# Supplementary Information - Short lifetimes of organic nitrates in a sub-urban temperate forest indicate efficient assimilation of reactive nitrogen by the biosphere

Simone T. Andersen[1], Rolf Sander[1], Patrick Dewald[1], Laura Wüst[1], Tobias Seubert[1], Gunther N. T. E. Türk[1], Jan Schuladen[1], Max R. McGillen[2], Chaoyang Xue[2], Abdelwahid Mellouki[2,3], Alexandre Kukui[4], Vincent Michoud[5], Manuela Cirtog[5], Mathieu Cazaunau[5], Astrid Bauville[5], Hichem Bouzidi[5], Paola Formenti[5], Cyrielle Denjean[6], Jean-Claude Etienne[6], Olivier Garrouste[6], Christopher Cantrell[7], Jos Lelieveld[1], John N. Crowley[1]

[1]Atmospheric Chemistry Department, Max-Planck-Institute for Chemistry, 55128-Mainz, Germany

[2]Institut de Combustion, Aérothermique, Réactivité Environnement (ICARE), CNRS, 1C Avenue de la Recherche Scientifique, CEDEX 2, 45071 Orléans, France

[3]University Mohammed VI Polytechnic (UM6P), Lot 660, Hay Moulay Rachid Ben Guerir, 43150, Morocco

[4]Laboratoire de Physique et Chimie de l'Environnement et de l'Espace (LPC2E), CNRS Orléans, France

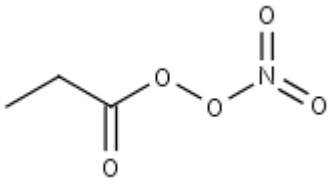
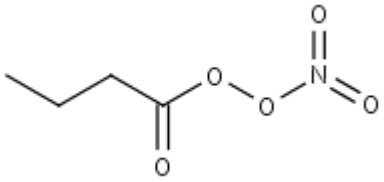
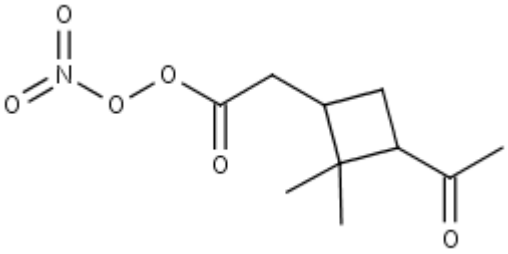
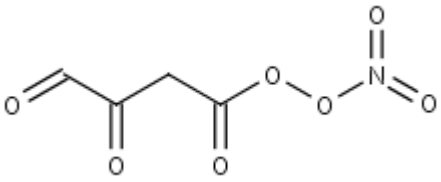
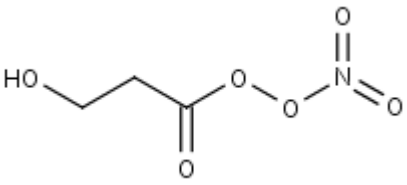
[5]Université Paris Cité and Univ Paris Est Creteil, CNRS, LISA, F-75013 Paris, France

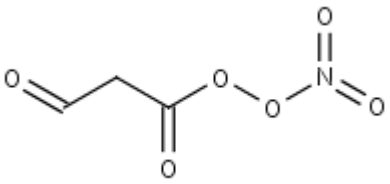
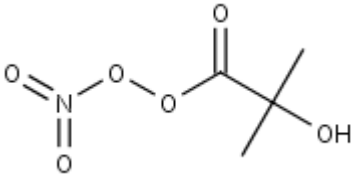
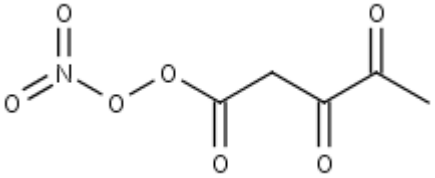
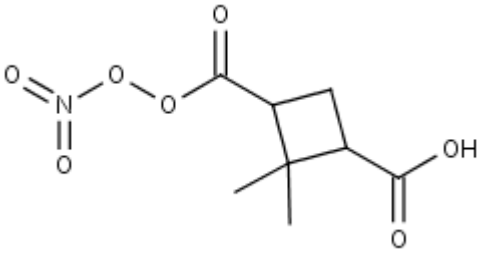
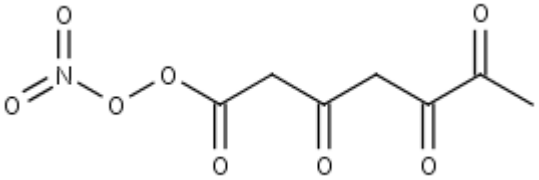
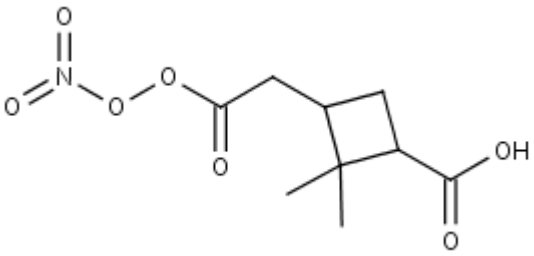
[6]CNRM, Universite de Toulouse, Meteo-France, CNRS, Toulouse, France

