HW1: Make a Plot

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1 Plotting Decisions

The following plots were created using the Python matplotlib library. I chose to go with a very short title for each plot that just lists the number of roughness elements, N, for the sphere. I thought the default colors were fine, so I chose to keep those, but I did make sure that they stay consistent across the separate plots. I grouped the data according to Phi, and made sure the color and Phi angle stayed paired across all figures.

This package defaults to using solid circle markers for all points and does not include tabs on the uncertainty bands. I chose to change to a set of open symbols that exclude difficult to read symbols such as x, +, -, and —. Additionally, I added tabs to the uncertainty bands. This is especially important as many of the uncertainty bands overlap, so without the tabs, the ending points would be impossible to distinguish. By default, the location of the legend moves to be inside the plot in a less busy section. I chose to clamp its position to be outside the plot boundary in the top right corner. I also decided to leave Phi in the legend for all sets of data so the Phi angle values are not confused with the Separation Angle.

Last, I started with a square aspect ratio, but chose to stretch the plots vertically. I also wanted all of the plots to be the same size, so I chose to put them in LaTeX, where I can manually set the dimensions of each figure. For the axes, I chose to have major ticks every 10 degrees with minor ticks every 2.5 degrees. I chose 2.5 for the minor ticks because some of the data is clustered tightly and just having minor ticks at 5 degrees didn't feel like enough resolution. With minor ticks at the quarter, half, and three-quarter divisions of the major ticks it is still easy to tell the value of each tick. I only labeled major ticks to minimize the amount of numbers on the plot. Due to the amount of data points on the graph, I also chose not to directly label the coordinates of each point as I felt that would leave the plot feeling too cluttered. For the horizontal axis, I put major ticks at 0.05 increments with minor ticks at 0.025 increments. I also adjusted the axis bounds to include 0. I believe the spacing of the major and minor ticks provide enough information to get the trend of the data. I chose not to include a trendline.

2 Plots

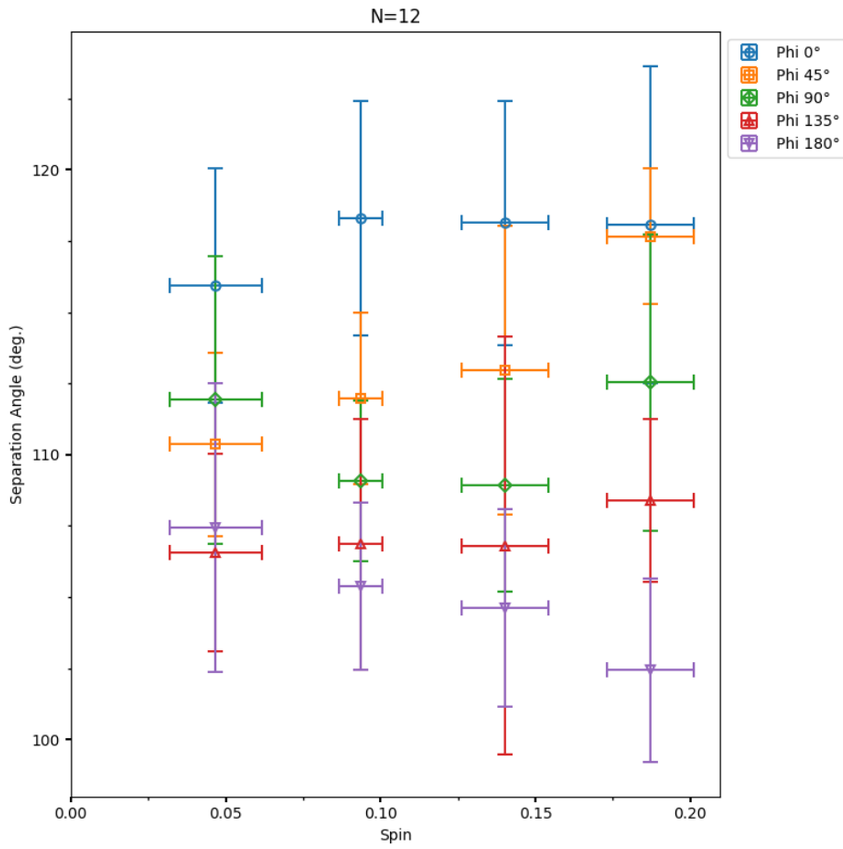

Figure 1: Boundary layer separation angle vs spin for a sphere with N=12 roughness elements

