



On the Risk of abrupt Warming after a Shutdown of all Emissions

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What would happen, if all anthropogenic greenhouse gas and aerosol emissions were abruptly suspended? Rapid warming would probably follow, because cooling by anthropogenic aerosols would cease within days whereas the warming by CO₂ would persist for many years. We investigated such a scenario using the Aggregated Carbon Cycle, Atmospheric Chemistry and Climate model (ACC2) and derived the following statements:

- 1) The warming after the emission shutdown is stronger for higher climate sensitivity.
- 2) The initial response of the climate system exceeds the common target for the rate of global warming (0.2°C/decade).
- 3) In the case of high climate sensitivity and the emission shutdown in the year 2020, the maximum global temperature reached thereafter may also exceed the common target (2°C warmer than at pre-industrial time). This maximum in global temperature can be considered to be unavoidable at the time of the shutdown (assuming that no geo-engineering actions are realised).
- 4) With high climate sensitivity, initial and maximum warming are even larger when we consider the interdependency of estimates in climate sensitivity, aerosol forcing, and historical temperature.

Altogether, if in the near future the climate sensitivity emerges to be high, we could be in a "climate trap". Rapid emission reduction in face of an accelerating temperature increase would result in a dangerously large abrupt warming.