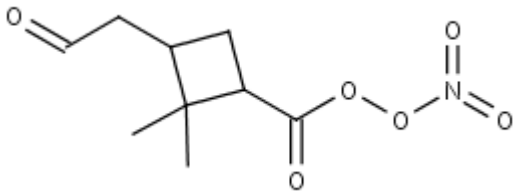
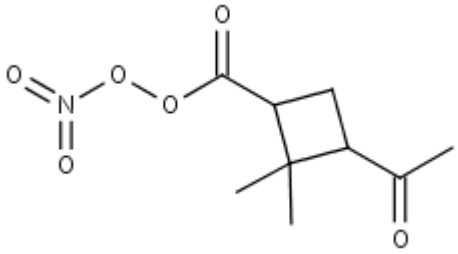
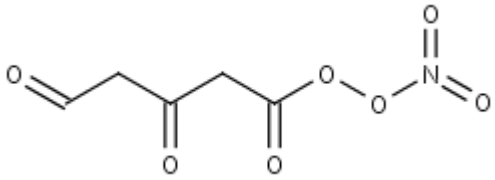
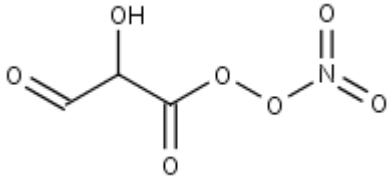
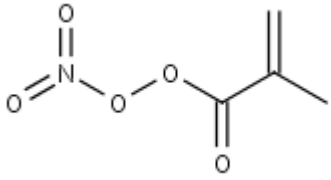
[7]Univ Paris Est Creteil and Université de Paris Cité, CNRS, LISA, F-94010 Créteil, France

*Correspondence to*: Simone T. Andersen (simone.andersen@mpic.de) and John N. Crowley (john.crowley@mpic.de)

**Table S1: List of PANs included in Figure 8 under "Other PANs" from the MCM coming from the degradation of acetaldehyde, isoprene, propane, n-butane, isobutane, α-pinene, β-pinene, and limonene.**

| MCM Name | Structure |
|---|---|
| PPN |  |
| PBN |  |
| C10PAN2 |  |
| C312COPAN |  |
| C3PAN1 |  |

