Taking some heat off the INDCs? The potential of short-lived climate forcers’ mitigation

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Motivation

The main focus of this study is to understand:

What are the potential short-term climate benefits of Short-Lived Climate Forcers in the context of the intended nationally determined contributions (INDCs)?

First studies show that ambitions in the INDCs are too low to reach greenhouse gas (GHG) reduction levels consistent with a cost-optimal pathway towards a 1.5 or 2 degree target. Due to this delayed action, a steady short-term global mean temperature (GTM) rise can be expected, with potentially adverse effects. The temperature rise can be mitigated by enhancing the ambition of the INDCs, but in the short term there might also be a role for intensified reduction of short-lived climate forcers (SLCFs): methane (CH4), ozone (O3), black carbon (BC) and hydrofluorocarbons (HFCs)

Approach

This study describes the EMF30 (30th modelling forum) work that goes into the relation between potential SLCF mitigation and the climate benefit in the INDCs. Eight models have taken part in the subset of INDC scenarios (see table “models”), with a large variety in modeling approaches (representation of the economy, level of foresight, representation mitigation options, and technological detail). Further, three scenarios from the project are particularly relevant in that context (see table “scenarios”).

The model comparison provides an assessment of regional and sectoral implications for emissions and the resulting global implications on the short-term climate. The aim of this assessment is to exist global mean temperature (GTM) rise. Additional SLCF policy on top of the INDCs can limit climate change. Secondly, the contribution of the individual forcers to the cooling effect is determined by estimating the reduced radiative forcing per SLCF. In a short-term scenario, the effects of SLCF policy in the INDCs can be assessed. Additional SLCF policy has little effect on reducing the maximum temperature before 2100, but it does reduce the temperature change rate at the beginning of the century.

Discussion and Conclusions

The proposed SLCF measures are found to have only a small effect (<1%) on reducing the maximum temperature before 2100, mostly because in the second half of the century these gases are already significantly reduced, either directly or indirectly via changing the energy system.

However, maximizing SLCF mitigation can reduce the maximum temperature rate of change in the short term, by up to 23%. All models show that the short-term reduction in temperature rate of change is particularly relevant in an INDC + 2 degree C case. In a continued INDC case the effect is less certain, and some models project a delay, but not a decrease in the temperature rate of change.

All three SLCF groups can potentially contribute to this effect, methane has the largest impact.

Additional HFC reduction is likely to be limited, especially if the recent inclusion of HFC reduction under the Montreal protocol will prove successful.

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In an INDC-to-2degree scenario, SLCFs are found to have a minor effect (1% - 3%) on reducing the maximum temperature before 2100. The main advantage of SLCF reductions is that they reduce the magnitude of climate change. In the continued INDC case, the main advantage is that they reduce the temperature rise in the short term, by up to 23%.

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