I. METHODS

We used the Swendsen Wang algorithm to simulate the Potts Model with $1 = 1, 2, 3, 4$ on square (dim=2) lattices of various sizes L, and with $q = 2$ in the cubic and hypercubic lattices (dim=3,4). In the largest cluster in each of $N = 10^5$ realizations, we measured the chemical distance, l, between two randomly chosen sites on the largest cluster, as well as the diameter D of the largest cluster. For $q = 1$, the standard deviation σ in the (uncorrelated) values for $\langle l \rangle$ and $\langle D \rangle$ were calculated as $\sigma_{uncorr} = \sqrt{\frac{1}{N-1}(\langle l^2 \rangle - \langle l \rangle^2)}$. For $q = 2, 3, 4$, successive measurements of l and D were not independent; each system of size L was therefore allowed to thermalize for $10^*\tau_{exp}$, where τ_{exp} is the fitted exponential correlation time for the mass of the largest cluster in the system. The standard deviation σ_{corr} was then considered to be $\sigma_{corr} = \sqrt{\frac{2\tau_{int}}{N}(\langle l^2 \rangle - \langle l \rangle^2)}$, where τ_{int} is the measured integrated correlation time for the chemical distance l. A similar analysis was used for the diameter, D.

dim	q	L	L_{min}	d_{min}	D_{min}
2	1	16,32,48,64,96,128	48	1.131(1)	1.138(1)
2	2	16,32,48,64,96,128	48	1.096(1)	1.102(1)
2	3	16,32,48,64,96,128	48	1.065(3)	1.071(1)
2	4	16,32,48,64,96,128	48	1.033(3)	1.039(1)

TABLE I: Scaling exponents d_{min} and D_{min} for $dim = 2$, $q = 1, 2, 3, 4$

dim	q	L	L_{min}	d_{min}	D_{min}
3	2	20,36,48,64,128	36	1.267(5)	na
4	2	12,24,36,48,64	24	1.485(7)	na

TABLE II: Scaling exponents d_{min} and D_{min} for $dim = 3, 4$, $q = 2$

II. FIGURES

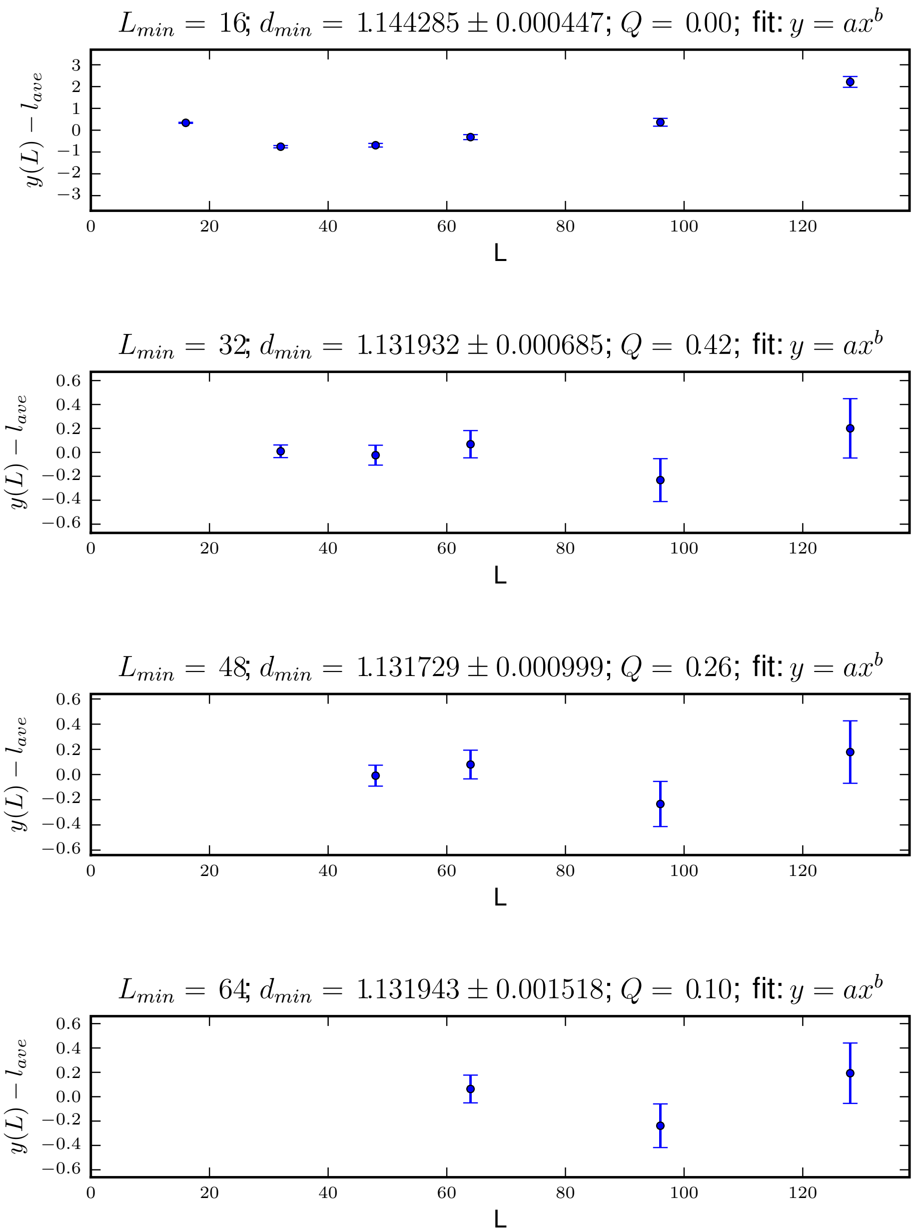

FIG. 1: The difference between the fit, $y(L) = cL^{d_{min}}$, and the average chemical distance $\langle l \rangle$ for dim=2, q=1.

