WORLD CLIMATE RESEARCH PROGRAMME

Session 2: Strategic Initiatives and Issues

WORLD METEOROLOGICAL ORGANIZATION

unesco Intergovernmental Oceanographic Commission

International Science Council

WCRP World Climate Research Programme

Session 2: Strategic initiatives and Issues

Session Outline

2.1 New and emerging science issues

2.2 New science - Task Team Updates

2.3 GCOS/WCRP collaborations

2.4 Future of Climate Modelling Workshop

2.5 Engagement with the IPCC climate science assessment processes

Duration: 35 mins

Chair: Helen Cleugh and Detlef Stammer

Rapporteur: Narelle van der Wel

Chat Moderator: Nico Caltabiano

WORLD METEOROLOGICAL ORGANIZATION

unesco Intergovernmental Oceanographic Commission

International Science Council

WCRP World Climate Research Programme

2.1 New and emerging science issues

- IPCC AR6 published - illustrates the real challenge of staying below 2 degrees, let alone 1.5 degrees (seems not feasible).

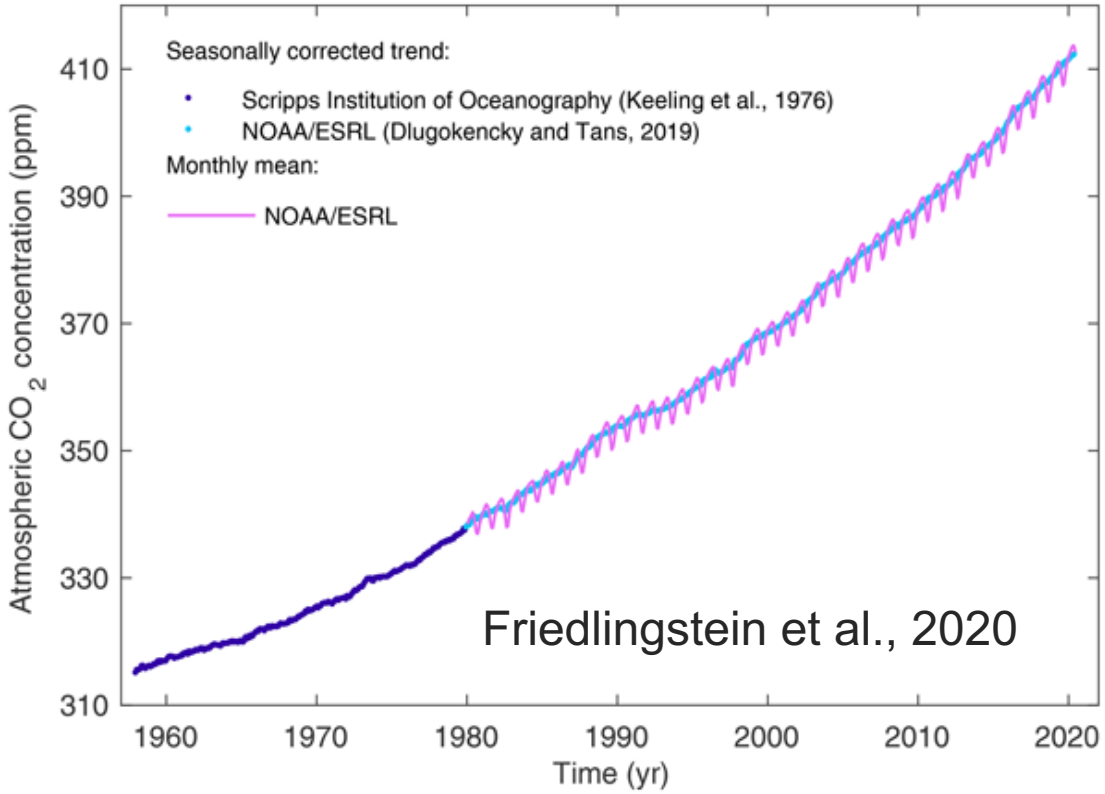
- All scientific assessments seem to point to emissions continuing to grow (although not as fast as, e.g., RCP8.5). Particularly, post COVID seems to have bounced back to pre-COVID emissions.

- The world continues to see accelerating warming and associated impacts, such as weather and climate extremes.

