Actual results and graphs in Excel file:

Sheet 1 has degree distributions, component distributions, clustering coefficients for Grand and Gr for each threshold r (have to scroll down to see some of these results). Sheet 2 contains the histograms of the degree distributions for each threshold.

1. For the “small” data set, i.e., the subregion in the Beaufort Sea, for each correlation threshold rthresh ∈ {0.95, 0.925, 0.9}, plot the degree distribution.

(a) Do you think the degree distribution is consistent with that of a small-world graph? Why or why not?

I would expect a normal-kind of distribution, but with higher numbers to the right of the graph (positive skew), since more nodes are likely to connect to other neighbor nodes. Most of them, however, will have a small number of connections.

From the given results, we can see that this is true. We see that kind of degree distribution.

(b) Identify any supernodes, i.e., vertices with significantly higher vertex degree than the average, and where they occur. Describe your determination of supernode.

There are some vertices with high number of nodes. I would say around 50 or so of them. I would say a supernode is one that has more than around x10 of the edges of the average node.

So, for example, in the case of r = 0.925. There are some vertices with up to 216 edges, while the average lies around 20. (most nodes are at the 1-40 range). So those vertices with 200+ nodes I would consider ‘super nodes’.

2. For the “small” data set, i.e., the subregion in the Beaufort Sea, for each correlation threshold rthresh ∈ {0.95, 0.925, 0.9}, compute the number of connected components in Gr and their size (i.e., number of vertices).

(a) For a small-world graph, how do you think the component structure should look?

I would expect a normal-kind of distribution, but with higher numbers to the right of the graph (positive skew), since more nodes are likely to connect to other neighbor nodes. Most of them, however, will have a small number of connections.

In terms of component structure, I would expect a lot

(b) Do your results support your hypothesis?

Yes. The results of my component distribution agrees with it being a small-world graph. There is 1 ‘super’ component, and a small number of other component sizes.

FULL\_PROJECT addition:

2. Compute the clustering coefficient, γ(Grandom), and the characteristic path length, L(Grandom), of a random graph Grandom corresponding to each Gr.

(a) Compare γ(Gr) and L(Gr) to γ(Grandom) and L(Grandom) for the random graph, Grandom, of comparable size.

(b) What conclusion can you draw from your results?

As we can see from the results of these comparisons…

The CPL and Clustering Coeff for the Graph are more or less equal than Grandom for r = 0.95.

However, for the other r’s, we can see that they are much lower, meaning that more nodes are connected close to each other with more edges in one super-component.

Given the variability, we cannot know for certain if the graph(small data) is random or small-world. But my guess would be that it is a small-world graph.