Textural, mineralogical properties , and amount of dust fallout in Basrah city for the years 2005-2008.

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Abstract

sixty samples are collect for dust sediments from five regions in Basrah city (Ashar, Qurnah, Abu Al-Khasib, Fao and Khor Al-Zubair) for the years 2005, 2006, 2007 and 2008.

Sedimentological study is show the texture of Khor Al-Zubair is sandy silt, while the texture in the other areas are sandy mud and clayey silt. These results are attributable to the role of sand storms in the western part of Basrah city and the dust storms were prevailing in the eastern and Northeast province . In addition , the high ratio of silt in the study area may be due to the transformation of many agricultural lands in the central and southern part of Iraq to arid region , and loss the fertile layer of soil (almost of the silt and clay) due to lack of rainfall and reduce the water concentration ratio to the main rivers in Iraq (Tigris and Euphrates). The dominate heavy minerals of the sediments in study areas Ashar, Qurnah, Abu Al-Khasib and Fao are Opaque minerals ,Un-stable and Meta-stable minerals ,while the opaque minerals and Ultra-stable minerals were the majority heavy minerals in the Khor Al-Zubair area. The rate of dust fallout in the study area for four years had increased significantly in the summer , cause by the increase the wind speed in this season (North-West winds), especially at the month of June and July, in addition to the high temperatures which played an important role in increase of evaporation degree and reduction the moisture continent to the soil which led to the loose grains and make the soil is more suited for wind erosion .

The high rate of dust fall in the Abu Al-Khasib area is due to the presence of the large numbers of palm trees and other trees in the open orchards , that formed as the natural barrier to the suspended dust in the air. The annual ratio of the accumulation dust is about 166-1090 gm/m^2 .

المواصفات النسيجيه والمعدنية وكمية الغبار المتساقط في محافظة البصره للسنوات 2005-2008

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المستخلص

جمع ستين نموذجاً لرسوبيات الغبار المتراكم ولخمسة مناطق في محافظة البصره وهي (العشار , القرنه , أبو الخصيب , الفاو و خور الزبير) ولأعوام 2005,2006,2007 و2008. بينت الدراسة الرسوبية بان نسيج رسوبيات خور الزبير هو غرين رملي بينما كان نسيج الرسوبيات لمناطق الدراسة الأخرى هو وحل رملي و غرين طيني ,تعزى هذه النتائج إلى سيادة العواصف الرملية في غرب محافظة البصره والعواصف الترابية في شرق وشمال شرق المحافظه, بالاضافه إلى إن نسب الغرين العالية في منطقة الدراسة قد تعود إلى تحول العديد من الأراضي الزراعية في وسط وجنوب العراق إلى أراضي قاحلة وفقدان الطبقة الخصبة من التربة والتي تكون بمعظمها من الغرين والطين بسبب قلة سقوط الامطار وتقليل نسب تركيز النهرين الرئيسين في العراق (دجله والفرات) . المعادن الثقيلة السائدة لرسوبيات منطقة الدراسة (العشار , القرنه , أبو الخصيب و الفاو) كانت المعادن المعتمة والمعادن الغير المستقرة والشبه المستقرة , بينما المعادن المعتمة والفوق المستقرة كانت من المعادن الاساسيه في منطقة خور الزبير . ازدادت نسب تراكيز الغبار المتساقط في مناطق الدراسة وللسنوات الاربعه بصوره ملحوظة في فصل الصيف وذلك لازدياد سرع الرياح الهابه في هذا الفصل وخصوصا الرياح الشمالية الغربية وخاصةً عند شهري حزيران وتموز, بالاضافه إلى ارتفاع درجات الحرارة والتي لعبت دوراً

هاماً في ازدياد درجات التبخر وتقليل المستوى الرطوبي للتربة مما أدى إلى تفكيك دقائق التربة وجعلها مهيأة أكثر للتعرية الريحيه. كذلك وجد أعلى نسبه للغبار المتساقط في منطقة أبو الخصيب والذي يعود إلى وجود أعداد كبيره من أشجار النخيل والأشجار الأخرى في البساتين المفتوحة والتي تشكل حاجزاً طبيعياً للغبار المعلق في الهواء مسببه تراكمه في هذه المنطقه . تراوحت نسب الغبار المتراكم سنوياً في منطقة الدراسة بحوالي 166-1090 غم/ م2.