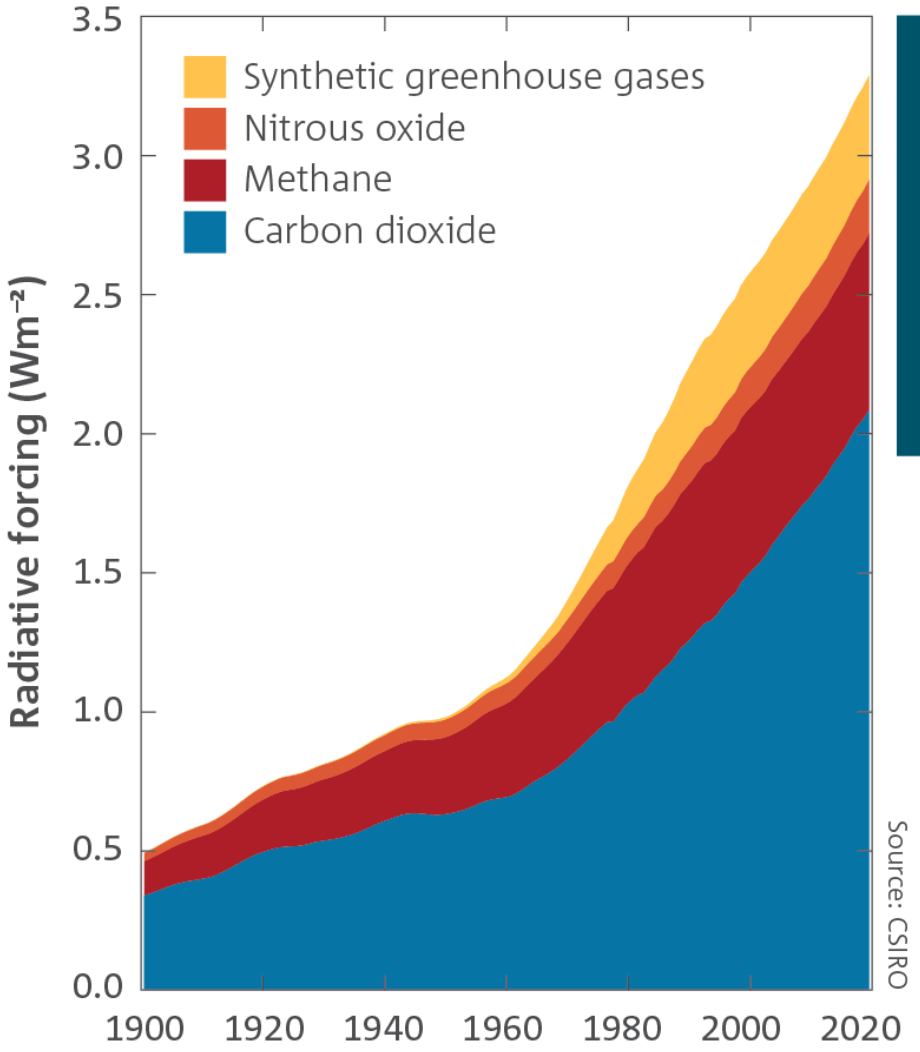
State of CO_2 emissions

- Increased concentrations of the major greenhouse gases are the primary cause for the temperature increase.

- Despite COP21 decisions, they continued to increase, despite short-term emission reductions in 2020 related to COVID-19.



