Modelling the radiative effects of smoke aerosols on carbon fluxes in the Amazon region

Demerval S. Moreira[1,2], Karla M. Longo[3,a], Saulo R. Freitas[3,a], Marcia A. Yamasoe[4], Lina M. Mercado[5,6], Nilton E. Rosário[7], Emauel Gloor[8], Rosane S. M. Viana[9], John B. Miller[10], Luciana V. Gatti[11,12], Kenia T. Wiedemann[13], Lucas K. G. Domingues[11,12], and Caio C. S. Correia[11,12]

[1]Universidade Estadual Paulista (Unesp), Faculdade de Ciências, Bauru, SP, Brazil.
[2]Centro de Meteorologia de Bauru (IPMet), Bauru, SP, Brazil.
[3]Centro de Previsão de Tempo e Estudos Climáticos, Instituto Nacional de Pesquisas Espaciais (INPE), Cachoeira Paulista, SP, Brazil.
[4]Departamento de Ciências Atmosféricas do Institudo de Astronomia, Geofísica e Ciências Atmosféricas, Universidade de *São Paulo* (USP), *São Paulo*, SP, Brazil.
[5]Geography, College of Life and Environmental Sciences, University of Exeter, Exeter, UK.
[6]Centre for Ecology and Hydrology (CEH), Wallingford, UK.
[7]Universidade Federal de *São Paulo* (UNIFESP), Campus Diadema, Diadema, SP, Brasil.
[8]School of Geography, University of Leeds, Woodhouse Lane, Leeds, UK.
[9]Departamento de Matemática, Universidade Federal de Viçosa (UFV), Viçosa, MG, Brazil.
[10]Global Monitoring Division, Earth System Research Laboratory, National Oceanic and Atmospheric Administration (NOAA), Boulder, Colorado 80305, USA.
[11]Centro de Ciências do Sistema Terrestre, Instituto Nacional de Pesquisas Espaciais (INPE), São José dos Campos, SP, Brazil.
[12]Instituto de Pesquisas Energéticas e Nucleares (IPEN) – Comissão Nacional de Energia Nuclear (CNEN), São Paulo, Brazil.
[13]Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, AZ, USA.
[a]Now at Universities Space Research Association/Goddard Earth Sciences Technology and Research (USRA/GESTAR) at Global Modeling and Assimilation Office, NASA Goddard Space Flight Center, Greenbelt, MD, USA.

Correspondence to: Demerval S. Moreira (demerval@fc.unesp.br)

