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Snowmass 2014:
Thoughts on both weeks of Snowmass

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Snowmass, Colorado

Outline

- Connecting IAV science/information needs to scenarios
- Lessons from impact researchers for scenarios and climate modelers
- Thoughts on ScenarioMIP
- Future directions

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Connecting IAV science/information needs to scenarios

Linkages between impacts and scenarios

- Improving understanding of scenario developers of how scenarios are used for impacts research, including
  - Sensitivity of different types of models to variation
  - Questions scenarios are used to address
  - This has implications for how many scenarios, of what type, and with what separation are required
- Encouraging more information exchange on the types of uncertainties of greatest concern/interest to users of IAV results and to IAV modelers/researchers
- Broader communication on more technical aspects of scenario use in IAV research (e.g., required data resolution, probabilistic information requested, variables needed, etc.)

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Lessons from impact researchers for scenarios and climate modelers

What are the challenges with using climate data?

- Resolution of data:
  - Many studies wanted higher resolution data
  - Some found that they had to make trade-offs between temporal and spatial resolution.
  - Many relied on downscaling of some kind.
- Scenario availability:
  - Some studies wanted to quantify benefits of climate change mitigation or quantify damages associated with small increases in emissions.
  - These studies were forced to use non-CMIP climate data.
- Model selection:
  - Sometimes seemed arbitrary
  - Concern about using multi-model mean because it may average away extremes
- Confidence in projections
- Downloading data from ESG is difficult and time-consuming

If you don't build it, they'll still come.

- If we don't provide information that the impacts community wants, they'll figure something out…
  - Socioeconomic scenarios
  - New climate scenarios using EMICs and/or pattern scaling (e.g., EPA's CIRA project)
  - Higher resolution data (temporal and spatial)
  - Probabilistic information either using MAGICC or magic

- The question is whether we should do anything about it.

The need for guidance

- From the climate modeling community:
  - Climate model selection
  - Downscaling
  - Pattern scaling
  - *Likelihood/probability of scenarios*
- From the IAM community:
  - Use of SSPs
  - *Likelihood/probability of scenarios*

The need for transparency

- Ease of use by impacts researchers:
  - Developing sub-national scenarios
  - Incorporating impacts into those scenarios

- Because we should!

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Thoughts on ScenarioMIP

For CMIP6 & ScenarioMIP, what is our goal?

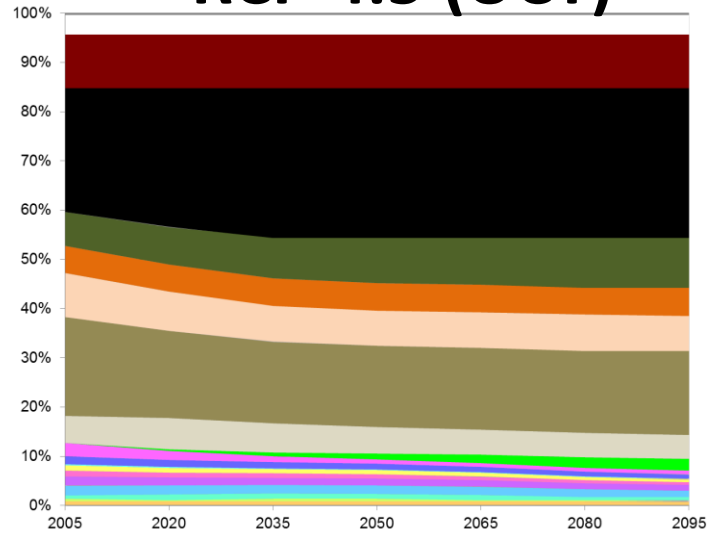
- Are we interested in increased understanding of climate science, in decision support, or both?

- If we're interested in decision support…
  - It's clear scenarios are useful for decision support.
  - Examples:
    - Reference + Mitigation: assess benefits of mitigation
    - Overshoot: can we delay policy and still get back to our goals?

