## ESS5203.03; Turbulence and Diffusion in the Atmospheric Boundary-Layer – W2020 PROBLEM SET #4

1) Establish formulae for the maximum ground level concentration downwind of a continuous point source at an elevation H above the ground, and the location of the maximum. [You can assume the basic Gaussian Plume formula, constant U etc.]

2) An accident in a factory near Hwy 7, due N of Petrie between Keele and Jane has led to a continuous, ground level point source release of toxic material at a rate of 0.1 kg/sec. If the 10m wind speed is 5m/s from the North and the exposure to a total dose (concentration x time) of 3x10<sup>-3</sup>kgm<sup>-3</sup>s is dangerous to health, estimate how long we can remain on the campus. Use the Gaussian plume model and sigma curves from my notes or any textbook (but say which since they differ) and determine (and report) the stability class based on conditions at the time you work on the problem.

3) Read up on the ratio between Lagrangian and Eulerian integral time scales and explain why they are different. With the data in Assignment3\_Data.txt", after rotation into a coordinate system with V = W = 0 (Qu2 of Assignment 3), compute and plot the Eulerian autocorrelations  $R_u(\xi)$  etc for u', v' and w' and, if you can, determine the integral time scales. (the integral may not converge numerically so estimate in that case).