Environmental Modeling
Homework #5
Due on Thursday, October 18, 2012

There are five rain gages inside a basin. The geographical coordinates of these gages are given in Table1.

Table 1. Geographical coordinates of five rain gages

Rain gage	X (km)	Y (km)
1	10	16
2	20	29
3	32	20
4	45	45
5	16	24

Table 2 shows annual precipitation measured over a 12-yr period at these five gages.

Year	Gage 1	Gage 2	Gage 3	Gage 4	Gage 5
2000	1010	1161	780	949	1135
2001	1005	978	1041	784	970
2002	1067	1226	1027	1067	1158
2003	1051	880	825	1014	1022
2004	801	1146	933	923	821
2005	1411	1353	1584	930	1483
2006	1140	1223	781	1056	967
2007	829	1003	782	796	1088
2008	1165	1120	865	1121	963
2009	1222	1018	1215	981	1174
2010	1012	751	832	683	771
2011	1153	1059	918	824	1188
Mean					
Standard deviation					

(1) Compute the average annual precipitation and standard deviation of precipitation at each rain gage.
(2) Compute the spatial correlation (r) of annual precipitation for these five gages.
(3) Make a scatter plot of the spatial correlation r (y axis) versus the distance d (x axis).
(4) Use the Matlab curve fitting toolbox (cftool) to fit the scatter plot of the spatial correlation versus the distance by the following equation: r=exp(-cd), where c is a constant. What is the c value?
(5) Use the inverse distance weighting method to estimate annual precipitation at each grid cell (1 km x 1 km) inside the basin (1 km $\leq$ X $\leq$ 50 km, 1 km $\leq$ Y $\leq$ 50 km) from 2000 to 2011. Make a map of annual precipitation in 2011. (When you use the inverse distance weighting method, if distance = 0, set d=0.1km.)
(6) Compute the areal average of annual precipitation inside the basin from 2000 to 2011 using the interpolated annual precipitation value at each grid cell (1 km x 1 km).