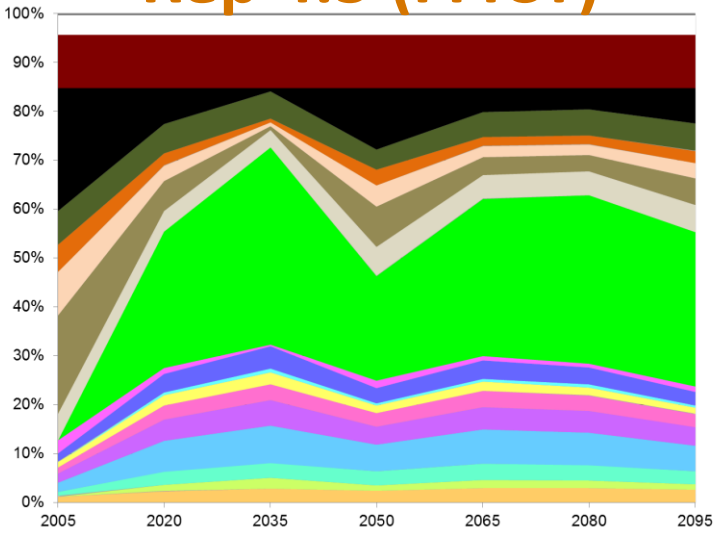
- If we're interested in understanding climate science…
  - A little less clear.
  - Single-forcing experiments may provide more insight.
  - But, there still may be some examples:
    - Putting bounds on range of potential climate change: Justification for RCP8.5 and RCP2.6, but this could also mean running higher than RCP8.5 & lower than RCP2.6
    - Overshoot?
    - Trade-offs among forcing agents

Quantifying the effect of land cover on temperature: Single Forcing Experiments

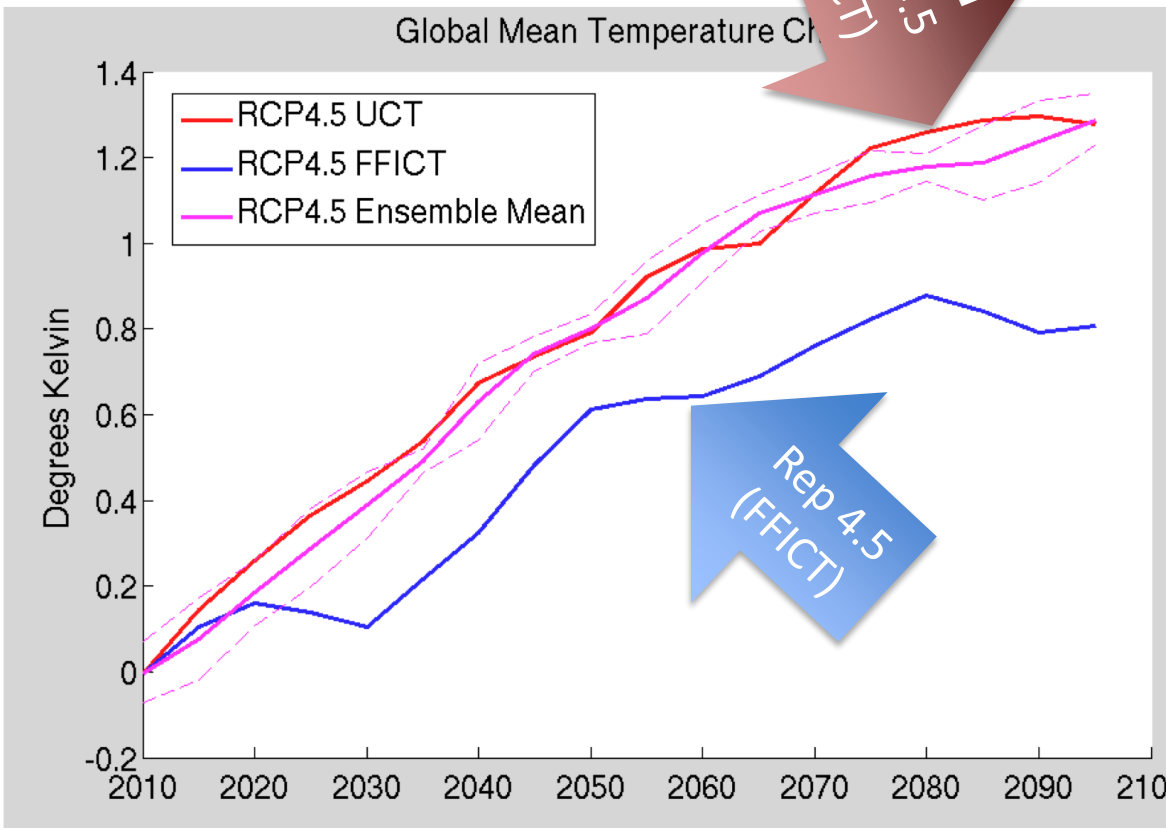
RCP 4.5 (UCT)