Supplementary Document

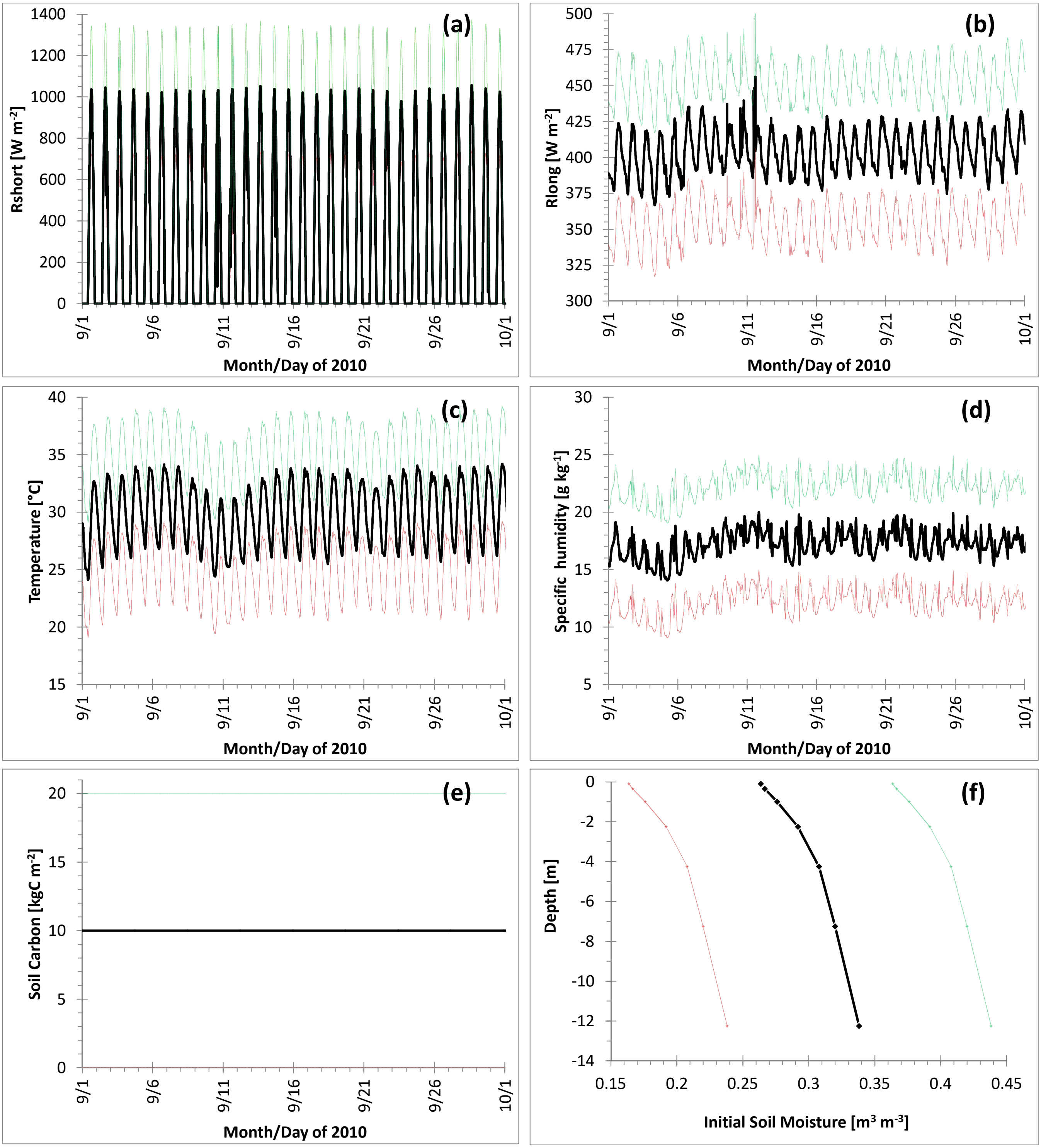

Figure S.1. Input data used to run the JULES offline. Black curve represents the reference value (x = 0 in Figure S.2)