| | |
|---|---|
| C3PAN2 |  |
| C4PAN5 |  |
| C5PAN9 |  |
| C721PAN |  |
| C7PAN3 |  |
| C811PAN |  |

| | |
|---|---|
| C89PAN |  |
| C9PAN2 |  |
| CHOC3COPAN |  |
| HCOCOHPAN |  |
| MPAN |  |

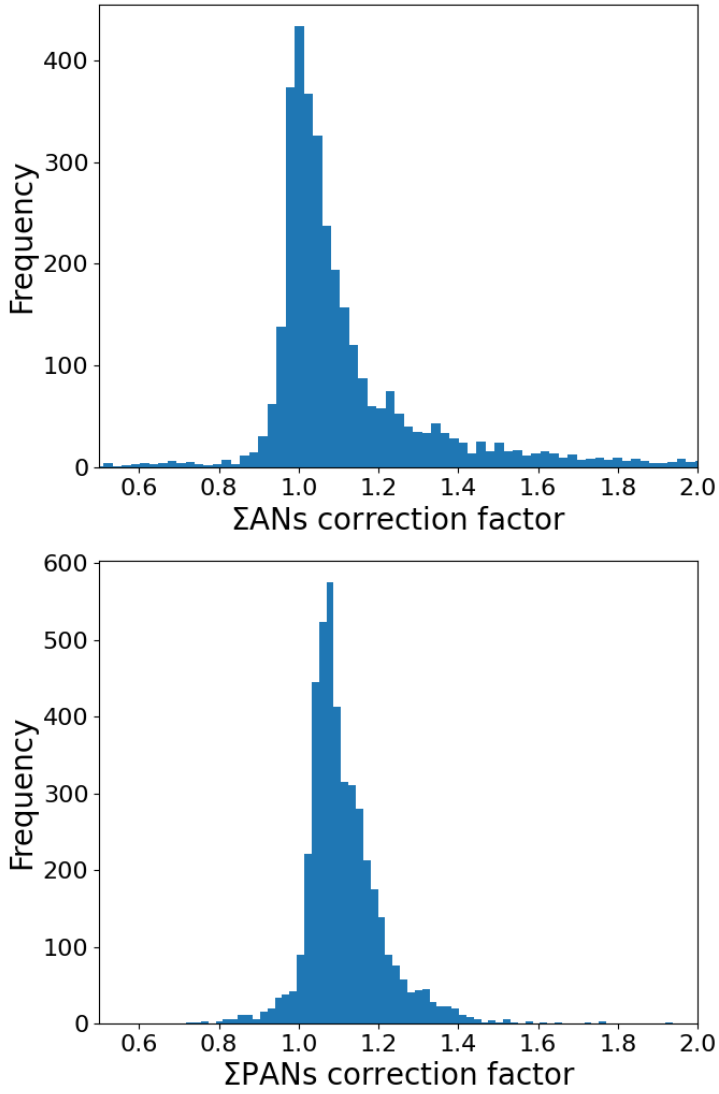



Figure S1: Distribution of correction factors for the ΣANs (top) and ΣPANs (bottom) measurements.

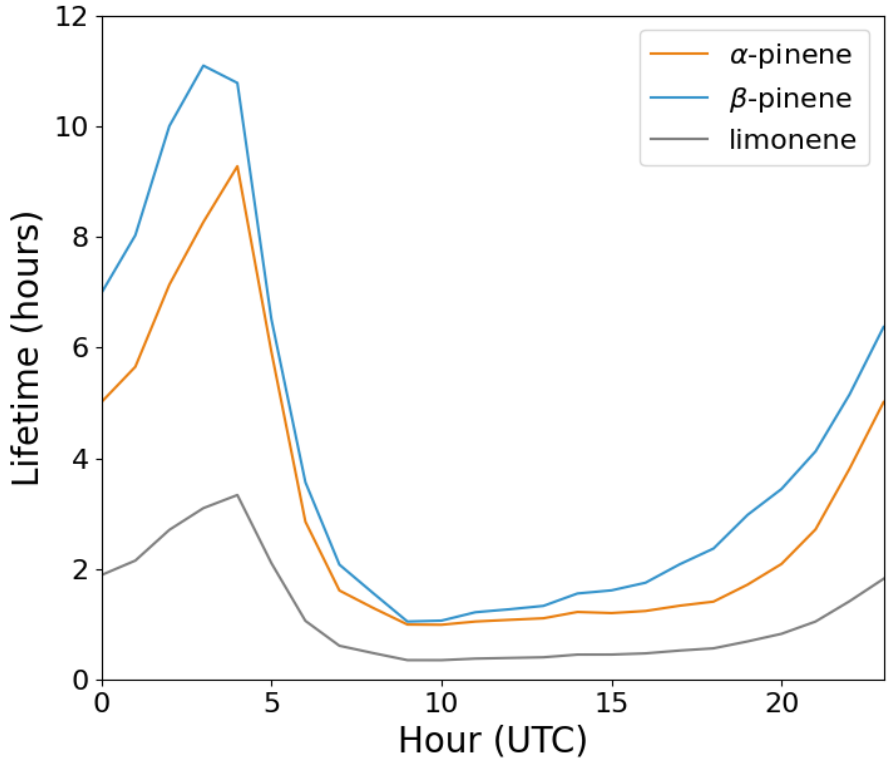



Figure S2: The derived diel profile of the lifetime of α-pinene, β-pinene, and limonene during the ACROSS campaign when taking reactions with OH, $O_3$, and $NO_3$ into account using the rate coefficients in Table 1.

