

AN EXAMINATION OF THE RELATIONSHIP BETWEEN HIGH CONCENTRATIONS  
OF GROUND LEVEL OZONE AND WEATHER IN THE  
CHICAGO METROPOLITAN AREA DURING THE 1977 OZONE SEASON

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## ABSTRACT

High concentrations of ground level ozone in the Chicago metropolitan area during the 1977 ozone season exhibited a significant relationship with various meteorological conditions. This relationship between high ozone concentrations and weather was quantitatively examined using simple correlation analysis, multiple correlation analysis, and principal component analysis in conjunction with simple and multiple correlation analyses. Four temporal sets of ozone and weather data were analyzed: mean monthly, mean daily, mean hourly and raw hourly sets. The largest proportion of the total variance in high ground level ozone concentrations was accounted for with the variable sets "relative humidity" with "wet-bulb temperature"; and "relative humidity" with "east-west component of surface wind" when conducting multiple correlation analysis. Ground level ozone concentrations were generally highest during the daytime. "Relative humidity," "air temperature," "surface wind speed" and "sky cover" were significantly related with high daytime ozone concentrations. The time lag between weather and high ozone concentrations was examined. There appears to be as much as a three-hour lag between weather and high ozone concentrations, however, the relationship between weather and high ozone concentrations was not as strong as the no time lag situation. The geographical variation in high ozone concentrations in the Chicago metropolitan area was apparently influenced by the Lake Michigan onshore "lake breeze" circulation, and the mesoscale circulation of Chicago's urban "heat island."