

Beyond RCPs: Mitigation options to avoid severe climate change

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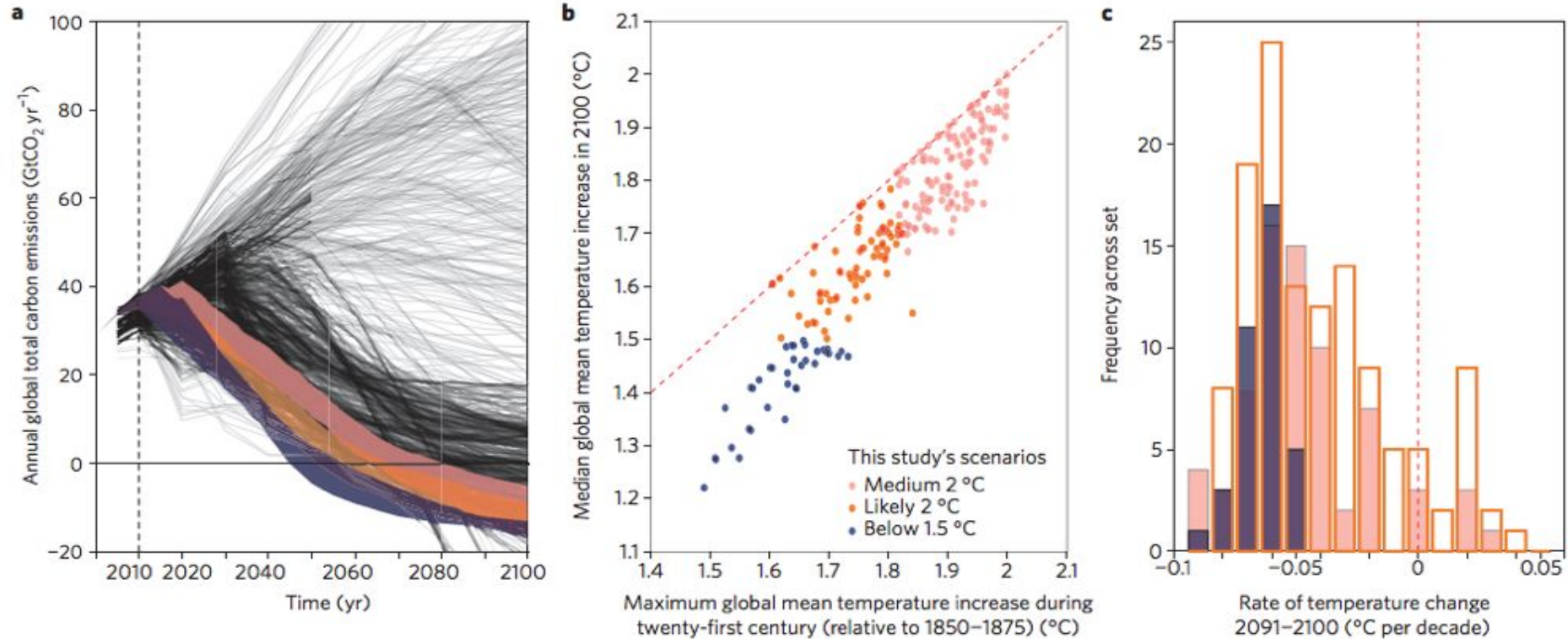
Simone Tilmes



Paris Agreement, article 2.1(a)

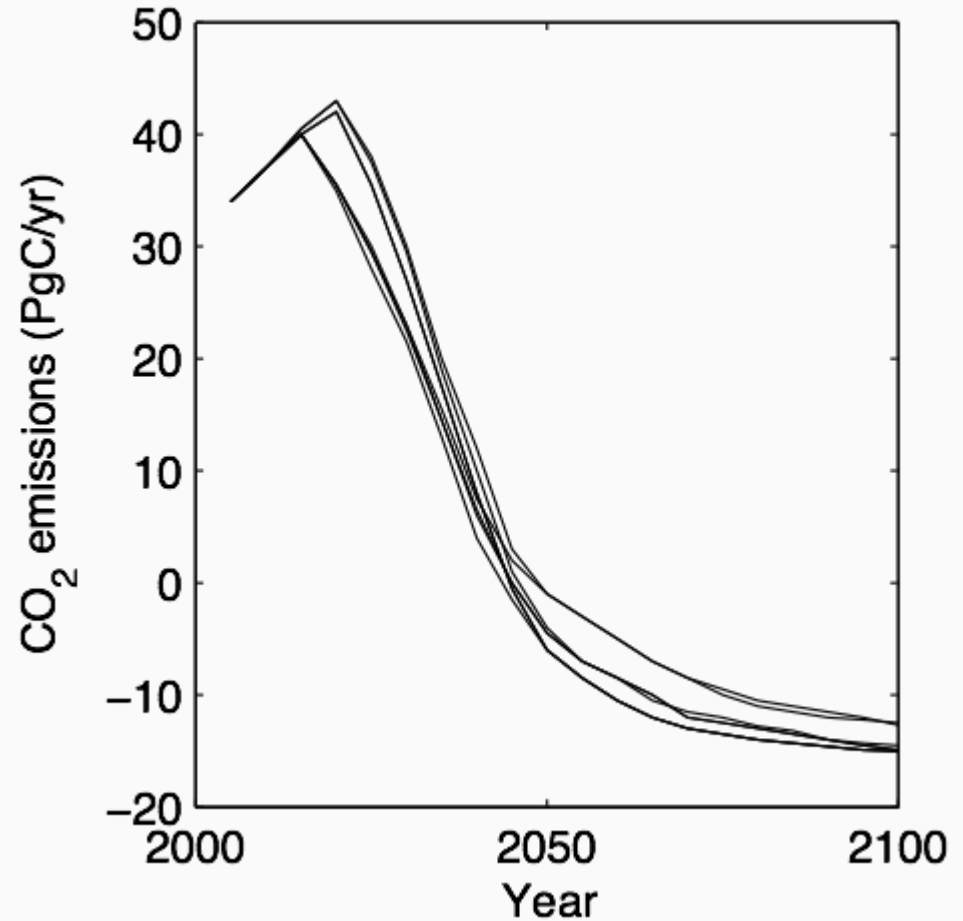
Holding the increase in the global average temperature to **well below** 2 °C above pre-industrial levels and to **pursue efforts** to limit the temperature increase to **1.5 °C** above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

