Title:	Impacts of Land Use Change on Air Quality Analysed Using Five Years of Continuous High Temporal Resolution in-situ Measurements
Authors:	S, Muhammed Shabin (/jspui/browse?type=author&value=S%2C+Muhammed+Shabin)
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Abstract:	Land use and land cover changes (LUCC) due to urbanization are a major cause for deterioration of ambient air quality. Here, we investigate the impact of land use land cover change in the form of a newly constructed highway and associated urban emission sources from a site transitioning from a suburban to an urban atmospheric environment. We utilized five years (2011-2016) of continuous measurements of a total of nineteen gases including ozone, nitrogen oxides, carbon monoxide, sulphur dioxide, VOCs and fine and coarse mode particulate matter. To focus only on the urban emissions, the entire dataset was filtered for the urban fetch region upwind of the site (70° to 150° wind direction bin). Selected time intervals based on peak traffic intensity (06:00 – 09:00, 09:00 – 18:00, 18:00 – 21:00 and 21:00 – 06:00) were further analyzed during the post monsoon, winter and summer seasons. After compensating for dilution effects due to meteorological conditions such as the ventilation coefficient, emission fluxes were calculated for compounds which were characterized by strong enhancements (>80% confidence interval) in the post LUCC period. Between 06:00-09:00 local time, season-wise at a confidence interval greater than 80%, the following compounds showed enhancements during the post road period: nitrogen oxides (average post/pre = 1.8 for summer); carbon monoxide (average post/pre = 1.7 for summer);; acetaldehyde and methyl ethyl ketone (average post/pre = 1.6 for summer); sulphur dioxide, benzene and methyl vinyl ketone (average post/pre = 1.5 for summer); acetonitrile, acetone, toluene and C-8 aromatics (average post/pre = 1.4 for summer); ozone, coarse particles, dimethyl sulfide and isoprene (average post/pre = 1.3 for summer); methanol, fine particles and C-9 aromatics (average post/pre = 1.1 for summer). Similarly, for the time interval 09:00-18:00, season-wise at a confidence interval greater than 80%, the following compounds showed enhancements during the post road period: nitrogen oxides (average post/pre = 1.4 for winter; average post/pre = 1.2 for summer; average post/pre = 1.2 for post monsoon); sulphur dioxide (average post/pre = 1.7 for winter; average post/pre = 1.5 for summer; average post/pre = 1.1 for post monsoon); toluene (average post/pre = 1.3 for winter; average post/pre = 1.5 for summer; isoprene (average post/pre = 1.6 for winter; average post/pre = 1.1 for summer); methyl vinyl ketone (average post/pre = 1.5 for summer); methyl ethyl ketone (average post/pre = 1.2 for winter; average post/pre = 1.3 for summer); acetaldehyde (average post/pre = 1.2 for winter; average post/pre = 1.1 for summer); acetone (average post/pre = 1.1 for winter; average post/pre = 1.3 for summer); ozone (average post/pre = 1.4 for winter); carbon monoxide (average post/pre = 1.3 for summer); C-8 aromatics (average post/pre = 1.2 for summer); acetonitrile (average post/pre = 1.2 for summer); C-9 aromatics (average post/pre = 1.2 for winter). For the hour interval 18:00 – 21:00, season-wise at a confidence interval greater than 80%, the following compounds showed enhancements during the post road period: nitrogen oxides (average post/pre = 1.4 for winter; average post/pre = 2.3 for summer); toluene (average post/pre = 1.1 for winter; average post/pre = 2.1 for summer); carbon monoxide and benzene (average post/pre = 2.0 for summer); methyl ethyl ketone (average post/pre = 1.9 for summer); acetone (average post/pre = 1.8 for summer); acetaldehyde and C-8 aromatics (average post/pre = 1.7 for summer); sulphur dioxides and methyl vinyl ketone (average post/pre = 1.6 for summer); isoprene and dimethyl sulfide (average post/pre = 1.5 for summer); methanol and acetonitrile (average post/pre = 1.4 for summer); ozone, fine particles and C-9 aromatics (average post/pre = 1.3 for summer). Between the time interval 21:00-06:00, season-wise at a confidence interval greater than 80%, the following compounds showed enhancements during the post road period: nitrogen oxides (average post/pre = 1.3 for summer; average post/pre = 1.2 for post monsoon); carbon monoxide (average post/pre = 1.2 for summer); acetaldehyde, methyl ethyl ketone and benzene (average post/pre = 1.1 for summer). The five highest emissions in the post road period across all seasons were as follows: carbon monoxide (2.4 g cm-2 s-1 for summer 18:00 – 21:00); nitrogen oxides (0.3 g cm-2 s-1 for summer 18:00 – 21:00); toluene (0.1 g cm-2 s-1 for summer 18:00 – 21:00); methanol (8.4 x 10-2 g cm-2 s-1 for summer 18:00 – 21:00) and acetone (7.6 x 10-2 g cm-2 s-1 for summer 18:00 – 21:00).
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