EVALUATION OF THE ACCURACY OF THE MAP MODEL ACCORDING TO THE AREA OF SOME ELEMENTS OF THE CLIMATE USING SPATIAL INTERPOLATION METHODS (NORTHERN IRAQ AS A MODEL)

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Abstract

This study focuses on testing the accuracy of the model using the methods of interpolating the areas for heat and rain. This happens by finding the areas to find out which methods are more accurate through the interpolation process for the spatial prediction of the areas. This is followed by a statistical regression for them to find out which methods are stronger in terms of linking to the main area from which are merged into one layer through the Map algebra within the grid calculator (raster calculator) in the spatial analyst tools.

Spatial interpolation methods are one of the methods adopted by geographers in solving many problems related to the study of natural phenomena. It studies phenomena such as elements of climate, as these methods give possibilities for values that cannot be reached or can be covered by ground stations(Earls & Dixon, 2007).

All tables and figures are made by the researcher by the use of GIS.10.6.

Keywords: Spatial interpolation, area, geostatistical, temperature, rain, deterministic methods.

Practical Aspect of Finding Interpolation Spaces

Given the importance of spatial complementation of climatic data, the process of forecasting data to complete uses statistical analysis tools in geographic information systems and to predict them. We take into account the basic spatial structure found in geographic information systems by which it is possible to predict certain unmeasured sites(Olson, 1976). Here, the application of Geostatistical analysis tools in the GIS10.6 program is used to find an area for each method and find out the area covered by the spatial interpolation using this tool for each method.

Spatial interpolation maps are unique in the feature of representing surfaces. The scientific method in these models depends on taking the data available in certain places of the study area, and then predicting the required data in areas where there are no measurements(Razuqi, 2020). The methods of interpolation all depend on the similarity of points which are close samples to create continuous surfaces. The objects close to each other are more similar than distant objects, so it can be assumed that the values of samples close to each other will be more similar than the values of distant samples(Tranmer & Elliot, 2001).

Ground statistics methods are similar to the deterministic methods in weighing the closest points more strongly than the far ones to derive a prediction for each location. Yet, the weights in the ground statistics methods are not based only on the distance between the points and the location of the estimate, but on the spatial arrangement between the points (climatic stations)("ESRI, Op.cit,").

Kriging's technique is based on the theory of regional variables, where the regional variable is in an intermediate position between the real random variable and the fully specified variable. Thus, the points in this method are in a continuous state from one location to the other, and therefore the points that are close to each other have specific degrees in its mathematical relations. Points that are widely separated become statistically independent(Schmidheiny, 2015). The Kriegging method consists of a set of linear regression equations("ESRI, Op.cit,") that minimize estimates of the variance in the covariance mode(Al-Tai, 2001).

To evaluate the methods of spatial interpolation, the study resorted to extracting spaces for each method of spatial interpolation. Then these layers are merged into one layer. So this data was processed in the work of re-classify and exported in Raster format and then extracted spaces for each of these methods.

An independent layer for each selection method is made according to the Select by Attribute criteria. After that, the areas are determined, a special table is made for the areas, and the data type is double selected. Then the layer is edited. After that the areas are calculated using the field calculator, and then they are exported and called the layer. An integration was made by using the map algebra tool to obtain the areas of these roads, where the size of the areas that were completed for each road for heat and rain in the study area is calculated.

This data is reduced by dissolving it as it is very large data amounting to millions, so a reduction is made for it. For example, the first category is within one feature in all regions.

An intersect is made to this data to merge it into one database and encode each factor within (GRID_CODE). Export results from the database to Excel within the command ((Export Table to Excel).

