



Supplement of

Biogenic isoprene emissions, dry deposition velocity, and surface ozone concentration during summer droughts, heatwaves, and normal conditions in southwestern Europe

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Figure S1. Wilting point parameter $[m^3/m^3]$ from Chen and Dudhia (2001) gridded over the Med-CORDEX domain with the USGS soil type map (STATSGO-FAO product).



Figure S2. Summer mean (JJA) drought (PLA_{SD}) and heatwave indicators (PLA_{T2m}) for 2012, 2013 and 2014.



Figure S3. Mean Δ LAI [m^2/m^2] between summer (JJA) 2012 and 2014 (upper left), relative difference of LAI (lower left) and time series of LAI spatially averaged over the Southwestern Europe (lower right).



Figure S4. Validation scores of the daily maximum surface $O_3 \ [\mu g/m^3]$ for summer (JJA) 2012, 2013 and 2014 ("Reference" simulations), with the European surface network observations AQ e-Reporting. Left column: mean bias. Right column: temporal correlation (R pearson). The number of stations taken into account is 167, 188 and 207 respectively for summer 2012, 2013 and 2014



Figure S5. Summer mean bias (JJA) of the daily maximum 2m temperature between observations (E-OBS) and simulations (CHIMERE) for 2012, 2013 and 2014.



Figure S6. Daily mean 2m temperature, shortwave radiation and soil wetness simulated by the WRF model during summer 2012 over the Balkans (upper panel), Pô Valley (middle) and Central Spain (lower).



Figure S7. Daily mean chemistry regime parameter [α] averaged over the summer 2012, 2013 and 2014 ("Reference" simulations). α calculates the ratio of the reaction rate of RO_2 radicals with NO (high-NOx regime) with respect to the sum of reaction rates of the reactions with HO_2 and RO_2 (low-NOx regime). It gives a relative indication of low- NO_x (low α , about 0.5) and high- NO_x (high α , about 0.9) regime areas that are detailed in Zhang et al. (2013). More information about the calculation method of α is provided on the online documentation (https://www.lmd.polytechnique.fr/chimere/).



Figure S8. Daily mean O_3 surface concentration $[\mu g/m^3]$ during summer 2012, spatially averaged over the Balkans (upper panel) and Central Spain (lower panel) from the EEA observations and the different CHIMERE experiments.



Figure S9. Simulated weather conditions (2m temperature, shortwave radiation, cloud fraction and soil wetness) by the WRF model over the Southwestern Europe, clustered by identified extreme weather events (from the RegIPSL model). The number of days is in parentheses. The analyzed period is summer 2012, 2013 and 2014, covering a total number of 276 days.



Figure S10. Land cover fraction of cropland, grassland and forests over the Southwestern Europe from USGS (left column) and MODIS MCD12 product (right column).



Figure S11. Daily HCHO total column [*molecules*/ cm^2] during summer 2012 observed by OMI (OMHCHOd level 3 product) and simulated by CHIMERE, averaged over the Balkans (upper left panel), Pô Valley (upper right panel) and Central Spain (lower panel). A moving average window of 3 days is applied on observations and only days with at least 30% of data over the spatial cover are kept. The number of observations (OMI pixels) is indicated below each panel.