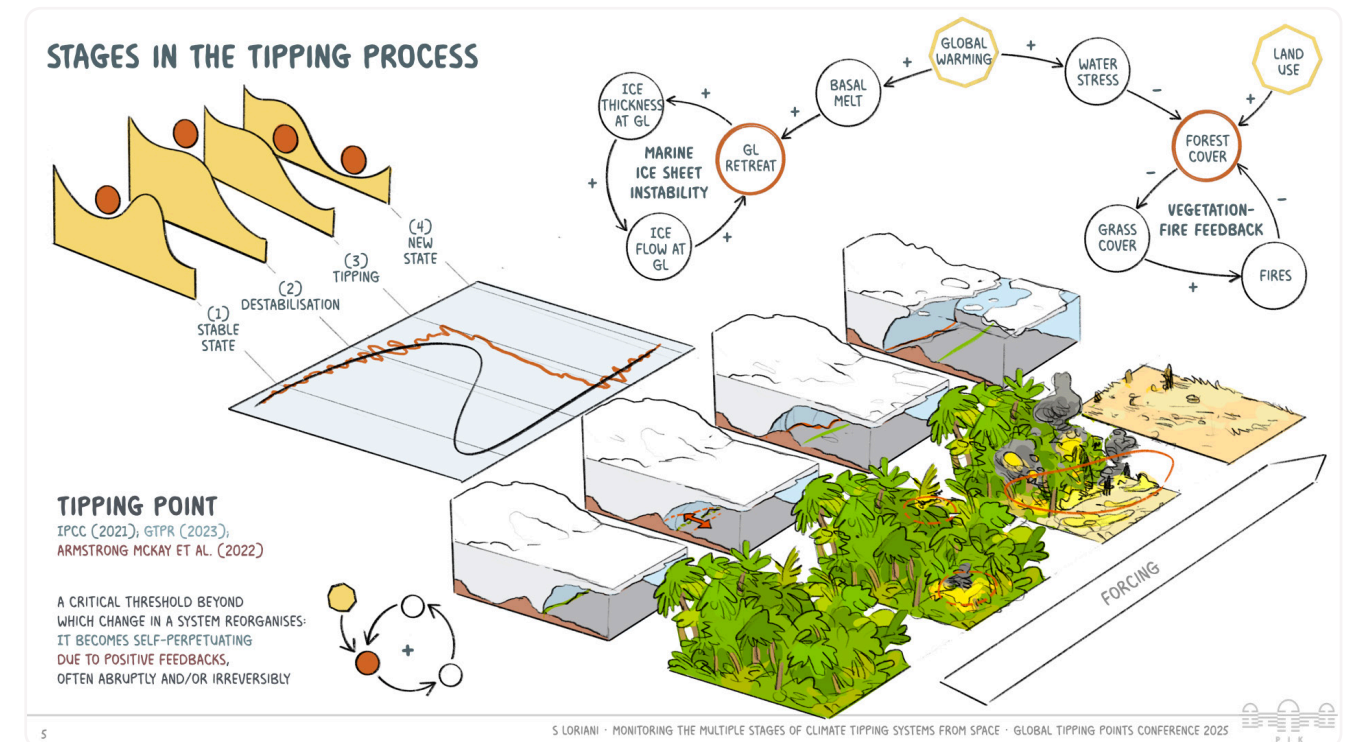


PLANETARY BOUNDARIES FRESCO WORKSHOP

Text: Bruce Phillips | Visuals: Bruce Phillips and Elise Van Breda

In early September, PIK had the opportunity to take part in the **Planetary Boundaries Fresco**, a workshop run by [Joy and Elise van Breda](#). The workshop is suitable for a variety of settings, including businesses, policy, and education. The Planetary Boundaries Fresco is a 3.5-hour collaborative and educational systems-thinking experience designed to raise awareness of humanity's impact on the planet – and what everyone can do to protect it. We can highly recommend the workshop: The experience was interactive, hands-on and a superb team building activity. The PB Fresco workshop, its tools, and the global community around it are all shaped by volunteers passionate about raising planetary awareness and driving collective action. By inviting Elise and Joy to deliver a professional (paid) workshop or facilitator training, you directly support the financial sustainability of their work, the tools, and the community behind it.

If you would like more information, please contact Joy and Elise via collab@somewhatgreener.com.