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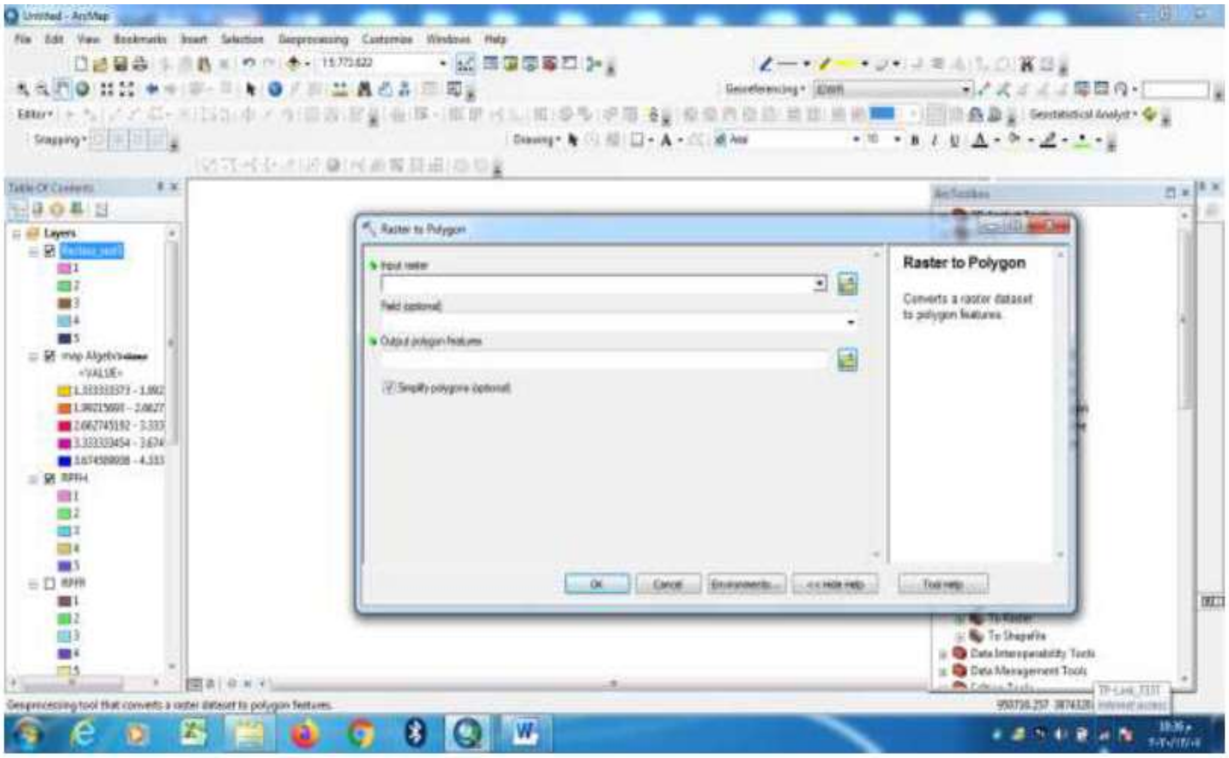

Figure (1) The working mechanism of extracting areas, converting the layer to Raster

