Assignment 1: ESSD

Jesse McDevitt-Irwin (jrm2275)

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1 Gravity

We start out by plotting the trajectory of a pear thrown in the air. As the pear has not hit the ground after 3 seconds, I extend the time vector to 3.1 seconds.
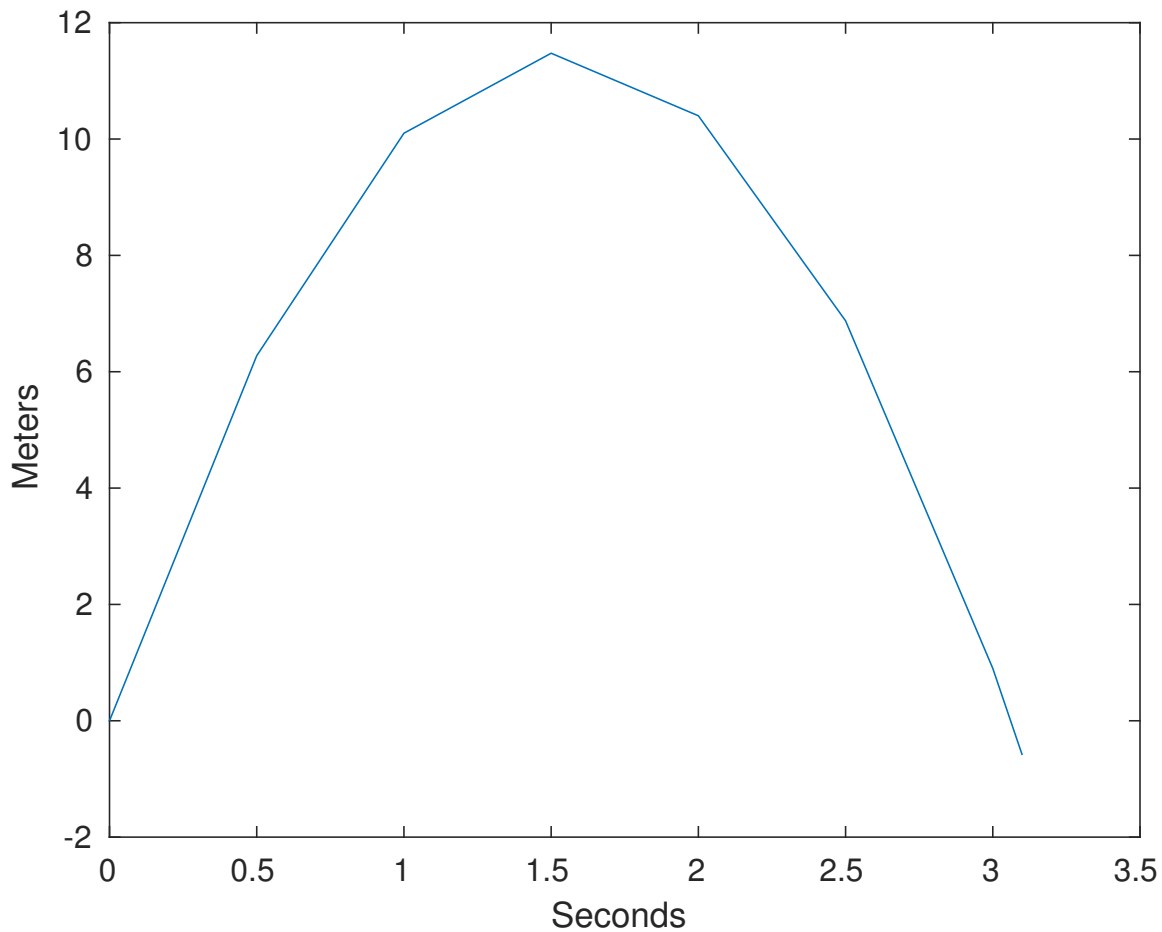