What do we know about 1.5 degrees?

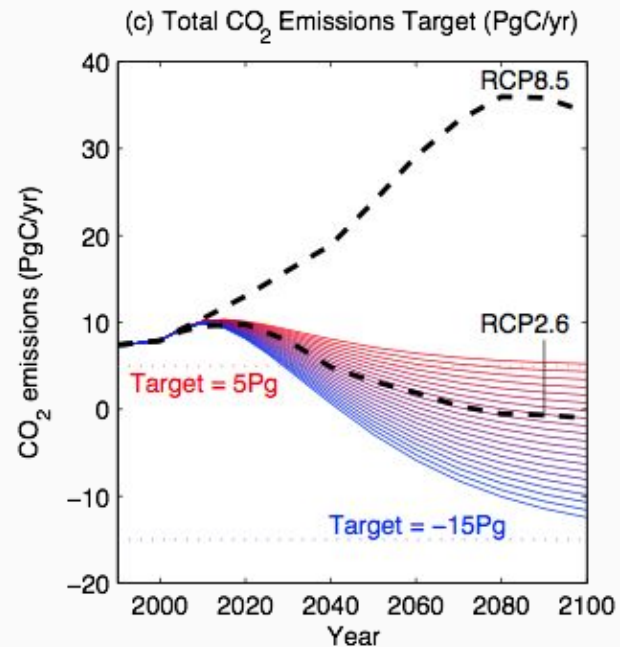
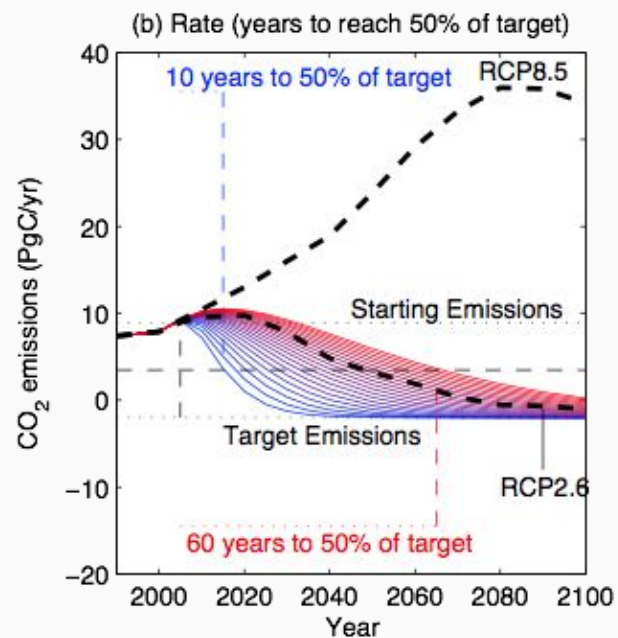
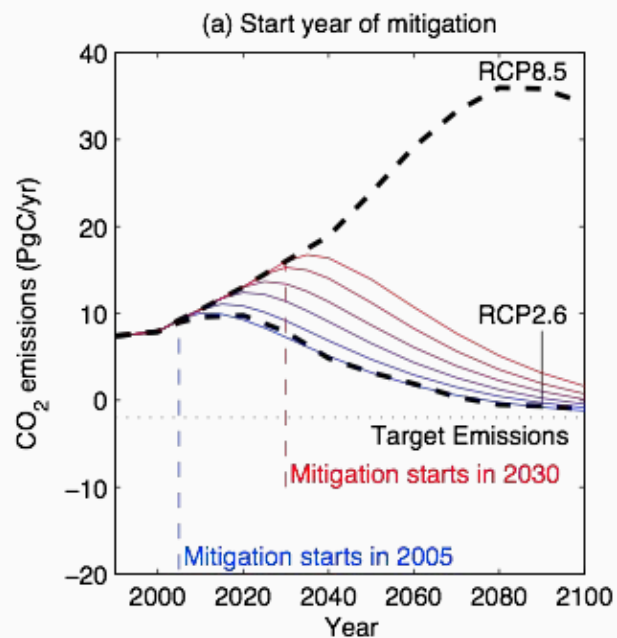


Rogelj, Joeri, et al. "Energy system transformations for limiting end-of-century warming to below 1.5C." *Nature Climate Change* 5.6 (2015): 519-527.