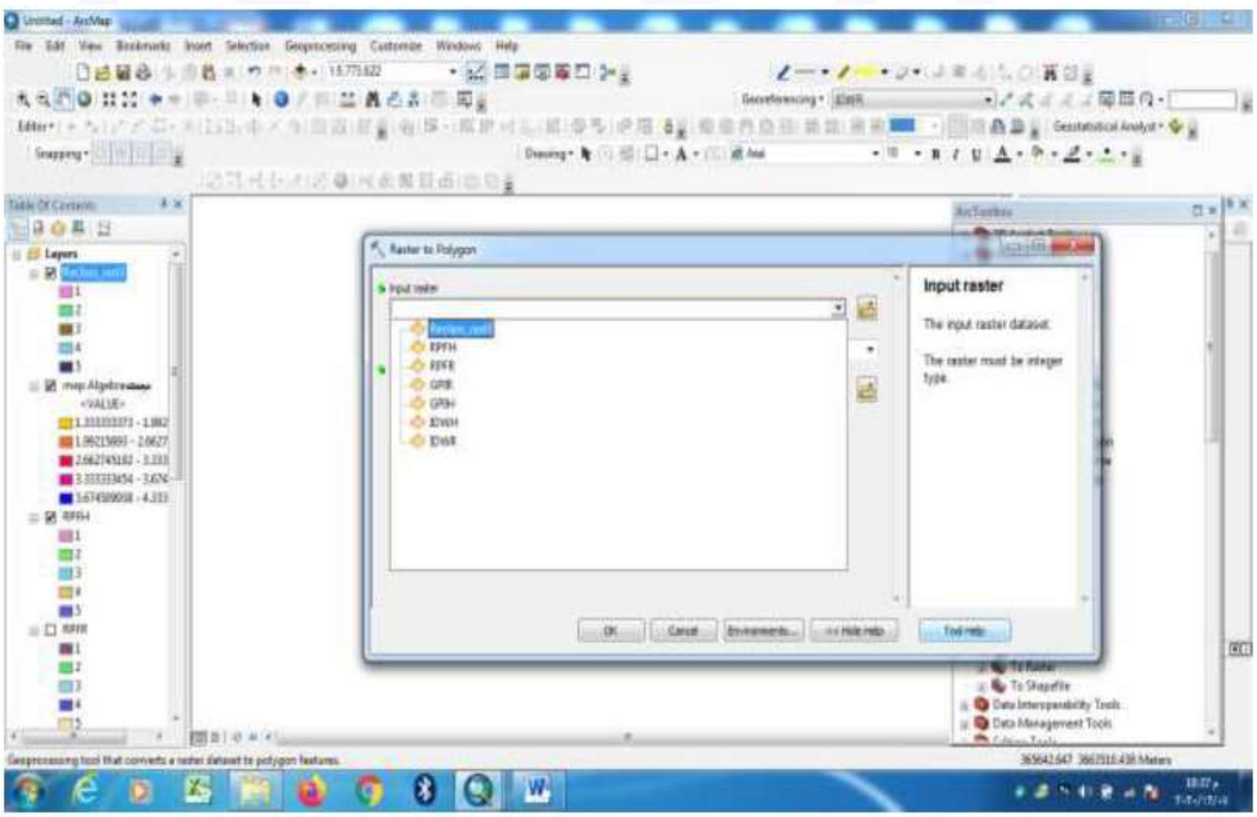

Figure (2) The mechanism of classification of spaces after converting the layer to Raster

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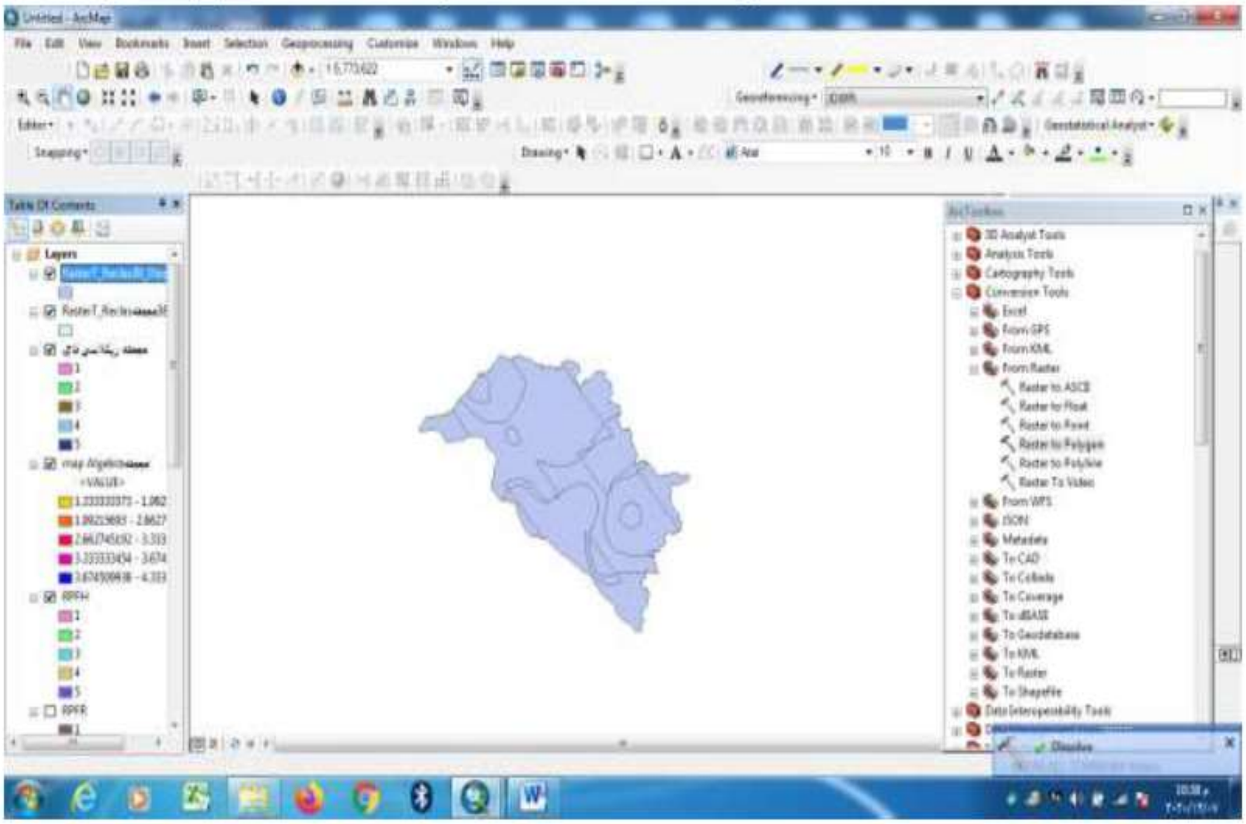

