

Review of ‘The success of emissions control legislation in mitigating air pollution is higher than previously estimated’, by N. Daskalakis et al.

General comments

The underlying premise to this paper is a good one: when we estimate the impact of emissions controls, it makes much more sense to compare to a projection of where we would be without them, rather than just assuming no emissions change as the baseline. It is important for policymakers to realise the true benefits that air pollution legislation has brought. Of course, the ‘true benefit’ is always going to be a model construct, as we don’t have two planets to monitor.

The choice of reference scenario is always going to be a bit contentious. What the authors have done here is probably reasonable (I am not an expert on constructing emissions scenarios) – however they describe the scenario they use as the reference as a ‘worst-case scenario’ – which is patently wrong, as for some regions the emissions in the ‘current legislation’ scenario exceed those in the worst-case (see specific comments below). The phrase ‘worst-case’ should not be used.

The paper is well organised and reasonably clearly written – but the English should be improved – I make a few suggestions below, but this isn’t really the job of a scientific reviewer. For example the first line of the Introduction(!): ‘The rapid Earth’s population increase...’ should be ‘The rapid increase in the Earth’s population...’

If these things and the specific points below are rectified, then this paper should be acceptable for publication in ACP.

Specific comments

P1 L20 (and elsewhere) 80’s -> 80s (or possibly 1980s, or ‘80s, but definitely not 80’s); also threat -> threaten

P2 l13 Do you mean troposphere, rather than atmosphere? I believe the main thing driving the increase in tropospheric O3 burden between 1890 and 1990 is the increase in anthropogenic emissions. Lamarque et al (2005) find a decrease (not increase) in O3 lifetime of ~30%.

P2 l28 Glacier?

P2 An obvious omitted reference here is Fiore et al (2012) (Global air quality and climate, Chem. Soc. Rev., 41, 6663, doi:10.1039/c2cs35095e).

The Introduction has rather more material on ozone than other air pollutants – one could argue that since the paper’s title contains the words ‘air pollution’ – and the most important air pollutants (at least for human health) are aerosols, this mismatch should perhaps be addressed.

P3 l24 Do you mean multi-annual, rather than interannual?

P4 l5 targets the simulation -> simulates

P4 l18 Maybe there is ice-core data for 1979-89, but I think perhaps you mean firn air data?

P5 l11 Define all acronyms at first usage (HTAP).

P5 l14 Fix double negative: “...does not account neither...” (also elsewhere)

P5 l18 Clarify what is done with shipping (and aircraft) emissions in these simulations (you refer to land anthropogenic emissions).

P5 I25 worldbank

P6 I3 The Business As 1980 (BA1980) case is described as a “worst-case” scenario, but this is misleading. For example, in some regions, for some species, the Current Legislation (CL) scenario actually shows larger increases between 1980 and 2010!! So it isn’t really the worst case, is it?

P6 I31 2 AND 3, ... respectively (I guess)

P6 I33 What are the ‘emission ratios’ referred to? Clarify.

P7 I2 Again, I am not sure you mean ‘interannual’.

P7 I16 spatial

P8 I9-18 The discussion of simulated vs observed trends does not match up with what I glean from Figures 2 and S5-S10. For example, you say “O3 and CO trends are also [nicely] well simulated, both in direction and in magnitude in most stations”. For CO, the ratio of the simulated CL trend to the observed trend at the seven stations shown is 2.3, 0.9, 0.02, 0.91, 0.45, 0.94 and 0.88. For O3, the ratios are: 0.6, 0.01, 0.41, 0.22, -0.46, 2.8, and 0.84. I think the trend magnitudes for O3 cannot really be described as “well simulated”.

P9 I4 Do you mean Figure 4 rather than Figure 3?

P9 I13 I think the climate impact on concentrations may be arising through factors other than simply changes in natural emissions brought about by variations in climate.

P10 I17 are modifying -> have modified

P10 I21 may or may not -> do or do not

P17 Table 1: define R

P18 Figure 1: I can’t distinguish the different symbols for different regions.

Table S2b: As commented on above, some ratios (CL/worst-case) are >1, which indicates that ‘worst-case’ must be an oxymoron.