Determine the mean, standard deviation, maximum, and minimum separation distances of stations in the three observing networks shown in Fig. 3.22. The coordinates (latitude and longitude) of the stations in each network can be obtained at:

http://web.ics.purdue.edu/~jtrapp/OK-stns.dat
http://web.ics.purdue.edu/~jtrapp/ARS-stns.dat
http://web.ics.purdue.edu/~jtrapp/us-stns.dat

The latitude (ϕ) and longitude (λ) values are given in these files as consecutive 1D vectors. In the U.S. network, use only the stations within the CONUS.

One suggested approach to this problem is to input and assign a (ϕ, λ) to each station, and compute a corresponding (x, y) for each station (using a conversion to Cartesian coordinates). Then, consider each station separately, and determine the ith station that is nearest:

$$\min\left[\left(x_0 - x_i\right)^2 + \left(y_0 - y_i\right)^2\right]^{1/2}$$

A slightly different approach is to convert station-separate distances in Cartesian space via

$$\Delta x = r_E \cos\phi \Delta\lambda$$
$$\Delta y = r_E \Delta\phi$$

where r_E is the radius of the Earth, and $\Delta\phi$ and $\Delta\lambda$ are in radians.

Each station should have a unique nearest station. Save the distance between each station and its unique pair, and then compute the mean and standard deviation of all pair distances, as well as the maximum and minimum separation distances over all stations.

For each network, comment on how well the Nyquist wavelength based on the mean station separation represents the scales resolved over the entire network.