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Biogeosciences Discussions

Interactive comment on "Mega fire emissions in Siberia: potential supply of soluble iron from forests to the ocean" *by* A. Ito

Anonymous Referee #2

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This manuscript presents an novel investigation into the contribution of large wildfires in Siberia to the deposition of soluble iron to the ocean. An emissions inventory is developed by integrating a burned area dataset with combustion completeness and fuel consumption estimates derived using a biogeochecmical model. Emissions estimates and their injection height (derived from MISR observations) are incorporated into an atmospheric chemical transport model and the modelled CO evaluated against MOPITT observations. The contribution of soluble iron deposition to the ocean due to large forest fires is assessed in relation to the contribution resulting from dust sources.

The manuscript is well written and presented. In general, beside some minor comments below, the paper is suitable for publication in Biogeosciences.

General comments

Line 16 (p. 1488) Briefly summarise any validation results that might be relevant to the evaluation between the modelled and MOPITT CO.

Line 17-20 (p 1490) : My interpretation here is that the distinction between ground layer and aboveground forest fires is based on the duration of the active fire detections. Do aboveground fires burn for just 1 day and ground layer fires burn for 2-8 days or do ground layer fires burn for >8 days and aboveground 1-8 days ? What is the basis for these temporal durations?

Line 4 (p 1492) : How is smouldering and flaming combustion defined / identified in relation to the emission factors?

Line 1-4 (p 1493) : If the method for identifying stand replacing fires for temperate forests is consistent with the approach used by Potapov et al. for boreal forest fires this could be mentioned earlier in the manuscript (e.g. 1st paragraph p. 1490). If methods to identify stand replacing boreal forest and temperate forest fires are different it would be beneficial to briefly outline how stand replacing boreal forest fires are identified (around page 1490). This is particularly relevant given the high fuel consumption estimates from these fires.

Line 3 (p 1501) : The differences in the spatial variation between the modelled CO and MOPITT observations at different altitudes is believed to result from the use of MODIS fire pixel counts to characterise the temporal variation of fire emissions. Line 13 (p. 1490) indicates that only pixel counts from Terra are used which may not fully account for the diurnal variation of biomass burning. Work by Vermote et al. (2009) indicates that a diurnal fire cycle exists in central Russia with greater fire activity during the Aqua overpass. Would including the Aqua observations to characterise the daily variation in fire activity improve the temporal consistency of the simulated CO? There also appears to be a slight temporal offset between the model and observations in Figure 3.

Vermote, E., E. Ellicott, O. Dubovik, T. Lapyonok, M. Chin, L. Giglio, and G. J. Roberts (2009), An approach to estimate global biomass burning emissions of organic and

black carbon from MODIS fire radiative power, J. Geophys. Res., 114, D18205, doi:10.1029/2008JD011188

Technical comments

Line 28 (p. 1491) : replace "that consume more" with "larger"

Line 24 (p. 1493) : replace "Amounts of monthly burned areas" with "Monthly burned area estimates"

Line 22 (p. 1495) : Replace "rest" with "remaining"

Figure 5 : To improve interpretation of the lower plots ("Effect of intense fires") the x-axis scale could be reduced to 100 and 200 ppb.

Interactive comment on Biogeosciences Discuss., 8, 1483, 2011.