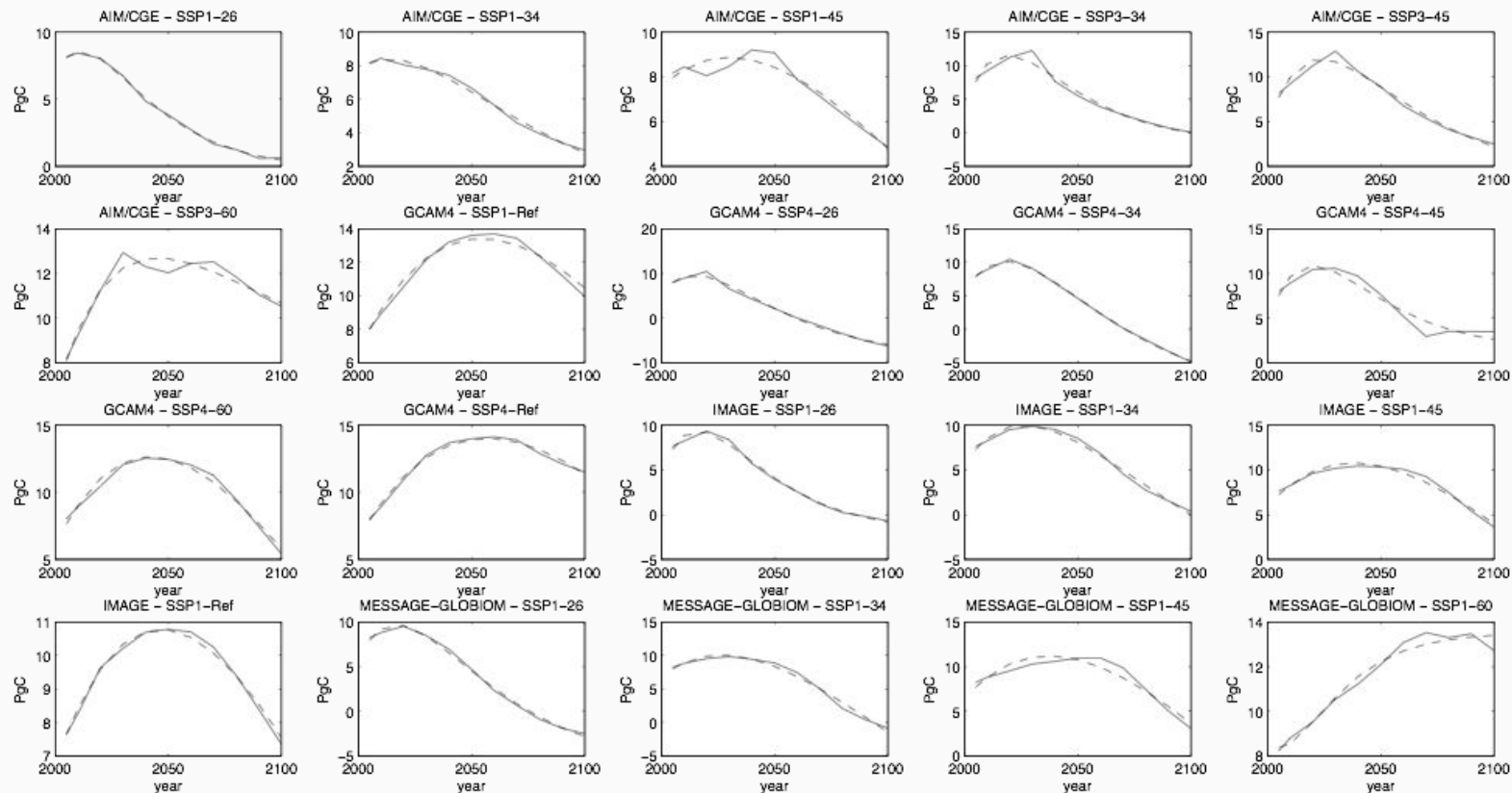
Not much choice?
How can we say?