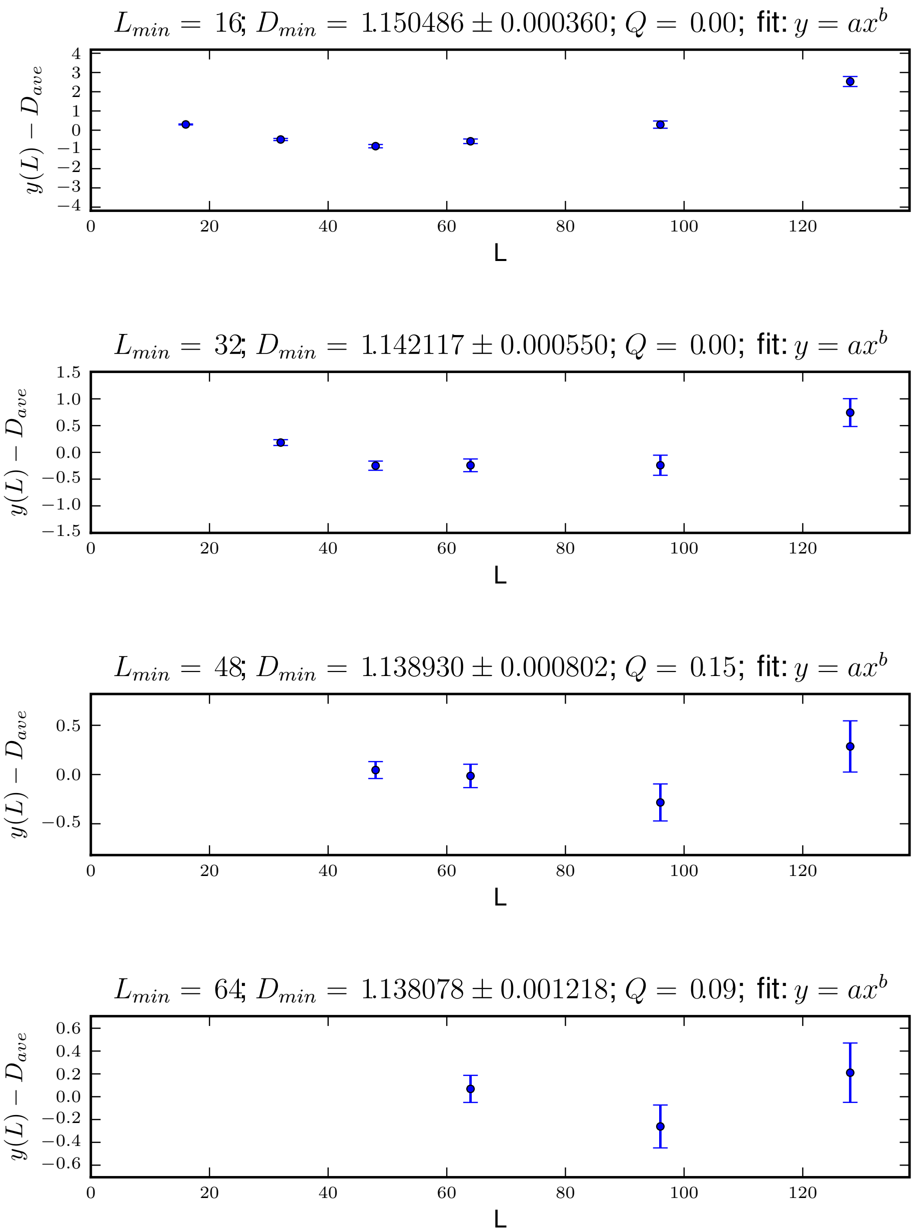

FIG. 2: The difference between the fit, $y(L) = cL^{D_{min}}$, and the average diameter $\langle D \rangle$ for dim=2, q=1.