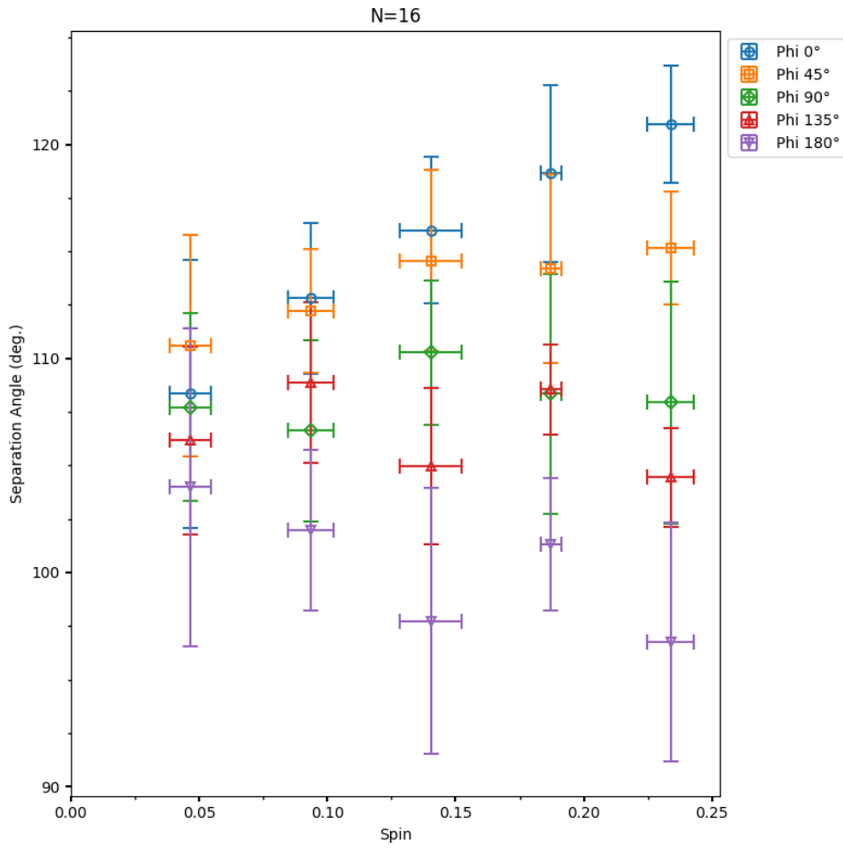

Figure 2: Boundary layer separation angle vs spin for a sphere with N=16 roughness elements