TIPMIP IN IPCC LEAD AUTHOR TEAMS

Text: Sina Loriani | Visuals: Sina Loriani

The Assessment Reports published by the **Intergovernmental Panel on Climate Change (IPCC)** are a cornerstone of the international climate change community. They provide an essential, consensus-driven resource for researchers, policymakers, and the wider public. Prepared by leading international experts, they present the most up-to-date global consensus on the state of the climate, the impacts of a changing climate, and the future paths for mitigation and adaptation. This summer, the IPCC has launched its next assessment cycle, working toward the **Seventh Assessment Report**, with the full Synthesis Report scheduled for release in 2029. The 2029 AR7 report will feature, for the first time, a dedicated chapter on **tipping points**, formally titled *"Abrupt changes, low-likelihood high-impact events, and critical thresholds, including tipping points, in the Earth system"*. This addition follows a rapidly growing body of scientific literature on these topics, as well as strong

interest from IPCC member states in greater coverage of tipping points. This theme attracted by far the greatest support for a stand-alone IPCC special report from member states, which was ultimately not pursued due to the ambitious timeline of the current assessment cycle. Nevertheless, the inclusion of a full chapter underscores both the scientific urgency and the political relevance of understanding tipping points in the Earth system.

Being appointed as an IPCC Lead Author is seen as a sign of scientific excellence in the research community. With the selection process now finalized, the TIPMIP team was delighted to see more than five TIPMIP domain leads and key contributors among the appointed authors. The first Lead Author Meeting is scheduled for December this year.

OUTLOOK

UPCOMING EVENTS, ACTIVITIES AND PUBLICATIONS RELATED
TO THE PLANETARY BOUNDARY INITIATIVE AND RELATED RESEARCH TEAMS

18 NOV 2025
TIPMIP4ALL ONLINE EVENT

Community engagement lies at the heart of any model intercomparison project. On 18 Nov., we will host an online event where we update interested people about the status of TIPMIP, and provide a platform for feedback and suggestions for the project.

More info can be found here: tipmip.org/tipmip-for-all-online-webinars-in-november/

2-13 MARCH 2026
TIPPING POINTS GO BIG IN JAPAN

Mark your calendars for March 2nd-13th 2026! This is when major gatherings on Earth system modelling will take place in Japan. Following the TIPMIP General Assemblies in Germany 2023 and the U.S. 2024, Asia is next in the continental rotation with the third **TIPMIP GA to take place in Tokyo**. This precedes the CMIP Community Workshop the week after in Kyoto, where state-of-the-art climate and component models are discussed, also in a tipping-themed session co-convened by many scientists from PB-Tip.

