

Global climate change, ground-level ozone and human health

S.N.Kotel'nikov and E.V.Stepanov***

**Prokhorov General Physics
Institute, Russian Academy of Sciences,
ul. Vavilova 38, Moscow, 119991 Russia**

* e-mail: skotelnikov@mail.ru

Introduction

Heat waves, ambient ozone and smoke from forest fires have a drastic impact on urban populations, which could increase with climate change. Ozone (O₃) is a well-documented respiratory oxidant, but increasing epidemiological evidence points to extrapulmonary effects, including positive associations between ambient O₃ concentrations and cardiovascular, respiratory morbidity and mortality.

Aim

Demonstration and determination of strength of relationship between concentrations of ground-level ozone with morbidity and mortality in Moscow and Vyatskie Polyany (Low-Urbanized Regions) during a period of extreme heat 2010.

Materials & Methods

We used statistical analysis for the time series of daily emergency admissions interrelationship with cardiovascular diseases and daily average temperature (T °C) of air and 24-hour average ambient ozone levels for summer months 2008, 2009 and 2010 in Vyatskie Polyany. In Moscow we used statistical analysis for the time series of daily emergency admissions interrelationship with respiratory diseases, mortality and daily max. 1-h ozone levels for summer 2010.

Time series of daily emergency admissions interrelationship with cardiovascular diseases obtained from the database of the ambulance station Vyatskiye Polyany and time series of daily emergency admissions interrelationship with respiratory diseases obtained from the database of the ambulance station Moscow, the total number of deaths from the [1], daily max. 1-h ozone levels obtained from the database of "Mosekomonitring", 24-hour average ambient ozone concentrations obtained from the database of the monitoring station Vyatskiye Polyany.

1. Zairatyants, O. V., Chernyaev A. L., Polanco N. and Osadchaya V. V., Trusov A. E. the Structure of mortality from diseases of the organs of circulation and respiration during the period of abnormal summer of 2010 // Pulmonology. 2011. No. 4. PP 29-33.

Results & Discussion

Strong correlation of the ozone content with the rate of ambulance calls related to cardio-vascular diseases was observed at average daily ozone concentrations above 60 µg/m³ lasting from 13 to 16 days running, correlation coefficient is 0.62 (p<0,05). The high level concentrations of tropospheric ozone observed in Moscow City were in strong correlation with the rate of ambulance calls related to respiratory system diseases. The correlation coefficient of hourly (p<0,05) average maximum of ground ozone content with community-acquired pneumonia (Figure 1) was found to be 0.787, and 0.808 (p<0,05) with mortality (Figure 2).

Conclusion

Lower concentration of ozone and high T °C no association with cardiovascular diseases. The influence 24-hour average ambient ozone more than 60 µg / m³ sixteen days are associated with increased emergency admissions with cardiovascular diseases. The smoke from forest fires has not increased quantity emergency admissions in Vyatskie Polyany.

In Moscow the acute effects of high ozone levels on mortality and respiratory diseases have been shown to vary with age and to be unfavorable to the elderly.

Graphs

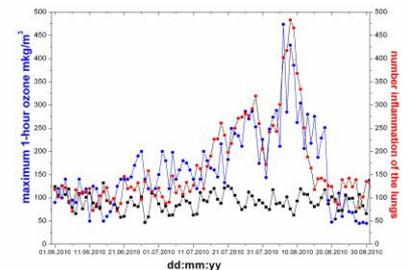


Figure 1. Average hourly maximum ozone concentration and the total number inflammation of the lungs in the summer of 2010 in Moscow
—●—●—●— max. 1-hour ozone, —●—●—●— number inflammation of the lungs 2010, —●—●—●— number inflammation of the lungs 2009.

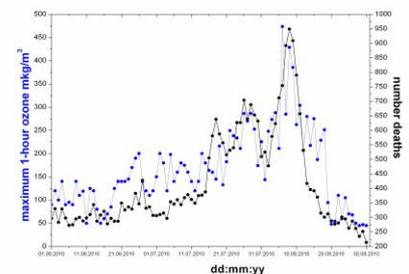


Figure 2. Average hourly maximum ozone concentration and the total number of deaths in the summer of 2010 in Moscow, —●—●—●— max. 1-hour ozone, —●—●—●— number deaths.