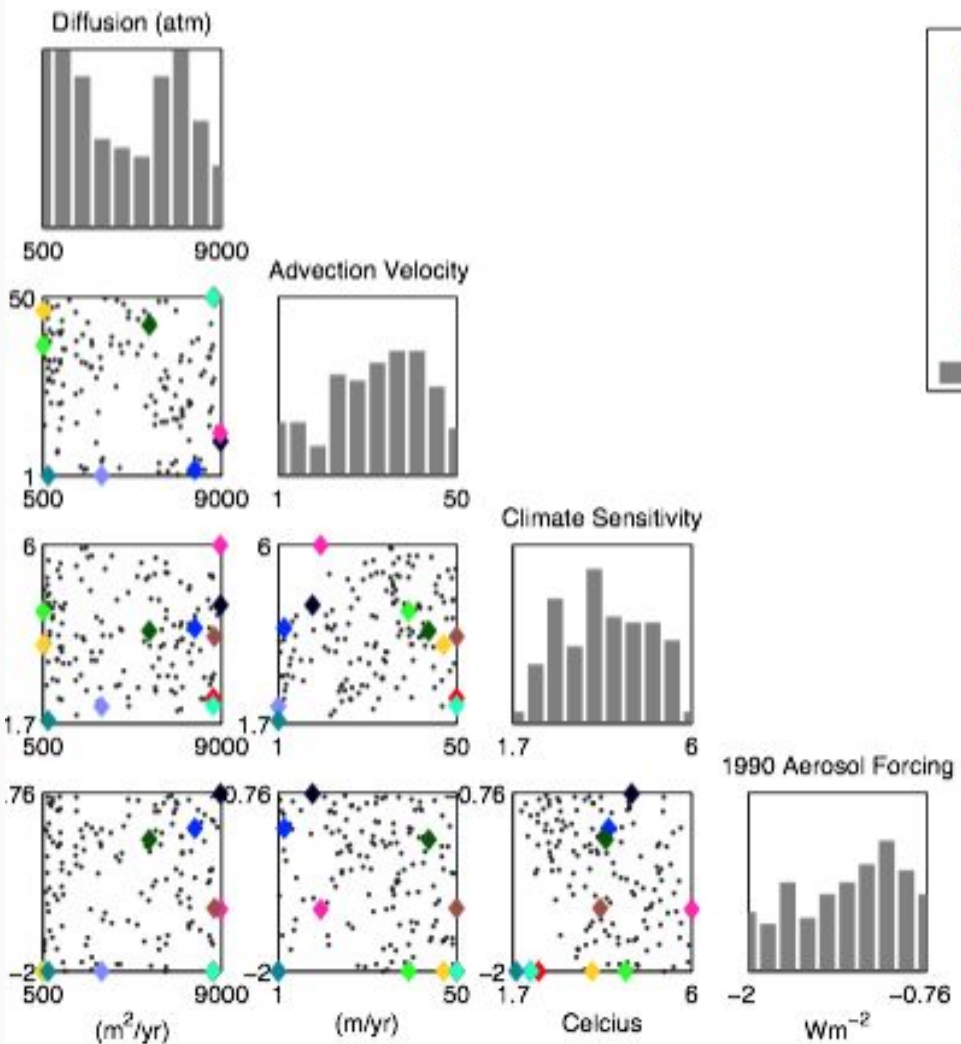
Perturbing around RCP2.6

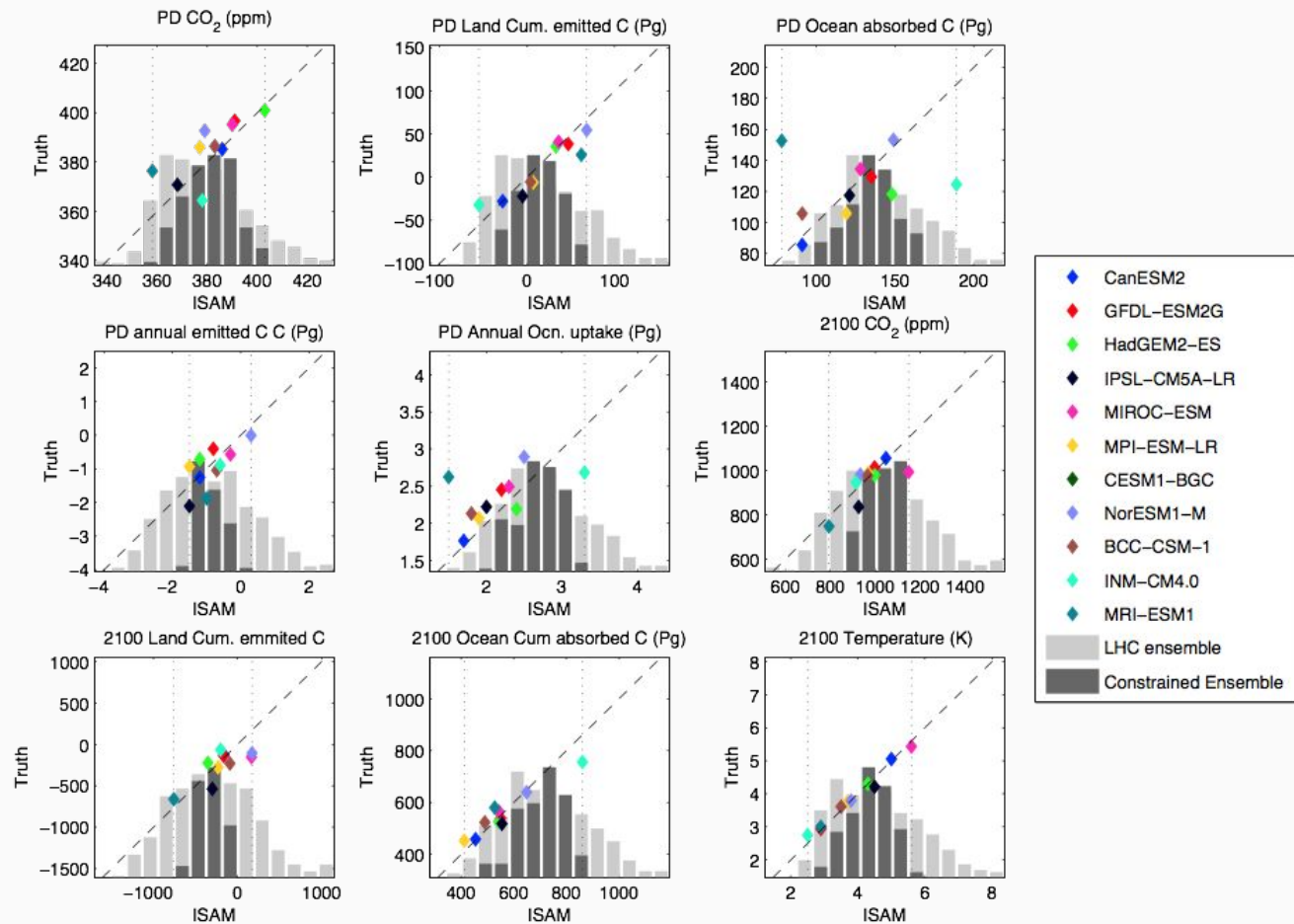


Approximating emission pathways

