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Meteorological Study of the Air Pollution in the Cities of Azerbaijan

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Abstract:The paper deals with the meteorological condition of air pollution in the large cities of Azerbaijan. Main emitted ingredients, the responsible natural and anthropogenic factors, as well as natural condition for the spreading of pollutants in the air, are studied. Regional features of the relevant meteorological processes are analysed. Data of the implemented observation are widely used.

Keywords: ingredients, air pollution, observation, meteorological

I. Introduction

The development of urbanization processes are followed by the influence of human activity on the nature. Rapid enlargement of the production affects the intensity of multilateral impact of anthropogenic processes. Change, observed in the atmospheric air may be responsible for deterioration of human health. Environmental problems territorially are typical for both core areas and suburban districts, particularly in the Baku-Sumgait agglomeration. In this connection, the study of meteorological condition and air pollution in the large industrial cities of Azerbaijan is among the most topical problems.

The investigation shows that not only anthropogenic factors but also meteorological factors play an influential role in the character and intensity of air pollution in Azerbaijan. This aspect, i.e. the role of natural and meteorological factors has not been studied completely, and the relevant researches make necessary broader investigation. Therefore, beside with anthropogenic factors responsible for the pollution of atmospheric air, the meteorological parameters and the change of synoptic processes and its dependency from seasons also should be taken into consideration when investigating the air pollution and spread of ingredients in the air of cities. The existence and spread of pollutant substances in the air is considerably affected by mezzo- and macro-scale processes.

A number of works on contamination of the atmospheric air in large industrial cities of Azerbaijan are mentionable. The carried studies of Madatzadeh and Mammadova are devoted to the influence of fog on air pollution in the industrial cities of the country [1,2]. The condition responsible for the emergence of fog is studied by Mammadova (2006, 2010), Agayev (2011), Belan (1991) and Kurilova (1967). Works of these authors are dealing with the investigation of influence of photochemical processes on air pollution [3,4,5,6].

The relevant experimental studies, carried on the example of cities of the Far East are reflected in the works of Belan, Mikushev and Panchenko [5]. These researchers show that typically the two pollution stages (tiers) in atmospheric air of cities are characteristic for an urban area in the research area due to the existence of two inversions. Thus, lower inversion may occur close to Earth surface over of which upper (elevating) tier is spread. These two inversions are not mixed each other. At 200-400 m of height where active photochemical gases exist, photochemical converting of primary mixtures is observed. As usual, photochemical processes are not characteristic for lower tier because upper tier does not discharge ultra-violet rays into lower tier.

Azizov (2002), Mammadova (2010), Aghayev (1982, 2011) indicate that photochemical processes are favourable for the occurrence of photochemical processes in the Absheron peninsula [7,3,8]. High intensity of solar radiation may be responsible as a preliminary factor for the emergence of photochemical processes which in their turn may entail new substances. These repeatedly created substances typically are more toxic compared to previous ones. For example, oxidization of sulphur dioxide gas that may take place due to photochemical reactions, leads to arising of sulphate aerosols in the atmospheric air [4].

II. Materials and methodology

Thickness of the atmosphere reaches up to 12-14 km in Azerbaijan. Dynamism of the atmosphere affects intensity of dissemination of pollutants in the air. Turbulence of the atmospheric air and the existence of air masses, as well as change of temperature are playing a determining role in arising of vertical gradient changes. Spread of pollutants in the atmospheric air is connected with the existence of air masses in the troposphere and stratosphere.

As the movement of air masses takes place horizontally and vertically, the spread of pollutants is not even, and may be influenced by dynamism of these mass in troposphere and stratosphere. Horizontal movement of the air makes 30-30 m/sec in the troposphere whereas vertical movement may be sharply different. It is defined with modern appliances that the speed of this movement is 15-20 m/sec in the troposphere. As for the speed within the stratosphere, it is only a few m/sec. Therefore, harmful substances discharged from the troposphere into the stratosphere may remain there for a long time, and even within a year. The implemented measurements on processes going in the stratosphere show that gases of anthropogenic origin may stay there for about 2-4 months. However, not all harmful substances are able to continuously stay in the troposphere. This is because high humidity entails washing and transformation of substances in the troposphere. Relatedly, concentration of atmospheric emissions reduces due to the mingling with air masses whereas hard substances gradually may sink after a definite period [7]. As transformation, migration and period of existence of pollutants in the atmosphere may depend on favourability of meteorological condition and physicochemical peculiarities of the atmosphere, intensity of spread of pollutants are not the same close to Earth surface. On the