Rep 4.5 (FFICT)

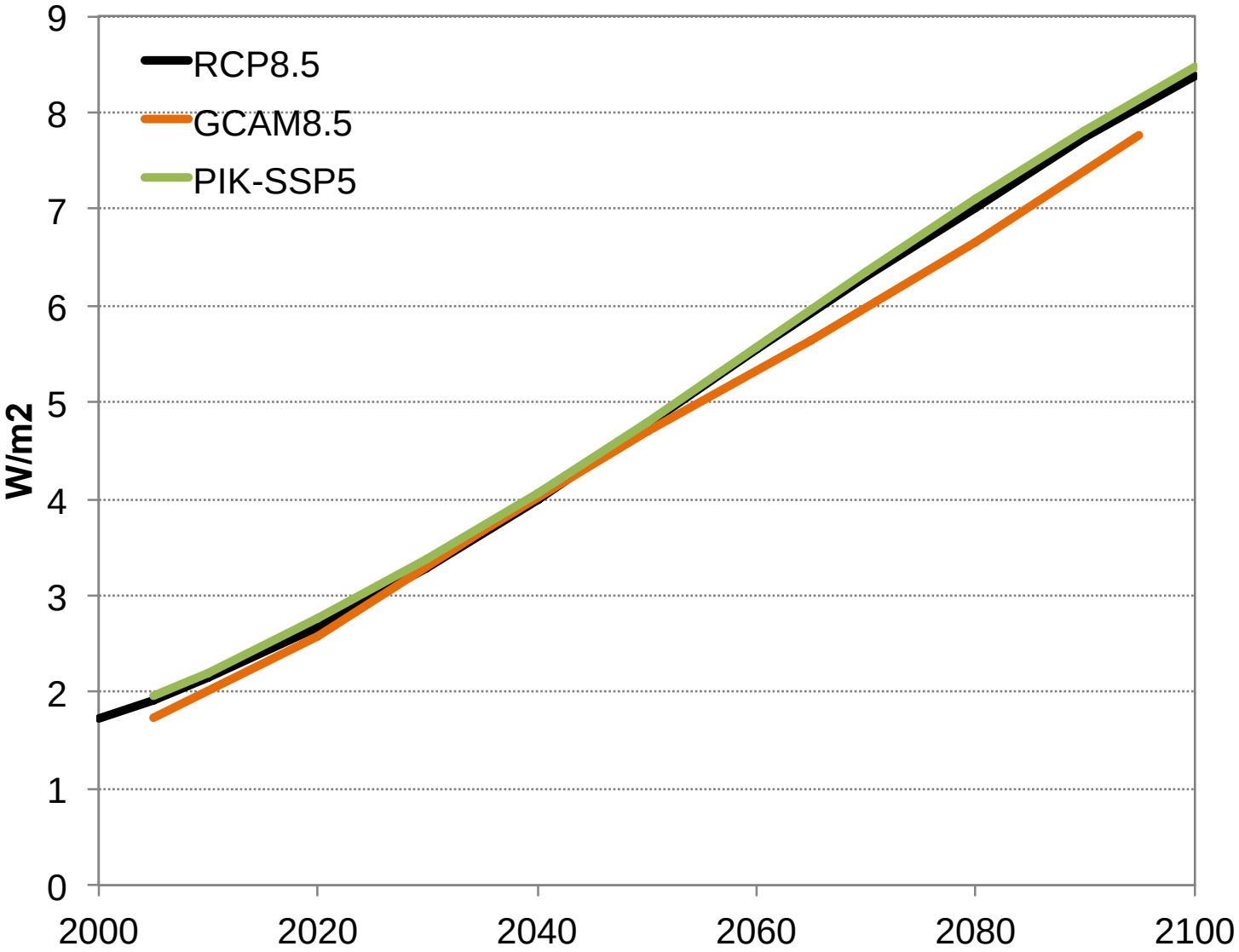


Calvin et al. (2014).