Introduction

Dust is known as a fine irregular particles which transported as a suspended load in the air to a long-distance. Wind erosion is a physical process associated with the capacity of wind to erode soil and capability of this soil to sweep (Fryrear,1990). Wind erosion, is one of the most important geological factors affecting in the sediments surface causing to separation and transportation the sediments and deposition in other places on the Earth's surface (Plummer et al.2003).

There are many factors that controller the rate and quantity of dust fall ,such as gravity of earth, the moisture rates , the relative of rainfall, speed and direction wind and the rise and decline of the sea level(Al-khalefa,2001).

Basrah city is subject to the dust storms and that is probably more than compared with the middle and north Iraq , may be cause by the geographic area and the nature of its composition whereas it surrounded by large desert areas, which consists of a non-cohesive sand for distance of 800 miles west (Buty,1984), in addition , most of the agricultural land around Basrah had turned to barren land in last years ,caused by the lack of rainfall and reduced the rates of supply water from the main rivers to Iraq, the Tigris and Euphrates. Lopez (1998) and Lee et al (1993) studies are show that the agricultural soil erosion is a serious global problem, cause to remove the layer of fertile soil, which affect on the environmental and economic of the soil under the direct influence of wind .

Tectonic setting of Basra city is lie in the non- stable shelf to the Arabic plate (Buday and Jassim, 1987) .The prevailing wind in this area is the North-West wind and that so-called Shamal winds (Foda et al.1985), which play a key role in the transfer of detrital sediment on the southern and South-West of Iraq. Temperatures in the study area are change between the summer and winter. Study area is slow decline towards the North-West to the South - East about 26.7cm/km degree and increase to 35cm/km towards Arabian Gulf (Al-Khiat, 2002). Many regional and local studies are discuss the dust deposition, like (Jassim,2008) which showed that dust is a kind of air pollution, it consist a very small particles from suspended dust which load by air , and (Fryrear,1971) indicated that suspended dust is result the wind erosion led to reduction in growth rate and development of plants, while the study of (Gasim et al .1986) show that movement of vehicles and human activities are Play a key role in increasing the quantity of dust rising, whereas the study of (Al-Biaty,1996) had shown that the amount of dust increase about 0,193 gm/m^2 in the air throughout the day of the year, and the study of (Salman and Saadallah,1986) which indicated that the amount of dust accumulated in the southern parts of Iraq by about 0.15 mm/year.

Methodology

Sixty samples are collect to dust fallout in five regions for Basra city (Figure -1) in years 2005-2008 . These samples are collect by use the dust container , then washing

the content of the container for several time , and empties the solution after every wash in a beaker (500 ml) , dry the solution by use oven with temperature 105 ° c. Use the wet sieves to separate the sand from the clay by use the sieve of 230 mesh , then use the hydrometer method to determine the silt and clay percentage in the sediments according to Folk (1974) .

The Bromoform solution is use to separate the heavy minerals from the light in the sediments , this minerals are determine by the polarized microscope point counter.

Results and discussion

Textural study is show the dust fallout in Khor –Al Zubair is sandy silt texture,the percentage of silt about (49-51%) , sand (40-42%) , and small percentage of clay about (8-10%),these results are indicate that sand particles rates were increase in Khor Al-Zubair compared with the other areas (Table -1-A,B,C,D) ,these results are due to fact the area of Khor Al-Zubair is take place in the western parts of the Basrah city, where the sandstorms, while the other areas were locate in the eastern and north east parts, where the dust storms (Salman and Saadallah ,1986), Therefore, the table (1) is show increase in the silt compared to sand in the Qurnah, Ashaar, Fao and Abu -Al Khasib areas, this is evidence that most of silt particles were form of fertile agricultural land and it transports by the wind. The proportion of silt and clay are increase in the year 2008 with respect the other years, which is an indication of the increase of desertification processes in the province of Basrah.

The Opaque group minerals are dominate heavy minerals in the study areas (Table -2), that back to high percentage of this minerals in the Mesopotamian plain (Ali,1976) , in the agricultural lands (Al-Maliki,1995) ,and in the shatt-Al Arab and Karon rivers (Albadran et al.,1996), while the Epidote and Un-stable minerals are form high percentage in Qurnah, Ashaar, Fao and Abu -Al Khasib areas (Table -2), cause by increase these minerals in Euphrates , Tigris and Shat Al Arab rivers (Salman et al .,1988 and Philip,1968), in addition, the Un-stable group minerals in the study area are indicate to near outfitted source (Witham et al .,2004) . The Ultra-stable group minerals are high in the Khor –Al Zubair area compared with other areas , is because of these minerals are found in high percentage in Didibba formation and west desert (Sadik,1977) and it transport by the sand storms .

