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Ozone levels still pose risk to health and vegetation

Peak levels of ozone pollution have fallen at rural and urban sites in both Europe and the US in recent years, a new study shows. However, the research also found that limits to protect health and ecosystems are still being exceeded.

After particulate matter, ground-level ozone is considered to be the second most important air pollutant in terms of its effects on human health. However, its effects are not limited to humans. Globally, ozone damage causes crop losses to an estimated value of €10.7-12.2 billion each year. It has also been shown to affect forest ecosystem services and biodiversity.

Ozone is not emitted directly as a pollutant, but forms in the air through chemical reactions between 'precursor emissions', such as carbon monoxide, volatile organic compounds (VOCs) and nitrogen oxides (NO_x). These are released through human activities, such as burning fossil fuels and fertiliser use. Historically, ozone levels are greater in rural areas than in urban due to nitric oxide (NO) from urban traffic emissions in depleting ozone.

There have been some indications that peak ozone levels in both Europe and the US have declined in response to air pollution control measures, such as those implemented through the Air Quality Directive in the EU. This study aimed to assess the risk of ozone to plants and people by comparing trends in levels of ozone and instances of exceeded regulatory limits over a 20 year-period, 1990-2010, between the EU and US. Within both the EU and US, the researchers compared data on ozone levels in neighbouring urban and rural areas from a total of 30 monitoring stations (16 in the US, 14 in Europe).

These urban-rural pairings formed the basis of their analysis. The recorded values were compared with European and US regulatory limits for protecting both plants and people.

The results showed that ozone levels, as well as instances of exceeded limits, were found to be higher in the US than in the EU. Maximum hourly ozone levels have fallen in both urban and rural areas in Europe and the US. However, the yearly average of ozone had risen over the 20 year period, compared with the average over the 20 years as a whole. Every year, the deviation from the average had increased by 7% at rural stations in both Europe and the US. It had increased at urban stations by 12% in the US and 17% in Europe.

Criteria for protecting people and vegetation were exceeded at both urban and rural sites at a high number of measurement stations. For example, in Europe, 29% of urban and 33% of rural stations, respectively, exceeded annual European thresholds for human health (more than 25 cases where ozone levels are above 60 parts per billion (ppb) in a year). Fifteen per cent of urban sites and 24% of rural sites exceeded EU limits for damage to vegetation (an average of over 9 parts per million (ppm) per hour during the growing season).

This research shows that ozone levels in urban areas are now rising faster than in rural sites, with urban and rural regions becoming more equal in terms of this pollutant. This is probably because measures to reduce nitric oxide emissions from traffic have been effective, removing a source of ozone depletion.

Overall, the study shows that ozone levels in the EU and US are still frequently high enough to damage the health of plants and people. This leads its authors to suggest that air quality standards for ozone can only be met in both urban and rural areas through tougher controls on both NOx and VOCs.

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