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other side, relief peculiarities and local environmental condition also may have an influence on this intensity. Dependency of spreading of pollutants on speed of wind is less in the air if a city is situated in mountainous, hill or depressive area. The main meteorological parameters as responsible factors for acceleration of spreading of harmful substances in the air are: temperature, inversion of temperature, wind regime, precipitation, humidity of air, fog, intensity of solar radiation, and cloudiness [2,4].

Origins of air pollution in the cities include mainly two groups of sources: stationary objects (manufacturing enterprises, facilities, service centers, etc) and vehicles (private cars, public transport).

In the large cities of Azerbaijan, meteorological and climate condition has definite accelerating effect in diffusion and spreading of pollutants, emitted from industrial enterprises and vehicles of transport. This takes place depending considerably on average yearly temperature, average speed, and direction of wind as chief parameters and factors. Influential role of air temperature in a process of vehicle-related pollution is evidently observable in warmer season, i.e. during summer months. Diffusion of harmful substances takes place hardly when temperature is higher, and causes heavy condition for organisms because of dominance of polluted air. It is defined that concentration of carbon-oxide become highest in summer compared to other harmful gases. Being changeable, concentration of carbon-oxide is proportionate with temperature, and is non-proportionate with speed of wind.

Motion of pollutants after discharging from vertical pipes takes place depending on air condition as well as height and shape of theses pipes. In windless condition, pollutants discharged from stationary sources may be horizontally spread 20-40 times as much far away compared to height of this source. For example, taking into consideration that the height of pipe is 120 meter, concentration of pollutants on the surface of Earth and near this enterprise is 2,4-2,8 kilometer. The factor which creates challenges is that harmful emittances are not directed to pipe of smoke efficiently, as a result of which intensity of air pollution and concentration of pollutants in the air may be increased. Harmful gases discharged from aluminous towers and elektroliz bodies may create concentration of high background in vicinity of manufacturing enterprise and nearby areas depending on direction and speed of wind [6,7,8,9].

In the previous works it is shown that inversion of temperature, i.e. existence of warmer air over colder air is disordering vertical diffusion of pollutants, and eventually, polluted air (below tier) may be pressed by upper warm. Such condition leads to arising of threat of smoke. Dust, smoke and ions may accelerate occurrence and spreading of fog. In this connection, thick and dense fog is typical for mainly those cities where number of manufacturing facilities is higher [2,3].

Many works such as creation of parks in cities, enlargement of urban and suburban greening areas, management of ecological expertise, training of engineering personnel, employment and application of new methods and safe technologies in production, as well as modernization of manufacturing, and other direct and relevant measures on improvement of environmental condition have been done in Azerbaijan [10].

III. Results and tables

Analysis and investigation of such responsible and relevant factors as temperature, humidity as well as speed and direction of wind, allow determine ongoing influence on the condition of atmospheric air and process of air pollution in the cities of Azerbaijan. Depending on distribution of atmospheric pressure, and also baric centers, air masses may enter the territory of Azerbaijan from various directions. Baric centers, including Kara anticyclone, Scandinavian anticyclone, the Azores maximum area, subtropical anticyclone, Southern anticyclone, Continental cyclone, Middle Asia anticyclone, as well as local atmospheric processes have an influence on climate of Azerbaijan. Thermic and baric condition of the territory of Azerbaijan have entailed the existence of winds of monsoonal regime, breezes, fyons, local dry and hot winds called ‘ag yel’, ‘qara yel’, as well as winds blowing between valleys and uplands [1].