The rate of dust accumulated in the study areas (Table 3 –A,B,C,D) are show an increase in summer season , which starts in the Basrah city in April to the October month, due to the role of northwesterly wind, which is reach speed of 15 m/s , cause by the seasonal depression (Abdullah ,1990), this is called the Summom wind especially during the months of June and July (Khalaf and Hashash ,1983), in addition to the high temperatures in this season, which contribute to high levels of evaporation on the soil surface, that lead to dry surface layer and reduce the content of moisture ,and it had became ready to wind erosion (Thomas,1997) . It is worth mentioning , the phenomenon of suspended dust may also arise in this season during absence of strong winds rapidly, owing to differences in temperature between the surface of the earth and the air component , so-called streams pregnancy , this is working to raise the loose grain and spread in the air (Al-Ali,2000), so the high level of dust fallout in the study areas is between 222.7 to 411.7 gm/m^2 for the months of May and October

respectively for the year 2006 and 227 to 230 gm/m² for the months of June and July of year 2008 (Table- 3-B,D), while the rates of dust fallout was reduce in the winter season, due to the decrease in temperature and evaporation, which leads to an increase in the cohesion of the soil and reduces the transport, also , high rainfall in this season is lead to germination many of the natural vegetation, cause to increase the cohesion of the soil-minute, in addition, the plants are reduce the wind speed ,owing to decrease (the dust fallout to minimum level (1.9 gm/m²

for the month of December in 2006 and 5.9 gm /m 2 for the month of January in 2008. Dust fallout in the Abu –Al khasib area is high compared to the other regions , may be cause by spread of palm trees and others, which form a natural barrier for dust deposition lead to high accumulation rates ,about 1090 gm/m² for the year 2008 . ((Table-3-D

The amount of dust fallout is low rate in 2005(166 gm/m²) compared to the 2006,2007 ,and 2008 (Table -3-A), which is clear indicate to transform the agricultural . land to the arid lands

Conclusion

1--The texture of the sediments are sandy mud and clayey silt with high percentage of silt, due to transformation many of the agricultural land in central and southern Iraq to .the arid lands, except the texture of Khor Al-Zubair sediments was sandy silt

The opaque group minerals are the most heavy minerals in study area and the-2 Epidote, Hornblende and pyroxene are the dominate heavy minerals in Qurnah, Ashaar, Fao ,and Abu -Al Khasib area, while the Ultra-stable minerals are found as a .high percentage in Khor Al-Zubair area

The rate of dust fallout is high in summer compared to winter season , owing to -3 .high degree of temperature and evaporation and reduce moisture content of the soil

Palm trees are form the natural barriers to dust deposition , so the dust fallout is -4 . high in the Abu–Al Khasib area compared to the other areas

The range of annual rates to the dust fallout in the study area are about (166-1090 -5 (gm/m²

