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Interannual variability of tropospheric aerosols and gases: exploring biomass burning emissions as a potential driver

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We perform experiments with the nudged version of the G-PUCCINI chemistry-climate model (GISS GCM with aerosol and gas chemistry) in order to examine the role of wildfires in driving the interannual variability of global tropospheric composition. For this purpose, we force the model with GFED3 biomass burning emissions, which cover the period of our study (1997-2009), and anthropogenic emissions that have been produced in support of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment report (AR5). A variety of observational composition data (surface, satellite) have been used in order to evaluate the model. Also, the modeled aerosol and gas emissions are compared to the output from a version of the model with interactive (meteorology-dependent) fires. To infer conclusions about the drivers of interannual variability, we compare results from an experimental run with biomass burning emissions fixed to climatological values, with results from the 'BASE' run, in which biomass burning emissions are interannually varying. We reach to conclusions about the different ways in which wildfires can drive the interannual variability of global aerosols and gases, a topic that has not been examined in detail in past studies.