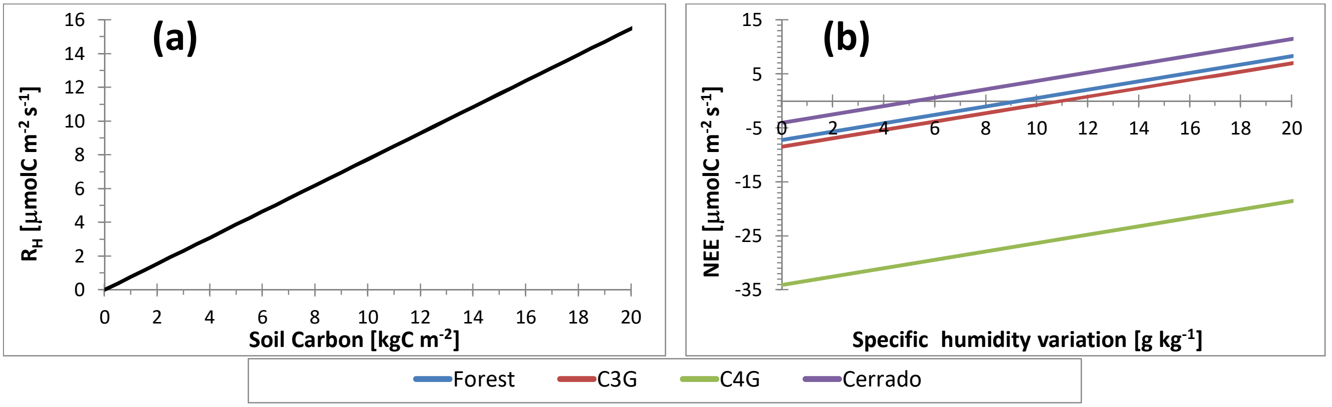

Figure S.2. Sensitivity test using JULES offline, running for a month (September 2010) and using the input data values shown in Figure S.1

