

Yara basin using -Estimating the size of wind erosion in Wadi Al geographic information systems

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Abstract : are concerned with the study of Applied geomorphological studies geomorphological processes and the variation of their types in the study area, as the appropriate natural environment helped to activate erosion processes. And the they contain within an formation of the terrain features and the natural resources integrated environmental system that may differ from the neighboring systems, whether they are in the land systems and what they contain of rocky variation, land urban Wind erosion is one of the most important . forms, or investment areas Loosening and drying of the for her role in basins river processes in the valleys of And then transported and soil and increasing its susceptibility to wind erosion he in t The wind speed as they contribute , deposited in places with different distances it works to and , basin area is a large part of the erosion and sedimentation process , break up the rock particles and soft crumbly materials in the slopes and slopes through the pressure resulting from the direct collision of raindrops with those . particles

- :Introduction

geomorphological phenomena, of some Winds have a major role in the emergence ticles of rock chips especially in dry areas. As the wind carries sand particles and par , and transports them from the areas of their formation to other distant regions depending on the factor of wind speed and the extent of its ability to carry these particles, and the ability of the wind to transport the particles of rock particles increases when the drought is severe and the presence of vegetation is scarce. The laden winds and their collision with the rocky edges gradually -g of sandblowin erodes these edges, as it is noted that the action of erosion or demolition is intensified in the lower parts of the rocky edges, not only because of the fragility of the rock in lower parts, but also due to the increase in the wind load of sand atoms and rock the) granules crumbled in the lower parts of it, which are close to the surface of the earth (1

The wind speed and direction have a significant impact on the geomorphological phenomena spread in the study area, which were formed by the processes of erosion, transport and sedimentation. The characteristics of the surface through the type of rock, the size of the fragments, and the type of vegetation cover, as well as the ce of the topography of the region through the elevations and depressions, and influen through that we notice that the processes of carving and transportation are active in areas while the processes of sedimentation are active in other areas, which results in of them a geomorphological form Indicates the influence of the wind factor in each the process of formation. Among these forms that spread in the study area are the

Damascus University Publications , - Muhammad, Landforms, Damascus University-Saud Al (1) . 199-198 .Kutub Press, 2010, pp-Dar Al

Philosophical Readings XIV.4 (2023), pp.31-44. 31

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grooves of wind sculpture, small rocky tables, as well as sand dunes with their .neem, nebak, and sandy surfaces with little thickness ,crescent types

1- -: **Research problem**

What is)) -The research problem is represented by the following main question : Yara basin in Sheikh Saad district, -of the Wadi Al the size of the wind erosion What are the methods of measuring and estimating ? southeast of Wasit Governorate ? ((its size

: **Research hypothesis**

which ,Yara basin-of the Wadi Al characteristics **The geomorphological** : is nditions for the activity of the wind erosion process, and thus provide create the co Al Yara estimating the size of the wind erosion For Wadi accurate capabilities in . basin Southeast of Wasit Governorate

