CHAPTER FIVE

TESTS AND RESULTS

5.1 Introduction

In this study a topographic map for Khartoum city downtown with a scale of 1:100,000 were used. The chart was hard copy so it was been scanned to make it suitable for modification using GIS software. The projection and datum of the original map and all details described in the table below.

Table (5.1) Original map information

Grid	UTM Zone 36
Projection	Transverse Mercator
Spheroid	Clarke 1880
Unit of measurement	Meter
Mer of origin	Greenwich
Scale factor at origin	0.9996
Datum	Adindan
Printed by	Sudan Survey Department
Sheet number	359-ND-36-B-3
Name	Khartoum

Three tests were carried out. The objective of the tests was to compare the effect of the projection and datum on the distance on a map. In each test the map had given a unique map datum and projections in the following table.

Table (5.2) Tests criteria

Test Number	Map Datum	Map Projection
One	WGS84 CLARK1880	UTM TM
Two	WGS84 CLARK1880	TM TM
Three	WGS84 CLARK1880	UTM UTM

Six points were chosen as testing points to compare the deformation on map distance in the three tests and mean difference in distance was computed. The results were as the following.

5.2 Test number one

In this test a UTM-WGS84 was compared with a TM-CLARK1880 and the result shown in the table below.

Table (5.3) Relationship between distance in(Km) on WGS84_UTM and Clark1880 _TM

From	To	Distance on WGS84_UTM (KM)	Distance on Clark1880_TM (KM)	Difference in distance(diff) (KM)
A	B	1.426	1.417	0.009
A	C	3.384	3.421	-0.037
A	D	4.242	4.263	-0.021
A	E	4.448	4.472	-0.024
A	F	4.646	4.682	-0.036
B	C	2.392	2.425	-0.033

From	To	Distance on WGS84_UTM(KM)	Distance on Clark1880_TM(KM)	Difference in distance(diff)(KM)
B	D	3.652	3.668	-0.016
B	E	3.880	3.894	-0.014
B	F	4.095	4.121	-0.026
C	D	1.582	1.573	0.009
C	E	1.785	1.779	0.006
C	F	1.989	1.996	-0.007
D	E	0.221	0.225	-0.004
D	F	0.437	0.454	-0.017
E	F	0.215	0.228	-0.013

$$mean\ difference\ in\ distance = \frac{\sum_{i=1}^{n} diff}{n} = -0.015$$

Table (5.4) test number one relationship between difference in distance against distance

Distance	Mean difference in distance (KM)
0-1	0.011
1-2	0.008
2-3	0.033
3-4	0.022
4-5	0.026

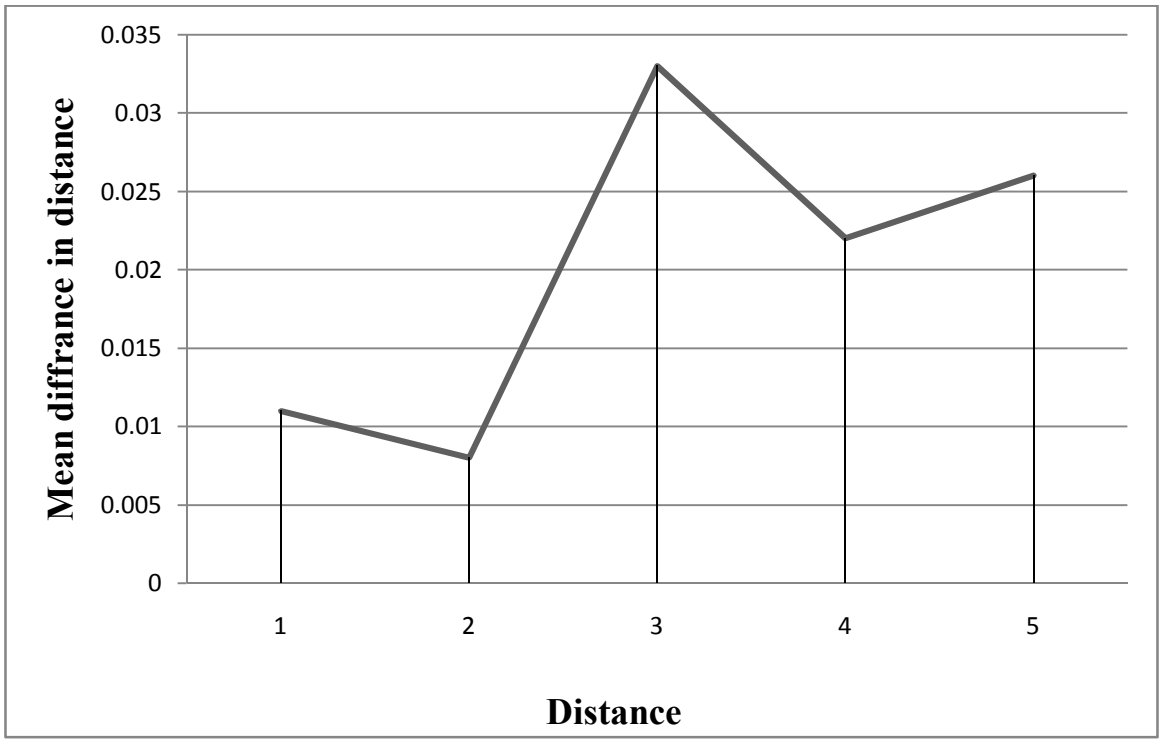

Figure (5.1) test number one ratio between difference in distance against distance

5.3 Test number two

In this test a TM-WGS84 was computed with a TM-CLARK1880 and the result shown in the table below.