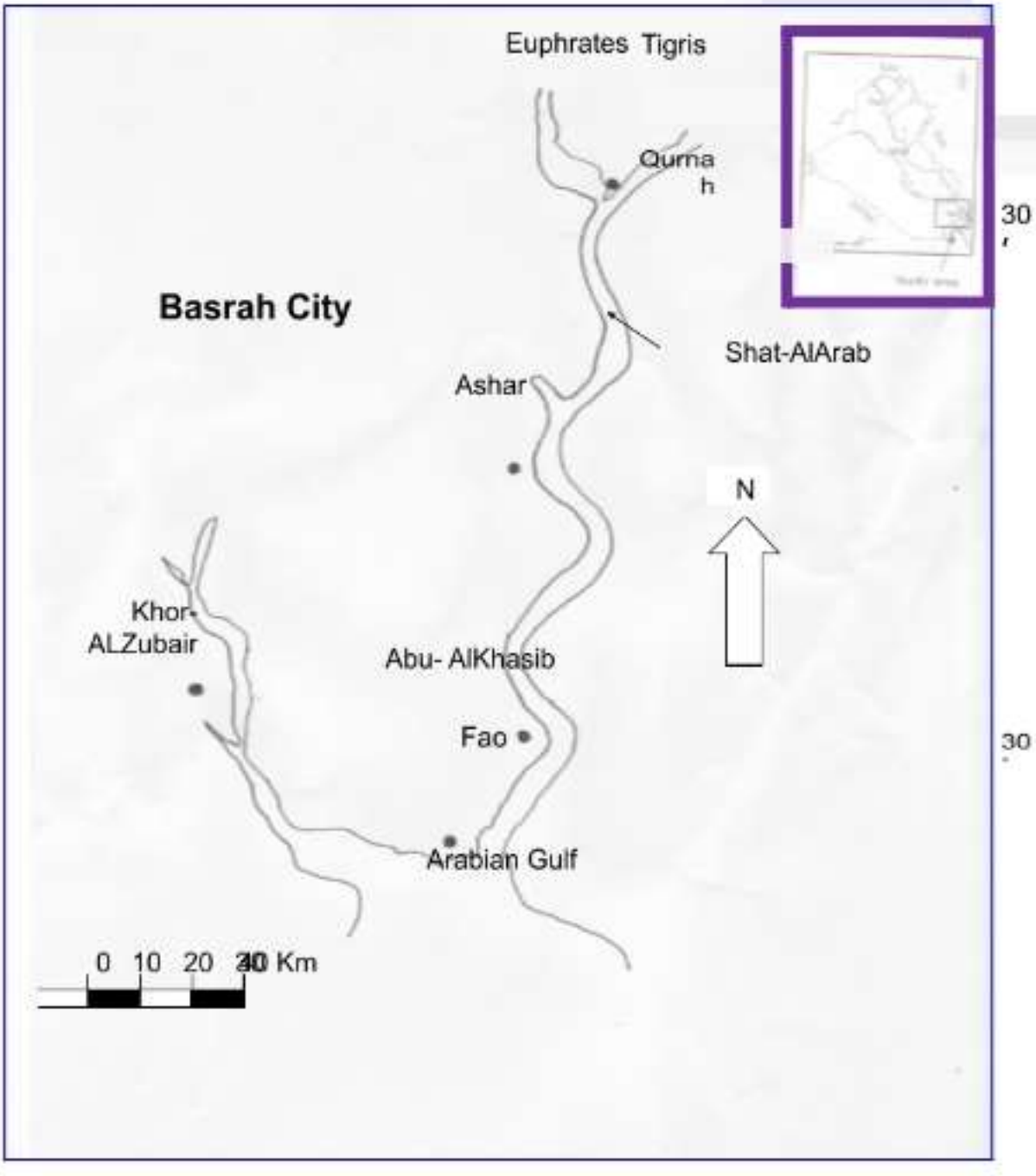

Figure 1: Location map

Table.1.A Grain size analysis to the sediments to year 2005

Station NO	*%Sand*	*%Silt*	*%Clay*	*Texture*
Khor-Al Zubair	40	50	10	Sandy silt
Ashar	12	65	23	Sandy mud
Fao	15	60	25	Sandy mud
Qurna	17	67	16	Sandy mud
Abu-Al Khasib	18	70	12	Sandy mud

Table.1.B Grain size analysis to the sediments to year 2006

Station NO	*%Sand*	*%Silt*	*%Clay*	*Texture*

Khor-Al Zubair	42	50	8	Sandy silt
Ashar	15	70	15	Sandy mud
Fao	17	68	15	Sandy mud
Qurna	14	70	16	Sandy mud
Abu-Al Khasib	15	71	14	Sandy mud

Table.1.C Grain size analysis to the sediments to year 2007

Station NO	*%Sand*	*%Silt*	*%Clay*	*Texture*
Khor-Al Zubair	41	51	8	Sandy silt
Ashar	15	61	24	Sandy mud
Fao	16	66	18	Sandy mud

Qurna	17	70	13	Sandy mud
Abu-Al Khasib	12	71	17	Sandy mud

Table.1.D Grain size analysis to the sediments to year 2008

Station NO	*%Sand*	*%Silt*	*%Clay*	*Texture*
Khor-Al Zubair	41	49	10	Sandy silt
Ashar	7	70	23	Clayey silt
Fao	5	70	25	Clayey silt
Qurna	8	78	14	Clayey silt
Abu-Al Khasib	10	73	17	Clayey silt