2- :**Search goal**

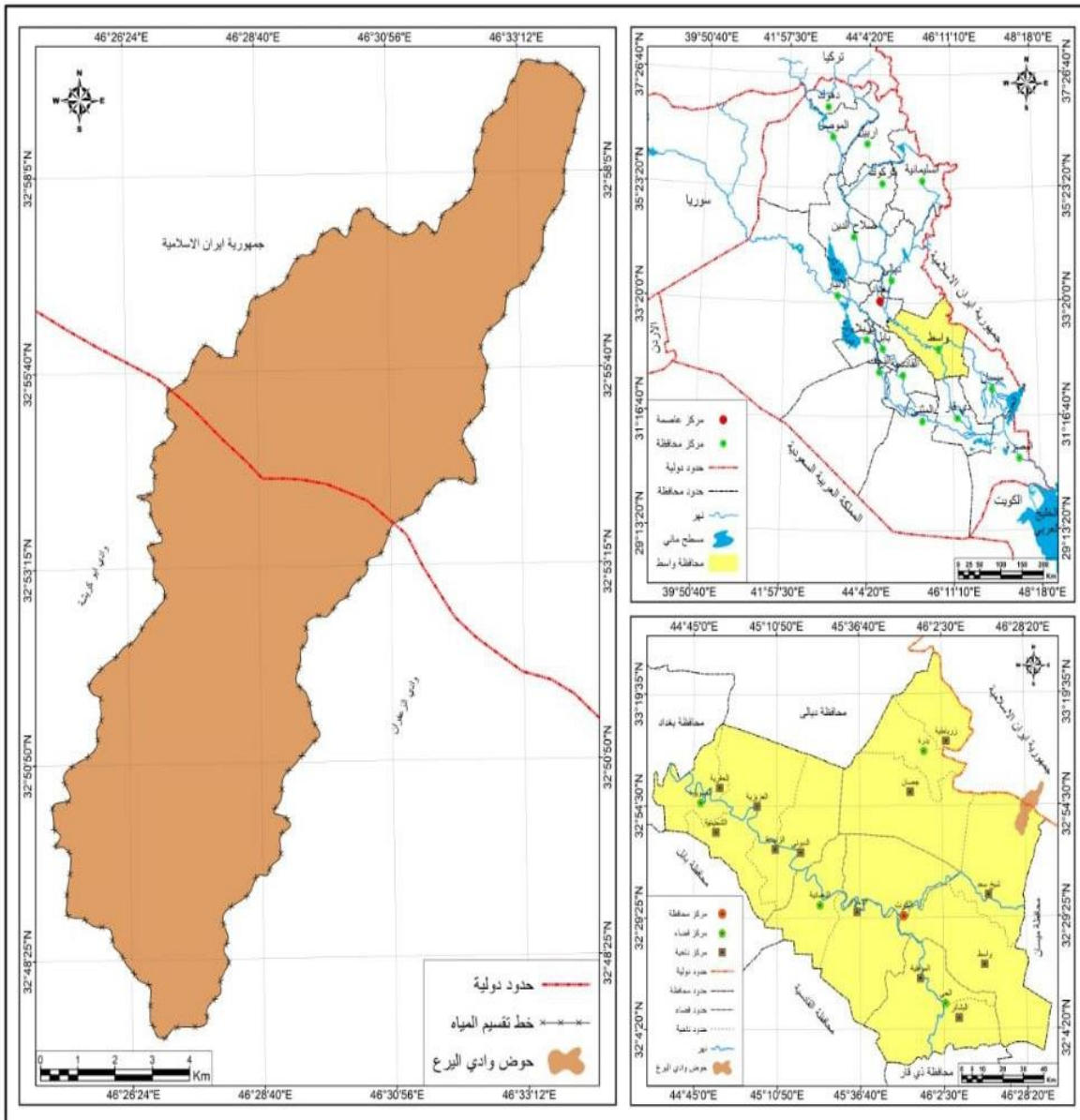
Yara -wind erosion of the Wadi Al estimate the size of the The research aims to Loosening and drying of the soil and basin, southeast of Wasit Governorate And then transported and deposited in increasing its susceptibility to wind erosion sensing techniques employing remote to the basin by places with different distances and geographic information systems in quantitative measurement and building a characterized geomorphological variables geographical database for it that contains . by the accuracy of the details

: **Research Methodology -4**

elied on following the regional and analytical technical approach The research r and the analysis approach in geographic information systems, which was based on the) interpretation of the digital elevation modelDEM and the extrapolation of (n from it for the purpose of conducting the geomorphological informatio .of the characteristics of the basin geomorphological analysis

3- : **The boundaries of the study area**

The study area (Wadi Al Yaraa Basin) is located in the district of Sheikh Saad, Shihabi , as it -southeast of Wasit Governorate , and the valley ends in the lands of Al) is astronomically located between two circles between two latitudes0.32.823 32 .59) (°22.232 32.47 32.47N) and arc longitude43.35 .46 863 " (52.919 46.24 ,E (It is bounded from the north by the Iranian city of Ilam, from the south by the western district of Ali, administratively affiliated to Maysan Governorate, from the west by district of Badra, from the east by the district of Sheikh Saad, and the basin ends the .(Shihabi towards the southwest of Map (1-at the lands of Al



Map (the (1 location of the basin from Wasit Governorate, Iraq

Source: So -1 The Republic of Iraq, the General Commi

.ssion for Survey, the administrative map of Iraq, scale 1/600000, for the year 2021

2 - The satellite view of Iraq for the Landsat 8 for the year 2022, and the , satellite 10.8 . program ArcGIS .