Figure 1: Flight Trajectory: Initial velocity 15 m/s

The plot is not smooth because we are calculating the pear's position every half-second. To make it smoother, we can increase the frequency of our calculation to .01 seconds.
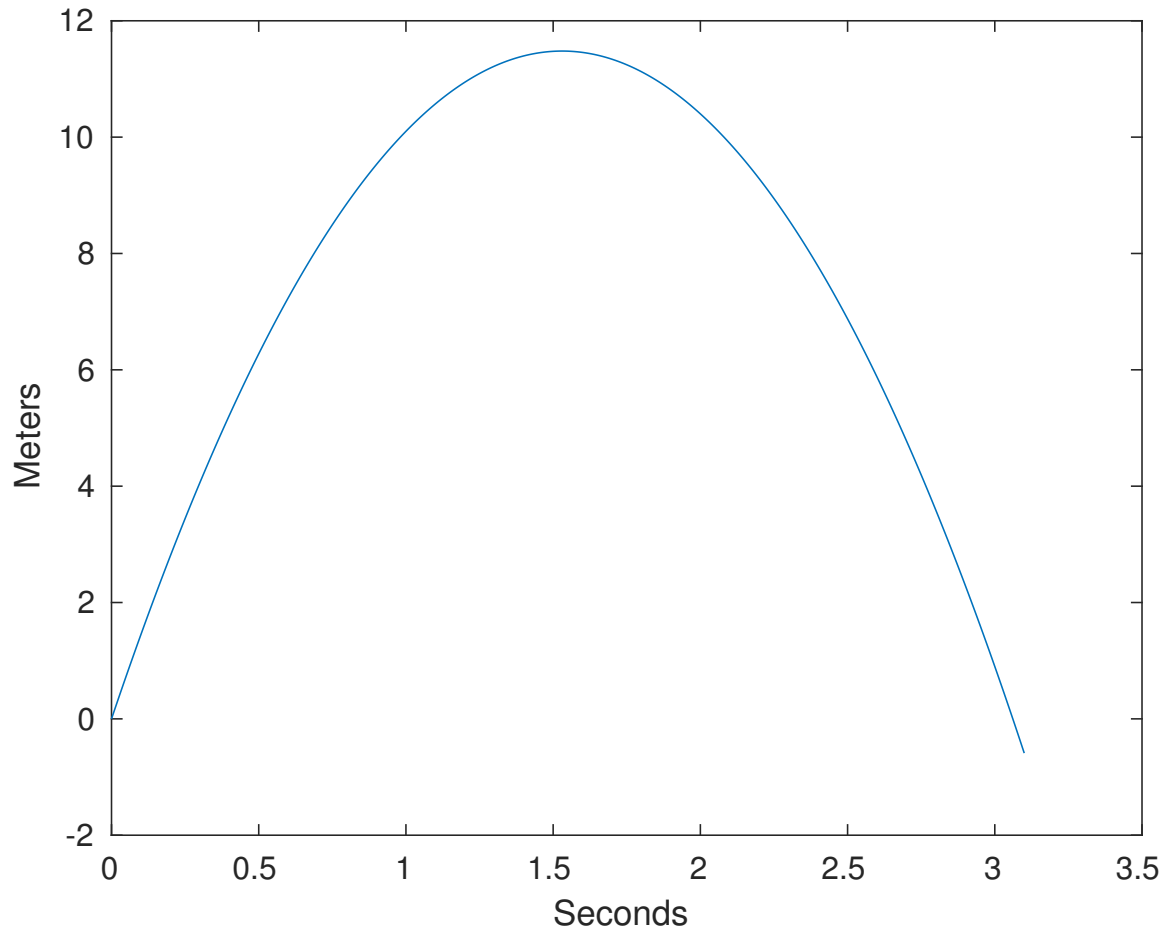
Figure 2: Smoothed Flight Trajectory: Initial velocity 15 m/s

