Title:	Ambient mixing ratios of ammonia during pre and post harvest paddy season in Punjab
Authors:	Ramteke, Saurabh Nandkumar
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Abstract:	Ammonia gas plays a key role in atmospheric chemistry as it partitions actively between gas and aerosol phase. The sources and ambient mixing ratios of ammonia are poorly known over the North West- Indo Gangetic Plain. Potentially the region is thought to be a hotspot for ammonia emissions because agriculture and biomass burning. The residue burning practice, is functional at NW- IGP after the harvesting of paddy, in October to November. This anthropogenic contamination has significant impacts on the formation of secondary inorganic aerosol particles and ill-effects on humans including irritation to the eyes, skin, nose and the respiratory system. No studies have been done yet to investigate changes in ambient ammonia mixing ratios due to paddy residue burning in the region. Other harmful gases are also emitted from the paddy residue burning such as carbon monoxide, acetonitrile, benzene and benzenoids. This study reports the measured enhancements seen in ambient ammonia in the post paddy harvest season (October 05,2015 to November 26,2015). Ammonia was quantified using the cavity ring down spectroscopy technique. Enhancements in the 4 minute averaged data were observed to be: for PM 2.5 (97.2±62.1 vs 23.1±51.5 μg m -3) , CO (658.9±442.7 vs 369.4±151.9 ppb), acetonitrile (1.3±1.2 vs 0.5±0.3 ppb), benzene (2.7±2.5 vs 1.4±1.1 ppb), toluene (4.2±4.9 vs 2.1±2.2 ppb), sum of C8 aromatics ;sum of ethyl benzene and xylenes (2.8±3.1 vs 1.7 ± 1.3 ppb) and ammonia (31.2±13.9.vs 25.0±9.1 ppb) were by a factor of 1.9, 1.8, 2.3, 1.9, 1.9, 1.6 and 1.2 respectively as compared to the pre harvest season (September 06,2015- October 04,2015). For ammonia during 09:00-12:00 hours of the day, a peak in mixing ratio is observed and it is 1.6 times than that observed in pre harvest season, clearly signifying influence of paddy residue burning emissions. The enhancement in gas phase ammonia scales with temperature and low relative humidity consistent with aerosol phase conversion of ammonium nitrate and ammonium chloride salts to gas phase ammonia. Results show active chemical processing of reactive atmospheric nitrogen which requires further investigations.
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