



Supplement of

Direct estimates of biomass burning \mathbf{NO}_x emissions and lifetimes using daily observations from TROPOMI

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Figure S1 Flowchart that illustrates the processes to select candidate fires.



Figure S2 Illustration of the processes that identify and filter out nearby plumes.



Figure S3 Illustration of two fire plumes with the absolute rotation biases (a) less and (b) greater than 30°. We define the rotation biases as the angle of the two red lines. The right plume is not selected because it does not align with the wind direction (i.e., rotation bias = -44°)



Figure S4 Maps of TROPOMI (left) and OMI (right) tropospheric NO₂ over Australia on October 21, 2018. The figures are acquired from TEMIS: https://www.temis.nl/airpollution/no2.php. The red box labels the location of the fire episode shown in Figure 2.



Figure S5 Same as Figure 3(d) but for (a) grassland, (b) savanna and (c) shrubland separately.



Figure S6 Same as Figure 3 but using original TROPOMI NO₂ data without updating the *a priori* profile.



Figure S7 Same as Figure 5 but using original TROPOMI NO₂ data without updating the *a priori* profile.



Figure S8 Same as Fig. 5 but for different TROPOMI NO2 column density levels.



Figure S9 Scatter plot between MODIS and VIIRS FRP for the selected fire events. The line is fitted with ordinary least squares, and the shadow represents 95% CI.



Figure S10 Same as Fig. 3 but for VIIRS FRP.