Figure (3) The sorted layer after the Raster procedure

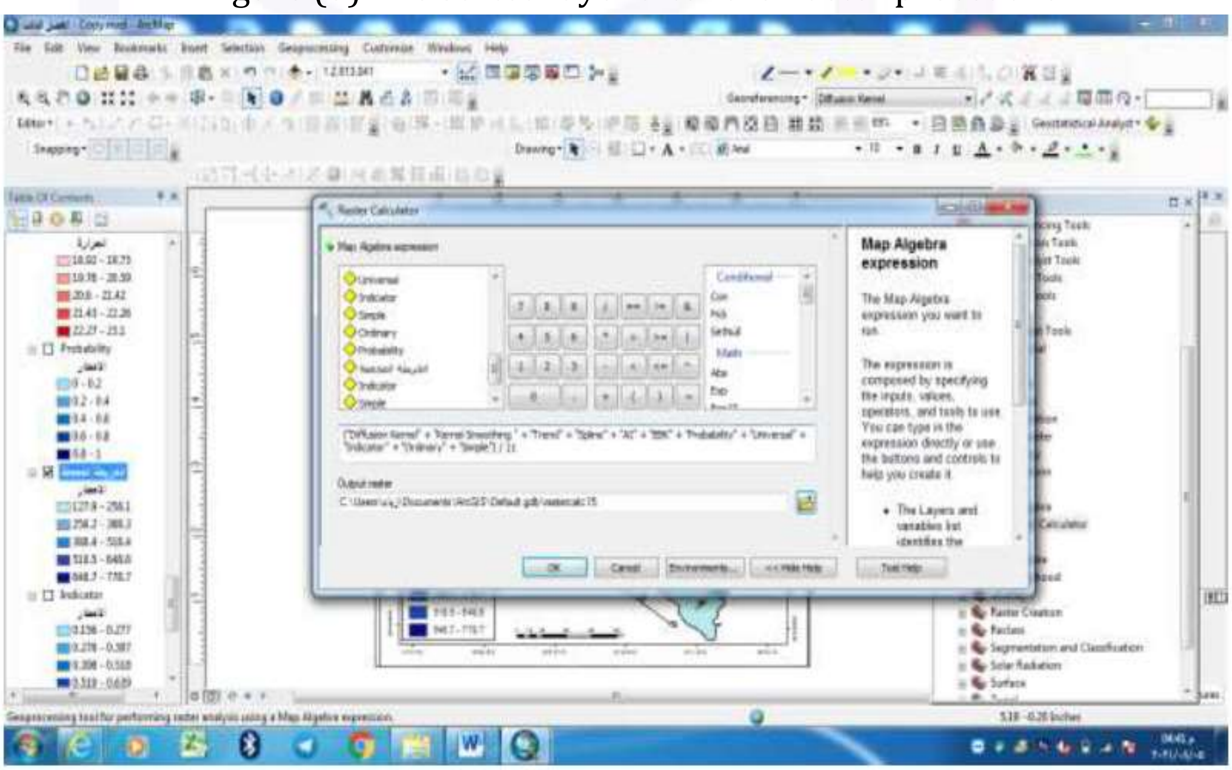

Figure (4) The mechanism of merging layers to extract the combined map Map Algebra

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Extraction of Deterministic Road Spaces For Spatial Interpolation

The process of extracting the areas that are completed through each of the methods of spatial interpolation of the areas of unknown monitoring to cover each station using the deterministic methods through several steps mentioned above divided into five areas according to specific categories in practice, through Table (1) and (2). It was found that for each of the inevitable spatial interpolation methods to complete a specific area, the highest method for areas was completed, which is the (RPF) method for heat with an area of (36930.9) km2 and for rain with an area of (37937.7) km^2. This is considered the highest area that has been completed in deterministic methods, but the least area that has been completed is. The (RPF) method has an area of (887.0) km2 for temperature, and as for rain, the areas have been completed to reach (29752.9) km2 for grouped according to the first category. Here, the overall total of the spatial interpolation is (25837.2) km2 according to the second category of the total area of the study area, where a combined map of the inevitable ways of heat and rain was made, map (1) and (2).