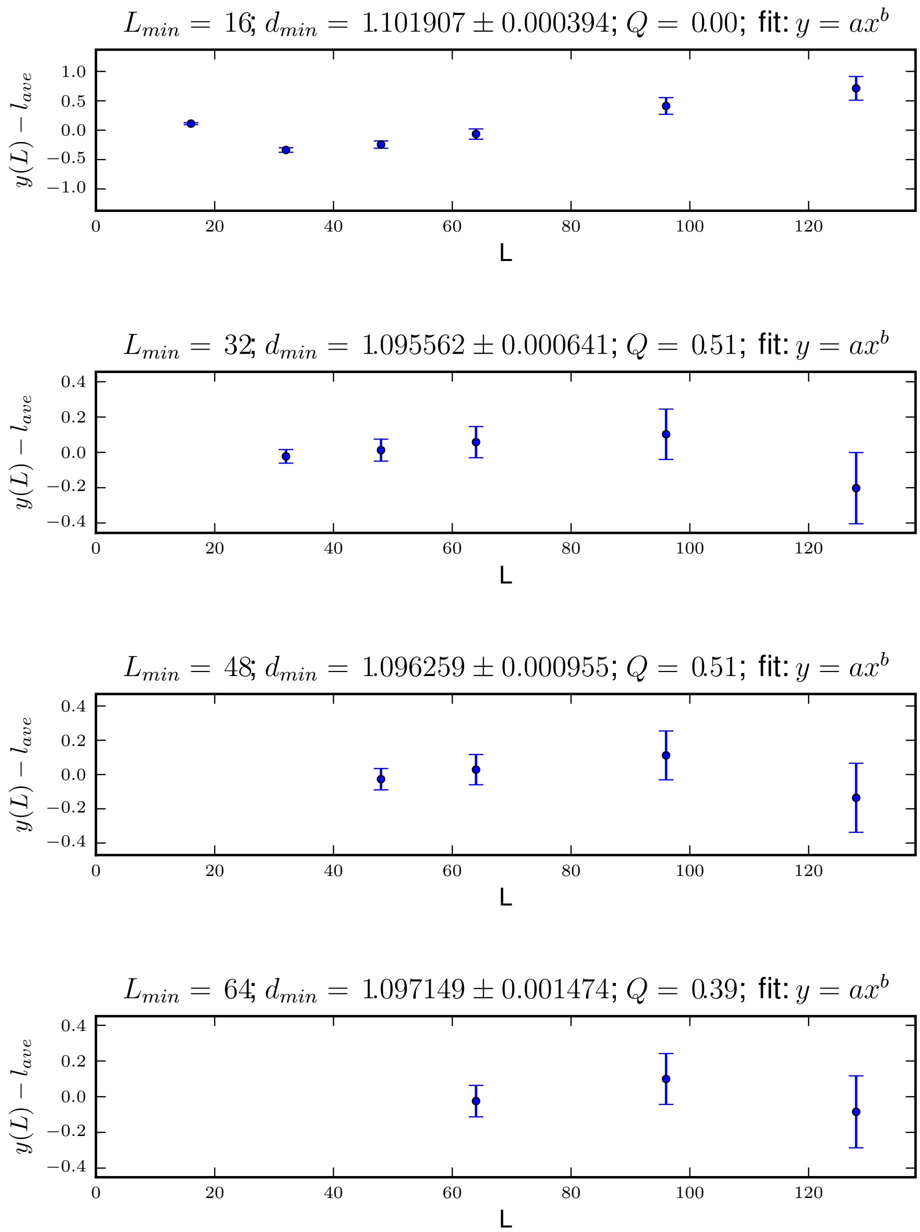

FIG. 3: The difference between the fit, $y(L) = cL^{d_{min}}$, and the average chemical distance $\langle l \rangle$ for dim=2, q=2.

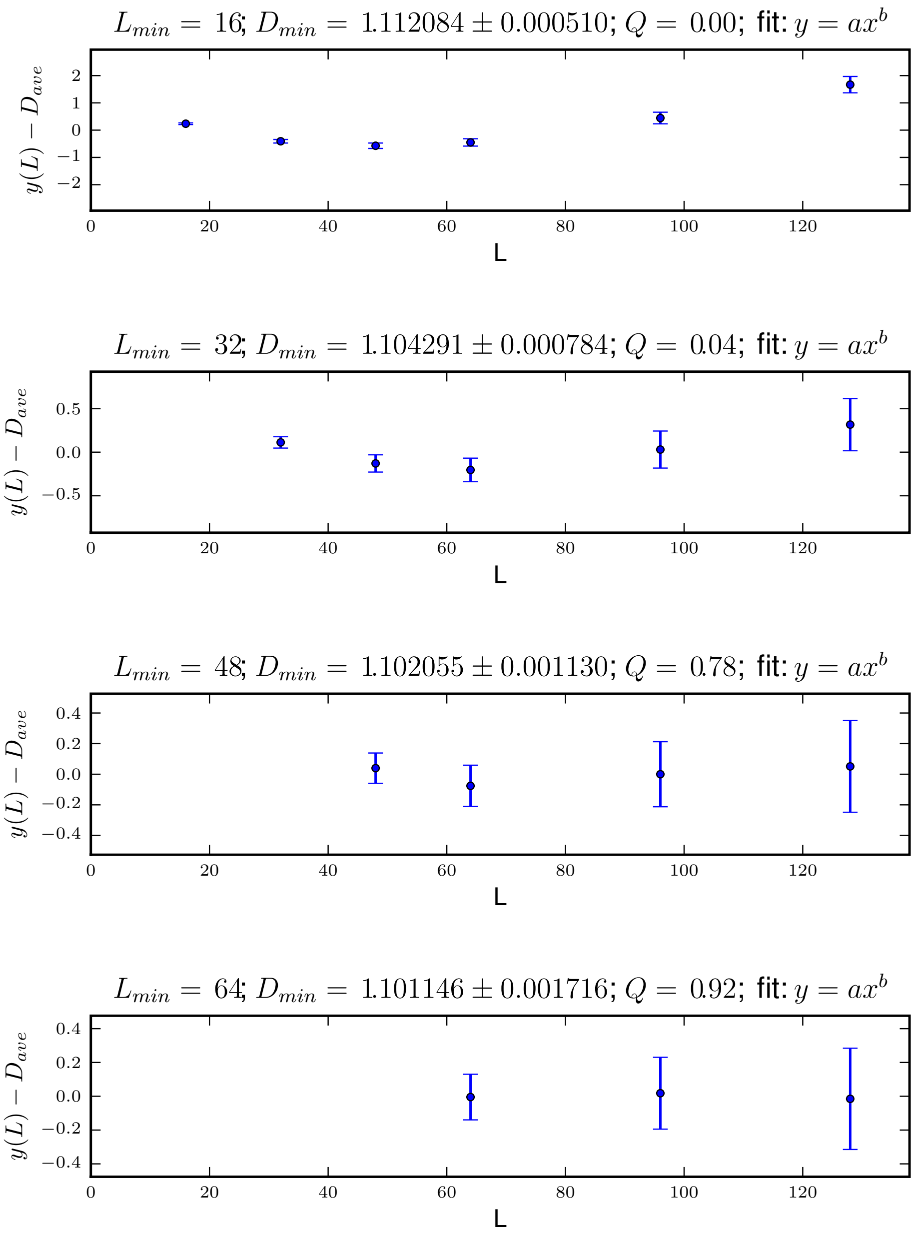

FIG. 4: The difference between the fit, $y(L) = cL^{D_{min}}$, and the average diameter $\langle D \rangle$ for dim=2, q=2.