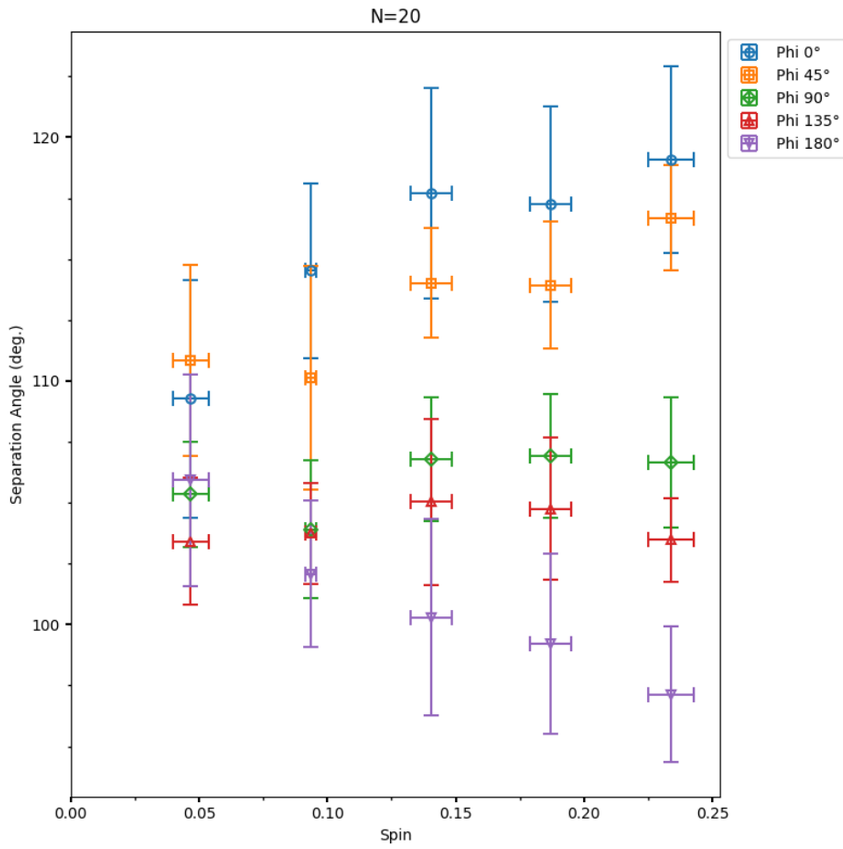

Figure 3: Boundary layer separation angle vs spin for a sphere with N=20 roughness elements

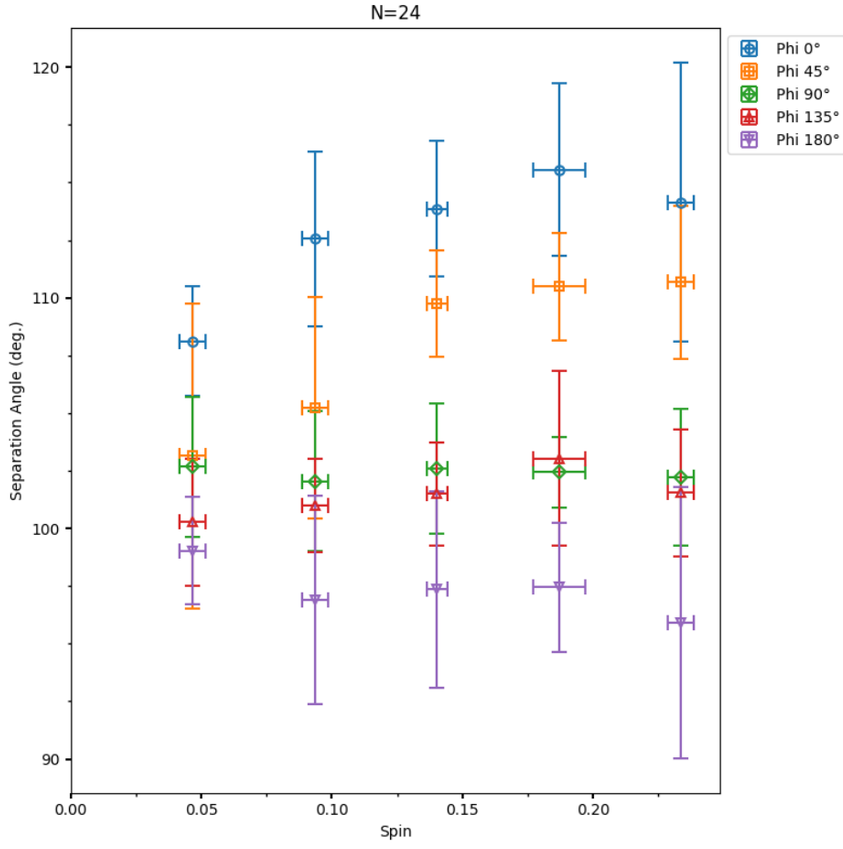

Figure 4: Boundary layer separation angle vs spin for a sphere with N=24 roughness elements