Map (1) A model of the deterministic spatial interpolation methods for the rain-collected map.

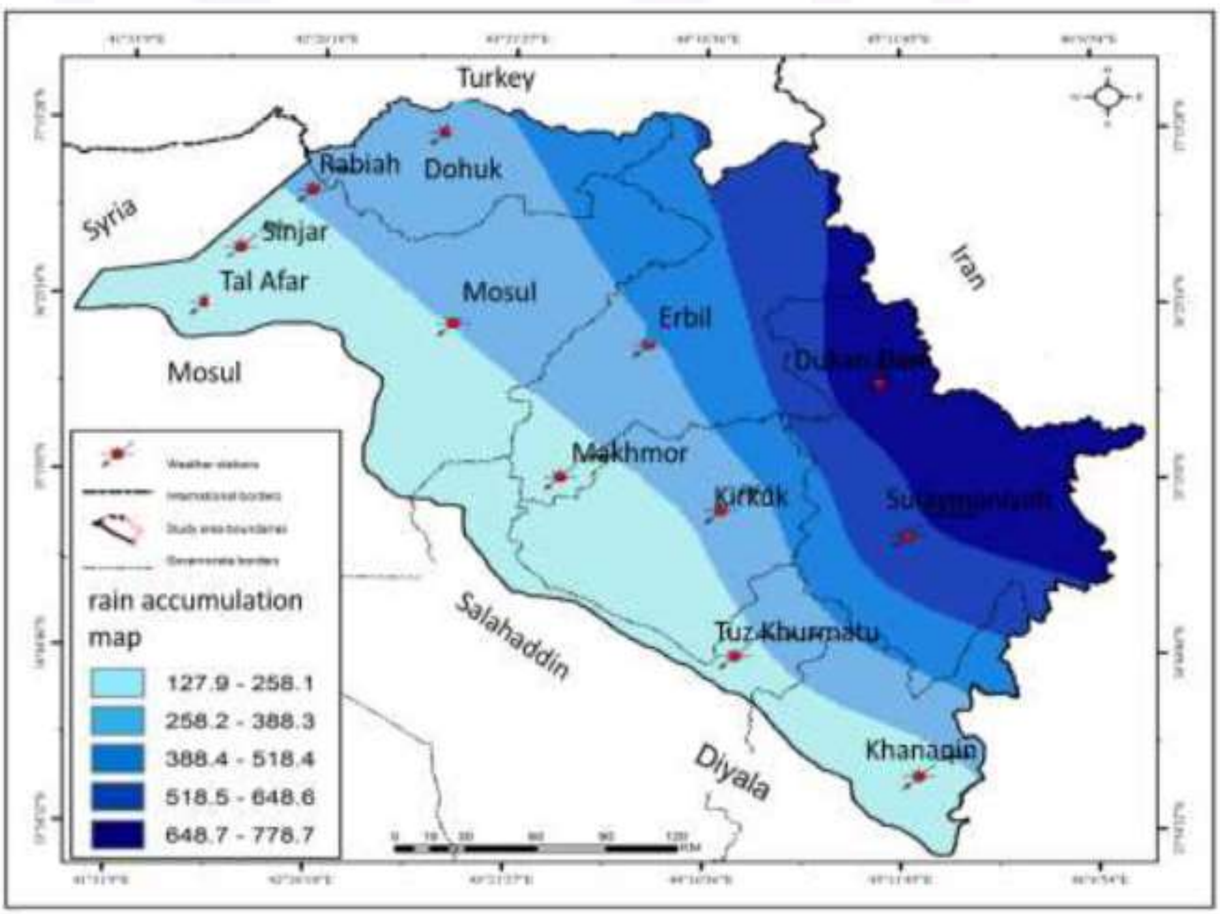


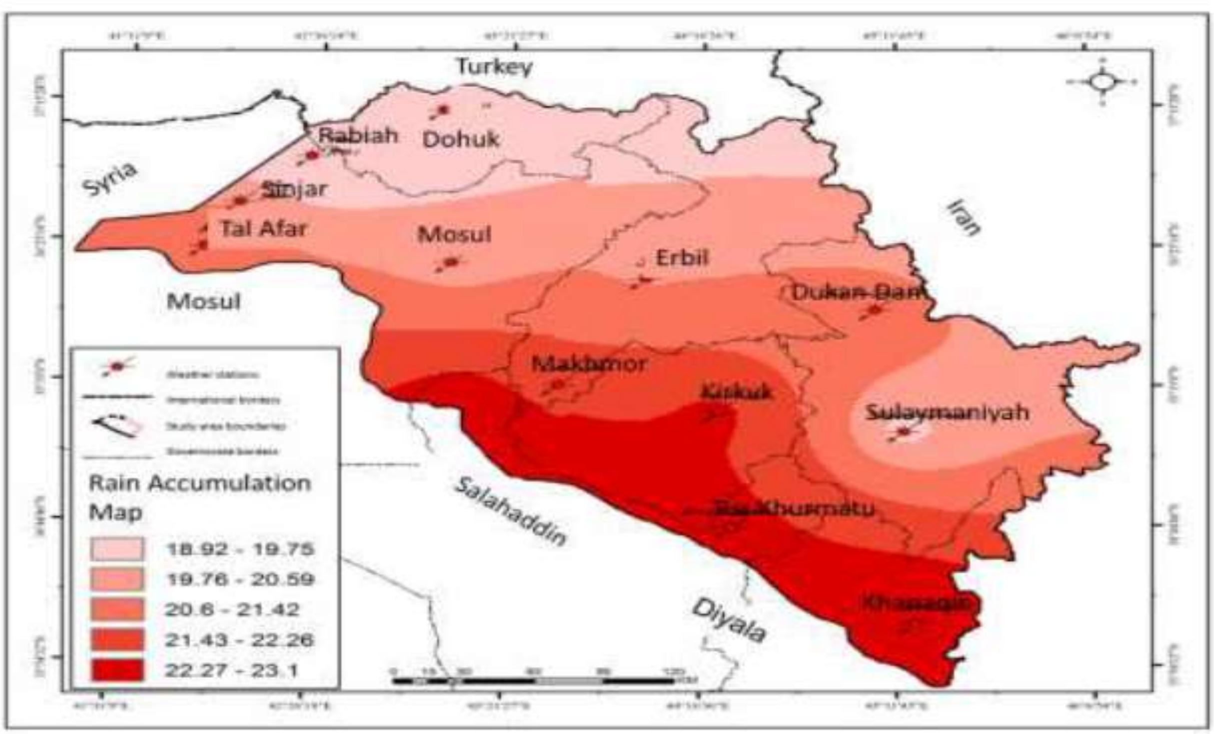
Table (1) shows the areas for each method, the deterministic methods for the schematic representation of the heat element

Category	LPIH	RPFH	GPIH	IDWH	total
1	14049.1	887.0	10459.2	2420.7	6689.4
2	27396.6	7599.6	22323.9	10724.5	25837.2
3	18216.7	36930.9	25095.7	32647.0	22364.5
4	13933.6	21301.4	16798.7	17260.4	14283.9
5	6261.3	13143.5	5184.3	16810.1	10689.6

Table (2) shows the areas for each method, the deterministic methods for the cartographic representation of the rain element

Category	LPIR	RPFR	GPIR	IDWR	total
1	31136.8	37937.7	3705.6	33963.1	29752.9
2	25645.2	16428.5	22519.2	24215.9	21355.0
3	13201.1	10110.2	25422.7	9203.9	11596.4
4	8996.1	8230.8	20773.5	9564.0	10250.4
5	897.9	7164.8	7450.0	2926.4	6927.7

Map(2) Model of the deterministic spatial interpolation methods for the heat-aggregated map



Extracting Areas By Geostatistical Methods For Spatial Interpolation

Spatial statistics methods are one of the tools used to analyze and sign the values associated with spatial phenomen(Cressie, 1993). They includes spatial (and in some cases, temporal) coordinates. Many geostatistical tools have been developed as a practical means of describing(Stein, 1999) the spatial patterns and values of unsampled sites. location instead of a modifier value(Kumar & Remadevi, 2001).

The processes of finding the areas were completed through each of the methods of spatial interpolation of the areas of unknown monitoring and forecasting to cover each station using the geostatistical methods of the ground(Balogun, 1982).

They were performed in several steps mentioned above divided into five areas according to the categories and through the table (3) and (4). It was found that each of the methods of spatial interpolation of geostatistical roads has a interpolation mechanism that differs in its interpolation of areas from other methods, as it took the highest percentage of interpolation of a specific area, where a method for areas was completed is the (Spline) method of heat with an area of (33768.4) km 2.

