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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Origin and radiative forcing of black carbon transported to the Himalayas and Tibetan Plateau" *by* M. Kopacz et al.

Anonymous Referee #2

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This well-written manuscript presents an interesting study on the origin and radiative forcing (direct and snow-albedo) of black carbon in the Himalayan and Tibetan Plateau region. The study estimate BC concentrations in snow using modeled BC deposition and precipitation rates from GEOS-Chem and compared them to observational data for 16 sites. BC direct and snow-albedo radiative forcing were calculated. The most exciting part of the study is the use of the adjoint of the GEOS-Chem model to identify the origin of BC for five sites. While emissions from India and China are found to be the main source of BC to the Third Pole, the study also finds biomass-burning emissions from Africa contributed non-negligible amounts for the modeled year (2001). I recommend this manuscript for publication in ACP, with minor improvements suggested

below.

P21622, L6: Doubling of absorption to account for internal mixing is too high. A factor of 1.5 is more appropriate (Bond et al., 2006).

P21624, L4: "…the likely reason for lower BC concentrations during the monsoon is that during the rainy season aerosols are scavenged close to source regions. As a result, less BC is transported to the remote mountains." It seems to me that concentration and deposition results from GEOS-Chem can be analyzed to give a definitive statement on this instead of resorting to an inconclusive statement using the word "likely."

P21625, L4: "Figure 2 shows that air concentrations are also lower during the monsoon season…" It is actually impossible to tell from Figure 2 because: 1) Figure 2 shows results of Jan, Apr, Jul, & Oct, not monsoon versus non-moonson seasons; and 2) the figure shows the whole globe, making it difficult to see the Himalayan region. It would be more useful if Figure 2 is zoomed into the Himalaya and Tibetan Plateau region (similar to Figure 1, but zoomed in even more). In addition to surface concentrations, it would also be more insightful if deposition rates are shown.

P21630, L5: "The Miao'ergou site atmospheric column, for example, receives about half as much BC as the Everest grid box, although the fraction deposited at that site is about a factor of five larger, resulting from lower precipitation at Miao'ergou than at Everest." Why would deposition rate at Mioa'ergou be higher if there its atmospheric column receives less BC and it has lower precipitation rate than at Everest?

P21635, L1: Please add discussion on biomass burning in 2001 in comparison to other years and what it means for contribution of this source of BC to the Third Pole. Was 2001 a typical, low, or high fire year in Africa? What is the range of variability in contribution of biomass burning emissions from Africa to the Third Pole?

Tables 2 & 3: I don't understand why these results are split into two tables with seasonal results shown for only two sites. Why not show seasonal results for all five sites (and remove Table 2 because the annual results are simply the average of the seasonal results)?

Reference Bond, T. C., G. Habib, and R. W. Bergstrom (2006), Limitations in the enhancement of visible light absorption due to mixing state, J. Geophys. Res., 111, D20211, doi:10.1029/2006JD007315.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 21615, 2010.