State of Climate Forcing



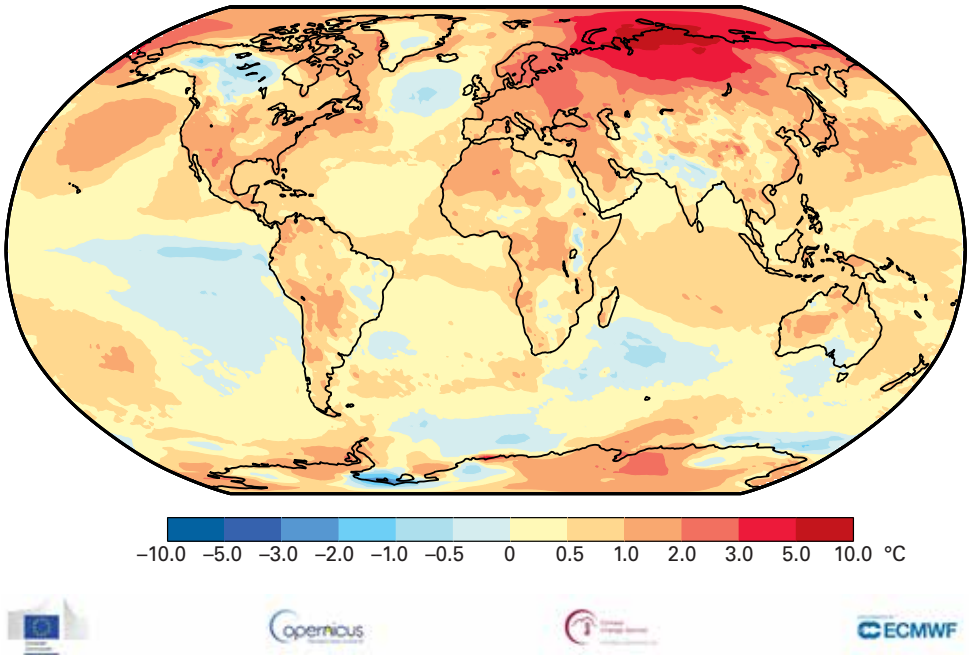
The increase of energy into the climate system of 3.3 Wm^{-2}, compared to 1750, is due to long-lived greenhouse gases.

Changes in Radiative Forcing 1900 – 2020, from baseline measurements at Cape Grim/Kannaook GAW Site in Southern Hemisphere

The World Continues to Warm

- The past six years have been the warmest years on record and temperature continue to rise.
- Associated climate variations show strong regional pattern and variations.

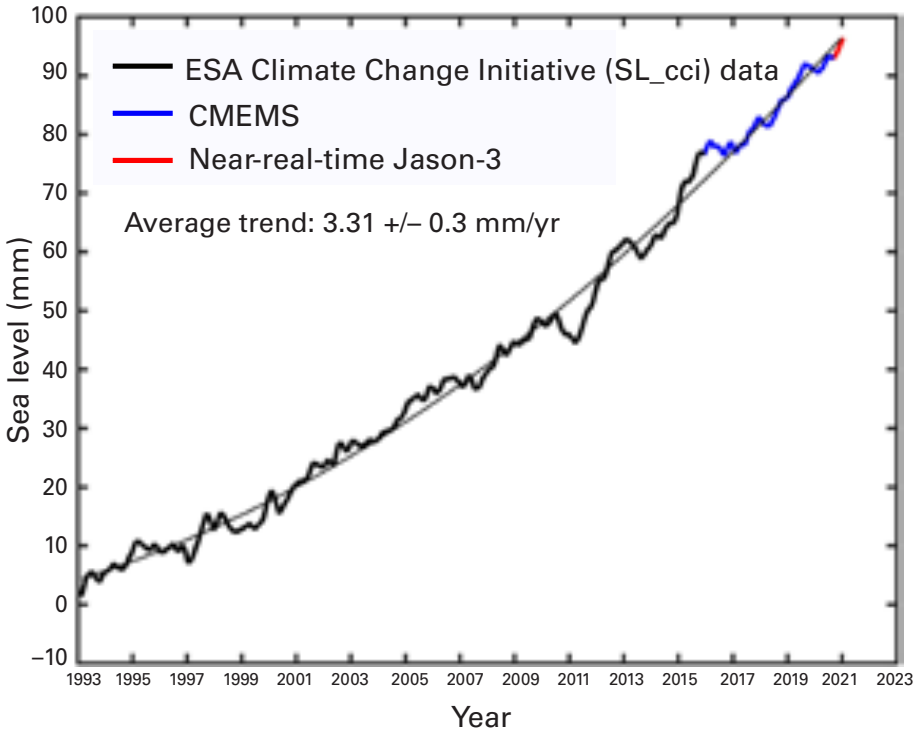
Temperature anomalies 2020 relative to 1981–2010



Source: ERA5

Global sea levels are rising

- Trend in sea-level rise is accelerating.
- Ocean heat storage and acidification are increasing.
- Significant impacts on the ocean's capacity to moderate climate change.



WCRP GC Sea Level

Climate Change and Risk

- Increased greenhouse gas emissions from human activity are already causing climate change that is harming people and nature.

- Further rapid reductions in emissions, adaptation to climate risks, and widespread adoption of new technologies and behaviors are needed to reach net-zero emissions and mitigate the worst climate impacts.