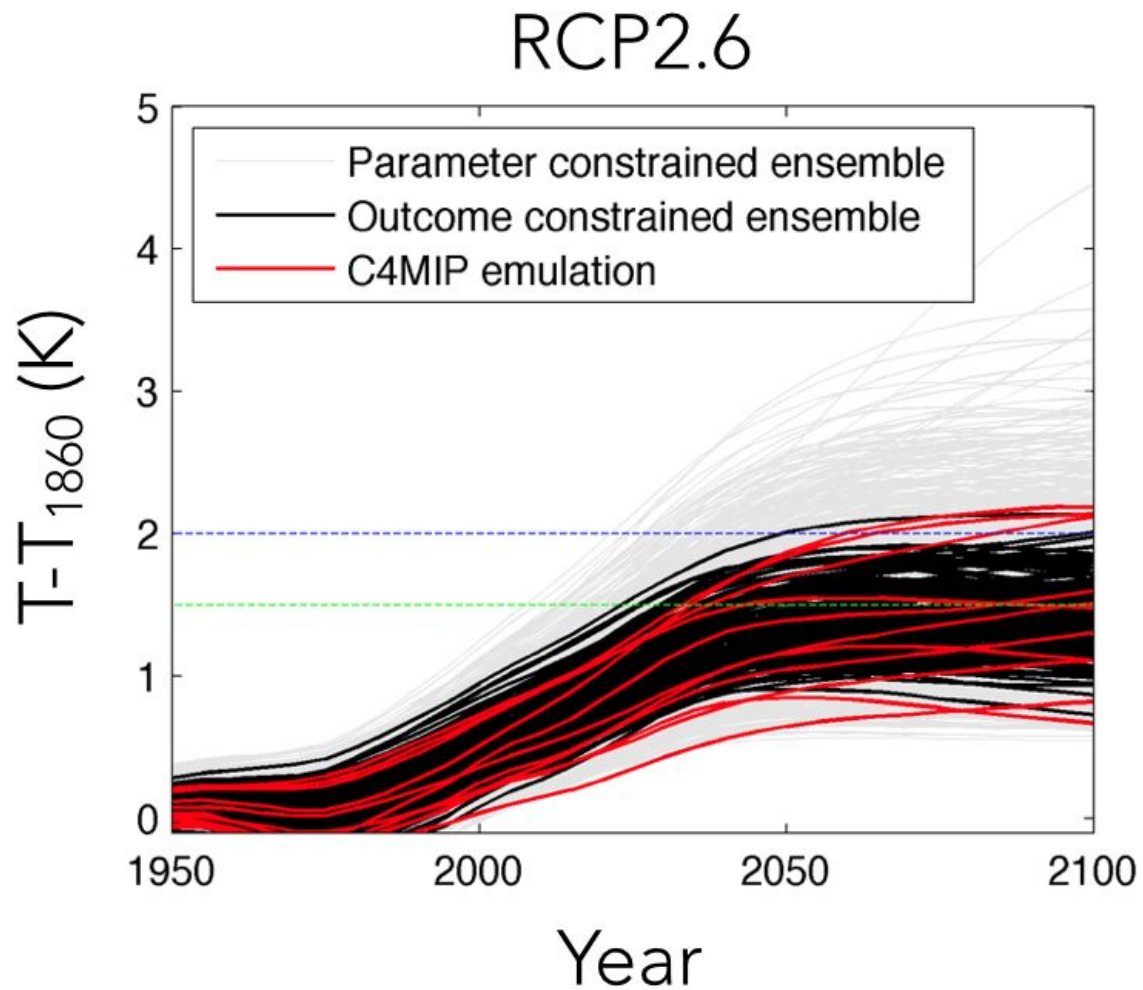


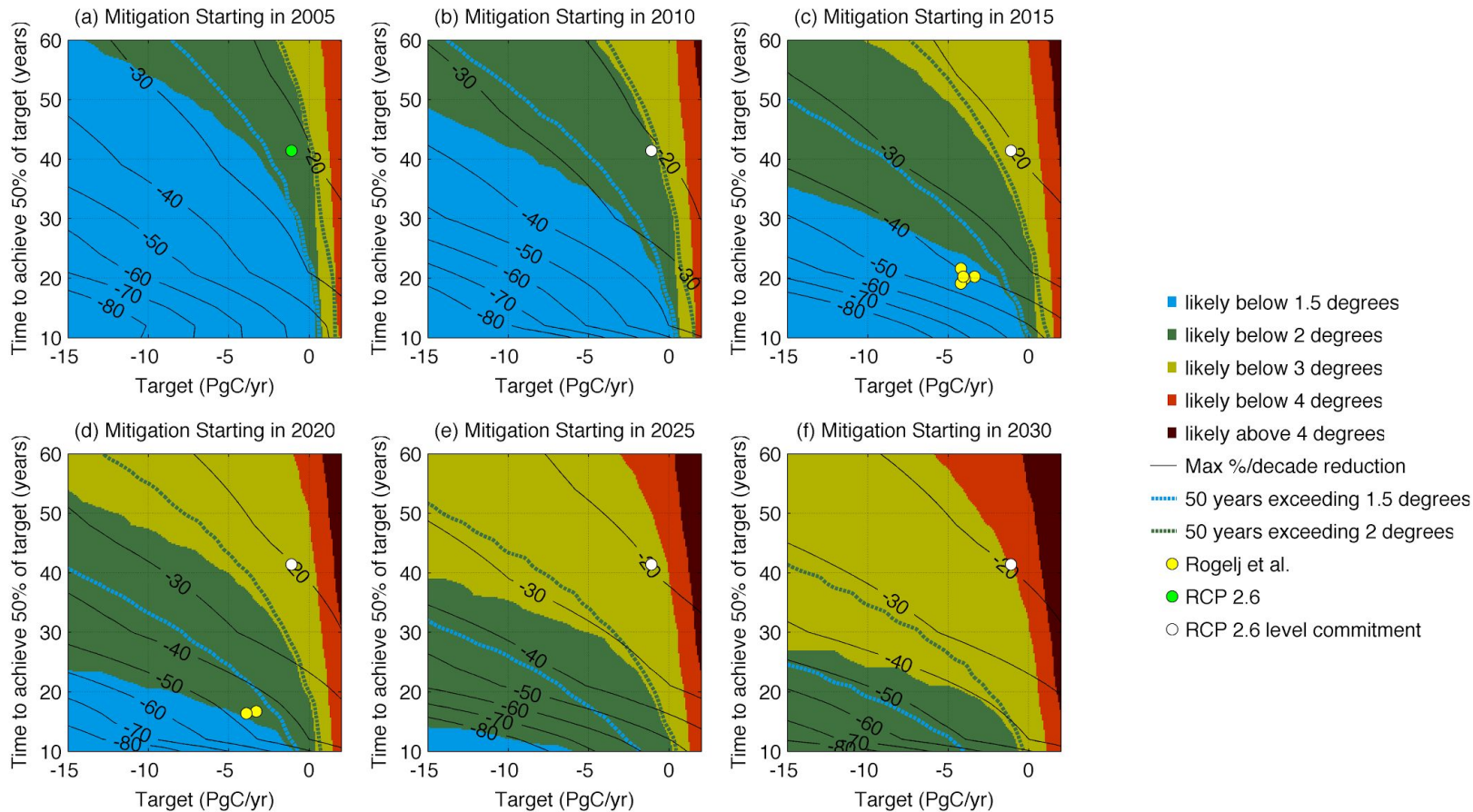
Sampling Response Space



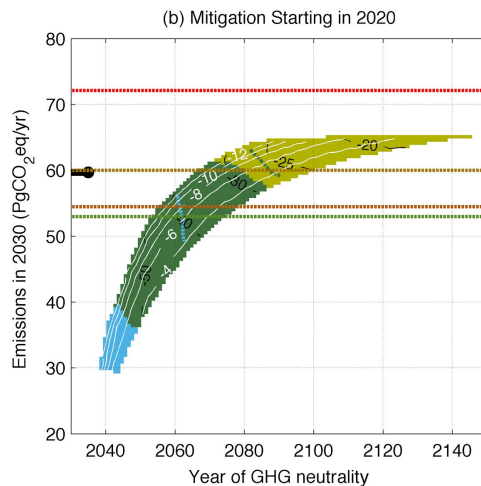
