Sixth Assessment Report of the Intergovernmental Panel on Climate Change
WG I

11 October 2021 Journal Club

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The IPCC Report

1. Introduction
   - Basic concepts

Global Monsoon

2. Chapter 3, 4 & 8
   - Different scenarios

Global Changes

3. Temperature
   - Precipitation

Summary

4. Summary
   - Outlook on Future Projections
The IPCC report

Different Working groups

➢ Working Group I (WGI) aims at assessing the **physical scientific basis** of the climate system and climate change.

➢ Working Group II (WGII) assesses the **vulnerability** of socio-economic and natural systems to climate change, negative and positive

➢ Working Group III (WG III) assesses **options for mitigating climate change** through limiting or preventing greenhouse gas emissions
The IPCC report

The report consists of 3 parts:

- **Summary for policy makers:**
  High-level overview for understanding current climate change ~39 pages

- **Technical Summary**
  Summarizes the key findings of the different chapters ~150 pages

- **Full report**
  Detailed overview in different chapters, large-scale information (Ch 2,3,4), process understanding (Ch 5-9), regional information (10-12) ~3500 pages
WG I Climate Change – The Physical Basis

5 different emission scenarios:

➢ high and very high GHG emissions, that roughly double from current levels by 2100 and 2050 (SSP3-7.0 and SSP5-8.5)

➢ CO2 emissions remaining around current levels (ssp2-4.5)

➢ very low and low GHG emissions and CO2 emissions declining to net zero ~after 2050, followed by varying levels of net negative CO2 emissions (ssp 1-2.6, ssp 1-1.9)
Emission has a huge influence!

Historical global-mean surface temperatures

Possible Futures

- Very high
  - SSP5-8.5
- High
  - SSP3-7.0
- Middle
  - SSP2-4.5
- Low
  - SSP1-2.6
- Very low
  - SSP1-1.9

CO₂ Emissions:
- Peaking
- Halving
- Net-zero
**Coupled Model Intercomparison Project Phase 6 (CMIP6)**

Climate Models

- Global Earth System Models of high complexity consisting of a General Circulation Model (GCM), representing the dynamics of the atmosphere and ocean
- Consisting of ~30 models, ensembles of climate simulations can be used to explore different sources of uncertainty and their magnitude
Coupled Model Intercomparison Project Phase 6 (CMIP6)

Likelihood statements

- Uncertainty interval: 90% as very likely range, 66% as likely range
- Virtually certain: 99–100%, very likely: 90–100%, likely: 66–100%, about as likely as not: 33–66%, unlikely: 0–33%, very unlikely: 0–10%, exceptionally unlikely: 0–1%
- Likelihood can indicate probabilities for single events or broader outcomes
Coupled Model Intercomparison Project Phase 6 (CMIP6)

Climate Models improved!

1. South Asian Monsoon
Outline

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Global Climate Change

- Interactively accessed at

https://interactive-atlas.ipcc.ch/
Global Warming

- Warming depends on the scenario, but **very high confidence** that the CMIP6 model ensemble reproduces observed global surface temperature trends.
- It is more likely than not that under SSP1-1.9, GMT relative to 1850–1900 will remain below 1.5°C throughout the 21st century, implying a potential temporary overshoot of 1.5°C global warming.
Global Warming

- Climate Models show a wide variety of warmings
- Ensemble mean does not mean a simple mean over all models, but a weighted ensemble mean to these models that do best fit in the historical runs with observation data
Impacts of Global Warming

- Impacts delayed by slow response of deep ocean and ice sheets, but with impacts for millennia.
- Low emission scenario show the potential to reduce the increase in ocean heat content and sea level rise but that some increase is unavoidable.
Changes in Precipitation
Changes in Precipitation

- Substantial further changes at global and regional scale
- Still: High Uncertainty in modelling changes in the hydrological cycle under future warming!
- Overall global increase in precipitation, but simple ‘wet gets wetter, dry gets drier’ is not true, especially in the subtropics
- Enhanced evapotranspiration will decrease soil moisture, followed by aridification
Changes in Precipitation

- Enhanced evapotranspiration will decrease soil moisture, followed by aridification.
- Precipitation changes impacts global water cycle world wide.
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Global Monsoon

- The global monsoon (GM) is defined as the area with local summer-minus-winter precipitation rate exceeding 2.5 mm/day
- CMIP6 models simulate the global monsoon domain and precipitation better than CMIP 5
Global Monsoon

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- Regional monsoon systems react very differently on external forcing, which might help explaining model uncertainties
Regional monsoon systems react very differently on external forcing, which might help explaining model uncertainties.

In the long term: North-South asymmetry, greater increase in NH than on SH, and similar East-West asymmetry.
Global Monsoon

- Likely that GM land precipitation will increase, although monsoon circulation weakens
- But changes are small compared to inter model-spread
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Summary

1) High certainty of future warming of at least 1.5°C, even in the best case scenario.

2) Global precipitation is likely to increase with high regional differences and uncertainties.

3) Global Monsoon likely to become stronger on the NH than SH, model variability larger than projected increase.
Thank you for your attention!

Questions?