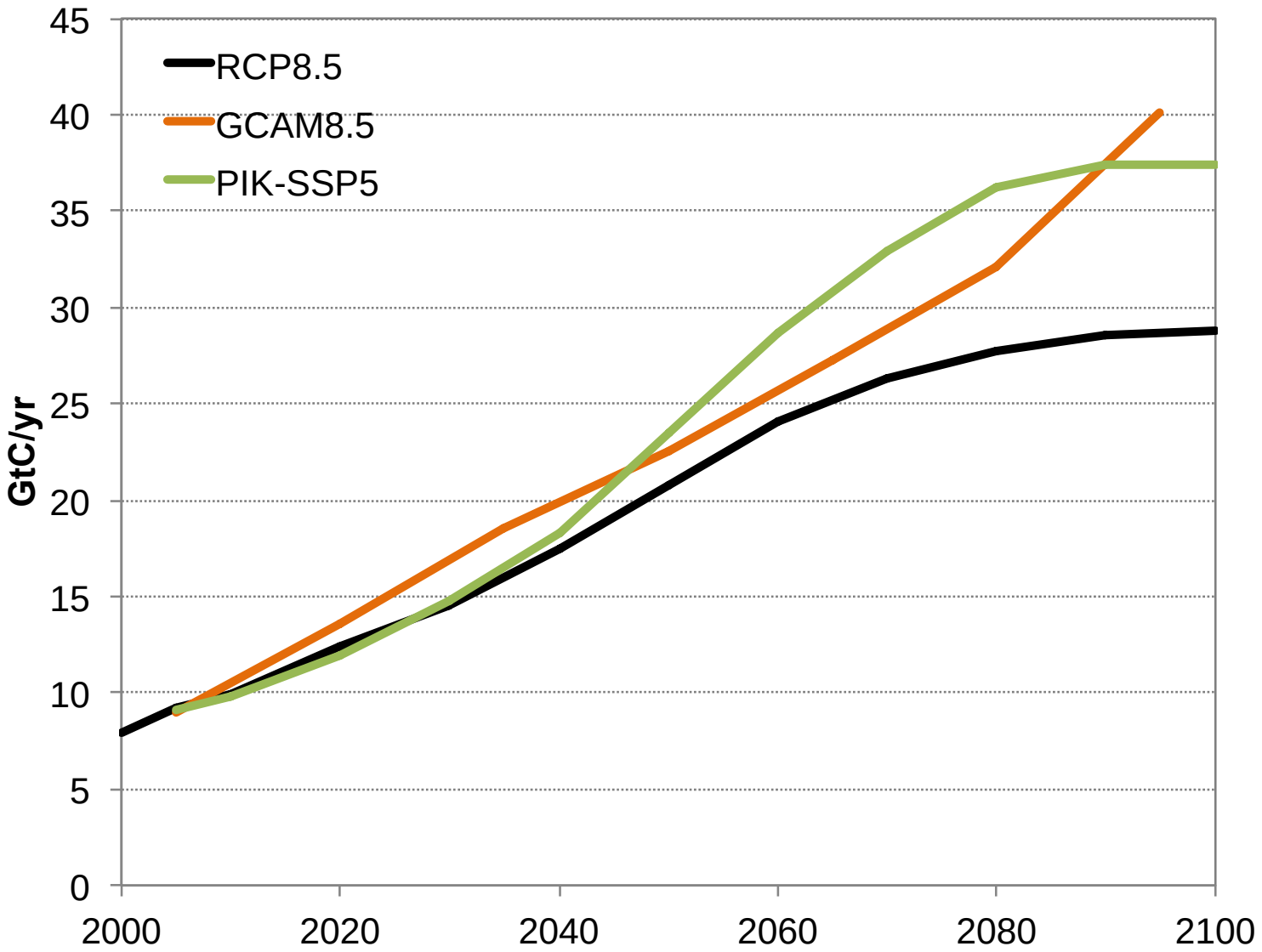


Jones et al. (2013).