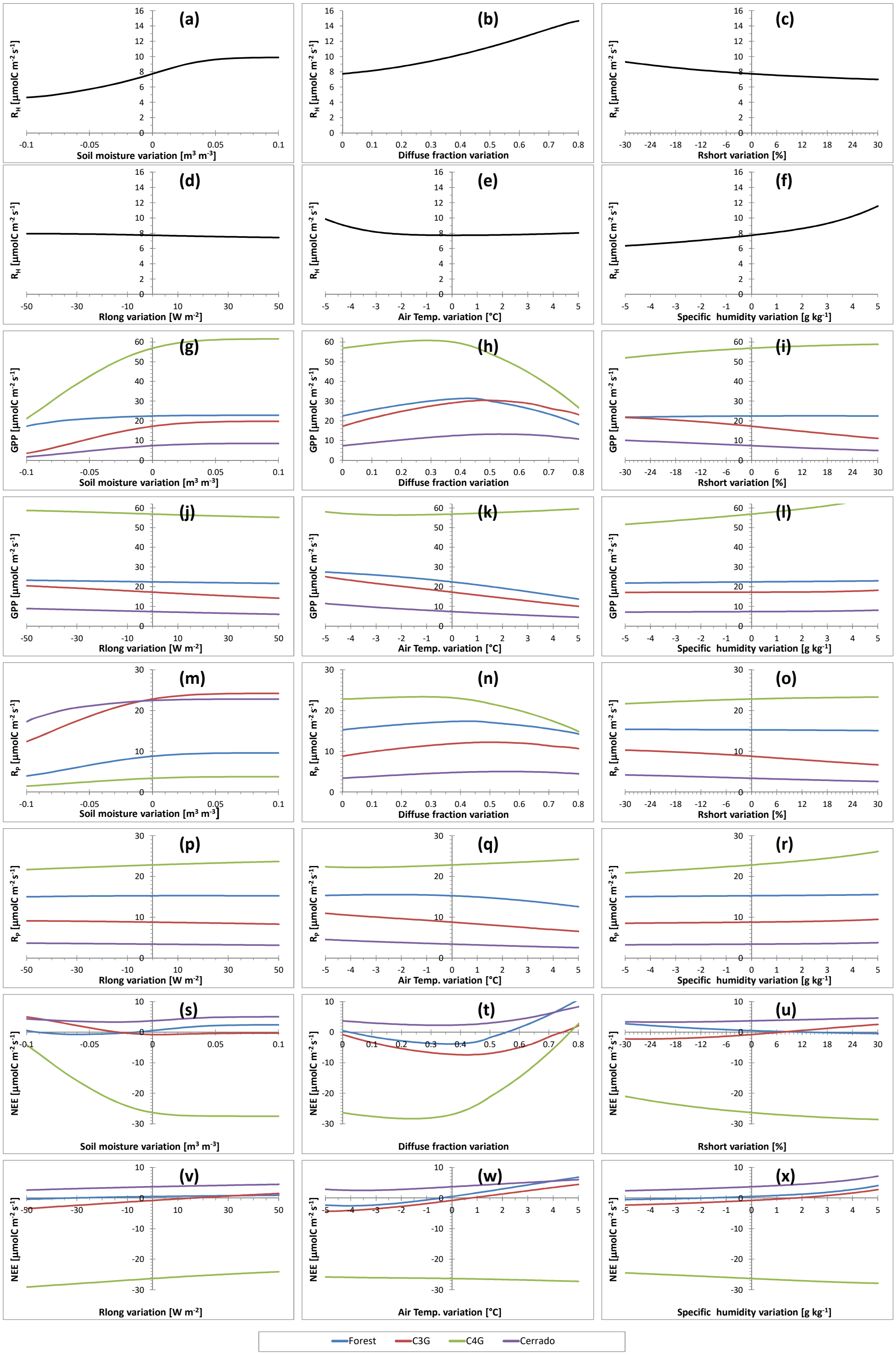

Figure S.3. Similar to Figure S.2, but decreasing and increasing the original value shown in Figure S.1.

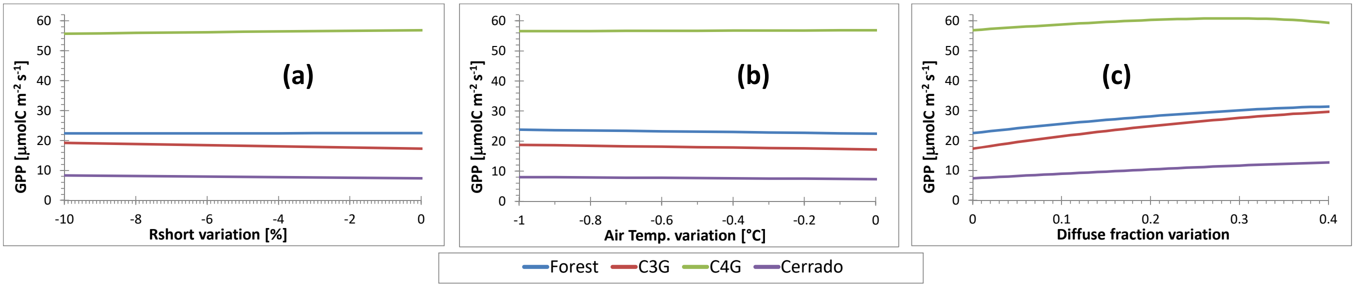

Figure S.4. Similar to Figure S.3, but with a zoom on the X-axis to better analyze the effects found in the simulations.