Wind : erosion

humid areas, of which the study area is a part, are -arid and even semi-The arid, semi characterized by being a scene of wind erosion processes. Its effect is from one place s that differ to another, because it blows according to directions, speeds, and pattern from one place to another, which leads to a difference in its effect in shaping the

geomorphological appearance. It prevails in which several factors must be available, the dryness, the most important of which are wind speed, the degree of its turbulence factor, the nature of rock formations, as well as the extent of surface roughness, the size of the crumbs, as well as humidity and lack of vegetation cover, as the lack of ity of cover rain and humidity with high temperatures and evaporation leads to scarce The vegetation and the lack of cohesion of the soil granules with moisture or organic matter, which contributes to the erosion process. With regard to wind speed, the in the nature of its blowing, and the strength of its impact as a factor of erosion region, the wind speed is high in the flat parts, as it is a corridor in which the speed of activity of wind erosion processes increases, and for the factor of drought for more and raise its than 8 months in The study area works to disintegrate and dry the soil susceptibility to wind erosion. As for the rock formations in the region, most of them are clastic, represented by clay and sandy rocks, so they are less resistant to wind and chemical erosion processes after these formations were subjected to mechanical weathering processes, which made them respond more to the wind erosion process, and the surface roughness is one of the factors that limit the ability of the wind to to wind. In Erosion, the greater the roughness of the surface, the greater its resistance the study area, the effect of this factor is minimal due to the lack of erosion. Also, the size of the crumbs and sediments affect wind erosion. There is a direct relationship their movement. between the size of the atoms and the wind speed required to start -For atoms with a diameter greater than one millimeter to move, they need to High speed winds and the size of the transported particles increases with the increase in the directly wind speed that characterizes the study area, and the wind strength is proportional to the cube of its speed and inversely to the square of the effective precipitation, as well as the effect of vegetation on wind erosion. The study area has is difficult to it two double processes in which two phenomena contribute, and determine which of them has the strongest impact¹

(Wind winnowing process in the lowest basin (2 (1) Picture



Source :
Field study
on

World, Applied (¹
Climatic Studies
Al-Sha'at al ,1997

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In th
Phil
Info

Winnowing (vacuuming) process: It means the process of lifting and transporting -A dry and loose particles that can be winnowed from the surface layer of the soil by the ^{control} kinetic energy of the wind (), and two main factors¹transfer of loose ^{the} materials, namely the size of the particles and the wind speed, and the winnowing ma process is carried out according to three methods: Crawling on the surface, jumping) and hanging²the winnowing action increases in the study area with the general (of the winds, represented by the northwest winds, while its role also appears direction when it blows from the southwest coming from the desert, as it is characterized by its dryness and intensity, as it blows from areas with little molarity with a lack of natural vegetation Therefore, it works to raise sand and dust particles, leaving large particles ^{photo}) such as small rocks and pebbles³(2)

the process of carving and filing rocks in the study area (2) Picture



Source:
Field
Study,
/12/11
2022E
46 41 54
N 32 44
56
The -B
process
of
carving
polishi)
-ng):

ki, the phenomenon of wind winnowing in the Mali-Abdullah Salem Abdullah Al)¹ governorates of Dhi Qar and Basra, a geographical study, an unpublished doctoral thesis, .College of Arts, University of Basra, 1999

Jawthari, The Impact of Geomorphic Processes on the-Hussein Al-Ali Hamza Abdul² Shinafiyah District, Master Thesis (unpublished), College -Formation of the Landform of Al .of Education for Human Sciences, University of Babylon, 2014, p. 92

Dulaimi, Taha Yassin Abdullah, geomorphological processes and -Khalaf Hussein Al(³ s of the region overlapping the western plateau with the Euphrates River manifestation .Valley, Anbar University Journal of Human Sciences, Issue 4, Volume Two, 2013, p. 296 Philosophical Readings XIV.4 (2023), pp.31-44. 35

the grinding and polishing process that the wind carries out through the particles it carries, sand particles and other rock fragments as a result of their friction and works on trimming and polishing them. This striking of the rock surfaces, so it process depends on the speed of the wind and the hardness of the rocks. rocks, pebbles and sand at a height of one meter above the surface of the earth, and when And that .⁽¹⁾ lled bottom necrosisthe winds are at their strongest, the process is ca most of the sand atoms that the wind uses as tools for carving and erosion settle at a the ' as for the quality of the rocks ,⁽²⁾ height of (0.5) m above the surface of the earth air resistance to erosion processes is very high, more solid the rocks, the degree of th .and the soft rocks are more influential in that process

three3. ways

(Suspensio) :Airborne -

In this method, the very fine granules, whose size is less than 0.05 mm, are transmitted. These granules are attached to the upper layers of the atmosphere and moved to very large distances that may reach hundreds of kilometers. They remain e air for a long time, then fall to precipitate when the wind speed suspended in th decreases and its strength weakens. To carry these granules, especially during the fall) of rain, and the deposition of these granules suspended in the air⁴ .(

