Week 1

Louis Nass

1 Monday (5/29)

Nothing to report, Memorial Day!

2 Tuesday (5/30)

Orientation, introductions and basic set ups. Lunch with Dr. Spiller, need to work on evaluating the max and means of the errors produced from the Kalman Filter as the period is reduced from 1000 to 500, 250, 125 etc. Thus far the Ensemble Kalman Filter I have created has been used to observe the results of the Lorenz Equations:

$$\frac{dx}{dt} = \sigma(y - x) \tag{1}$$

$$\frac{dy}{dt} = x(\rho - z) - y \tag{2}$$

$$\frac{dz}{dt} = xy - \beta z \tag{3}$$

We discussed the next steps also. We will eventually be taking the ensemble and the particle filters and using them to evaluate a higher dimensional (5+) nonlinear ODE's. Additionally, I spent time setting up and learning how to write on LaTeX.

3 Wednesday (5/31)

Made adjustments to the filter, originally I was taking the mean of the 'true' values from the Lorenz equations calculated, but I needed to mean the assimilated values as they were created.
I successfully created the algorithm that evaluates one data set and reduces the period from that data set (i.e. I evenly took points from my data set to reduce the period) and observed the max errors and mean errors from the different periods. My findings are somewhat expected:

- The max figure should always be increasing or relatively constant since the data points are removed from the set to reduce the period. Therefore with a larger period there are more points from the original set, which are more likely to contain the maximum error.
- The mean seems to vary. My inclination would be that as the period increases we would see the mean decrease. As I run the filter multiple times, I will sometimes get a decreasing function (good) but sometimes get and increasing function (bad). I am unsure how this variation makes a difference, mainly because the range of the error is roughly between .23 and .3.

Also I created a program that runs the filter multiple times and reduces the period after each run. I observed that as the period increases the mean error decreases, no conclusive results were observed based on the max error as the period is adjusted.

4 Thursday (6/1)

Listened to Dr. Factor's talk about research techniques (the good/bad), ways to approach problems etc.
Continued to run error tests on the ENSK, met with Dr. Spiller. She gave me two articles and a power point to read. Began reading and annotating. Goal is to write a program that solves the Lorenz equations on MatLab similar to Leib-Lappen and Christopher M. Danforth's approach in their paper "Aggressive shadowing of a low-dimensional model of atmospheric dynamics". Additionally I need to create a time-line of objectives and milestones for the weeks ahead.

5 Friday (6/2)

Continued the reading, specifically Leib-Lappen and Danforth's article mentioned above and "Standing Swells Surveyed Showing Surprisingly Stable Solution for Lorenz '96 Model" by Morgan Frank, Lewis Mitchell, Peter Dodds, and Christopher M. Danforth.