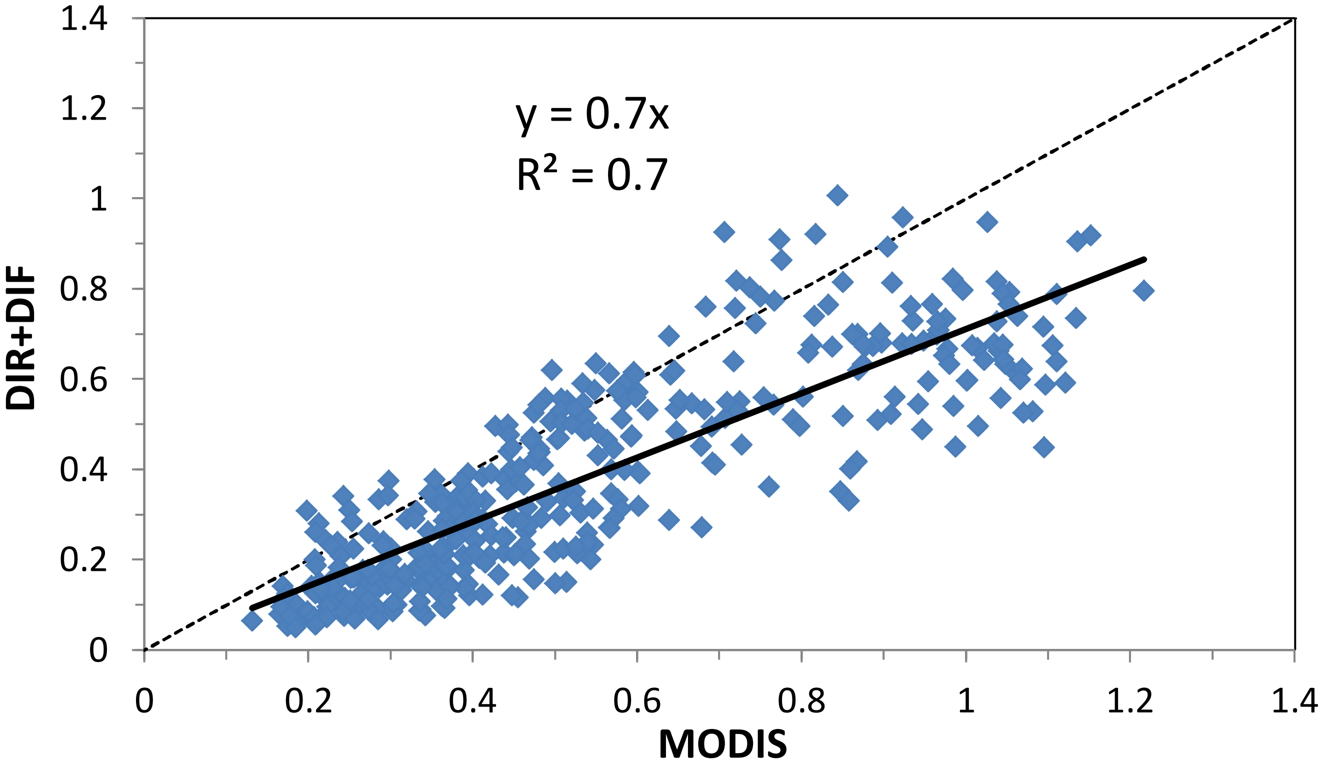

Figure S.5. Scatter plot of AOD at 550 nm from the model according DIR+DIF simulation and MODIS retrievals.

