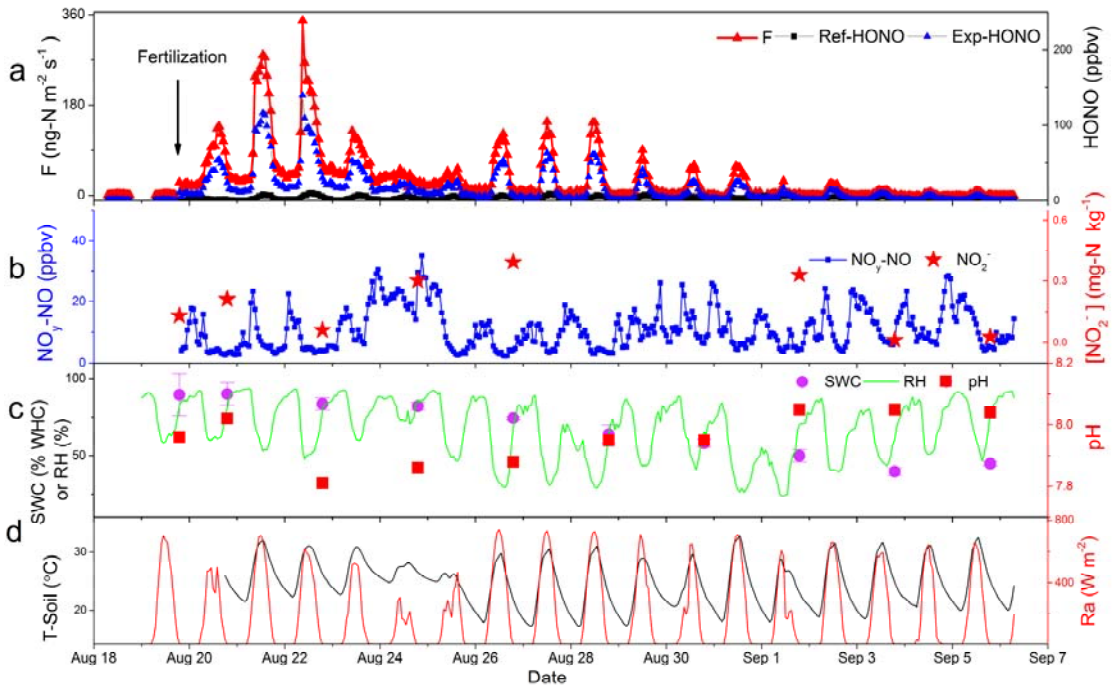
HONO emission from agricultural fields in the NCP

Chaoyang Xue, Chenglong Zhang, Zhuobiao Ma, Pengfei Liu, Yujing Mu

Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences,
Beijing, 100085, China

Atmospheric HONO is an important source for OH radicals that initiate photochemical reactions leading to formation of O_3 and secondary aerosols. The unusually high HONO concentrations observed in daytime suggest strong unknown HONO sources at ground surfaces and soil emission has been proposed to be the potential HONO source. Here, we present the direct evidence and essential reason for the extremely high HONO emission from a typical agricultural field in the North China Plain (NCP). We find the peak HONO emission of 348 ng-N m^{-2} s^{-1} at noontime is two orders of magnitude greater than those measured from fields. Rather than the existing mechanisms proposed for HONO emissions from soils, a mechanism relating to ammonium nitrification and the loss of soil water was found to be responsible for HONO emission from the field.



The time series of HONO concentrations in the experimental chamber (a, Exp-HONO, the triangle in blue color) and the reference chamber (a, Ref-HONO, the square in the black color), HONO fluxes (a, F, the triangle in red color), the ambient concentration of NO_y minus NO (b, NO_y-NO, the solid dot in blue color), soil NO_2^- concentration (b, the star in red color), soil water content (c, SWC (% WHC), the solid dot in pink color), relative humidity (RH) of the ambient air (c, the green line), soil pH (c, the square in red color), the soil temperature (d, T-soil, the black line) and radiation of sunlight (d, Ra, the red line)