Table 1

Annual average temperature of the air in the cities of Azerbaijan

City	2000	2001	2002	2003	2004	2009
Baku	15	15,2	14,8	14	14,8	15,3
Lankaran	15	16,9	15	14,3	14,9	14,3
Nakhchivan	13,6	**	**	**	**	**
Mingachevir	16	16,4	15,7	15	15,9	15,1
Sheki	13,2	14,1	12,7	12,3	13,2	13,6
Sumgayit	15,1	16,1	14,9	14,1	15,1	15,5
Ganja	13,4	15,1	14,3	13,8	15,1	15,4

It should be noted that the highest temperature (over 14,5°C) in average is fixed in the and south-eastern pre-Caspian part of the Kura-Araz lowland whereas plane areas’ annual temperature is 14–14,6°C.

Speed of wind in Baku may reach 40 m/sec. Breezes are characteristic only for the pre-Caspian coastal zone. Fions may cause to rise of temperature (as 6-8°C higher). North-west, north and north-east winds are typically dominant during winter and summer seasons in the Absheron Peninsula and the nearby areas. Yearly average temperature is 200-300 mm in most parts of the Gobustan region while the corresponding indicator is 245 mm and yearly average temperature is 14,2°C in Baku. North-west, north-east and south winds are most blowing winds in the Absheron peninsula. Speed of wind is 6-10 m/sec, and about 25% of winds blow at 11-15 m/sec.

Table 2

Speed of wind in the cities of Azerbaijan (m/sec)

City	2000	2001	2002	2003	2004	2005
Baku	24,4	19,7	35	29,7	28,5	21,4
Lankaran	111,4	82,8	86,3	103	96,7	69,9
Nakhchivan	15,2	**	**	**	**	**
Mingachevir	27	22	21	41,3	26,1	25,2
Sheki	63,6	52,5	79,3	83,3	66,3	52,1
Sumgayit	17,5	16,6	26,3	20,5	20,2	15,8
Ganja	**	**	25,4	23,5	**	**

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Amount and regime of precipitation is different in the territory of Azerbaijan. Annual precipitation in average fluctuates between 110-1750 mm. The monitoring of composition of snow cover is managed at the observation points, located in Damaji village (Southern slope of the Greater Caucasus), Giriz village (North-eastern slope of the Greater Caucasus), Dashkasan city (The Less Caucasus), Kalvaz village (Talish Mountains) and Shahbuz city (Nakhchivan region) in order to study composition of background of precipitation in the country.

Table 3

Amount of average annual precipitation in the cities of Azerbaijan (mm)

City	2000	2001	2002	2003	2004	2009
Baku	12,8	14,8	12	11,6	12,3	10
Lankaran	1,5	1,3	1,4	1,5	1,6	1,6
Nakhchivan	1,7	1,4	1,5	1,7	1,6	1,7
Mingachevir	2,5	2,6	2,3	2,1	2,5	2,2
Sheki	1,5	1,6	1,6	1,4	1,8	1,6
Sumgayit	4,9	4,8	4,7	3	3,8	4,3

In general, there are 10 synoptic-climatic regions in Azerbaijan: Guba-Khachmaz, Absheron-Gobustan, Central Field Area, Jeyranchol-Bozdagh, Lankaran-Astara, Oguz-Ismayilli, Zagatala-Sheki, Ganja-Gazakh, Yukhari Garabagh, and Nakhchivan. 7 of these regions include the large industrial cities of Azerbaijan which are the research objects in this paper. The main features and parameters are given below.

1. Absheron-Gobustan region (including the cities of Baku and Sumgayit). The average annual temperature is 14-15°C, including 3-4°C in January and 24-26°C in July whereas precipitation amount make 100-250 mm. Repeatability of fog, storm and snow is less.

2. Eastern part of the Kura-Araz lowland, Central Field Area (including Shirvan city). The average annual temperature is 14-15°C (in January – 2-4°C and in July – 25-27°C). The average annual precipitation is 200-250 mm. The autumn is considered as rainy season. Eastern winds typically prevail in summer, and western winds are dominant in winter. Breezes are being observed in coastal zone. Monsoons blow in the Kura-Araz lowland. Repeatability of fog is higher. Existence of long-term dry air condition is characteristic for the Kura-Araz lowland. South-eastern winds and north-western winds (speed up to 12,5 m/sec) are blowing in all parts of the depressive area of Kura.