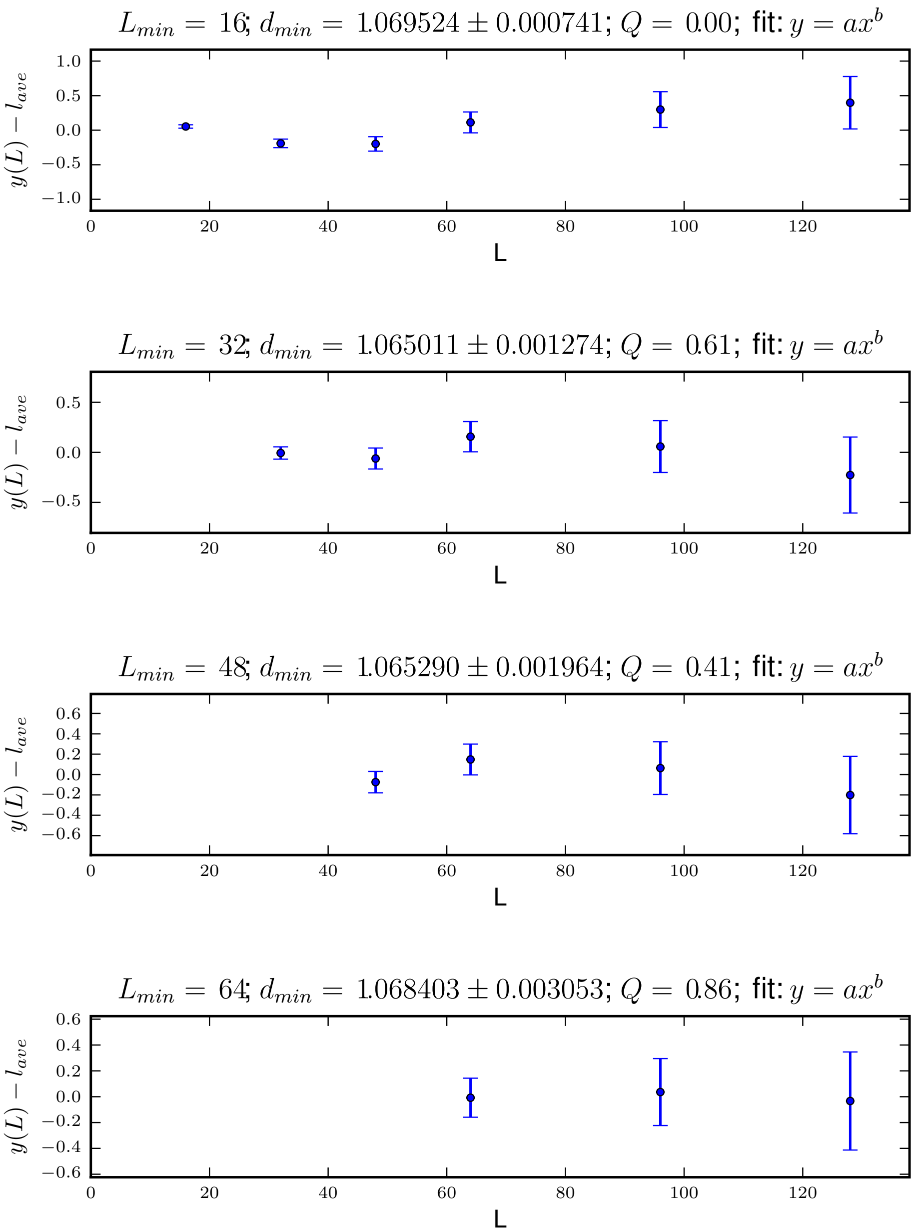

FIG. 5: The difference between the fit, $y(L) = cL^{d_{min}}$, and the average chemical distance $\langle l \rangle$ for dim=2, q=3.