If we try different initial velocities, the maximum height of the pear-trajectory will change, as will the moment it hits the ground.
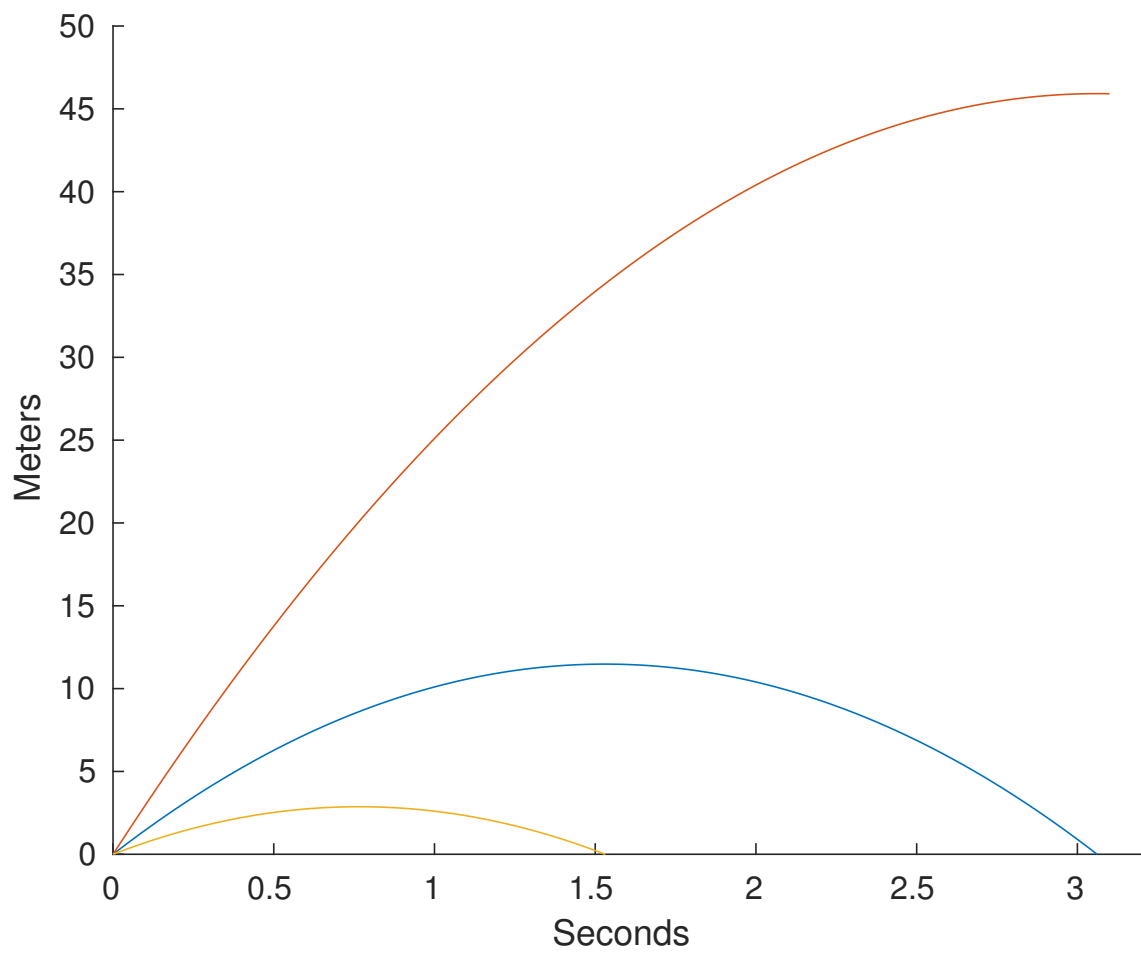
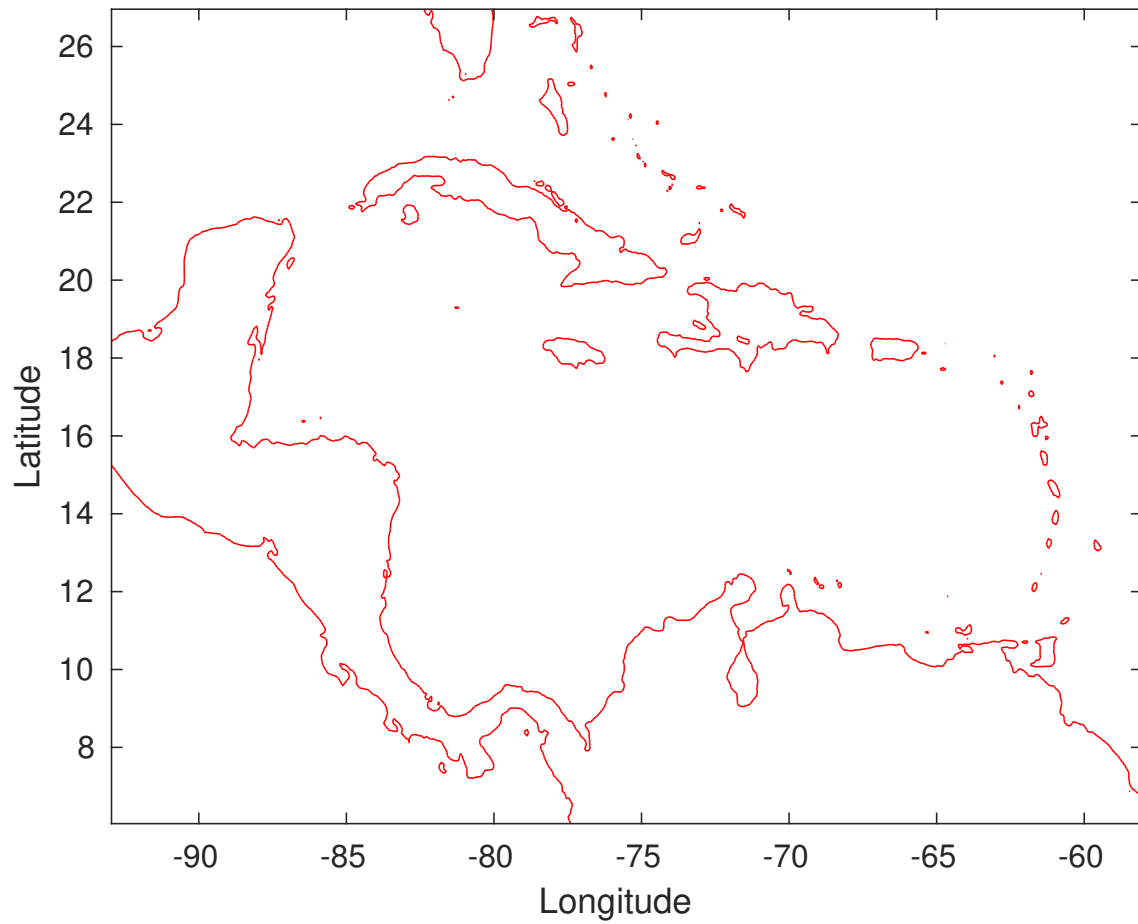Figure 3: Flight Trajectories: Initial velocity 7.5, 15, 30 m/s