The dry wind 'Ag yel' is blowing in all plane areas of Azerbaijan and in particular in the Kura-Araz lowland while air temperature may reach 35-40°C and relative humidity makes 15-30%. Speed of 'ag yel' is 10-15 m/sec. North-western winds and south-eastern winds are the most blowing in the central part of Kura-Araz. In winter season, winds blow mainly from north-western and south-eastern directions.

3. Jeyranchol-Bozdagh region (including Mingachevir city). Cold air masses are observable from the west, and in part from the east. Fions are usually dominant is winter whereas dry and stuffy air is observable in summer. Annual air temperature in average is 12-14°C whereas it is between 0 and –1°C in winter and 23-25°C in summer. The precipitation amount is 300-400 mm. Most of precipitation is observable in spring season. Fog and storm may be repeated much more in the region. Annual average temperature of air is 14,8°C in Mingachevir.

4. Lankaran-Astara region, encompassing lowland territory and foothill areas (including Lankaran city). The annual temperature in average is 11-14°C whereas it is 11-14°C in January and 22-26°C in July. Annual precipitation is between 600-1700 mm. Highest amount of precipitation is observed in autumn. Storm and fog take place as well. Snow cover may remain continuously. Coastal breezes and winds between valleys and uplands are characteristic for the territory. In Lankaran city, the annual average temperature of air makes up 1111 mm and medium temperature is 14,1°C.

5. Zagatala-Sheki region (including Sheki city). The medium temperature is 11-12°C. It is 0-1°C in winter and 22-24°C in July. The annual precipitation is 500-700 mm. Fog and storm take place intensively during warmer period of year. Winds between valleys and uplands also occur, and their speed is 0-1 m/sec. In Sheki city, annual precipitation in average is 692 mm.

6. Ganja-Gazakh region composed of foothill and lowland subregions (including Ganja city). The annual temperature is 12-14°C, including –1°C in January and 24-25°C in July. The annual precipitation makes up 250-300 mm. Storm is characteristic for warmer season. Snow cover is not sustained, and western winds are prevailing in the territory. Local dry and hot winds called 'gara yel' are typical for western regions and blowing very hardly in summer. In Ganja which is the second largest city in Azerbaijan, medium annual precipitation makes up 246 mm whereas annual temperature of the air in average makes up 13,1°C.

7. Nakhchivan region (including Nakhchivan city). In this territory, most of precipitation is observable in spring season whereas summer usually is very dry. Valley-upland winds, eastern, south-eastern and north-eastern winds are also characteristic. Dry 'Ag yel' winds may blow in lowland and foothill areas. Air temperature is between 35°C and 40°C. Relative humidity makes 15-30%. Winds' speed is at 10-15 m/sec but 0-6 m/sec in lowland. Medium yearly temperature is 12,9°C in the territory. Stuffy air is characteristic for warmer period. In the Arazboyu planes where Nakhchivan city is located, annual precipitation is 200-300 mm. As for Nakhchivan city, the medium annual air temperature makes up 12-14°C whereas precipitation makes up 251 mm.

Table 4

Frequency of winds of different direction in percentage (2009)

Wind	City					
	Baku	Sum-gait	Ganja	Minga-chevir	Sheki	Nakh-chivan
North	22	19	2	10	5	14
North-western	11	39	25	11	20	8
East	–	1	3	7	–	5

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South-eastern	1	16	13	11	10	20
South	5	10	2	12	14	7
South-western	12	3	12	3	33	4
West	1	1	2	12	18	4
Windless weather	48	11	37	34	–	38

As results of observations in 1996 showed, extremely high level of pollution of the air took place in the large cities. In Sumgait city, high pollution with mercury has been fixed two times on August, and once on September. Concentration of mercury exceeded the sanitary norm 10-16 times as much. In Baku city, high relative pollution with mercury has been fixed on March, July and September once or two times while it exceeded the norm 3-4 times. In 1996, dust, azote dioxide, chlorine and furfural exceeded the norm 2-2,6 times as much in the air of Baku and Sumgait.

In 1997, extremely high pollution of the atmospheric air has not been observed. In the same year, compounds with mercury have been fixed 13,7 times as much more than the norm in Sumgait. In Baku, high pollution with carbon-oxide 3-3,6 times as much more has been fixed near highways on October and November. Despite reduction in industrial output, pollution with furfural, soot, dust and azote-dioxide took place as 2-2,8 times as higher than the norm.