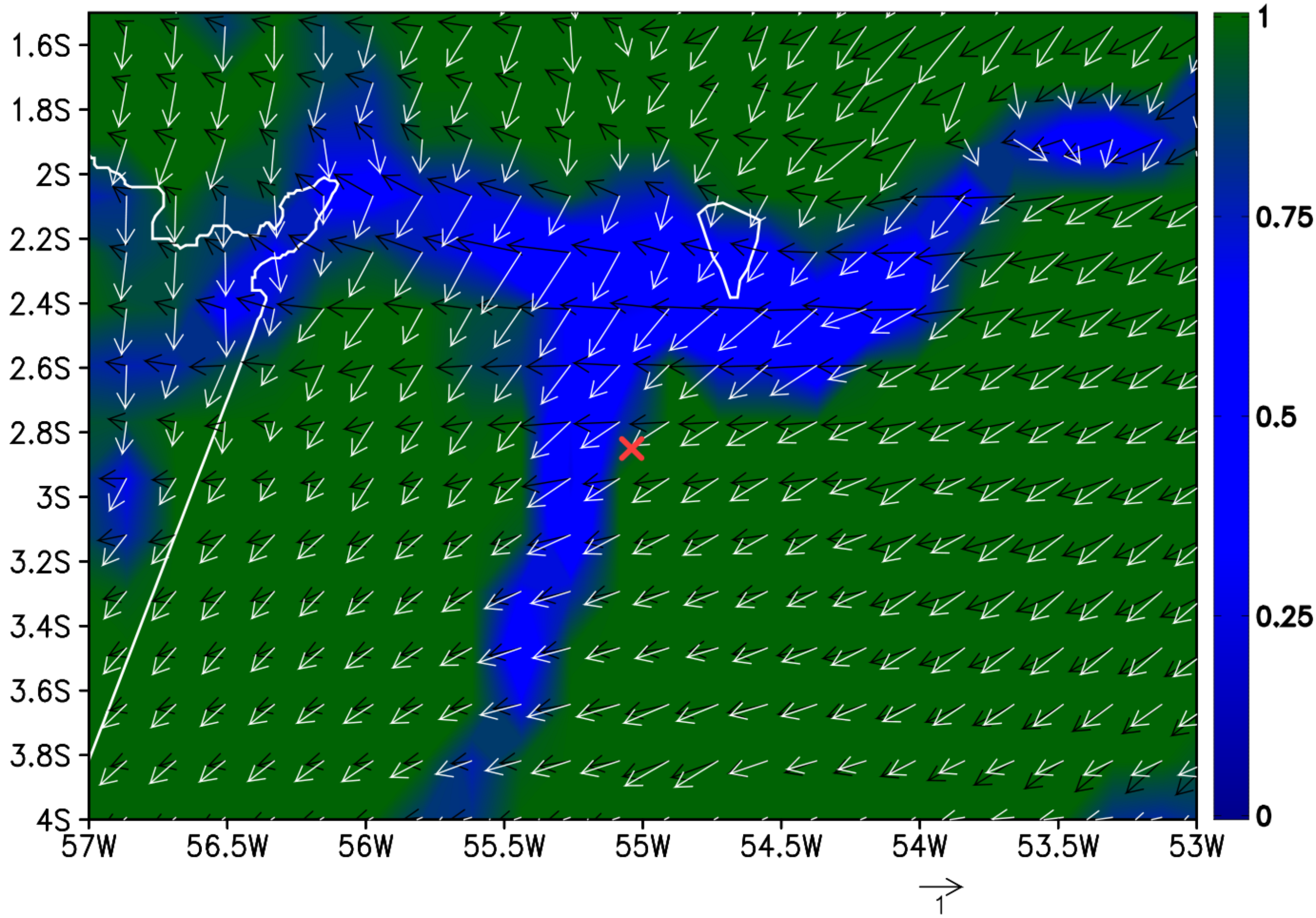

Figure S.6. Monthly mean wind at 10 meter at 00 UTC (black arrow), and 10 UTC (white arrow). The blue shaded is the Amazon and Tapajos rivers and the white contour shows the states border. The location of the km 67 tower is indicated with the red cross.

