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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Anthropogenic radiative forcing time series from pre-industrial times until 2010" *by* R. B. Skeie et al.

Anonymous Referee #2

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The paper seeks to investigate how the size of anthropogenic forcings have varied through time. Although a wide range of different climate forcers are followed, the paper's main emphasis and strength lies in its calculation of short lived climate forcers (ozone and aerosol) via detailed chemical transport and radiative transfer modelling, while the calculation of the other forcers mainly relies on, and extends, pre-existing work and techniques. The paper clearly states where the new and original contribution lies while acknowledging the work of others. The breadth and rigour of this paper is impressive and the presentation of the results and comparison to other works and observations is clear and thorough. I have two questions as well as several minor comments which are listed below:

Linearity Assumptions

The paper does not carry out detailed calculations for several of the forcers, and instead has to rely on some assumptions to calculate time-series for the forcings. In places these assumptions have not been given sufficient justification and a reason or reference should be added if possible. Specifically:

For the stratospheric components the chemistry was not calculated. Instead the RF time-series due to ozone depletion was linearly scaled with effective stratospheric chlorine and water vapour forcing is scaled linearly with the time-series of methane forcing. Can the authors provide any justification for this assumption?

Equally is the assumption that the cloud lifetime effect varies linearly with the cloud albedo effect a reasonable one?

Uncertainty estimates:

Several of the uncertainty estimates in figure 1d are based on the range calculated by other authors for a multi-model ensemble scaled to your calculated value. Eg the uncertainty estimate for: tropospheric aerosols taken from Forster et al 2007, stratospheric water vapour taken from Forster et al 2007, direct aerosols from Myhre 2009 and indirect aerosols from Isaksen 2009.

This does not give the error from the modelling techniques incorporated in this paper but merely reflects the amount of error spread found in previous studies. If a more complete error analysis was not possible then perhaps its worth explaining the reason for this.

Minor comments:

Abstract: For completeness include calculated size of indirect aerosol effect.

Introduction:

p22547 line 14 - need to add reference for land use effects (could move Forster citation to end?)

P22548 line 2 - ice cores drilling → ice core drilling

p22548 line 16 – is on the short lived components

p22548 line 29 → simulations for the IPCC ..

Section 2.2

First paragraph – Why is a factor of 20% used to reduce agriculture and waste burning by in pre-industrial times. A reason or reference should be added if possible.

p22551 line 22 – acronym VOCs not explained.

Section 2.4

Could add a short passage describing the other effects that land-use change has e.g. hydrological cycle and why this is not followed (e.g. feedback not climate forcer).

Section 3.

p22554 line 17 → Unless otherwise stated all RF values presented are relative to year 1750..

Section 3.2.1

p22558 line 3 → we also underestimate the CO in the NH where CO . . ..

section 3.2.2

p22561 Paragraph 1 last line– meaning not clear. Re-word.

Section 3.3

Last paragraph. - a comparison with other models results for stratospheric water vapour eg the range from Forster et al could be useful

section 3..4.1

p22564 line 23 - should also be given in mg(SO4)m-2 for completeness.

Section 3.4.3

Last paragraph – you explain discrepancy with Forster et al due to other models not including SOA but your OC contribution alone is still higher than the range presented in this paper, so this explanation is still insufficient, this could be made clearer.

P22579 line 9 – in the repeated twice.

figure 3 – why are legends only on some figures?

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 22545, 2011.