In 1998, extremely high pollution and high pollution have been observed in the air of cities. High concentration of carbon monoxide has been fixed in the central districts and near highways with high intensity of motion of vehicles. On May 19, 1998, weak dusty fog emerged in Baku. It lasted one day till noon hours on May 20. As observations showed, level of pollution grew in this period and was followed by too high concentration of chlorine, azote dioxide and furfural (1,3-2,5 times higher than the norm).

In 1999, 27 stationary centers of observation were functioning in the large cities of Azerbaijan, including 9 centers in Baku, 5 in Ganja, 3 in Sumgait, 4 in Mingachevir, 2 in Nakhchivan, 2 in Shirvan, 1 in Sheki and 1 in Lankaran. Condition of high pollution has not been observed in this year. However, in Baku city, concentration of azote-dioxide exceeded the norm 4-4,5 times as much in the air of Baku, as well as azote-dioxide was higher 3,3 times, soot 3,6 times, and furfural 2,3 times as much. In Ganja, Mingachevir, Nakhchivan, Shirvan and Lankaran, events of pollution were fixed but at weak or very weak grades. In Sheki, concentration of all harmful pollutants was less than the norm.

In 2010, events of relatively high pollution have been observed in Baku whereas average annual temperature made up 15°C, and speed of wind were at 12,75 m/sec. Annual precipitation was 24,4 mm. Highest concentration of dust in the air has been fixed as 2-4 higher than the norm in Sumgait. Meanwhile, highest concentration of dust and hydrogen fluoride in Ganja, highest concentration of dust and carbon oxide in Mingachevir, highest concentration of dust and fluoride in Shirvan and highest concentration of nitric oxide 5 in Lankaran exceeded the norm. In Sheki and Nakhchivan, condition of the air was relatively clear, and harmful compounds were fixed as less than the allowed norm [3].

In 2009, the monitoring on pollution of air basin and precipitation were implemented in 27 observation centers, located in light cities (Baku, Sumgait, Ganja, Mingachevir, Shirvan, Sheki, Nakhchivan and Lankaran), and based on 92976 samples and relevant 96002 analyses by 18 substances and compounds. Estimations on air pollution proved to be right. In the same year, low level of pollution was characteristic for the territory of Azerbaijan in general [3,9].

Analysis on chemical composition of precipitations has been implemented at 21 observation centers located in six different regions of Azerbaijan – the Absheron peninsula, Kura-Araz lowland, the Less Caucasus, North-eastern part of the Greater Caucasus, Southern slope, and Lankaran. The analysis has been done on 10 indicators, including sulfate, nitrate, phosphate, ammonium, chlorine, magnesium, hardness, pH, hydrocarbonate, and hydrogen ions, and on the basis of samples taken at 20 points. Least amount of annual precipitation (246 mm) has been taken at the Pirallahi station (Baku city). In 2009, HCO3-, SO42-, Ca2+, Cl- and NO3 – as main pollutants in the composition of precipitation have been determined in the territory of country. Compared to 2005, the extent of pollution has not been grown, and in opposite, the concentration of chlorine ions has been reduced 1,5 times as less while the amount of pollutants in the composition of rainwaters has been registered 1,2 times as much, and made 1454 tons. The average monthly and annual data on air temperature, direction and speed of winds have been calculated based on the results of observation implemented in Baku city (2001-2009). These data have been reflected correspondingly on the table 5.6.

In Baku, the analysis of correlation between carbon oxide and temperature and also speed of wind (as seen on Figures 1 and 2) shows that in the air of Baku, the concentration of carbon oxide was higher in June and July due to lower speed of wind (despite that the highest temperature has been observed in August). In general, the high correlation (coefficients of correlation at 0,73 – 0,88) has been defined, as is shown on the following Figures.