Yet, the least area was completed and predicted using the spatial interpolation method (Ordinary) with an area of (2334.1 km2) within the first category. In terms of rain, it reached the highest area that was completed about (50213.3) km^2, which is considered the highest area completed in the geostatistical methods in the (EBK) method.

The least area that was completed is the (Spline) method, with an area of (3012.43) km2 for temperature. The rain-collected areas have been completed to reach (35355.3) km2 for the grouped according to the first category.

As for the temperature, the general total of the spatial interpolation of the complex reached a rate of (27743.8) km2 according to the second category of the total area of the study area, where a combined map of the geostatistical methods of heat and rain was made, as in map (3) and (4).

Table (3) Areas for each of the methods of the geo statistical surface of the heat), Geospatial interpolation Methods Model, Al-Majmaah Rainfall Statistics

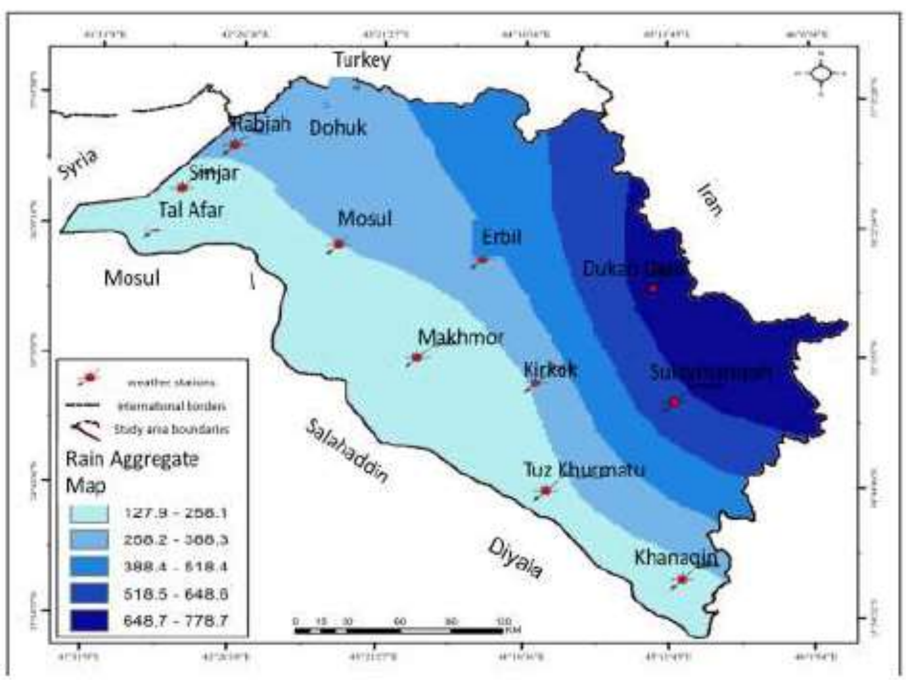
Table (3) Areas for each of the methods of the geo statistical surface of the heat element

Probability	Universal	Indicator	DK	Ordinary	KS	Simple	Trend	Spline	AL	EBK	total
8867.6	6137.6	3077.0	14966.2	2334.1	14966.2	11156.5	10476.9	4377.2	3347.2	11417.8	5246.6
23665.9	15022.9	24173.1	18684.1	11954.4	18684.1	12760.2	22309.1	13016.0	13697.4	22074.1	27743.8
18763.4	16491.7	16705.1	21929.4	30377.9	21929.4	24826.1	25111.5	33768.4	27788.6	20439.5	21506.5
21960.9	18177.1	19508.4	18411.3	17754.8	18411.3	16898.2	16787.0	27627.4	19929.0	14093.5	13280.9
6611.8	24030.3	16403.8	5881.0	17438.3	5881.0	14232.9	5186.8	1063.7	15099.5	11825.8	11788.3

Table (4) Areas for each of the methods of the geo statistical surface of the rain element