Climate Change and Risk

- Anthropogenic climate change – even 1.5 °C warming brings many significant challenges and risks that affect almost all aspects of life on Earth:
  - Droughts, heavy rain and flooding, heatwaves, extreme fire weather, and coastal inundation.

- These are just some examples of what is already occurring and where amplified risks and impacts in the future will threaten millions of people around the world.

WORLD METEOROLOGICAL ORGANIZATION

unesco Intergovernmental Oceanographic Commission

International Science Council

WCRP World Climate Research Programme

What will future climates look like?

- Which pathway exactly the emissions, and thus temperature, will take is unknown. However, the detailed pathway matters.
- What will a 3 degree or 4 degree warmer world look like?
- WCRP needs to provide this information.

Climate Change and Risk

- Risks will evolve further under progressively greater warming, and the extent of these impacts depends on our success in meeting our emissions targets.

- Climate information is needed at a regional level to allow action at the scale required for adaptation, and understanding at the scale required to assess ecosystem and human impacts.

New science initiatives for WCRP

- Task Team on Climate Intervention
- Task Team on Cycles and Budgets – particularly relevant for annual stocktake and our collaborative work with other partner programs, especially GCOS and Future Earth, including the Global Carbon Project (GCP)
- GPEX and “Water Decade”
- Future of Climate Modelling.
- Strategic planning for CMIP (talk from JF Lamarque, CMIP Panel Chair)
- Post AR6 engagement with IPCC – lessons learned, science gaps, science areas where WCRP needs to prioritise, assessments that WCRP can facilitate etc.

Other High-level Science Questions

2.2 New science - Task Team Updates

2.3 GCOS/WCRP collaborations

2.4 Future of Climate Modelling Workshop

2.5 Engagement with the IPCC climate science assessment processes

IPCC and WCRP planning a joint Workshop in 2022 to discuss …

- **Emerging science needs and opportunities** from IPCC Sixth Assessment Report, and how WCRP can respond through (captured in WCRP's Science & Implementation Plan).
- How **WCRP can support the IPCC's** reporting "cycle" through rapid updates, mini-assessments etc.
- Lessons learned re. "**best practice approaches**" to conducting scientific assessments, ahead of IPCC Seventh Assessment Report (AR7).
- Importance of improved coordination **between** IPCC Working Groups.

Draft Goals (for further discussion and refinement)

- Identifying knowledge gaps that emerged through AR6, for which new science is needed – incremental or breakthrough (incl. gaps in modelling and observing systems; process understanding; etc)
- Discuss opportunities for WCRP to address some or all of these gaps ahead of AR7.
  - What can WCRP do to facilitate and coordinate the research needed and deliver this in time for AR7?
  - How can this knowledge be developed and delivered in a more rapid and timely way?
- Build awareness in the broader IPCC community of WCRP's new science initiatives, especially: new Core Projects, RIfS and ESMO; new Lighthouse Activities; emerging science activities focused on Linked Carbon, Water and Energy Cycles, Climate Intervention, and GPEX; and the Open Science Conference in 2023.
- Identify and strengthen some of the key linkages needed across / between the IPCC Working Groups and also the cross disciplinary needs of WCRP activities (*noting that several LHAs have indicated the need to go beyond traditional physical climate science*).

2.5 Engagement with the IPCC climate science assessment processes

IPCC and WCRP planning a joint Workshop in 2022 to discuss …

- **Emerging science needs and opportunities** from IPCC Sixth Assessment Report, and how WCRP can respond through (captured in WCRP's Science & Implementation Plan).
- How **WCRP can support the IPCC's** reporting "cycle" through rapid updates, mini-assessments etc.
- Lessons learned re. "**best practice approaches**" to conducting scientific assessments, ahead of IPCC Seventh Assessment Report (AR7).
- Importance of improved coordination **between** IPCC Working Groups.

- **Survey** prior to the Workshop to identify science gaps, needs and opportunities, and Workshop themes.
- **Timing:** Likely in Q4 of 2022 (ahead of WCRP OSC2023, COP28, AR7).
- **Format:** In-person "brainstorming" Workshop, virtual attendance will be accommodated to support goals of sustainability and inclusion (diversity).
- **Attendees:**
  - Invite all Chairs of IPCC WGs; seek their advice on IPCC authors to be invited.
  - WCRP to nominate attendees from Core activities and leadership groups.

End of Session 2