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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Global and regional emissions estimates for N2O" *by* E. Saikawa et al.

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Please clarify one point for a student. At 19483:23-4 you say "N2O regional emissions are approximately mixed globally in two years[.]" This seems reasonable, but it *is* a particular empirical claim which I have not previously encountered (possibly due to my lack of experience and erudition) for which I'd like to know the source. From the context (19483:14-28):

"we first ran the global chemical transport model MOZART v4 with the prior emissions discussed in Sect. 3.1 to yield a reference run. Next, we perturbed sectoral regional emissions by increasing them by 100 % for each sector, region, and year, one at a time while leaving the emissions for the other sectors, regions, and years unperturbed and ran MOZART v4. (c.f. Chen and Prinn, 2006). We then tracked atmospheric mole fractions in the perturbed runs for two years (first year when the emissions are

increased and the second year after the emissions return to the same level as the prior emissions) and compared them to the reference mole fractions. Because N2O regional emissions are approximately mixed globally in two years, the response of the increased atmospheric mole fractions after this period is similar at all sites. Therefore, we assume that the perturbed mole fractions exponentially decrease to the globally well-mixed values after the end of the second year at all measurement sites, regardless of the regions and sectors (Chen and Prinn, 2006; Rigby et al., 2010; Saikawa et al., 2012)."

it seems (again, to this mere student) like the source for the mixing-time claim is one of

* the modeling discussed in this paper

* Chen and Prinn, 2006

* Rigby et al., 2010

* Saikawa et al., 2012

* general understanding of global GHG modelers

but I would appreciate a separate cite for this particular (and IMHO significant) claim. (Not least because it would be quite handy for, say, a masters thesis :-)

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 19471, 2013.