Table 5

Average monthly data of observation in Baku city (2001-2009)

Tem-pe-rature (Cº)	Wind speed (m/sec)	Carbon oxide (mg/l)	Months	Tem-pe-rature (Cº)	Wind speed (m/sec)	Carbon oxide (mg/l)
5,5	2,4	1,9	VII	25,8	2,9	1,
5,2	3,2	1,9	VIII	26,5	2,3	1,
7,5	3,6	1,2	IX	22,4	2,4	1,
11,9	3,1	1,6	X	16,9	2,7	1,
17,6	2,5	1,6	XI	11,3	2,7	1,
23,4	3,7	1,5	XII	5,7	2,8	1,

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Table 6
Average annual data of observation in Baku city (2001-2009)

Month	Temperature (C°)	Speed of wind (m/sec)	Carbon oxide (mg/l)
2001	15,1	3,6	1,4
2002	14,8	3,4	1,4
2003	14,9	2,6	1,5
2004	14,9	2,3	1,3
2005	15,4	2,1	1,6
2006	15,5	3,1	1,4
2007	14,7	2,9	1,5
2009	15,9	3,2	1,6

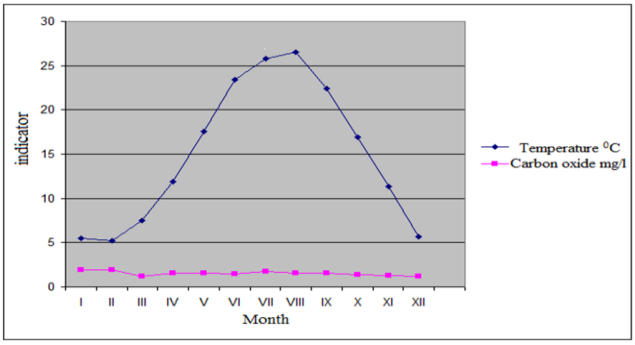

Fig. 1. Change of carbon oxide (CO) depending on the average annual temperature in Baku city (2001-2009)

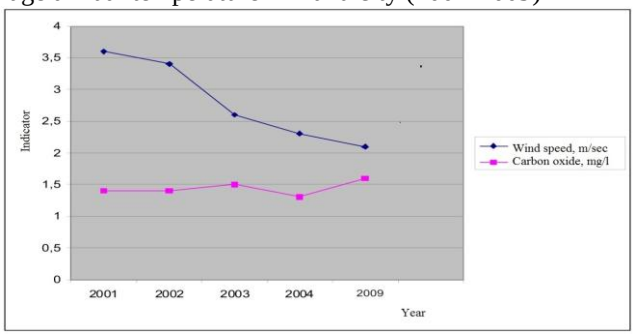

Fig. 2. Change of carbon oxide (CO) depending on speed of wind in Baku city

In order to study transported pollutants in the composition of precipitations (rain, snow), and also evaluate their environmental effect, as well as manage control over qualitative indicators of precipitation, the monitoring is being implemented in Azerbaijan. This monitoring are being managed at 25 observation points, located in upland areas, continuously covered with snow, and deal with the study of chemical composition of snow (at 4 points) and precipitations (at 21 points).

The studies show that chemical composition of rains is seasonally changeable, and therefore, concentration of remained compounds are averagely calculated on the basis of data of current year. According to results of observation carried on the air of Baku, 19,5% of chemical composition of annual precipitations is composed of sulphate whereas 9,5% of nitrate, 1,0% of ammonium, 11,0% of chloride, 20,5% of hydrocarbonate, 0,02% of phosphate, 8,73% of calcium, and 3,75% of magnesium ions. More than half of the determined pollutants emerged due to vehicles. In particular, the share of venomous pollutants in the composition of rainwater is higher in Baku city due to high density of traffic.

The direct influential role of meteorological factors in spreading of pollutant ingredients in the air has been studied by the 2003-2009 years, as a result of which it was defined that the concentration of these harmful substances exceeded the allowed nor a few times. The calculations showed that in Baku, the repeatability of northern and north-eastern winds made up 22-48% in the cold period of year (from November to March) while the perennial average temperature was 5,5-16,5°C. As for the warm period, the repeatability of southern and southern and south-western winds made 7-40%, and the average perennial temperature made up 23,5-26,5°C. Under this meteorological condition, the medium concentration of dust, carbon monoxide, soot and nitrite 4 oxide in the air of Baku city, made up 1,2-1,9 mg/m3, or 1,5 times as much higher than the allowed concentration.