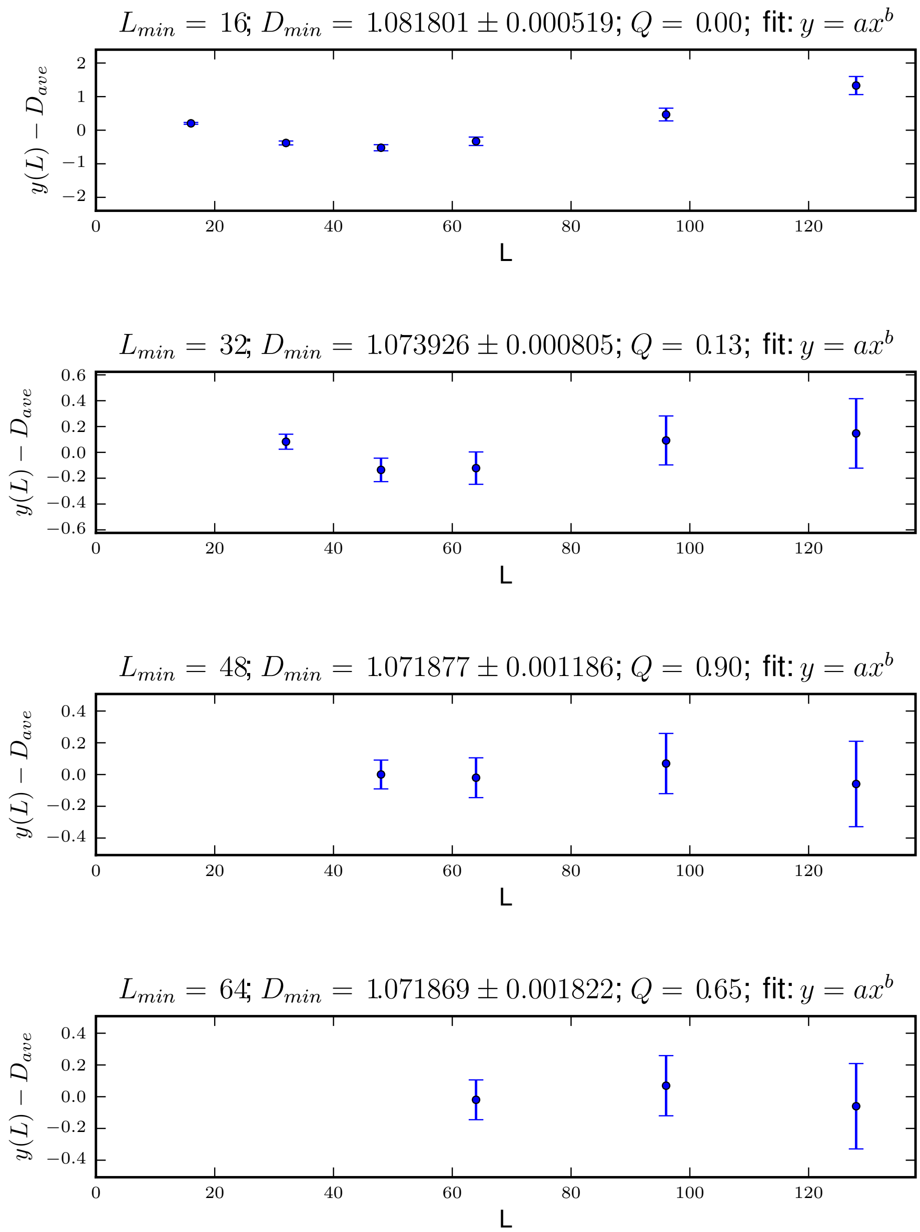

FIG. 6: The difference between the fit, $y(L) = cL^{D_{min}}$, and the average diameter $\langle D \rangle$ for dim=2, q=3.

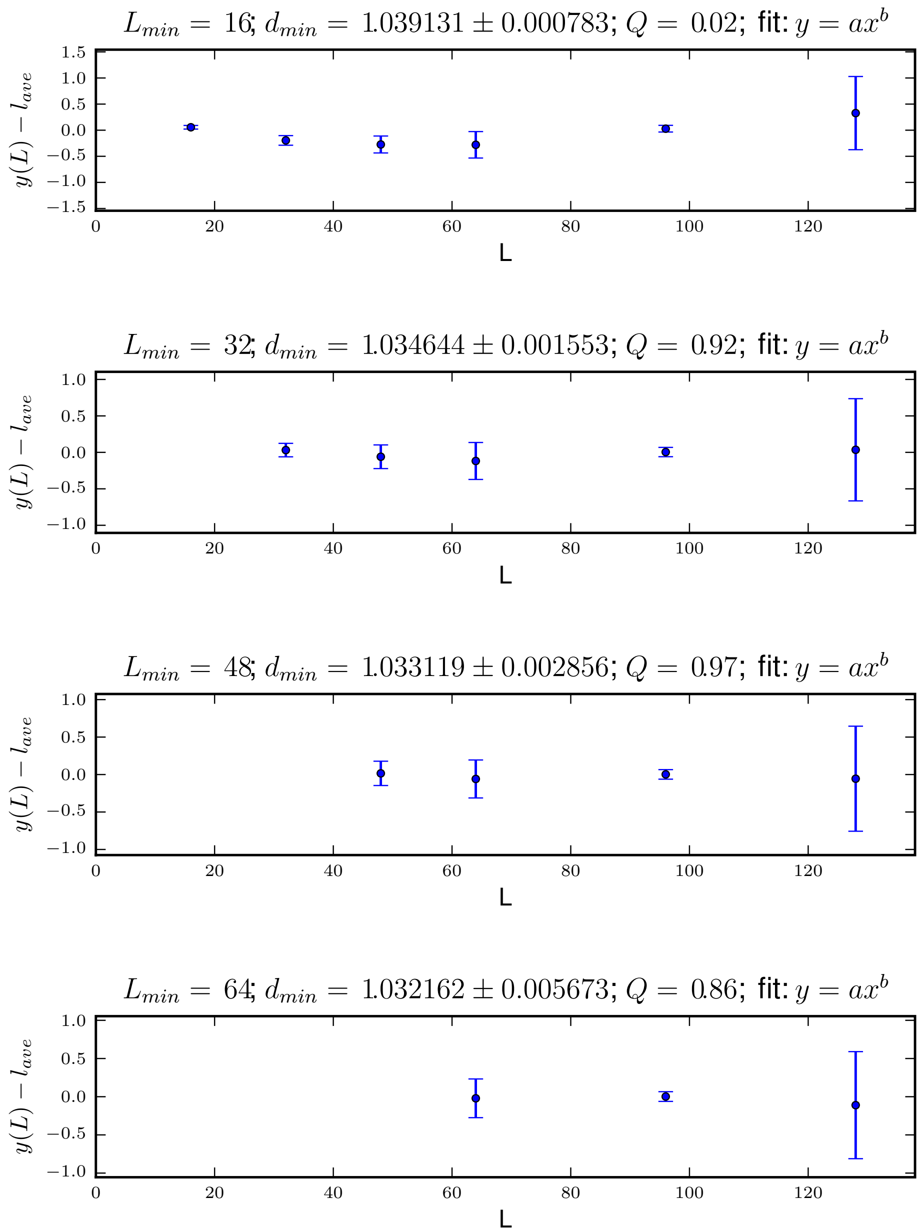

FIG. 7: The difference between the fit, $y(L) = cL^{d_{min}}$, and the average chemical distance $\langle l \rangle$ for dim=2, q=4.

