12.714 Problem Set Section 2 PS 01   Due Wednesday April 25, 2012

(1) Four data files CDA_S2PS01_Q1[a-d].dat are given for this question. (The data files are attached with this email and are available on the http://geoweb.mit.edu/~tah/12.714 web site). The data are uniformly spaced space realizations from four different stochastic processes. For each process:
(a) Plot the time series and lag plots
(b) Determine the autocovariance (acvs) autocorrelation sequences (acs)
(c) Determine the variance spectrum (S_j)
Based on the analyses above, what can you deduce about stochastic processes from which these realizations were generated. (25-points)

(2) For an AR(1) process defined by $X_t=bX_{t-1}+e_t$ where b is a constant and e_t is white noise sequence with zero mean, derive the analytic expressions for the covariance function, correlation function and the variance spectrum. (25 points)

(3) Figure 92 of PW (and figure on page 14 of Sec2 L04 notes) shows the Fourier series that would be generated by finding the transform with varying numbers of data (4,16 and 64). Verify the results plotted by generating the times series pair for the transform and sampling the time series at the appropriate number of points and computing from the time series the Fourier transforms. The problem may be solved numerically. Submit your matlab code with the solution. (50-points).