Table (5.5) test number two relationship between distance in Km on WGS84_TM and Clark1880 _TM

From	To	Distance on WGS84_TM(KM)	Distance on Clark1880_TM(KM)	Difference in distance(KM)
A	B	1.407	1.417	-0.010
A	C	3.412	3.421	-0.010
A	D	4.264	4.263	0.001
A	E	4.470	4.472	-0.002
A	F	4.677	4.682	-0.005

From	To	Distance on WGS84_TM(KM)	Distance on Clark1880_TM(KM)	Difference in distance(KM)
B	C	2.416	2.425	-0.009
B	D	3.662	3.668	-0.006
B	E	3.884	3.894	-0.010
B	F	4.106	4.121	-0.015
C	D	1.570	1.573	-0.003
C	E	1.773	1.779	-0.006
C	F	1.981	1.996	-0.015
D	E	0.221	0.225	-0.004
D	F	0.444	0.454	-0.010
E	F	0.222	0.228	-0.006

$$mean\ difference\ in\ distance = \frac{\sum_{i=1}^{n} diff}{n} = 0.007$$

Table (5.6) Test number two relationship between difference in distance against distance

Distance	Mean difference in distance(KM)
0-1	0.007
1-2	0.009
2-3	0.009
3-4	0.009
4-5	0.005

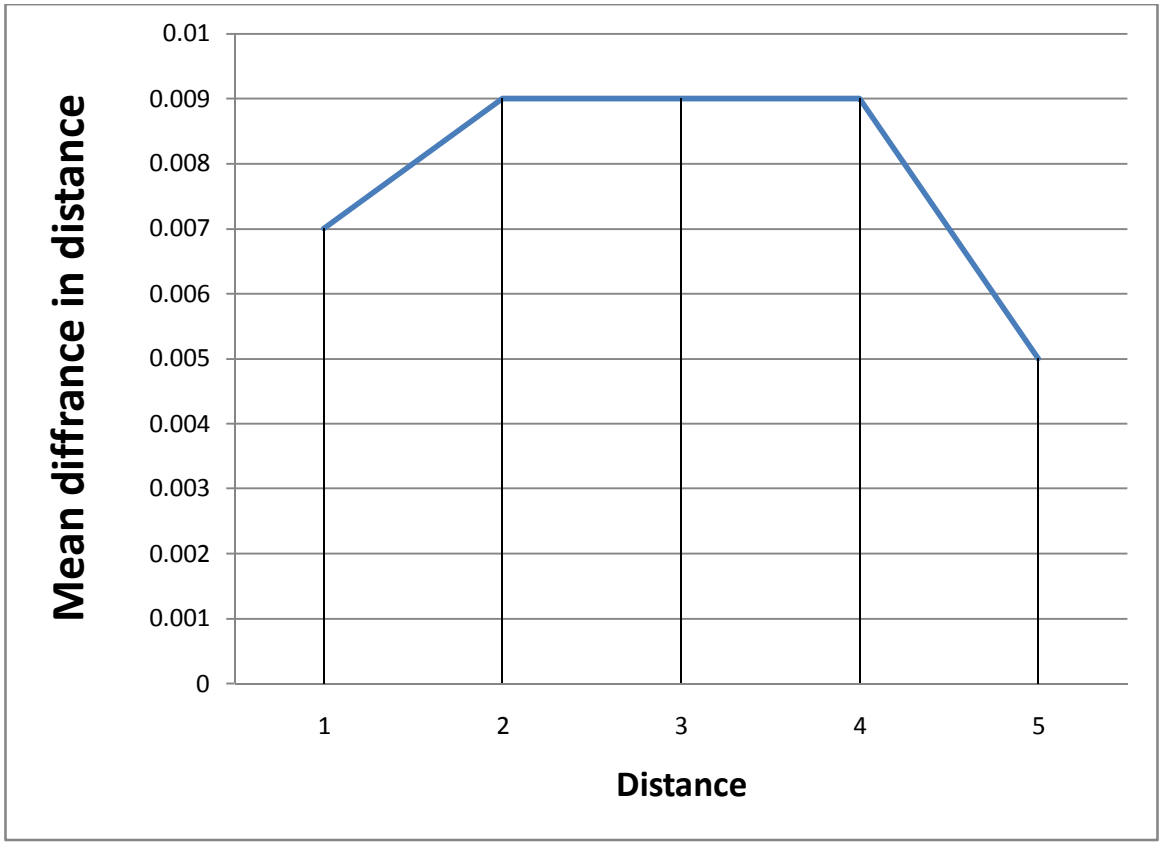

Figure (5.2) test number two ratio between differences in distance against distance

5.4 Test number three

In this test a UTM-WGS84 was computed with a UTM-CLARK1880 and the result shown in the table below.

