

THE IMPACT OF TEMPERATURE ON TROPOSPHERIC OZONE IN THE NOVA GORICA REGION

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Introduction

The aim of the study was to identify the temperatures, at which ozone concentrations having a significant impact on human health tend to arise, as well as to assess the impact of temperature on ozone air pollution levels in the Nova Gorica region.

Methods

The assessment was carried out on the basis of average hourly temperatures and corresponding ozone concentrations collected by Environmental Agency of the Republic of Slovenia in 2002-2006. Firstly, the 42,469 8-hour daily averages were calculated to assess the ozone air pollution levels and then, the temperatures at which harmful ozone concentrations arise were determined. Subsequently, the strength of association between hourly ozone concentrations and air temperature was assessed by analyzing 39,903 hourly periods by means of correlation analysis and linear regression.

Table 1. Recommended and intermediate values of ozone concentration and the value of ozone concentration at high levels of pollution for the maximum 8-hour daily average according to the Guidelines of the World Health Organization.

Value	Ozone concentration for maximal 8-hour daily average
Recommended value	100 µg/m ³
Intermediate value	160 µg/m ³
High pollution level value	240 µg/m ³

Results

Ozone concentration values with significant impact on human health occurred at air temperatures 30°C onwards. In the range of air temperatures below 17°C, the concentration of ozone in the rise of temperature by 1°C increased on average by 1.2 µg/m³ (strength of association was relatively weak; r=0.233). In the range of air temperatures including 17°C onwards, the concentration of ozone in the rise of temperature by 1°C increased by 6.0 µg/m³ (strength of association was relatively strong; r=0.681), while in the range of air temperatures including 30°C onwards, the concentration of ozone in the rise of temperature by 1°C increased by 6.7 µg/m³ (strength of association was moderate; r=0.391).

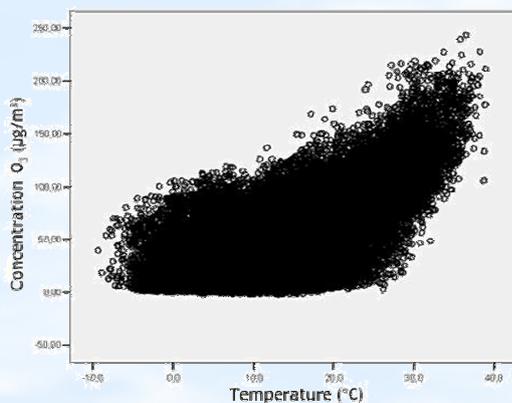


Figure 1. Scattergram of 39,903 daily temperature values (°C) and corresponding hourly ozone concentration values (µg/m³) for the period 2002-2006; Nova Gorica measurement site.

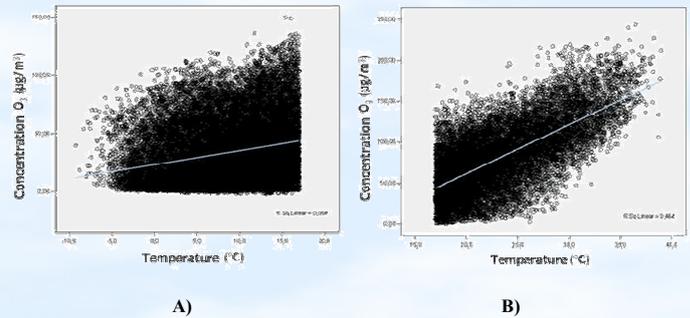


Figure 2. Scattergram of daily temperature values (°C) and corresponding hourly ozone concentration values (µg/m³) for the period 2002-2006; Nova Gorica measurement site. LEGEND: A) range of air temperatures below 17°C (25,917 intersections); B) range of air temperatures including 17°C onwards (13,986 intersections).

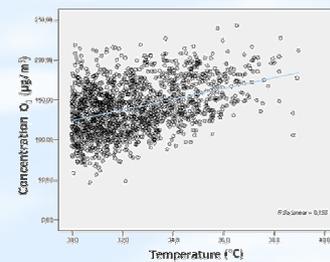


Figure 3. Scattergram of 1,488 daily temperature values (°C) and corresponding hourly ozone concentration values (µg/m³) for the range of air temperatures including 30°C onwards for the period 2002-2006; Nova Gorica measurement site.

Table 2. CORRELATION ANALYSIS and LINEAR REGRESSION - RESULTS

	<=16,9°C	>=17°C	>=30°C
R ²	0,054	0,464	0,153
b	1,201	5,966	6,694
r	0,233	0,681	0,391
ASSOCIATION	WEAK	STRONG	MODERATE

Legend:

R²...coefficient of determination of a linear regression
 b... regression coefficient
 r... correlation coefficient

Conclusion

Temperature substantially affects ozone air pollution in the Nova Gorica region. The impact is becoming stronger as the temperature rises, although at air temperature exceeding 30°C the rise in ozone concentration levels are predominantly caused by other factors besides temperature. The most important among them are stronger W and SW winds bringing polluted air from the Padan Plain from northern Italy.