In the air of Sumgait city, the repeatability of the northern and north-eastern winds made up 2-5% and 12-38% correspondingly in the cold period of year (from November to March) while the perennial average temperature was 5,3-16,2°C. As for the warm period, the repeatability of southern and southern and south-western winds made up 14-20% and 13-46% correspondingly, and the average perennial temperature made up 24-27°C.

In Ganja city, eastern and western winds have played the major role in the spreading of pollutants (24% and 30% respectively). However, the pollutant ingredients were fixed as within the norm here. Ad for Mingachevir and Shirvan cities, the repeatability of north-eastern and eastern winds made up 16-30% in the cold period and 25-35% in the warm period. The concentration of various ingredients in the air has been fixed as within the allowed norm.

Fog, blizzard and dustbowl are the atmospheric processes which sometimes may take place in Baku. Fog may be observed chiefly in cold period of year. The average number of days in Baku is 4, whereas this figure is 5 in February and March. The least number of fogs may happen in June and September. Fogs may take place mostly between six and twelve o'clock. In Baku, not only usual (natural) fog but also special dry fog is typical for Baku city. The main role in the emergence of this process is played by the Caspian Sea and also emission of salt, soot, smoke and dust, taking place due to the functioning of industrial facilities. Emitted by factories, aerosol wastes cause to the intensification of arising of harder fog. The probability of emergence of such fog may grow due to the increase of industrial facilities. Eventually, the number of fogs in Baku is much more compared to the adjacent territories. Aerosols and ions emitted from vehicles also may intensify the emergence of fog in Baku. This takes place particularly during summer months when the temperature of air is high. Part of heavy ions may be elevated up to higher part of the atmosphere depending on temperature of the air. In the condition of fog, light ion's number reduces as 35-45% as less, whereas heavy ions rise as 145-155% as much. This takes place because light ions

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may merge with drops of water in the air, and be in such way heavier.

As ions, accumulated under a cloud may play a role of reflector, electromagnet waves are reflected more in the condition of cloudiness. In the condition of hard pollution with electromagnet fields, such condition of human health as flabbiness, sleeplessness, and loss of memory can be faced.

In Baku city, dustbowls may be observed more in Baku compared to other regions of the country. Dustbowls emerge as a result of hard winds and the existence and elevation of too many dusts, sands and other fractions in the air of Absheron. According to the observations of the meteorological station of Baku, 7 dustbowls a year in average may take place in the city. In general, dustbowl is a most responsible meteorological process for spreading of wastes, and may transport accumulated wastes to another environmentally cleaner territory. Such pollution may happen also related to wastes of transport sector. As dustbowls take place also between state borders, wastes may be transported to another country.

It is defined that motor transport is the most responsible for the highest concentration of such harmful ingredients as carbon oxide, or nitrite compounds in the air of large cities of Azerbaijan during warmer period of year. 65-70% of pollutant ingredients originate due to motor transport in the cities of Azerbaijan (9). The analysis of data of the implemented observation shows that some change in amount of wastes of motor transport has taken place in definite years. Thus, in 2000-2007, such ingredients have grown from 229,9 thousand tons to 410,7 thousand tons in Baku city as well as from 20,8 to 37,2 tons in Ganja, and from 14,3 tons to 8,2 tons in Sumgait.

IV. Conclusion

Formulating the above-mentioned, it should be noted that transport facilities, as well as industrial activity and various service facilities are the sources of emission of wastes which pollute the environment, including the atmospheric air in the cities. Meanwhile, unfavourable meteorological condition and factors such as direction and speed of wind, high temperature and humidity, and hazy condition have more influence on concentration of pollutant substances in the air. As a result of the repeatability of pollution, harmful substances' concentration becomes higher than the norm. The main pollutants are carbon monoxide and nitrite oxides.

In recent years, depending on meteorological condition, the diversified development of economy in Baku, Sumgait, Ganja and other cities as well as the increase in number of vehicles lead to the growth of gaseous pollutants in the atmosphere. In Baku, the concentration of hydrogen fluoride in average were increased by 1,2 times as much. In the air of Sumgait city, such ingredients as dust (1,2-2,0 times), nitrite 4 oxide (1,5-2,5 times) and carbon monoxide (2,0-3,0 times) exceed the allowed limit of concentration a few times as much. In Ganja city, dust and nitrite 4 oxide is higher than the allowed concentration.

