2.001 Photochemical formation of C1-C5 alkyl nitrates in suburban Hong Kong and over South China Sea.

Early Career Scientist

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Abstract:

Alkyl nitrates ($RONO_2$) are important reservoirs of atmospheric nitrogen, regulating nitrogen cycling and ozone (O_3) formation. In this study, we found that propane and *n*-butane were significantly ($p<0.05$) lower at the offshore site (WSI) in Hong Kong, where C_3-C_4 $RONO_2$ were comparable ($p>0.05$) to the suburban site (TC). Stronger oxidative capacity at WSI led to more efficient $RONO_2$ formation. Relative incremental reactivity (RIR) was for the first time used to evaluate $RONO_2$-precursors relationships. In contrast to consistently volatile organic compounds (VOCs)-limited regime at TC, $RONO_2$ formation at WSI switched from VOCs-limited regime during O_3 episodes to VOCs and nitrogen oxides (NO_x) co-limited regime during non-episodes. Furthermore, unlike the predominant contributions of parent hydrocarbons to C_4-C_5 $RONO_2$, the productions of C_1-C_3 $RONO_2$ were more sensitive to other VOCs like aromatics and carbonyls, which accounted for ~40-90% of the productions of C_1-C_3 alkylperoxy (RO_2) and alkoxy radicals (RO) at both sites. This resulted from the decomposition of larger RO_2/RO and the change of OH abundance under the photochemistry of other VOCs. This study advanced our understandings on the photochemical formation of $RONO_2$, particularly the relationships between $RONO_2$ and their precursors which were not confined to the parent hydrocarbons.