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Atmospheric Pollutions Emissions, environmental challenges of Isfahan City

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Extended abstract

1-Introduction

The recent fatal events with regard to the rise in the atmospheric pollutants levels have suggested that the reason of their occurrence be more identified. The long-term and short-term effects on the environment caused by pollutants that reached unacceptable level are apparent; existence of pollutatnts has led to short-term effects such as appearance and aggravation of cancer and respiratory, optic and lung diseases. The sequence of long-term effects is seen on DNA, intelligence and physiology. The air pollution results in water and soil pollution. Of course, aquatics and plants are under the influence of these pollutions. Men are not safe from them because they enter man's food chain too. The statistical model represented in this research can estimate the acceptable rate of surface- ozone by measuring the climatic data of synoptic meteorology of Isfahan Station and evaluating surface pollution rate of station of the Environment Protection Agency. This research shows that equations that profited from two variables including square sunshine and square carbon monoxide concentration could explain %35 of concentration changes in surface- ozone during a day. Even though multivariable regression models can explain dramatical concentration changes in surface– ozone and protector concentration, practical use of these models is limited because of numerous entrance variables. Ozone as one of the most significant secondary pollutants not only influences general health but also has a considerable effect on agriculture. Surface – ozone is in ppm or ppb and it comprises the number of ozone molecules per million and per billion of air molecule.

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2- Theoretical basis

As regards exceptional importance and poisonous state of ozone special in agriculture, it is essential to measure the rate

of this gas for quantitative and qualitative survey of garden products and birds and livestock's health. In general pollutants threat stable development and environment. Furthermore, because its rate is higher than acceptable level, it disrupts man's daily activities. So, it is necessary to study this process. To display a statistical model is the purpose of this study so that surface- ozone rates can be acceptably estimated using atmospheric factors. The main question is this: can an appropriate estimate of surface-ozone rates be determined using a statistical model? It is assumed in this study that climatic factors of land surface play remarkable role in surface- ozone forming. Statistical models using Excel and Spss Software have been used to regionalize pollutant rates. At first, necessary entrance data were adapted from Isfahan Meteorology Station. Data include: A) Temperature and soil moisture. B) Atmospheric factors including: air temperature, atmospheric humidity, sunshine, wind velocity and precipitation.

C) Land surface data of pollutants adapted from the Environment Protection Agency including: surface-ozone, so2, Nox. Then, using these data and specific model, a relationship was found to estimate surface concentration. This study has been done in Isfahan. Climatic data and air pollution and atmospheric pollutants data have been taken from measuring station of air quality in five centers of city (Laleh Square, Bozorgmehr Square, Azadi Square).

3– Discussion

Data of daily mean temperature during statistical course is 16.7c. Median, variance and standard deviation are 17.9, 95.2 and 9.8, respectively. Minimum and maximum temperatures are -6.6 and 33.4◦ centigrade. Based on skewness test and Kolmogorov – Smirnov Test frequency distribution of temperature data is normal. Mean dew-point temperature is -1.9 during studying course. This factor also has a normal curve like temperature. But Kolmogorov- Smirnov Test shows a contrary result. Range of dew-point temperature is between -25.9 to 14.2. Standard deviation is 5.7 ◦ centigrade that is lower than standard deviation of temperature (10.9 ◦ centigrade). Mean dew–point temperature, median and standard deviation are -2, -1.4 and 5.2. Both above mentioned tests show that the frequency distribution is normal. Average of hourly ozone concentration data is 31.4 ppb and median is 27 ppb. Mode as the most abundant in this statistical sample is 10.1ppb. Three above mentioned statistics are not the same. So, frequency distribution curve of hourly ozone concentration is not normal. Furthermore, because Mod<Med<Mean so a positive skewness diagram is expected. Standard deviation of date equals 19/4 ppb. The high rate of standard deviation illustrates that observations distribution is around mean. To assess correlation of daily date, based on Pearson Method, the most correlation seen between ozone and atmospheric factors in sea level pressure equals 0/135 and level of 850 milibar equals 0/134 and cloudiness equals 0/117. The level of 850 milibar is measured directly based on sea level pressure. This explains its high correlation with ozone. It seems hard to explain positive relationship between ozone and cloudiness physically. Any of temperature-humidity factors and factors such as sunshine hours and radiation do not show determined correlation with ozone. To find stronger relationship, some atmospheric parameters entered and measured daily, were used. 3-hour date and ozone also were measured daily and collectively 18 atmospheric factors as variable were achieved. After assessment

of correlation of daily date, it is shown that the most correlation between ozone and atmospheric factors is seen in sea level pressure and level of 850mb as negative relationship and with cloudiness as a positive relationship.