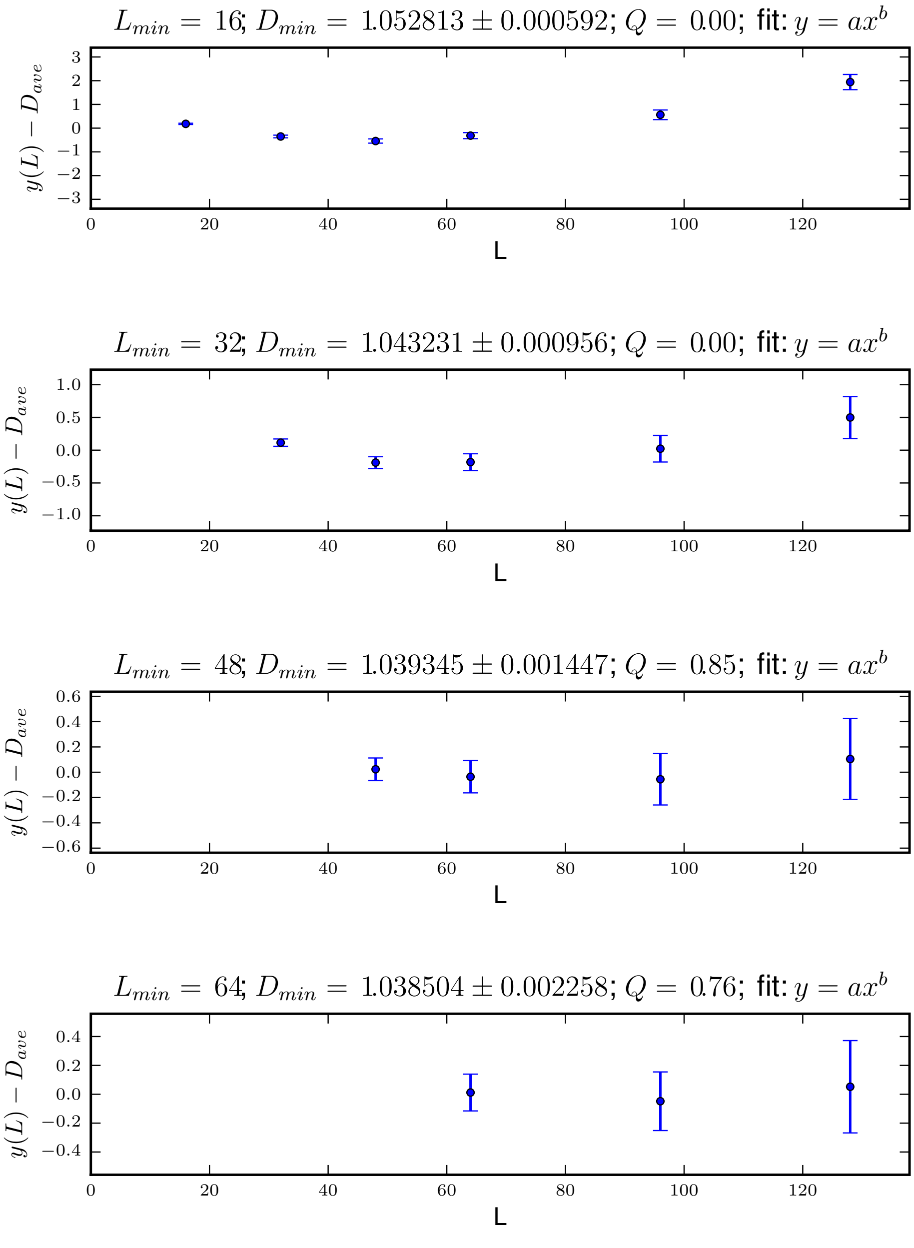

FIG. 8: The difference between the fit, $y(L) = cL^{D_{min}}$, and the average diameter $\langle D \rangle$ for dim=2, q=4.