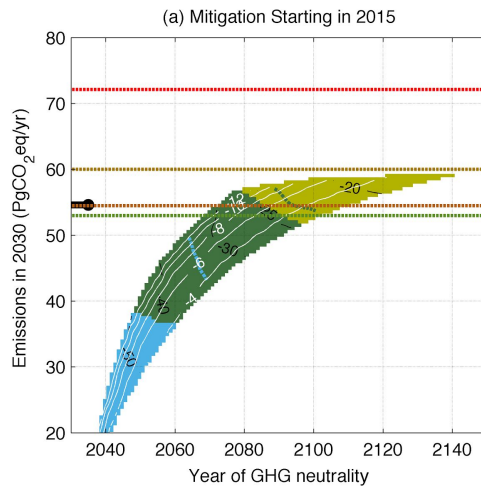


Probability of temperature exceedence



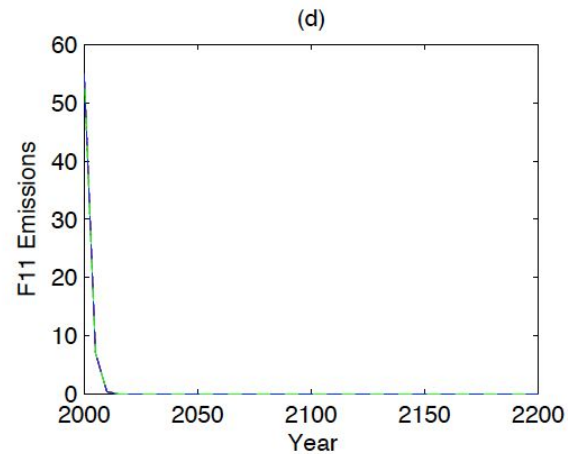