:Jumping -Saltation sand grains move by jumping to a height close to the the - surface of the soil due to the effect of wind pressure on them, as the grains jump to the top and when they collide with the surface of the earth they jump again with a winds that cannot carry them to long distances. new air column resulting from new They fall because of their weight, and other grains of sand rise to the wind stream,) mm) are transferred 1-and in this way the grains whose size ranges between (0.05⁵(

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Ilah Razuqi Karbal, The Science of Landforms (Geomorphology), previous source, pp. –al Abd²
.p. 246–245

Haider Hamza Radi, Wind Erosion and the Forms Resulting from it in the Eastern (³
.p. 36 ,2017 ,Qadisiyah-District of Hamza, BA research, College of Arts, University of Al

Khashab, Geomorphology , definition , development, fields and -Wafiq Hussein al(⁴
applications, part one, University of Baghdad, 1978, 226

Abdul Aziz Tareeh Sharaf, Natural Geography, Forms of the Earth's Surface, University Culture (⁵
tion, 1993, p. 76Founda

:Crawl-

which the wind cannot lift, are moved by the ,Coarse granules and pebbles creeping method by hanging and jumping because of their large size and heavy weight. These moving granules crawl on the surface of the earth for a short distance, () r granules and move them as welland when they crawl, they may collide with othe) Its repeated collision of coarse granules, which leads to their creep ^{.12}The size of . (.(mm 2.0-the granules that move in this way ranges between (1.0

s that the actual effect of As for the reality of wind speed in the study area, it indicate the wind is significant due to the wind speed. The annual rate of wind erosion in the soils of the study area can be estimated by applying the climate equation (Chepil) based on the presumption of climatic susceptibilityto wind erosion .

$$C=386XV^3 / (PE)^2$$

C .climatic susceptibility to erosion =

V average wind speed in miles per hour =

PE effective precipitation according to the Thornthwaite equation, according to the = :following equation

$$PE=115X (P/(T-10))^{9/10}$$

P precipitation amount of =

T rate of heat =

Batihi, desertification, its -Razzaq Muhammad Al-Muhaishi and Abdul-Abdul Qadir Mustafa Al ⁽¹ concept and spatial spread, causes, results and ways to combat it, The Open University, Tripoli .(p. (163 ,1999

Desertification and Sand Dunes Fixation, College of Meteorology and ,Atallah Ahmed Younes² .Agricultural Structure for Dry Areas, King Abdulaziz University, 2006, p. 61 Philosophical Readings XIV.4 (2023), pp.31-44. 37

The degree of erosion according to the climatic susceptibility to wind (1) Table) erosion chepil classification (

degree of erosion	wind presumption
Very little erosion	17-From 0
little erosion	35-18
stripping Medium	71-36
high denudation	150-72
very high erosion	more than 150

Bayati, Kazem Musa, Climate and Infrastructural Capacity of Winds in -Source: Adnan Hazaa Al . Ani Press, 1989, p. 79-Iraq, Journal of the Iraqi Geographical Society, Issue 23, Al

climatic susceptibility to wind erosion at the stations of the study area (2) Table

degree of erosion	Climatic susceptibility to wind erosion C	effective precipitation rate PE	average wind speed (mph)	heat (rate(F	precipitation amount (inch)	station
very high erosion	4867,44	8,9	12,56	76,1	5,66	Kut
very high erosion	2698,53	9,12	13,92	76,46	9,33	Badra
very high erosion	7946,49	9,15	14,60	77,72	7,22	Ali Gharbi
very high erosion	745,27	18	10,53	75,38	11,70	Dahlan

Communications, General Authority for Source: Ministry of Transport and .Meteorology, Climate Department, unpublished data

) After applying the chepil equation to the stations of the study area, it was shown (as the ,that they are located within the very high degree of erosion (1) from Table climatic susceptibility to wind erosion at Kut station reached (4867.44), at Badra

Gharbi station (7946.49), while in Dahran station, -station (2698.53) and at Ali Al .(the lowest values were recorded (745.27

wind erosion Estimating soil susceptibility to -2

Soil susceptibility to wind erosion is the amount of soil granules that are estimated to be lost annually from the surface layer of loose soil due to the wind factor, which is e the most influential factor in the process of wind erosion of the soil. The force exerted on the dry and loose particles of the soil surface is greater than the force of friction of those particles on the surface of the earth, which accelerates their ⁽¹⁾ separation from the surface and then their movement, causing erosion