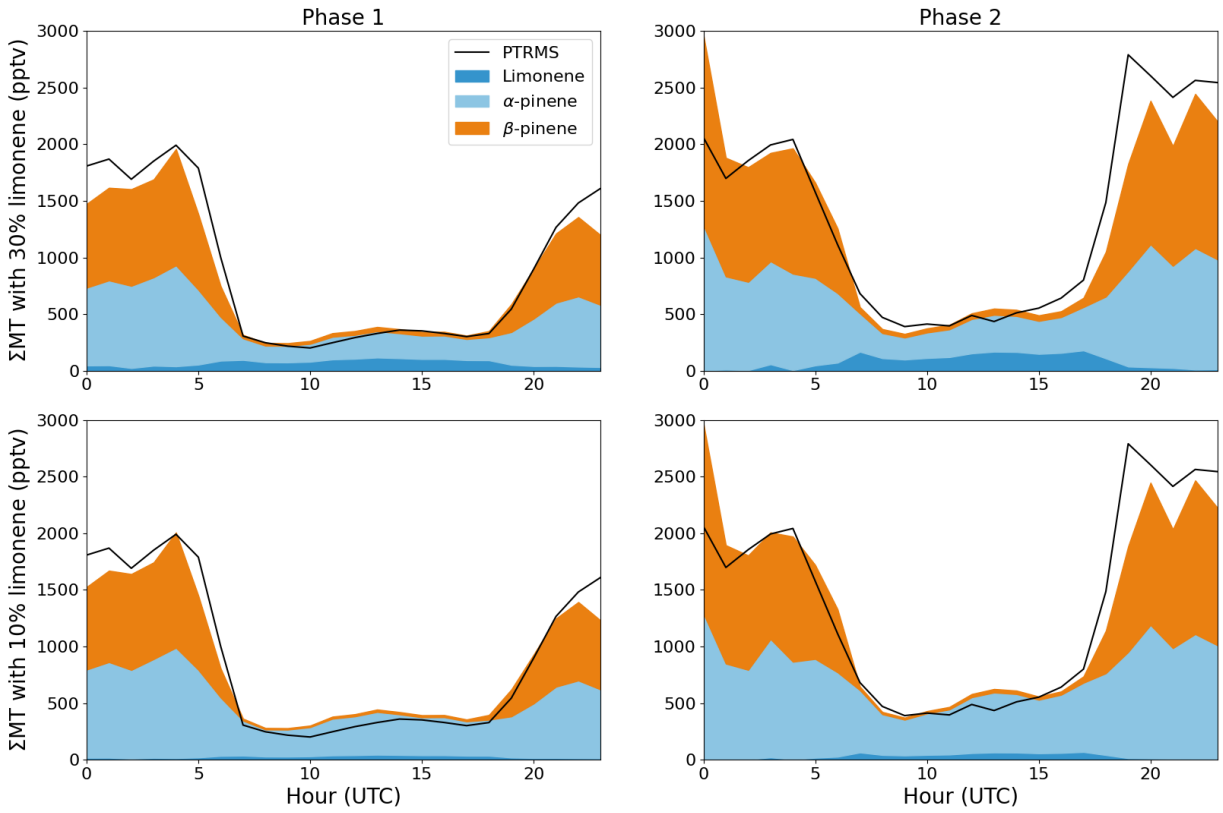



Figure S3: Average diel profiles for the measured total monoterpenes by PTRMS for phase 1 (left) and 2 (right) together with the derived monoterpenes mixtures of 10% β-pinene, 60% α-pinene, and 30% limonene (top) and 5% β-pinene, 85% α-pinene, and 10% limonene (bottom).