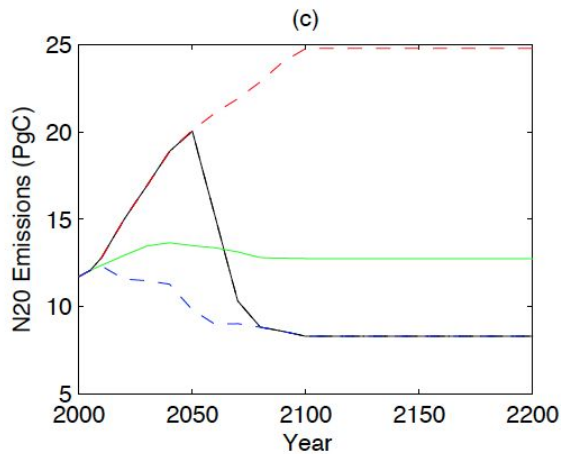
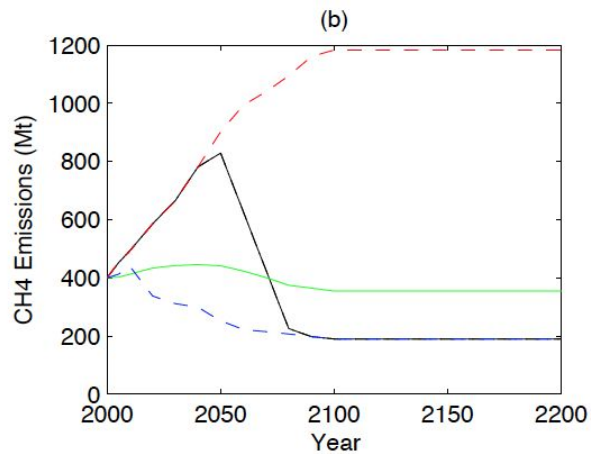
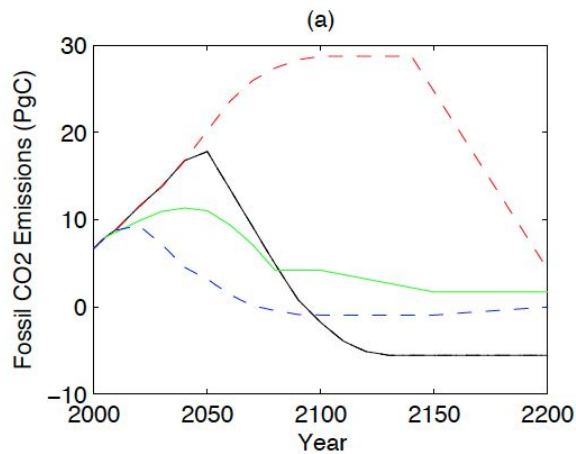


What will the INDCs achieve?