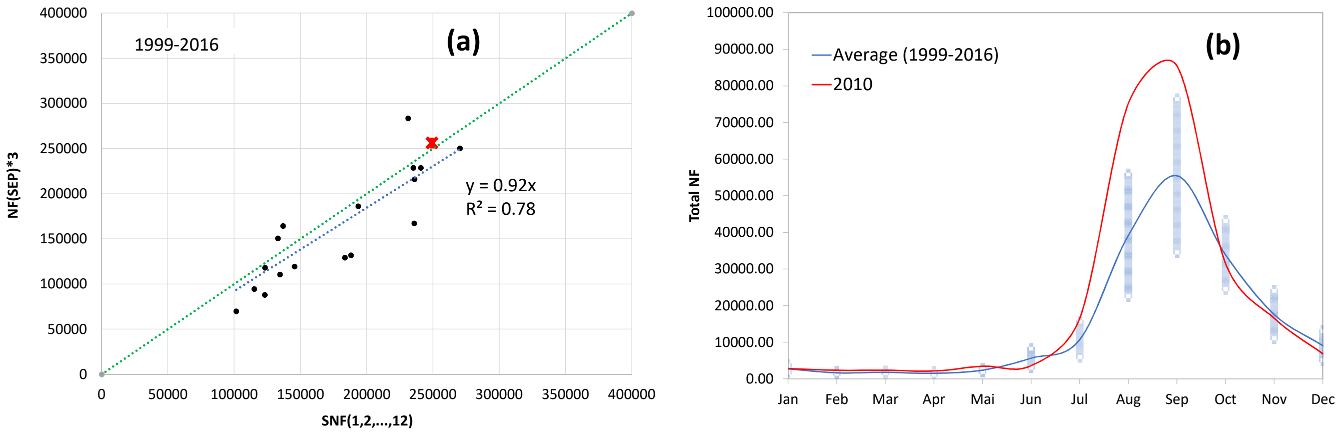

Figure S.7. a) Scatter plot of the number of fires detected in Brazil from 1999 to 2016 in September multiplied by 3 versus the total number considering the detection from January to December. The red cross is the year 2010. b) The mean annual cycle of the total number of fires for years 1999-2016 and respective standard deviation (blue) and 2010 only (red). Fire counting using NOAA-12 and AQUA MODIS as reference in 1999-2001 and 2002-2016, respectively. Data source: https://queimadas.dgi.inpe.br/queimadas.

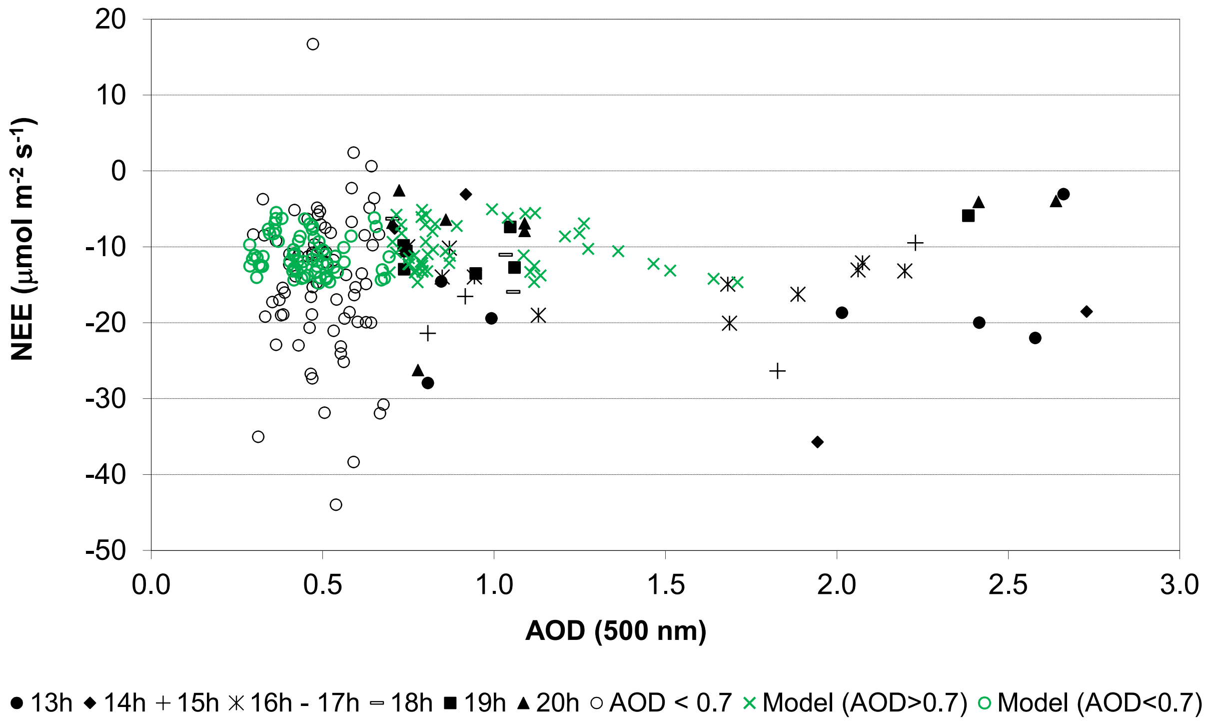

Figure S.8. NEE (µmolC $\mathrm{m^{-2}\,s^{-1}}$) versus AOD at 550 nm wavelength from the DIR+DIF experiment at the gridbox nearest to the Jaru site location (green) and measurements from Yamasoe at al. (2006) at the same location for 19 September to 15 November of 2002 (black).