

Weekly Report

CISESS
Cooperative Research Program Division (CoRP)
STAR/NESDIS
National Oceanic and Atmospheric Administration (NOAA)

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Date of Submission: 5/14/2021

Publications

Lightning and Oxidant Study published in *Science*: CISESS Scientist Xinrong Ren from Air Resources Laboratory (ARL) and CISESS Consortium Scientist Eric Bruning from Texas Tech University are co-authors of a new study published in today's (May 14th) issue of *Science*. While lightning production of nitric oxide (NO) and its link to ozone (O_3) is well known, this study demonstrated that lightning also directly generates the hydroxyl radical (OH) and the hydroperoxyl radical (HO_2), two important oxidants that contribute to the atmosphere's ability to cleanse itself. While these products, collectively known as HOx, were expected products of lightning, it was believed that their lifetimes were milliseconds so that they did not alter the atmosphere's oxidative capacity. However, airborne instruments in anvil clouds correlated with lightning map arrays measured these species at concentrations orders of magnitude greater than any previous atmospheric observation (see figure). Given the frequency of lightning storms, the researchers estimate that 2 to 16% of global atmospheric OH oxidation is created under these conditions.

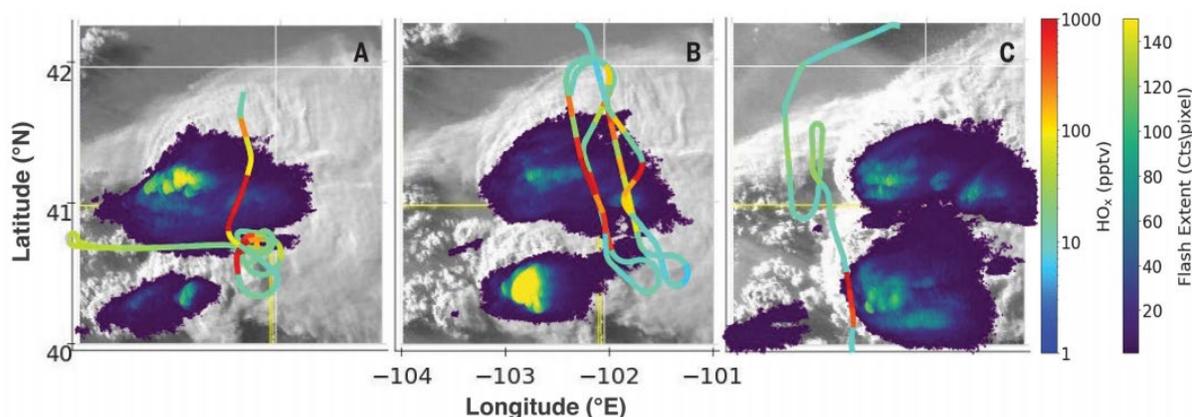


Figure: HOx abundances (indicated by colors and logarithmic scale) along the DC-8 flight track overlaid on LMA flash extent (44) and satellite anvil images during the flight on 22 to 23 June 2012 for three 1-hour periods: (A) 23:30 to 00:30 UTC; (B) 00:30 to 01:30 UTC; and (C) 01:30 to 02:30 UTC. The flash extent locations are shown for the entire hour as the storms moved from

west to east. The storm cores are region of the most intense flash extent. Cts/pixel, counts per pixel (each pixel is about 1 km³).

Brune, W. H.; P. J. McFarland, **E. Bruning**, S. Waugh, D. MacGorman, D. O. Miller, J. M. Jenkins, **X. Ren**, J. Mao and J. Peischl, 2021: Extreme oxidant amounts produced by lightning in storm clouds. *Science*, **372**, 711–715, <https://dx.doi.org/10.1126/science.abg0492>.

(POC: X. Ren, xinrong.ren@noaa.gov; Funding: ARL)