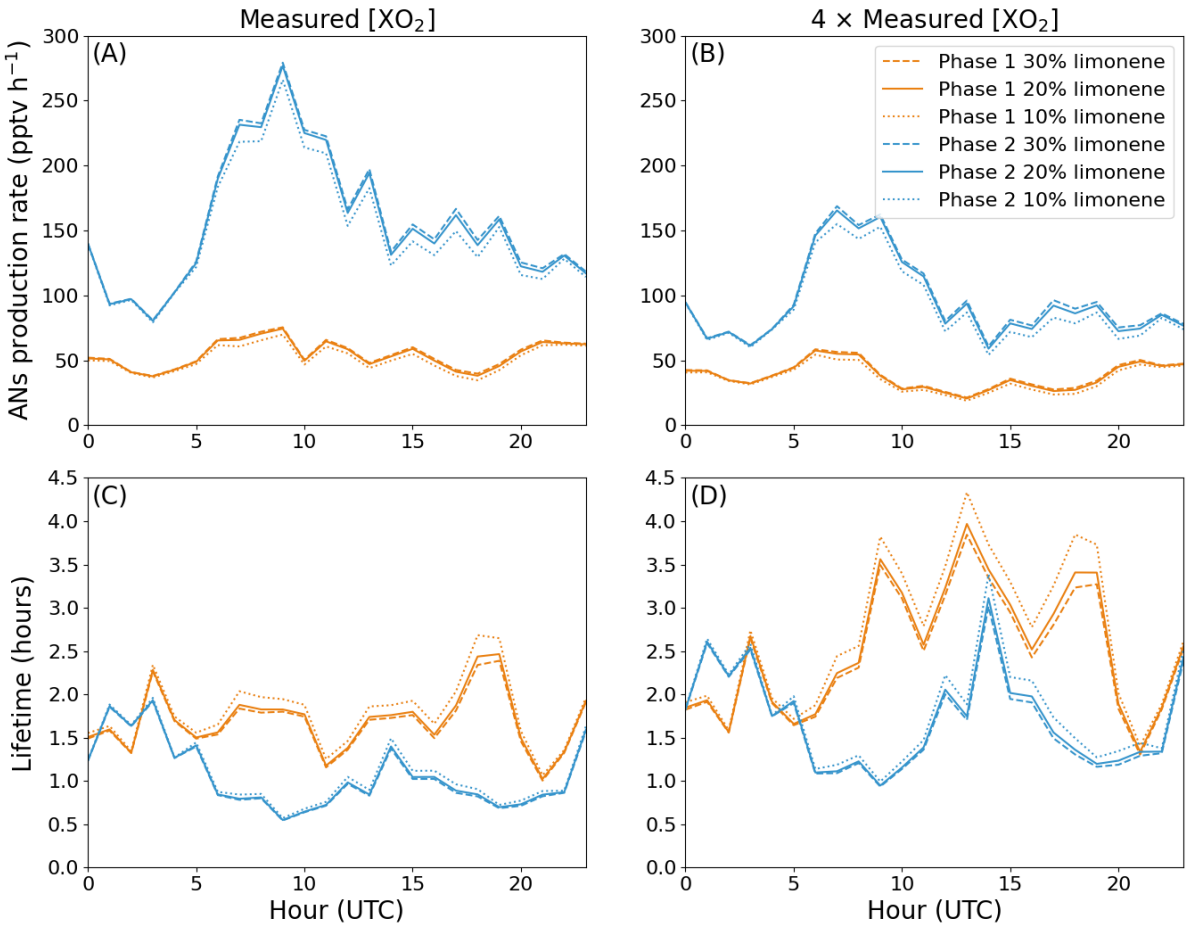



Figure S4: Average diel profiles of the total ANs production rate (top) and lifetime for phase 1 (orange) and 2 (blue) for the three different monoterpene mixtures (dotted, solid, and dashed lines) using the measured [$XO_2$] (left) and 4 × [$XO_2$] (right).

