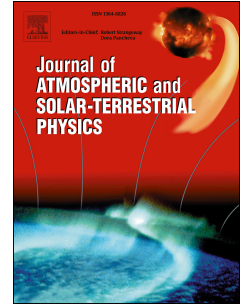


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Thunderstorm induced changes in near-surface O₃, NO_x and CH₄ and associated boundary layer meteorology over a tropical coastal station

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1 Thunderstorm induced changes in near-surface O₃, NO_x and CH₄ and associated boundary layer
2 meteorology over a tropical coastal station

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9 **Abstract**

10 The paper presents four cases of the response of near-surface O₃, NO_x and CH₄ to
11 thunderstorm activity at a tropical coastal site in India, occurred during pre-monsoon and post-
12 monsoon seasons. The associated changes in boundary layer meteorology in terms of
13 temperature, relative humidity (RH), wind and boundary layer height (BLH) are also examined.
14 The meteorological parameters like temperature and RH respond very fast depicting changes
15 during the initial phase of the thunderstorm activity, whereas a delayed response is observed in
16 the wind direction (changing from the sea breeze to land breeze) and collapse of the BLH (1-1:30
17 hour delay) at the mature phase of the activity. Associated with the thunderstorm activity,
18 significant changes were observed in the mixing ratios of the near-surface O₃, NO_x and CH₄. An
19 increase in NO_x (5.2-8.7 ppbv) and CH₄ (36.7-134.6 ppbv) and reduction in O₃ (9.9-18.8 ppbv)
20 were recorded at the mature phase of the thunderstorm. The rise in NO_x is attributed to combined
21 effect of thunderstorm activity and wind reversal whereas that in CH₄ is attributed to the wind
22 reversal and associated change in air mass. A post activity increase is observed in mixing ratio of
23 O₃ in all the four cases. This is attributed to the downdrafts characteristic of the dissipation phase
24 of thunderstorm activity which brings in O₃ rich upper air down.

25

26 *Keywords: Thunderstorm; Trace gas; Boundary layer Meteorology; lightning*

27

28 **1. Introduction**

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