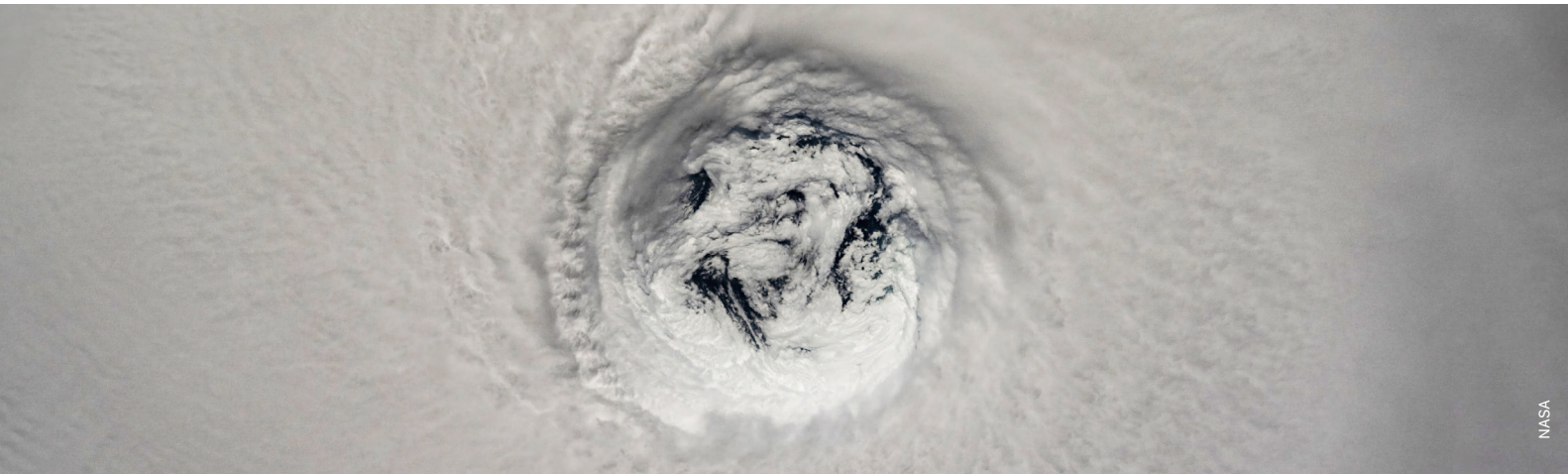
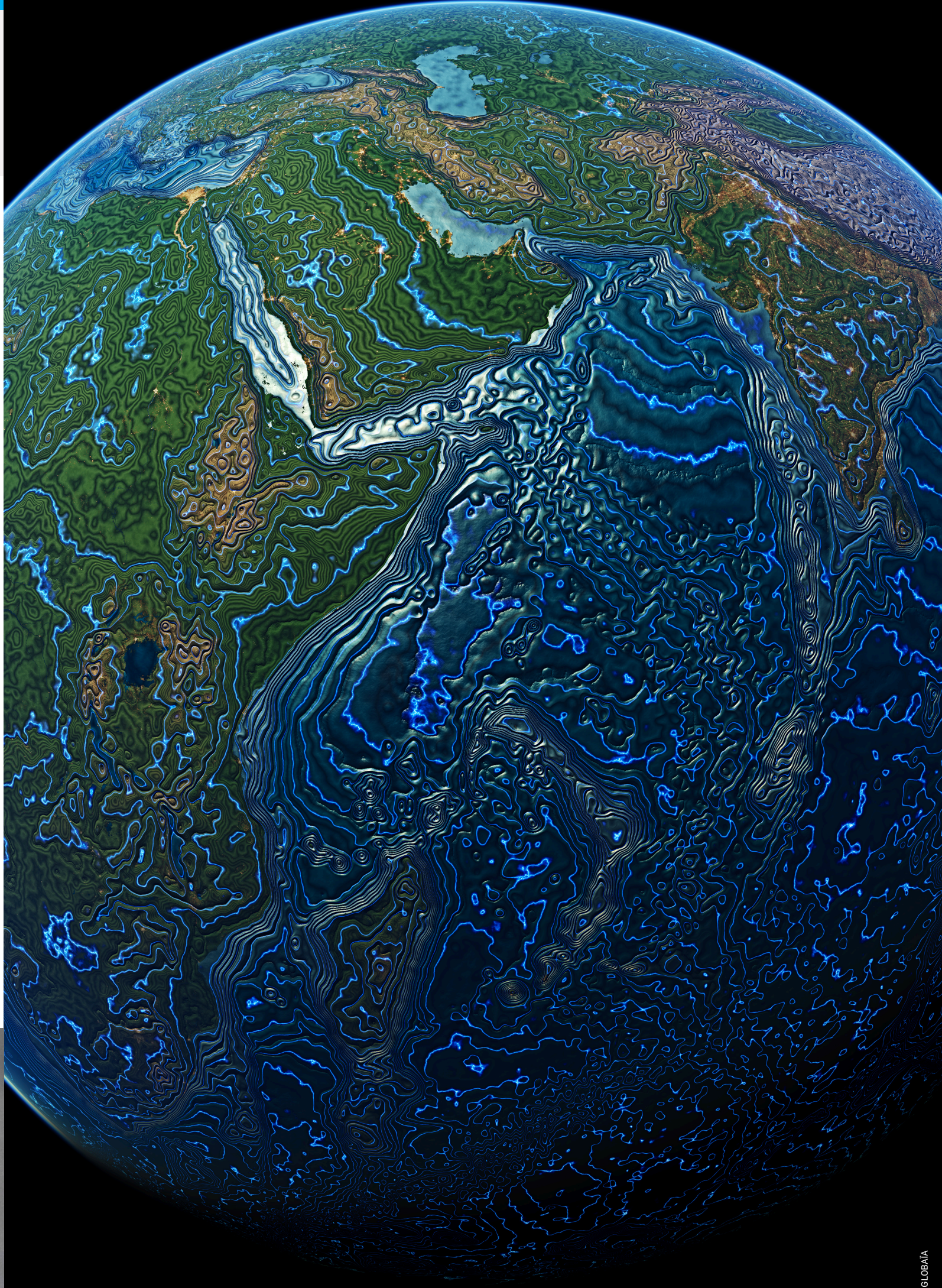
OCTOBER 2025
GLOBAL TIPPING POINTS REPORT 2025

Following the first successful **Global Tipping Points Report 2023**, this year will see an update, just in time for the decisive **COP30** in Brazil. We will dive more into this in the next issue of the newsletter.

10-21 NOVEMBER 2025
COP30 IN BRAZIL

PIK Potsdam and our Partners the **Planetary Guardians** will be represented at **COP30** in the **high level blue zone**, where political negotiations on climate change and environmental protection take place. At the *“Planetary Science Pavilion”*, a varied program covering everything from nature based solutions to the latest **EAT Lancet report** is planned for the event to make sure the negotiators have the latest science at hand, with the ability to call upon specialist scientists in the field they are negotiating.

Having a scientific pavilion within the COP’s restricted blue zone is rare, and shows how relevant Planetary Boundaries Science and associated fields, such as Tipping Points research, have become. It also highlights that climate change is only one of the vital biophysical systems we must protect to preserve a planet worth living.



NASA

GLOBIA

An aerial photograph showing a vast landscape. On the left, a deep valley is filled with a patchwork of green agricultural fields and small settlements. To the right, a large, rugged volcanic cone rises, its slopes covered in grey ash and scree. A small plume of white smoke or steam is visible near the summit of the volcano. The overall scene illustrates the intersection of human land use and natural geological features.

THANK YOU...

for your interest in Planetary Boundaries science. By providing us with feedback on our activities, you can help us to continuously improve our outreach efforts:
pbscience@pik-potsdam.de