2 Hurricane Ivan

Figure 4: The Caribbean Basin

- Adding the basin_lat and basin_long arguments specifies the scales for the contour map. It now uses latitude and longitude instead of the internal index of the basin.

- 'r' makes the contour red.

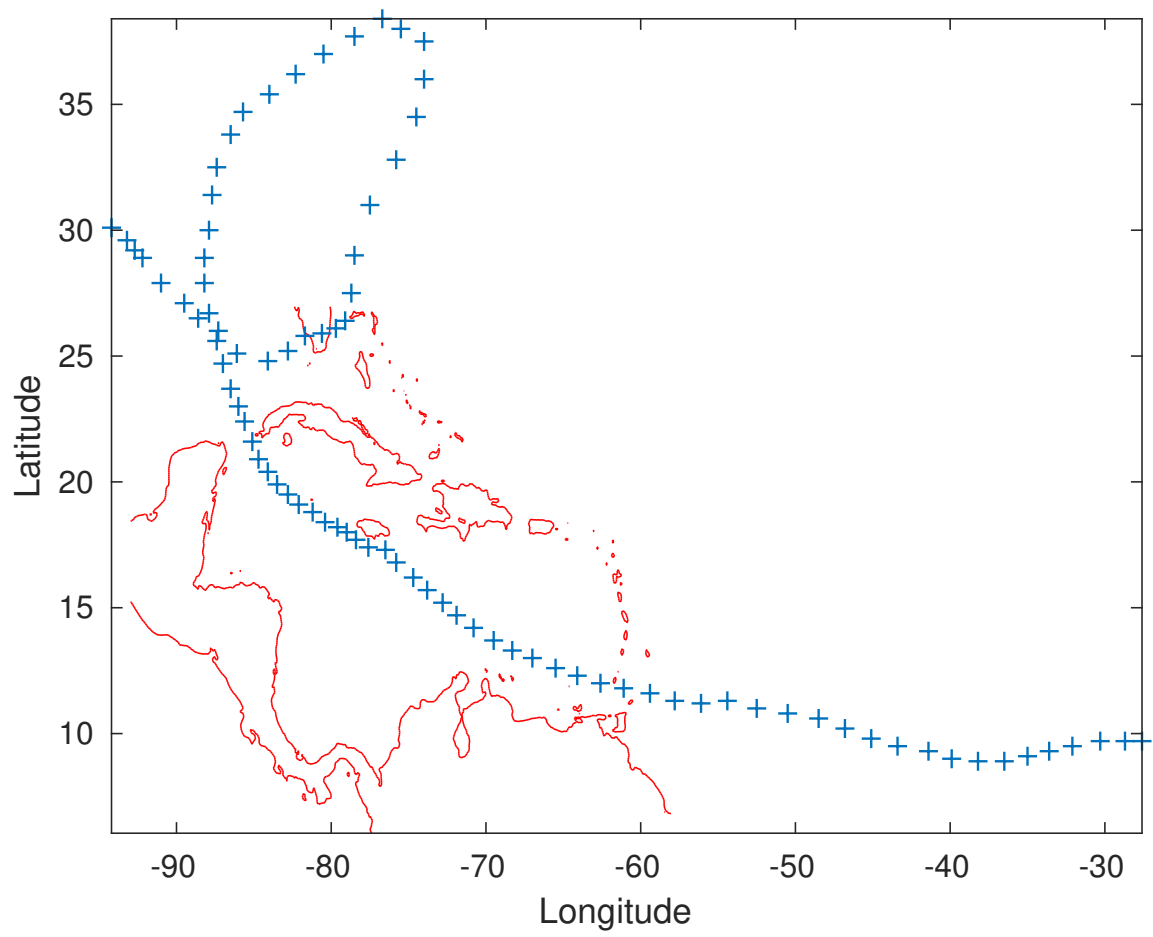- The command 'figure' prints the last plot, allowing us to export it manually.