Pollution grade of the atmospheric air is evaluated as 'medium' in the air of Baku city. Sumgait, Ganja and Mingachevir are cities where pollution grade is considered as 'modest'. In other cities of the country, including Shirvan, Sheki, Nakhchivan, and Lankaran the air is 'weakly polluted'.

Reference

i. *Madatzadeh A.A. Natural and synoptic climate seasons of the Eastern Caucasus. Baku. 1973. 'Annual Statistic Journal' of State Statistical Committee of the Republic of Azerbaijan. Baku. 2001-2009.*

ii. Mammadova Sh.I. Ecogeographical assessment of the atmosphere in the industrial cities of Azerbaijan. Proceedings of Baku State University (series of environmental sciences). 2006. Vol. 3, pp. 172-180.

iii. Mammadova Sh.I. Meteorological condition of the cities of Azerbaijan and study of related ecological problems created due to pollution of the atmosphere. Proceedings of Baku State University (series of environmental sciences). 2010, Vol. 4.

iv. Aghayev T.D. Improvement of data processing methods on the earth and space information with aim of study and forecasting of anthropogenic pollution of cities' air. Abstract of doctoral dissertation. Baku. 2011.

v. Belan B.D., Mikushev M.K, Panchenko M.B. Features passage of photochemical processes in the air of industrial centers. Optics of Atmosphere. 1991-4, No. 9, pp. 995-105.

vi. Belan B.D., Kourilova Y.B. Some possibilities of using radiation data from satellites in the synoptic analysis. Meteorology and Hydrology. 1967, No. 7, pp. 20-28.

vii. Azizov B.M. Method of the remote determination of harmful gaseous compounds in the air basin of Absheron Peninsula. Proceedings of Baku State University (series of environmental sciences). Baku. 2002, Vol. 3, pp. 232-236.

viii. Aghayev T.D. Investigation of temperature inversion in combination with weak wind and fog over the Absheron Peninsula. Proceedings of Republican Conference of Young Postgraduate Students. Baku. 1982, pp. 60-62.

ix. Bayramov Sh.R., Idrisova R.V., Hashimova R.A, Huseynov J.H., Avazova M.A. Study of quantitative change of carbon oxide in the atmospheric air of Baku city. Proceedings of Hydrometeorology and Monitoring of Environment. Baku. 2007, pp. 88-93.

x. Hajiyev G.A., Ahmadova J.N, Bayramov Sh.R. Condition of air pollution. Journal of Azerbaijani Nature. Baku. 2007. No. 1-2, pp. 6-9.

xi. Hasanov A.A. Problems of ecology of cities of Azerbaijan. Baku: Elm. 2003.

xii. Afandiyev V.A. Urbanization and urban settlements of Azerbaijan. Publishing house of Baku University. 2002.

xiii. Belan B.D., Mikushev M.K, Panchenko M.B. Features passage of photochemical processes in the air of industrial centers. Optics of Atmosphere. 1991-4, No. 9, pp. 995-105.

xiv. Mirbabayev M.Y. Ecology of air basin. Baku: Nafta-Press, 2005.

xv. Mammadov A.S. Periodical change of temperature of air in Baku. Proceedings of Baku University (series of environmental sciences). 2008. Vol. 3, pp. 204-207.

xvi. Mammadova Sh.I. Global and regional problems of pollution of atmosphere and questions of their protection. Proceedings of Baku State University (series of environmental sciences). Vol. 2, 2008, pp. 201-206. Baku.

xvii. Karimov R.N. Problem of emergence of wastes in urban environment. Proceedings of the International Conference 'Actual problems of sustainable development in the condition of globalization', 2011. pp. 192-194. Azerbaijan University. Baku.

xviii. Ecotoxicology in Theory and Practice. Ecotoxicology Series. Vol. 2. 1993. V.E. Forbes & T.L. Forbes. Chapman & Hall, pp. 252-260.

xix. Handbook of Ecotoxicology 1994 David J. Hoffman & B.A. Rattner (Editors). CRC Pres, pp. 712-759.