:to the following law According

$$P = V^2 * 0.006$$

: whereas

P (^{m2} / amount of wind pressure (kg =

V ^(*) (wind speed (km /h =

After applying the above equation to the climatic data of the stations of the study that the average annual wind pressure force was (3) area, it is clear from Table Gharbi and -And Badra, Ali Al . stations Kut kg / m2 at the (0.27) (0.45) (0.28) (0.54) Dahlan, respectively, and this rate varies during the months of the year, if it increases ne according to the gradual increase in wind rates in the starting from the month of Ju stations of the study area, and this increase coincides with the high temperatures and the dryness of the summer season, which helps to increase the activity of wind nd speed is within the range of the minimum speed of This means that the wi , erosion wind erosion, which is necessary to move and transport sand grains with diameters of (4) less than (0.1) mm. Table

Sahaf, -Ahmed Saeed Hadid, Mahdi Muhammad Ali Al , Khashab-Al Wafiq Hassan (1 s development, its fields and applications, previous source, Geomorphology, its definition, it .p. 220

.(x wind speed squared (km/h 0.006 = (Wind pressure force (kg/m2 ^(*)

of the basin lands The amount of wind pressure per square meter of the surface (3) Table

Dahran		Ali Gharbi		Badra		Kut		station Months
Wind pressure (m ² /kg)	Wind speed m / s	Wind pressure (m ² /kg)	Speed wind m / s	Wind pressure (m ² /kg)	Wind speed m / s	Wind pressure (m ² /kg)	Wind speed m / s	
0.13	2,2	0.29	3,6	0.14	3,7	0,20	3,3	January
0.15	2,6	0.31	3,8	0.15	3,7	0,22	3,6	February
0.19	3,4	0.42	3,4	0.23	3,2	0,26	3,9	March
0.20	3,9	0.47	4,6	0.23	4,3	0,31	3,9	April
0.23	4,1	0.47	4,5	0.20	4,1	0,32	4,6	Mays
0.34	4,9	0.88	6,2	0.34	5,8	0,39	4,1	June
0.44	3,2	0.80	6,0	0.34	5,8	0,42	4,1	July
0.43	3,3	0.67	5,5	0.27	5,4	0,44	4,7	dad
0.32	3,1	0.43	4,4	0.20	3,9	0,33	4,5	September

0.27	2,5	0.31	3,6	0.13	3,3	0,28	2,5	October
0.19	2,2	0.27	3,5	0.08	3,2	0,19	2,4	November
0.11	2,1	0.17	2,8	0.12	2,2	0,17	3,3	December
0.27	3,1	0.45	4,3	0.28	4,1	0,54	3,7	the average

Source: Ministry of Transport and Communications, General Authority for Meteorology, Climate Department, unpublished data

particles (mm) and wind speed required for erosion Diameters of (15-Table (2 (m/sec)

Wind speed (m/s) required for erosion	Particle diameter (mm)
3,6	and less 0.01
3,7	0,025
3,8	0,05
4	0,1
4,5	0,25
5,3	0,5
6,6	1

Maliki, The phenomenon of wind winnowing in the -Source: Abdullah Salem Abdullah Al governorates of Dhi Qar and Basra .a geographical study), PhD thesis (unpublished), College of Arts, University of Basra, 1999, p. 60)

(in a basin (1 The retrograde sculpture (9-Photo (2



Source : Field

2022/12/11 study on E 46 47 16 N 32 52 47

-:Conclusions

reached by the study are the following **conclusions** The most important

The natural and human factors, especially the dry climatic conditions and the occurrence of the study area within the arid climate, in which the average temperature is high, the lack of rain, the high values of evaporation and the lack of humidity as facilitated as The role of the human factor and its activities in soil drying , which well . erosion wind the process of soil degradation and increased

) It appeared through the application of the W -chepil equation to estimate the size of (the wind erosion on the stations of the study area and it was found that they are located within the very high degree of erosion, as the coefficient of wind erosion for n Badra station (2698.53) In Ali Kut (4867.44) and i , the stations of the study area Gharbi station (7946.49), while in Dahran station, the lowest values were -Al recorded (745.27). The results of the stations in the study area were characterized by . very high erosion due to the variation in wind speed

kg / m² (0.27) (0.45) (0.28) (0.54) he average annual wind pressure strength was T - Gharbi and Dehran, respectively, and this -Kut, Badra, Ali Al -at the stations of Al average varies during the months of the year . According to the gradual increase in tes in the stations of the study area, and this increase coincides with the high wind ra temperatures and the dryness of the summer season, which helps to increase the activity of wind erosion, which means that the wind speed is within the range of the

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