4– Conclusion

The study done in this research shows that in 3-hour scale of atmospheric factors, temperature and wet-bulb temperature had the most correlation.It means tha temperature and humidity are positively effective on ozone forming. Beside, pressure level of station shows negative relationship with ozone. Negative correlation between ozone and pressure factors is unexpected since this relationship shows increasing ozone concentration in instable atmosphere (presence of low pressure system). Increasing temperature causes thermal low pressure growth so it can be resulted that direct and positive effect of temperature on increase of surface-ozone is more obvious than its indirect role decreasing surface pressure in lessening of ozone concentration. Particularly, two round-the-clock pressure changes and ozone curves are exactly contrary curves. Beside, results assessed from model about happening of sea level pressure illustrate that it can not play a role in point analysis of model and using this factor is not helpful to improve the equation. These studies shows that the regression equation measured out of atmospheric factors of synoptic stations can not singly estimate ozone concentration. These explain just some parts of ozone changes.Whereas beside ozone data, five more pollutant gases have been measured. For the next step these data in tow 3-hour and daily scales were considered beside atmospheric factors as predictor ozone variable. Significant correlation between ozone and Noxs represent that ozone rate is increased by inflation components in Nox s concentration. Surface – ozone forming caused by these components in presence of sunshine is a remarkable point because high level of them is available in Isfahan. Here, significant correlation was not seen between ozone and carbon monoxide, but for the next step and special daily scale, a notable correlation is proved between them. Dominated pollutant in Isfahan is carbon monoxide so it has direct and remarkable effect on ozone forming. In short, equation profited tow variables including square sun shine and square carbon monoxide concentration could explain 30 percent of daily ozone concentration changes. It sounds that because of numerous entrance variables, regression models and complicated functions models are not practically helpful; however, they are fairly working to explain surface-ozone changes and predictor ozone concentration.

5– Suggestions

-To form pollutant evaluation network
- To form general data base
-To compose national standard of acceptable pollutant level
-To inform public about human-induced pollutant;

Key words: Secondary pollutants, statistical models, ozone level, Regionalization

Refrences

The book of statistics of environmental protect organization .2005.The publications of Esfahan environmental protect organization.

Ejlali, farid. 2006. Airpollution, The agicultural education publication.

Omidvari, majid. 2006. Fluactuations of atmospheric ozone and interaction with lower troposphere and stratosphere in Esfahan, M.Sc theses, department of physics,Esfahan university.

The data bank of Esfahan airpollution, ozone and air chemistry research center, 1995-2004.

Rahbar, Mohsen. Zand nia poor, Ahmad. 2000. The production of Ozone Air pollutants in Tehran, department of geophysics, Tehran University.

Ezzatian, Victoria.2007. The investigation about ehe effects of meteorological parameters on air quality index in Esfahan city, PHD Theses, Esfahan University.

Moghadam, majid., Mohammadi, amir, Aghaee, mohammad.1994. Multivariate statistical methods,The publications of pioneer science.

Abdulvahab, S. 2005. Principal component and multiple regression analysis in modeling of ground level ozone factors affecting, Environment modeling and software, 20. 1263-1271

Ahrens, D. 1998. Essentials of Meteorology, 314- 336-491

Alexandrov. A. V. et all. 2005. Quantifying nonlinearities in ground level ozone behavior at mountain – valley station at ovnarsko, Bulgharia by using neutral net work. Bulgarian Geophysical Journal, Vol. 31, 2005, 45-58.

Bogucka, B. 2008. High Ozone concentrations in selected regions of Poland and their relationship to weather patterns.EMS8 / ECAC7. Vol. 5, EMS 2008 – A - 00461

Debaje. S.B., Kakade, A.D. 2006. Measurements of Surface Ozone in Rural Site of India Aerosol and Air Quality Research, Vol. 6, No. 4, pp. 444-465, 2006

Isakson, I. 1994.Dual effect of ozone reduction. Nature 372. P-P 322-323

Demuzere. M, Lipzig.N,. 2010. A new method to estimate air-quality levels using a synoptic-regression approach. Part I: Present-day O3 and PM10 analysis, Atmospheric Environment 44, pp 1341–1355.

Jiang .N,. 2005. Effects of meteorological conditions on concentrations of nitrogen oxides in Auckland, Weather and Climate, 24, 15-34.

Lin. W,. 2008. Contributions of pollutants from North China Plain to surface ozone at the Shangdianzi GAW station, Atmos. Chem. Phys. Discuss., 8, 9139–9165.

Nolle, M. et all. 1996. A study of historical surface ozone measurements (1884-1900) on the island of Gozo in the central Mediterranean

Rahbar, M. 1989. Ozone Variability at a Semirural Site in France, CNRS, Orleans, DT/1034/LPCE, 532-534.

Schu¨rmann. G.J, Algieri. A, Hedgecock. I.M., Manna.. Pirrone .G, N, Sprovieri. F,.2009, Modelling local and synoptic scale influences on ozone concentrations in a topographically complex region of Southern Italy, Atmospheric Environment 43,pp 4424–4434

20- Sebald, L. et all. Spectral Analysis of Ozone Air pollutants. Atmospheric Environment, 34. 3503-3509

Solomon, K. et all. ., 2003, Changes in tropospheric composition and air quality due to stratospheric ozone depletion, Photochem. Photobiol. Sci, 2, 62–67.

Rao, S.T. Zur benko, I,. 1994. Detecting and tracking changes in ozone air quality. Air and waste management association, 44. 1089- 1092

Thompson. M. et all.1999.A review of statistical methods for the meteorological adjustment of tropospheric ozone, NRCSE-TRS No. 026.