Probability	Universal	Indicator	Simple	Ordinary	Spline	Trend	DK	KS	AL	EBK	total
22339.4	17923.81	1280.287	21971.64	34726.46	44041.68	3901.1	11620.7	22881.94	33094.04	50213.3	35355.3
9428.6	15001.53	16164.48	23361.96	19670.23	19260.13	22686.7	23189.8	23037.8	24795.45	26013.01	18056.3
6602.8	15825.26	25202.47	14722.46	10106.03	11240.78	25300.4	27301.8	12630.9	10310.09	15163.1	10527.0
6318.3	13708.31	30096.62	10864.53	8133.066	4633.802	20686.9	14760.0	12203.0	7168.196	13222.79	8987.0
6611.83	24030.33	16403.81	14232.86	17438.33	3012.43	10510.28	7285.65	6545.15	4497.66	5798.941	6651.6

Map (3), Geospatial interpolation Methods Model, Al-Majmaah Rainfall Statistics



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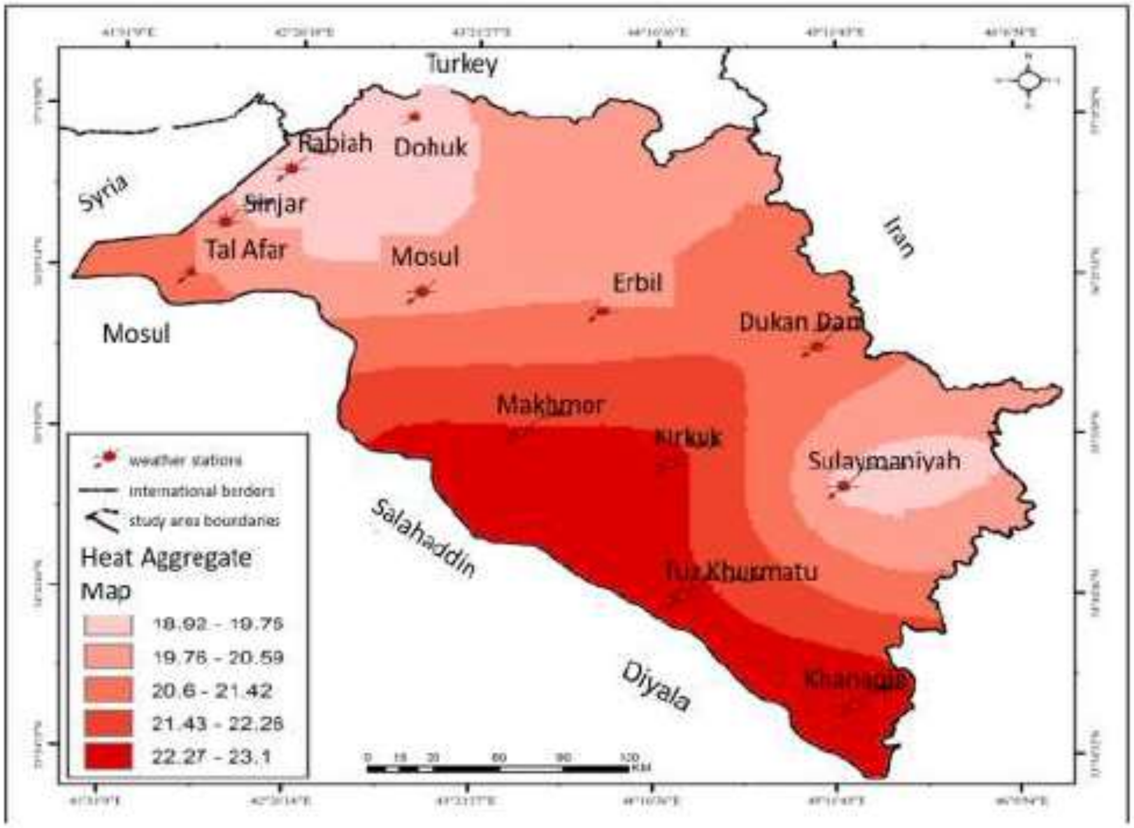
Map (4) Model of Geospatial Interpolation Methods, Geostatistics, Combined Heat,



Conclusion

The use of interpolation methods to process climatic data for temperature and rain showed effective results in the cartographic average monthly, annual temperatures and the amount of rain for the study area. This is by using the Arc GIS software, which is characterized by high accuracy and speed that gives a clear and close picture of reality and predict it where it was. The areal representation by the methods of spatial interpolation, including geostatistical methods for the elements of heat and rain showed a difference between the spatial prediction processes between the deterministic methods and the geostatistical surface, through the areal interpolation processes for each method. This is through which the design of the objective maps with several Linear and spatial layers in the process of cartographic representation of the layers. These layers were created depending on the methods of spatial interpolation and their layers exported to GIS and its developed programs.

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