Atmos. Chem. Phys. Discuss., 11, C2519–C2521, 2011
www.atmos-chem-phys-discuss.net/11/C2519/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric impacts of the 2010 Russian wildfires: integrating modelling and measurements of the extreme air pollution episode in the Moscow megacity region" *by* I. B. Konovalov et al.

N. Chubarova

chubarova@imp.kiae.ru

Received and published: 29 April 2011

Comments on the paper Konovalov et al., "Atmospheric impacts of the 2010 Russian wildfires: integrating modeling and measurements of the extreme air pollution episode in the Moscow megacity region." by Natalia Chubarova (Moscow State University, Faculty of Geography)

This is a very interesting paper with the detailed description of the methods involved and careful and critical description of the input data, which is quite important for as-

sessing the quality of modeling in a complex situation of the emission in wildfire event conditions. However, I have some comments, which, I guess, might help to further improving the quality paper. 1. In the subsection 3.1 there is a description of how the photolysis rates are taken into account in the presence of high aerosol loading. It seems that the conversion factor in the equation (4) was obtained from calculations with too small single scattering albedo (SSA=0.8, as mentioned in the text). We have SSA estimates directly in Moscow via well known AERONET algorithm (Dubovik, King 2000) for the particular Moscow forest and peat bog fires during this and during the previous, very similar, fire event in 2002 (see, for example, Chubarova et al., 2009, Chubarova et al., 2011). It was shown that the SSA values for the both fire events are quite close and the aerosol from wildfires in Moscow is characterized by extremely high SSA values of 0.95-0.96 instead of SSA=0.8. These values correspond well with the estimates in other forest fires (see, for example, Eck et. Al., 1999, Dubovik et al., 2002). This is quite important for estimating the photolysis rates since the slightly absorbing aerosols can provide much higher scattered radiation which can dramatically increase the photolysis rates. For example, at ground the difference in NO2 photolysis rate change from 5.47 10-3 to 2.85 10-3 1/sek, at AOT500=1.4 and zenith angle =50 (TUV model calculations with 8 stream DISORT solver). In conditions of fires the optical thickness can reach 5 so the difference can be even more pronounced and it can increase with the height because of multiple scattering processes. This might significantly change the final results. I guess the discussion on this point should be added in the text. Also I don't clearly understand the Y axis in Fig 2. Is the gamma a conversion factor there or an effective optical depth as it is shown on the graph? 2. In the section 4.1 the authors tried to define the emission from peat fires. I think that the territories of peat land near Moscow are mainly covered by forest. So I assume that peat fires almost always should be accompanied by forest fires. It would be nice if a discussion on this point is added in the text. 3. Minor comments:

You mentioned (p.12168) with the reference to Fig. 9 that there was an absolute temperature maximum for the 100 year period at the same site. You refer to the data of the Meteorological Observatory of Moscow State University but this can not be possible. The Observatory was organized only in 1954 (see the web page http://momsu.ru/english.html).

In the section 5 (p. 12169) backward trajectories have shown the air transport from south east (not west) direction.

References: 1. Dubovik, O., King M. D.: A flexible inversion algorithm for retrieval of aerosol optical properties from Sun and sky radiance measurements. J. of Geophys. Res., 105, D16, 20673-20696, 2000. 2. Dubovik, O., Holben B. N., Eck T. F., Smirnov A., Kaufman Y. J., King M. D., Tanre D., Slutsker I.: Variability of absorption and optical properties of key aerosol types observed in worldwide locations. J. of Atm. Sciences, 59, 590-608, 2002. 3. Eck, T.F., B.N. Holben, J.S. Reid, N.T. O'Neill, J.S. Schafer, O. Dubovik, A. Smirnov, M.A. Yamasoe, and P. Artaxo (2003) High aerosol optical depth biomass burning events: A comparison of optical properties for different source regions, Geophys. Res. Lett., 30(20), 2035, doi:10.1029/2003GL017861. 4. Chubarova N. Y., Prilepsky N. G., Rublev A. N., Riebau A. R.: A Mega-Fire Event in Central Russia: Fire Weather, Radiative, and Optical Properties of the Atmosphere, and Consequences for Subboreal Forest Plants. In Developments in Environmental Science, Volume 8 A. Bytnerowicz, M. Arbaugh, A. Riebau and C. Andersen (Eds). Elsevier B.V. 249-267, 2009. 5. Chubarova N., Smirnov ĐŘ, Holben B.N. Aerosol properties in Moscow according to 10 years of AERONET measurements at the Meteorological Observatory of Moscow State University. “Geography, Environment, Sustainability”, 2011, in print.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 12141, 2011.