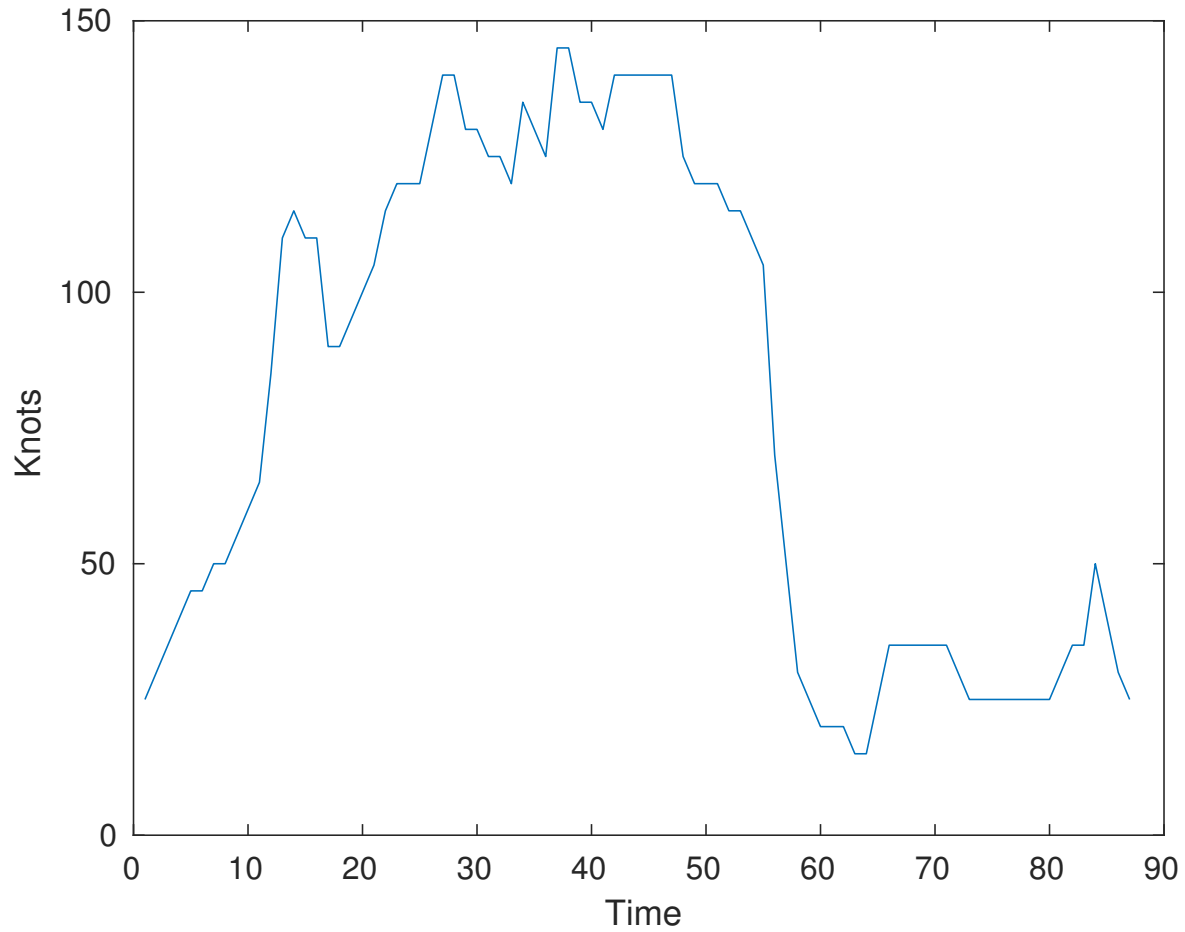Figure 5: Hurricane Path through the Caribbean

Figure 6: Windspeed over Time

- The axes are knots and 6 hour periods.

- Ivan become category 1 (64 knots) 66 hours from observation, or September 5th (as per NOAA report that Ivan began on September 2nd [Stewart, 2011], Saffir-Simpson chart accessed via NOAA website [Saf,]).

- Category 4 (113 knots) was reached 132 hours from observation– September 7th.

- Ivan eventually reached category 5 (137 knots) 162 hours from observation– the evening of September 8th.