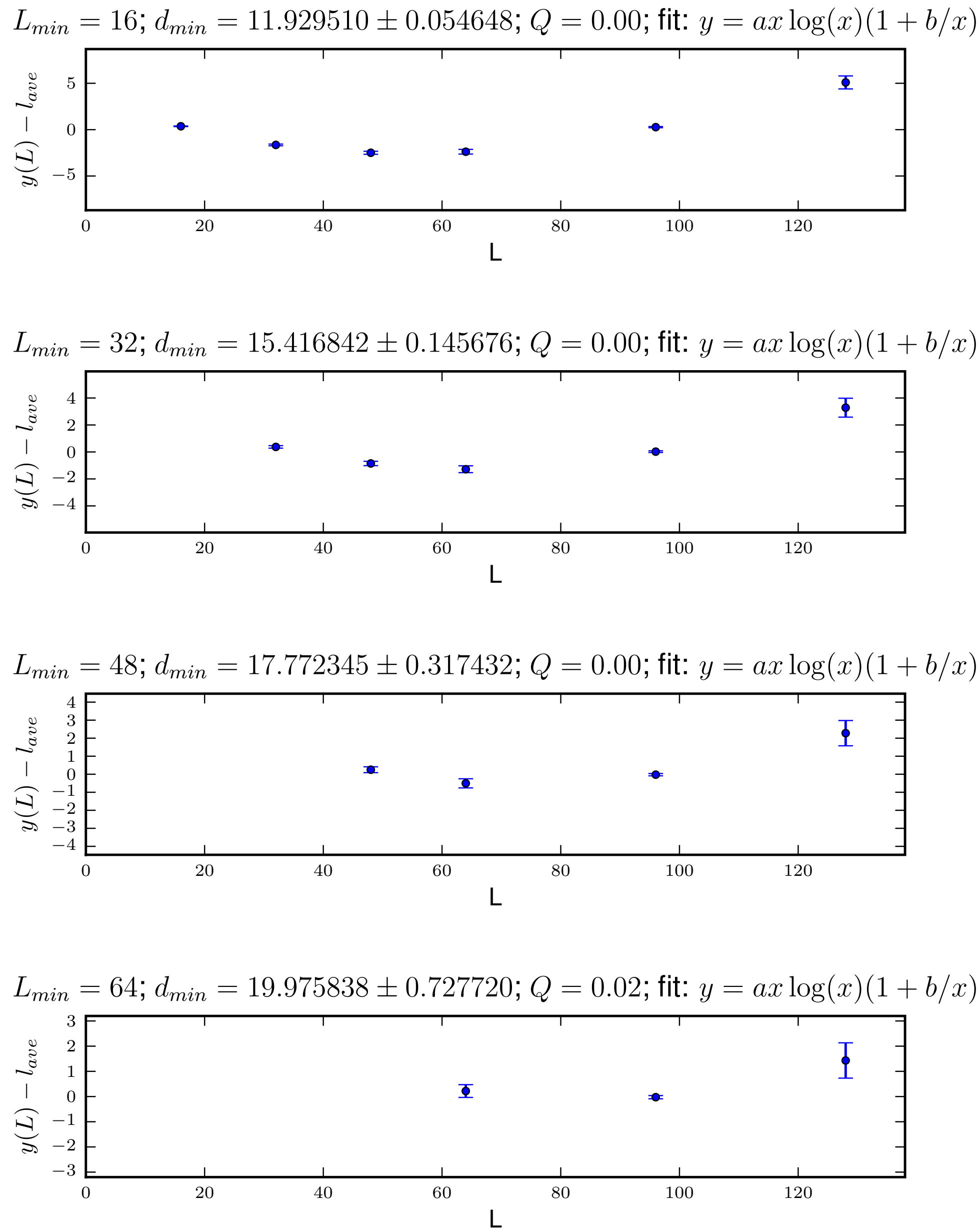

FIG. 9: d_{min} for D=2, q=4; log fit. Q values low – won't use.

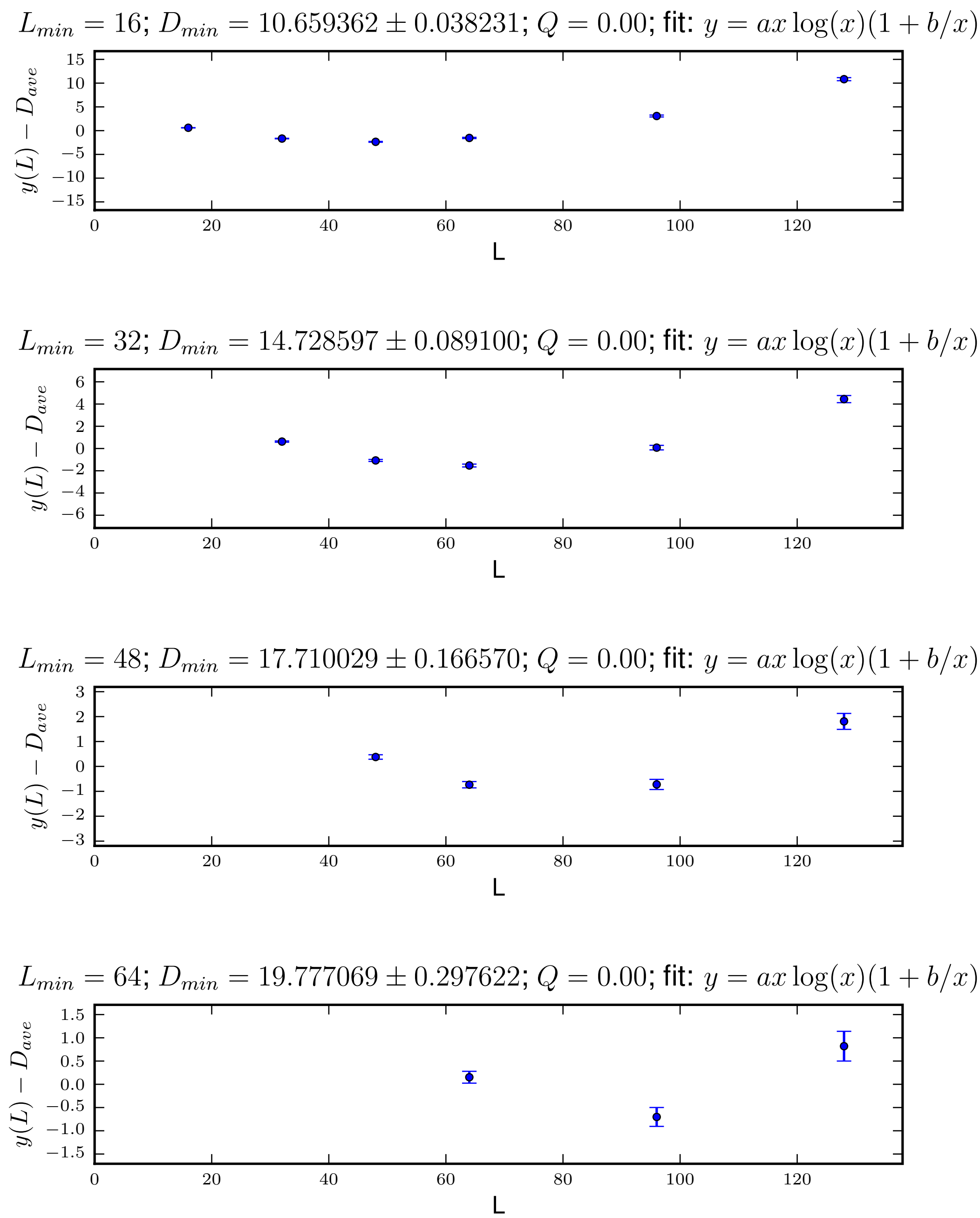

FIG. 10: D_{min} for D=2, q=4; log fit. q values low – won't use.