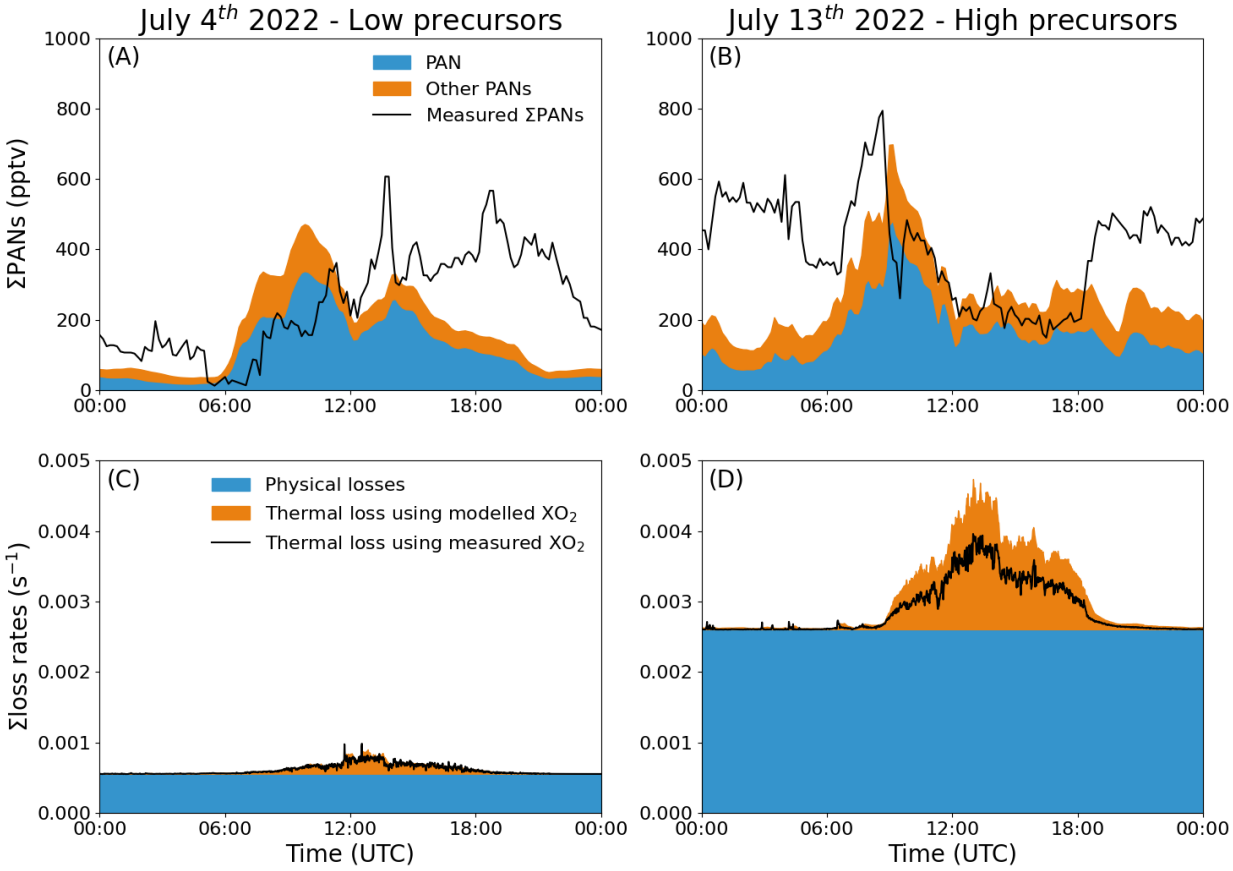



Figure S5: The measured and modelled when optimizing for daytime agreement ∑PANs is plotted for two individual days; one with low precursors (A) and one with high precursors (B). The optimised physical loss for each day is shown in panel C and D together with the thermal decomposition when taking recombination into account using both the measured and modelled mixing ratio of $XO_2$.

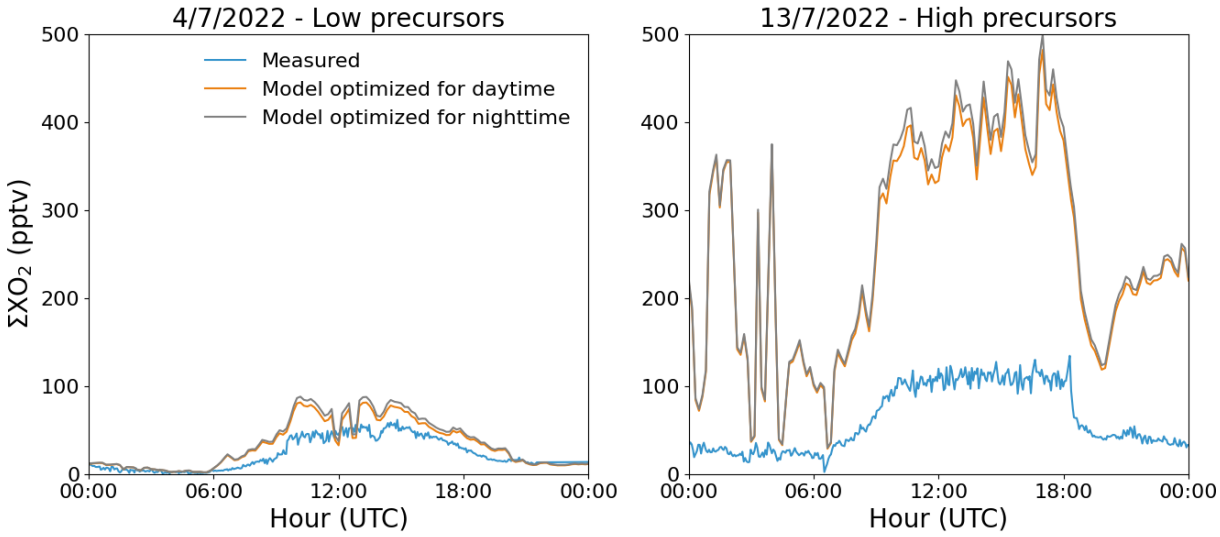



Figure S6: Measured and modelled $XO_2$ for a low and high precursor (of PANs) day.