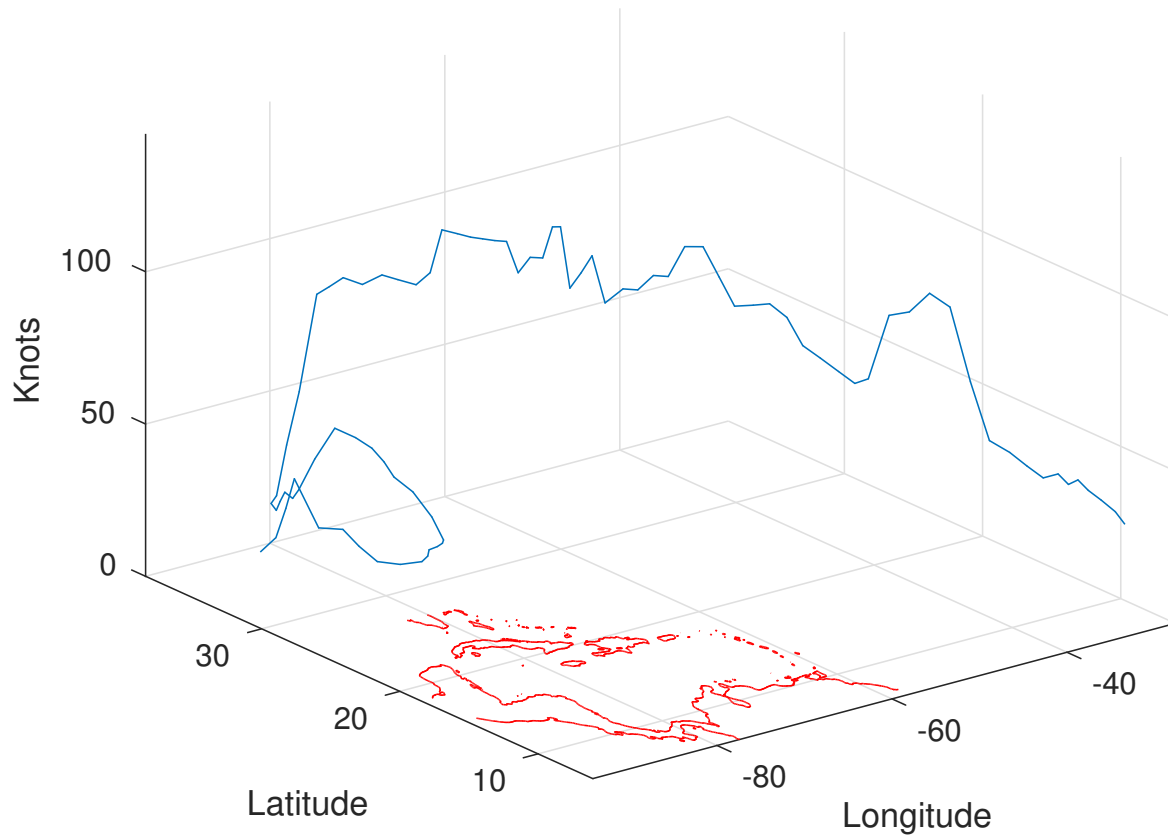- The storm got very big, and then lost intensity rapidly upon landfall.

Figure 7: Windspeed accross Path

Clearly the intensity of the hurricane was affected by the surface it passes over– windspeed slowed while the hurricane passed over land.

Hurricanes are created by convection caused by warm water. Heated by the water, the air rises and new air takes its place. The spin of the earth causes hurricane to rotate clockwise or counter-clockwise, depending on the hemisphere (as shown in the episode of the Simpsons where Bart calls Australia). Thus the storm gained windspeed over warm water, and lost it over land.

References

[Saf,] Saffir-Simpson Hurricane Wind Scale. Available at https://www.nhc.noaa.gov/aboutsshws.php, accessed September 2018.

[Stewart, 2011] Stewart, S. (2011). Tropical Cyclone Report. *National Hurricane Center*, page 44. Available at https://www.nhc.noaa.gov/data/tcr/AL092004_Ivan.pdf, accessed September 2018.