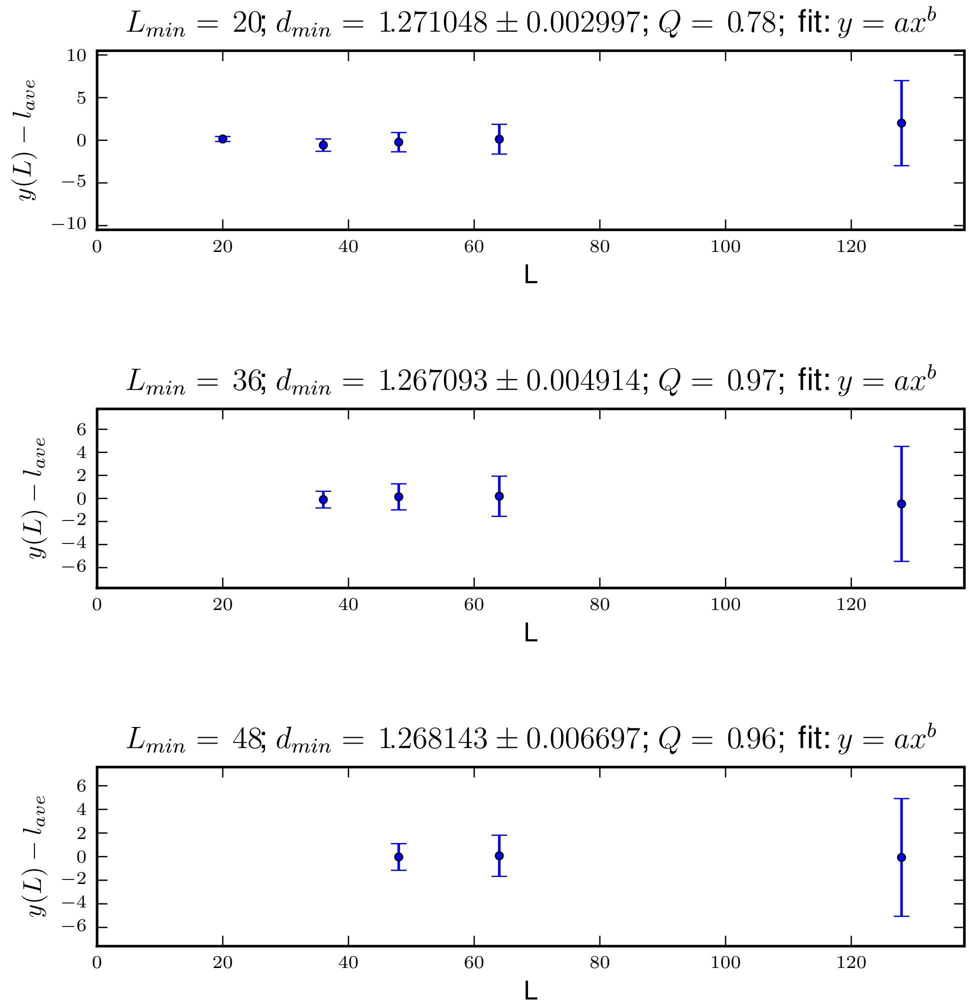

FIG. 11: The difference between the fit, $y(L) = cL^{d_{min}}$, and the average diameter $\langle l \rangle$ for dim=3, q=2.

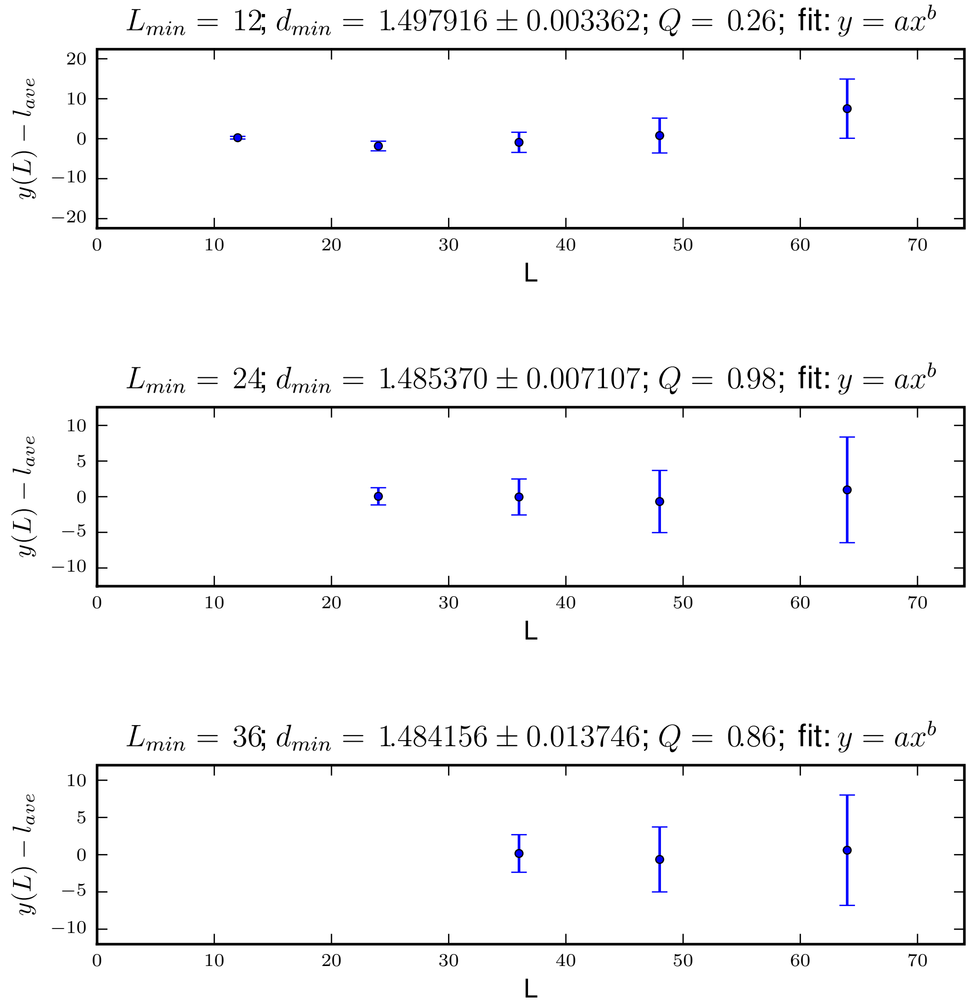

FIG. 12: The difference between the fit, $y(L) = cL^{d_{min}}$, and the average diameter $\langle l \rangle$ for dim=4, q=2.