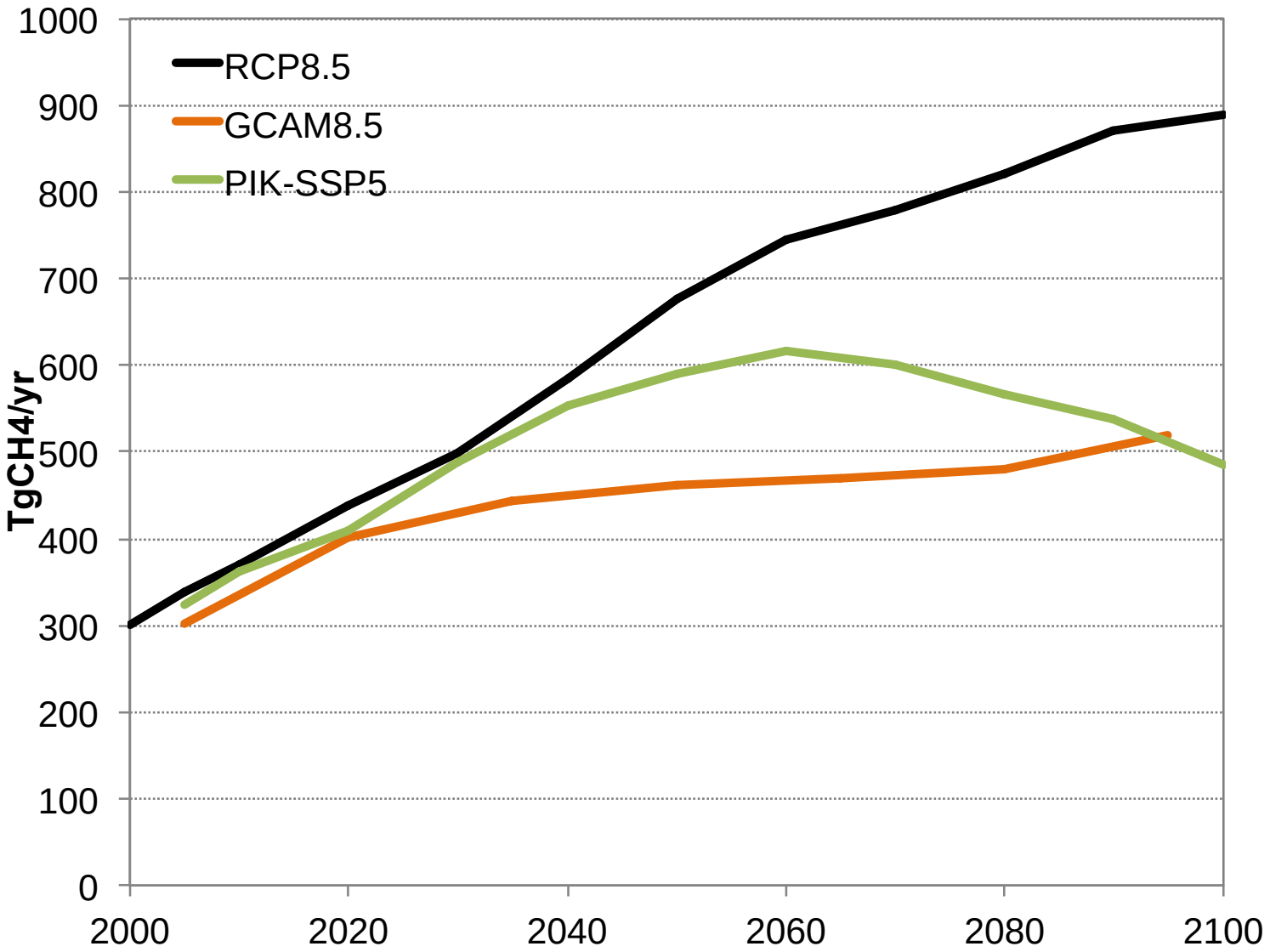
RCP8.5 vs. Others: Radiative Forcing



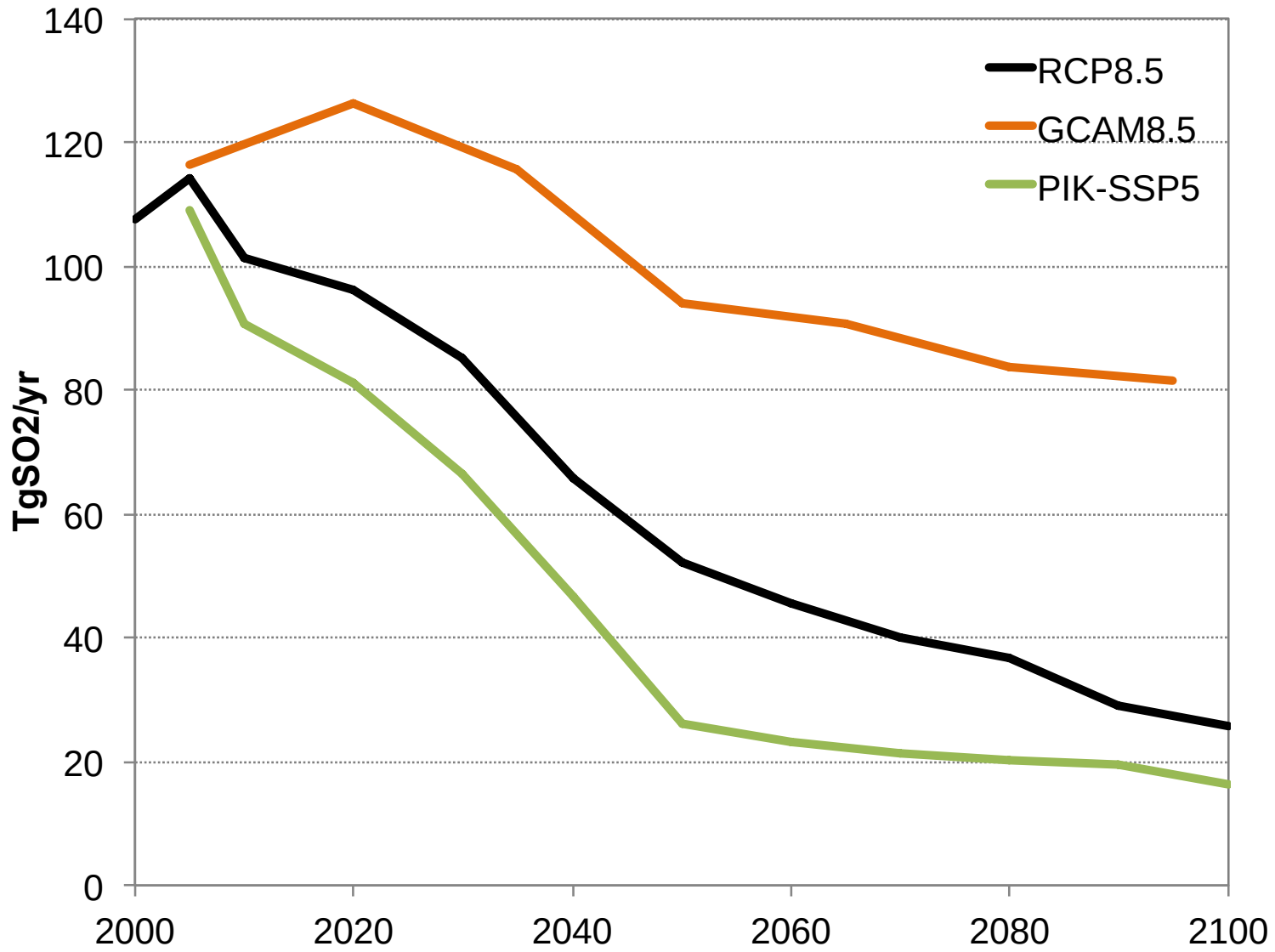
RCP8.5 vs. Others: CO_2



RCP8.5 vs. Others: Methane



RCP8.5 vs. Others: Sulfur



Other thoughts…

- How different should scenarios be from the original RCPs (or newly defined scenarios)?
  - Particularly of interest for the high scenario, since the original RCP8.5 is part of the DECK
  - Can we establish objective criteria for this?
  - Should we look at regional results instead of just global?
- How do we improve harmonization and data transfer between IAMs and AOGCMs/ESMs?

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Moving Forward

Moving forward

- Scientific interaction:
  - Further guidance on various aspects of climate-related research
  - Cross-disciplinary/cross-WG information exchange
- Transparency:
  - Provide underlying data and models used to generate the various components of the SSPs.
- Communication:
  - How do we talk about scenarios and differences across scenarios?
- Impacts white paper:
  - Include a section on scenarios and linkages to scenarios?

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DISCUSSION