Table (5.7) Test number three relationship between distance in Km on WGS84 _UTM and Clark1880_ UTM

From	To	Distance on WGS84_UTM(KM)	Distance on Clarke1880_UTM(KM)	Difference in distance(KM)
A	B	1.426	1.409	0.017
A	C	3.384	3.425	0.049
A	D	4.242	4.267	-0.025
A	E	4.448	4.468	-0.020
A	F	4.646	4.677	-0.031
B	C	2.392	2.415	-0.023
B	D	3.652	3.647	0.005
B	E	3.880	3.864	0.010
B	F	4.095	4.087	0.008
C	D	1.582	1.562	0.020
C	E	1.785	1.761	0.024
C	F	1.989	1.970	0.019
D	E	0.221	0.217	0.004
D	F	0.437	0.440	-0.003
E	F	0.215	0.223	-0.008

$$mean\ difference\ in\ distance = \frac{\sum_{i=1}^{n} diff}{n} = 0.003$$

Table (5.8) Test number three relationships between differences in distance against distance

Distance	Mean difference in distance(KM)
0-1	0.002
1-2	0.02
2-3	0.023
3-4	0.021
4-5	0.017

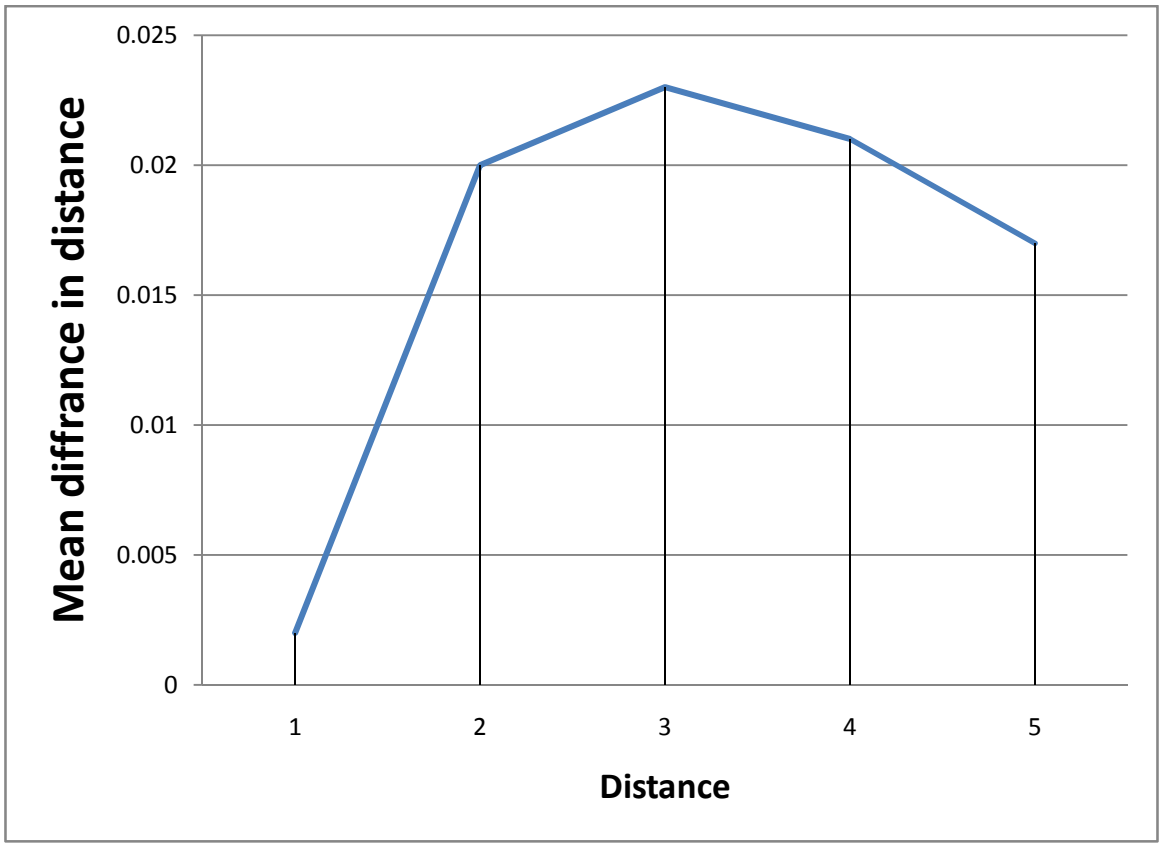

Figure (5.3) test number three ratio between differences in distance against distance