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Anthropogenic influences on atmospheric boundary layer CO₂ and CH₄ in SW London

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Current levels of atmospheric CO_2 and CH_4 are the highest since records began and still increasing, mostly due to emissions from anthropogenic activities. These emissions have modified the biogeochemical cycling of C and are believed to impact the Earth's climate. Modification of the surface environment has had major impact on greenhouse gas emissions, notably roads, gas distribution pipelines and landfills. Long-term monitoring of near-surface air masses can be used to discern trends in CO_2 and CH_4 , and identify sources.

 CO_2 and CH_4 since 2000 at the suburban RHUL site vary on daily, seasonal and annual time scales. Daily cycles vary with daylight and temperature, which influence the degree of vertical mixing and surface fluxes. Fossil fuel use and combustion processes are higher during weekdays than at weekends and this is clearly observed in the CO_2 record. Analysis of air mass back trajectories and meteorological data for eight wind sectors shows that the highest mixing ratios of both gases are recorded for the E and NE sectors, representing anthropogenic emissions from the London conurbation. The lowest mixing ratios were recorded for the S and SW 'background' sectors.

An averaged annual CO_2 increase of 2.45 ppm yr⁻¹ from 2000 to 2012 represents a higher rate of increase than the observed global trend due to high regional anthropogenic emissions. Over the same period the CH_4 mixing ratio remained relatively steady, despite a sharp increase in the global growth rate since 2007, reflecting a decrease in regional emissions due to better landfill and gas distribution practices.