Atmos. Chem. Phys. Discuss., 10, C8562–C8564, 2010
www.atmos-chem-phys-discuss.net/10/C8562/2010/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Anthropogenic sulfur dioxide emissions: 1850–2005" *by* S. J. Smith et al.

Anonymous Referee #2

Received and published: 12 October 2010

General Comments

The authors assess sulfur dioxide emissions worldwide, considering all major sources and using country-level monitoring data in place of bottom-up mass balance calculations where the country-level data are judged to be reliable. Spatial resolution of the global SO2 inventory is improved to 0.5 x 0.5 degree, in contrast to past work which has been mostly 1x1 degree resolution.

The relative amounts of text devoted to methods and results are not well-aligned with what will be most interesting and informative to ACP readers. In particular, the methods section needs to be shortened by moving details and long lists of references on data sources to supporting information. The results section should be expanded to show more intermediate results and guide the reader through more of the direct findings of the study.

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

Specific Comments

1. It is suggested that the authors show time series plot of sulfur contents in key fuels: coal, residual fuel oil, distillate fuel, and gasoline, over the entire inventory period (1890-2005). Separate results could be shown for Europe, North America, Asia, etc. if the authors are able and wish to show greater detail. In cases where country-level data are available, fuel sulfur content could be back-calculated. This could help to expand the results section of the paper, although what would be shown could include more intermediate values rather than just final results for SO2.

2. On page 16119, lines 7-8, there is excessive precision in reported fuel sulfur contents (2.86 and 1.25%). The authors should include error bars for these numbers. It is not plausible to define these values to three significant figures. While the residual fuel sulfur content seems reasonable, the reported distillate fuel sulfur content seems very high, unless the authors are somehow implicitly including blends of residual & distillate fuel (i.e., No. 4 fuel oil) into the reported value. The authors should review other data sources as a check on these values.

3. The authors should briefly discuss coming changes to fuel sulfur contents, and the challenges this will pose for estimating SO2 emissions in future years. For example, mandates for Sulfur Emission Control Areas and Ultra-Low Sulfur Diesel Fuel will likely spread, with resulting decreases in SO2 emissions.

4. Some specific areas in the methods section where more concise exposition (and/or greater reliance on supporting information) would help include page 16114, lines 20-23; page 16115, lines 9-10 and lines 14-26, line 28; page 16117, line 27 through page 16118, line 4; page 16121, lines 27-29.

5. Important shifts have occurred in the use of natural gas versus home heating oil versus coal for winter season heating in the residential sector. The effects of the transition away from coal to natural gas are mostly on black carbon, but sulfur emissions from domestic fuel combustion are also affected. These transitions began around 1950

ACPD

10, C8562–C8564, 2010

in US and some European countries. Former Eastern European nations made these transitions much later, including abandoing use of high-sulfur brown coal. It would be informative if the authors could discuss in more detail the consistency of their SO2 results in terms of known fuel transitions and timing for various countries or regions.

6. On page 16130, line 17, I dispute the contention that most of the SO2 reductions have been achieved through use of scrubbers. In the US at least, the reductions have been overwhelmingly due to switching to lower sulfur coal supplies.

7. In section 2.2, prior work of Corbett and coworkers on ship emissions should be cited.

Technical Corrections

Page 16112, line 15, sulfate acid should be sulfuric acid

Page 16117, line 7, Supplementary is misspelled

Page 16123, line 10, a word (from?) is missing between Emissions and smelting.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 16111, 2010.