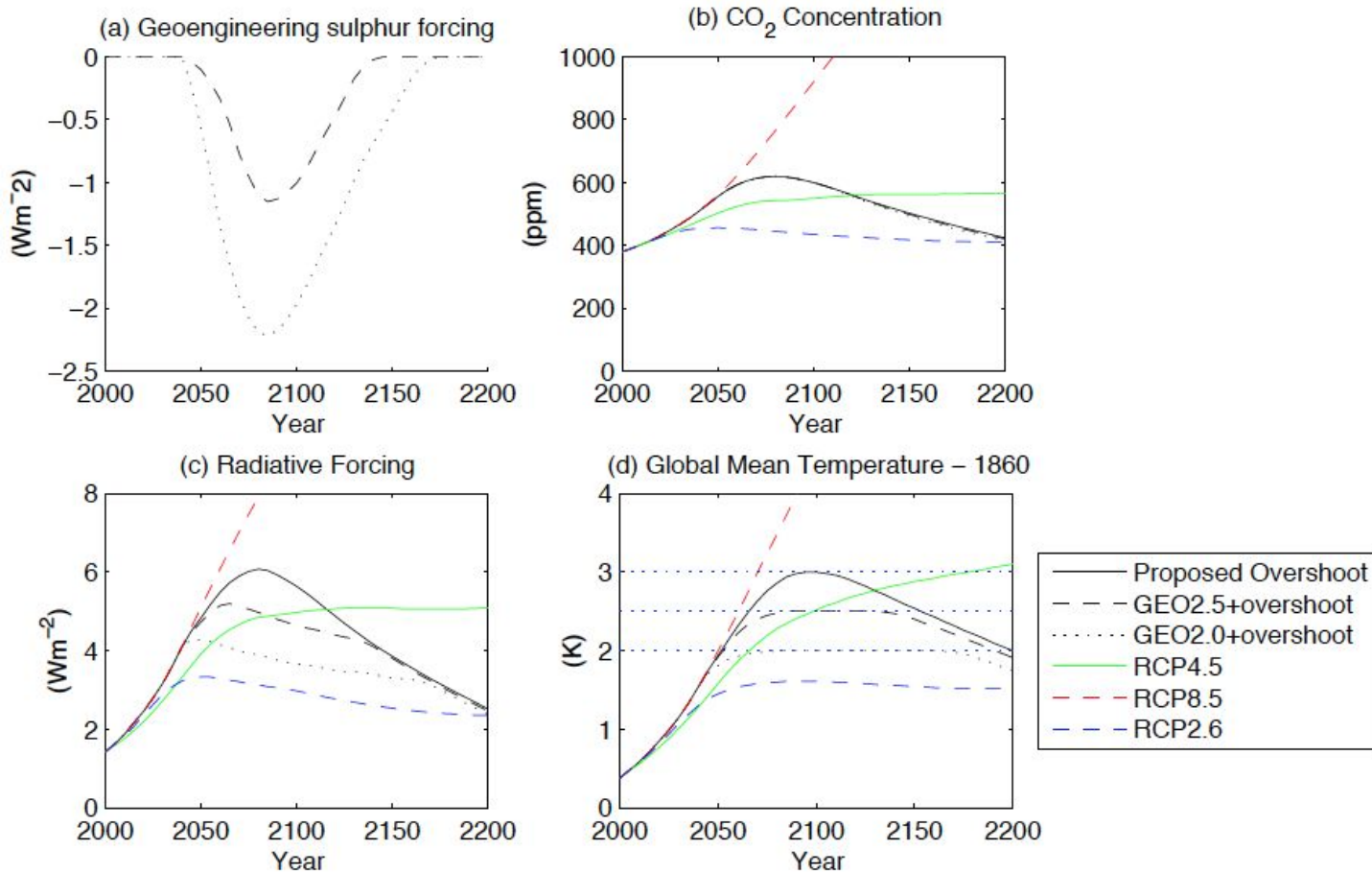


- Conditional INDCs (2030)
- Unconditional INDCs (2030)
- Current Policy (2030)
- Baseline 2030 emissions (RCP8.5)
- Starting Emissions (RCP8.5)
- likely below 1.5 degrees
- likely below 2 degrees
- likely below 3 degrees
- likely above 3 degrees
- Long term C emissions level (PgC/yr)
- Maximum decadal reduction (%)
- 50 years exceeding 1.5 degrees
- 50 years exceeding 2 degrees

Waiting until 2040
to act...



Predicting CESM before we run it...



- 2 degrees is no longer likely with an RCP2.6 level of commitment
- If INDCs are achieved in 2030, negative emissions significantly greater than RCP2.6 are required later in the century to stay below 2 degrees
- If emissions could be cut by 10 percent by 2030, long term RCP2.6 negative emissions would suffice.
- 1.5 degrees requires net zero GHGE before 2050
- Delay until 2040, followed by intense mitigation would imply a 200 year overshoot of 2 degrees.