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Enhancement of HONO production from HNO3 photolysis on surface by organic matters

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Some recent field measurements made on the mountaintop sites have shown significant daytime HONO production without simultaneous increase in NOx concentrations, resulting in a HONO-to-NOx ratio maximum during the day. This suggests a strong daytime HONO source without significant NOx production. Our previous laboratory results show that HNO3 photolysis on glass surfaces produces significant amount of HONO and NOx, with a HONO-to-NOx ratio of about 1:2. While the pure surface HNO3 photolysis mechanism may explain the observed high daytime HONO production, it could not explain the high daytime HONO-to-NOx ratio. Considering that these measurements were performed several meters above ground/canopy level, we speculate that organic matters play a role in the photolysis process, resulting an enhancement of HONO production. Preliminary laboratory experiments confirms that model organic compounds, including humic acid, significantly affect the production and product distribution of HONO and NOx from HNO3 photolysis on glass surfaces, i.e., enhance HONO production but suppress NOx production. This implies that HNO3 photolysis on ground surfaces, at the presence of natural organic compounds, contributes to the observed higher daytime HONO-to-NOx ratio.