Table -2-Heavy minerals in study area according to majority

Study area	*Heavy minerals according to majority*								
Khor-Al Zubair	Opaque mineral	Zircon	Tourmaline	Rutile	*Hornblende*	Pyroxene	Garnet	Chlorite	Biotite
Ashar	Opaque mineral	Pyroxene	Hornblende	Epidote	Garnet	Chlorite	Biotite	Staurollite	Zircon
Fao	Opaque mineral	Hornblende	Pyroxene	Garnet	Epidote	Kyanite	Chlorite	Zircon	Tourmaline
Abu-Al Khasib	Opaque mineral	Epidote	Hornblende	Pyroxene	Garnet	B.H	Chlorite	Zircon	Kyanite
Qurna	Opaque	Epidote	Hornblende	Garnet	Pyroxene	Chlorite	Biotite	B.H	Zircon

	miner al								

B.H: Basaltic Hornblende

(Table -3- A- Rate of dust fall in study area for year 2005 (gm/m²

Month	*Janu ary*	*Febru ary*	*Marc h*	*Apri l*	May	Jun e	July	Augu st	Sep tem ber	Oct obe r	Nov emb er	Dec emb er	Total year) (
Khor-Al Zubair	28.6	28.4	28	28.5	*29*	30.7	31.9	25.7	20.4	20.2	15.6	13.8	300. 8
Ashar	27.2	27	26.5	27	27.5	28	28.5	13.8	12.5	11.9	23.3	51.8	305
Fao	18	17	16.5	16.9	17.3	17.7	18	8.7	10.2	6.5	11.6	7.9	166
Abu-Al Khasi b	14.12	13.9	13.4	13.7	14	14.4	14.7	11	56.5	15.1	17.1	28.6	226. 5
Qurna	10.2	12.3	13.4	14.2	13.8	14	15.9	10.9	20.4	25.2	11.9	13.8	176

(Table -3- B- Rate of dust fall in study area for year 2006 (gm/m²

Month	*Januar y*	*Febru ary*	*Mar ch*	*Apri l*	May	Jun e	July	Augu st	Sep tem ber	Oct obe r	Nov emb er	Dec emb er	Total year) (

Khor-Al Zubair	17.2	167.9	16.6	128.9	*18*	8.4	112.5	5.4	15.3	6.5	13.8	3.9	506
Ashar	20.3	37.9	15.7	38.3	**33.4**	23.4	23.2	16.3	22.7	20.4	12.5	14.3	278
Fao	10.8	12.7	11.4	12.3	222.7	8.9	6.4	5.5	63.4	2.6	65	9.8	432
Abu-Al Khasib	10.1	13.8	59.9	41.9	10.7	37.9	49.7	43.9	25.7	411.7	26.3	11.7	743
Qurna	13.4	12.3	11.8	40.9	108.4	40	3.8	10.7	6.55	3.9	7.9	1.9	262

(Table -3- C- Rate of dust fall in study area for year 2007 (gm/m²

Month	*January*	*February*	*March*	*April*	May	June	July	August	September	October	November	December	Total year) (
Khor-Al Zubair	7.1	8.5	34.7	30.2	*55*	3	3.4	13.2	6.1	8.6	12.6	12.6	195

Ashar	13.6	33.5	39.9	35.5	26.2	30.2	25.2	9.7	11.2	10.8	18.4	17.2	271.5
Fao	2.3	20.7	25.2	21	19.3	8	13.2	6.4	7.3	6.6	4.8	35.9	171
Abu-Al Khasib	27.4	59.7	71.2	24	43.5	63.5	37.1	34.6	29.6	24.1	20.3	21.2	456
Qurna	6.5	16	10.5	32.2	22.3	10.9	10.7	6.6	6.3	11.4	15	20.2	169

(Table -3- D- Rate of dust fall in study area for year 2008 (gm/m²

Month	*January*	*February*	*March*	*April*	May	June	July	August	September	October	November	December	Total year) (
Khor-Al Zubair	14.1	7.1	9.3	11.3	*45.7*	29.2	30.1	28.2	42.8	22.2	7.6	6.2	254
Ashar	12	24.3	22.8	44.6	60.2	118.7	120	28.3	14.6	12	10.9	18.4	487
Fao	6.6	15	10.3	35.9	14.7	10.7	30	20	21.9	6.2	6.7	84.3	262
Abu-Al Khasib	21	35.8	30	215.8	65.5	227	230	30.2	167	20.8	35.9	10.5	1090
Qurna	5.9	11.9	10.1	30.8	24.4	6.8	43.2	10.4	13.1	60	13.8	11.6	242

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