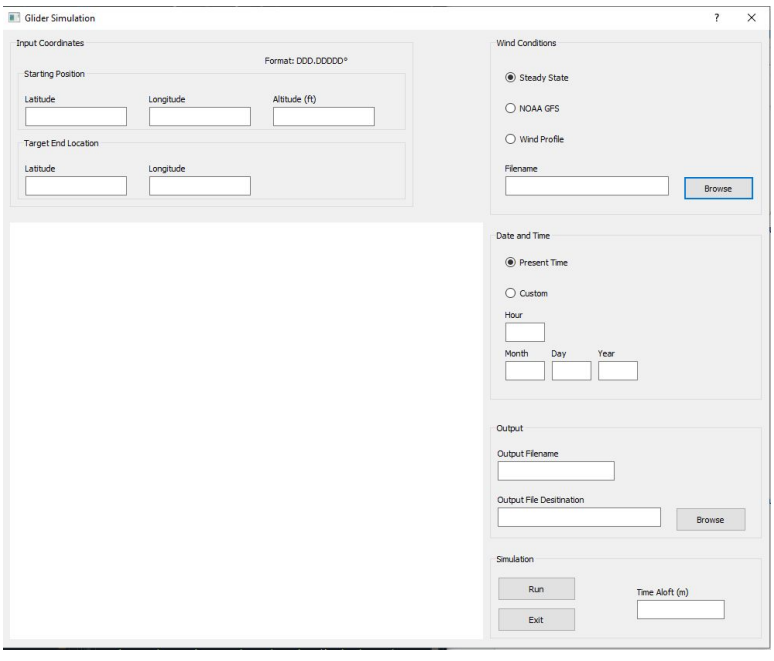
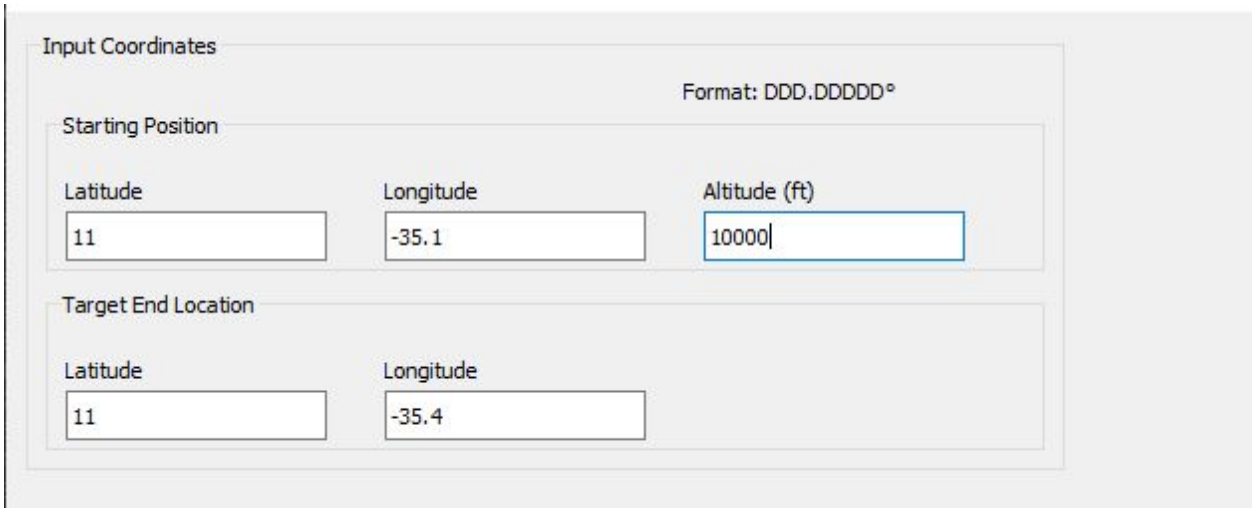
**Simulation Instruction:**

- Download the zip file that includes 5 separate files
  - DragPolarSeniorDesign_updated
  - Glider_Class
  - QT_main
  - QT_Simulator
  - QT_Simulator.ui
  - stopcrashingexcel
- Ensure all required packages are installed: (**NOTICE**: If having difficulties installing packages for proper execution feel free to contact Garrett Clay at garrett.clay@okstate.edu or garrett.clay1@gmail.com. Please attach an image of error)
  - PyQT5
  - math
  - metpy
    - `conda install -c conda-forge metpy`
  - xlrd
    - `conda install -c anaconda xlrd`
  - matplotlib
  - numpy
  - datetime
  - netCDF4
    - `conda install -c anaconda netcdf4`
  - siphon
  - Pandas
  - scipy
- Open QT_main and run. The GUI shown below should appear

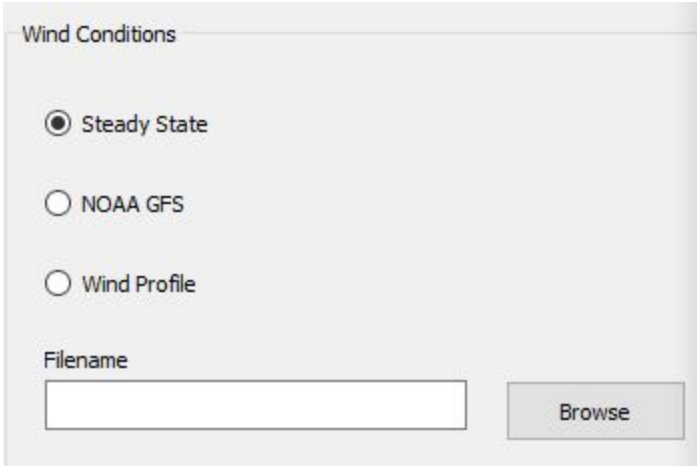


- For any run a starting latitude, longitude, and altitude in decimal degrees (xx.xxx) and a desired ending latitude and longitude in decimal degrees must be input.




**Running Steady State Glide**

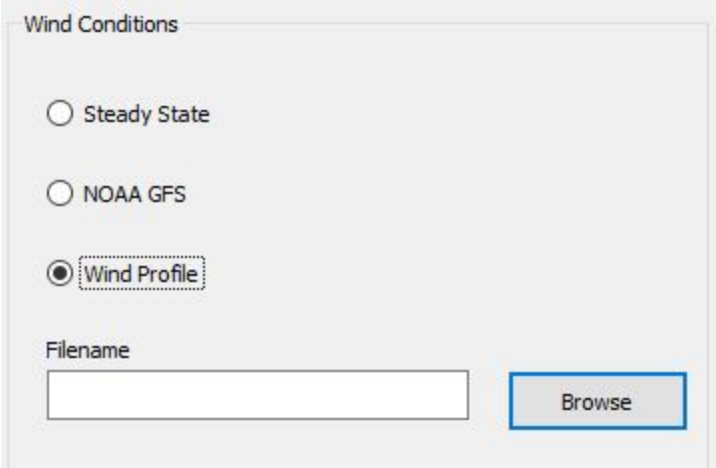
- Input starting and desired ending coordinates and starting altitude
- Select the "Steady State" option shown in the image below




- Hit the run button
- Simulation is completed when Time Aloft in minutes is displayed and graph is shown

## Running Simulation Using Data File

- Input starting and desired ending coordinates and starting altitude
- Select the “Wind Profile” option and Browse for wind data text file



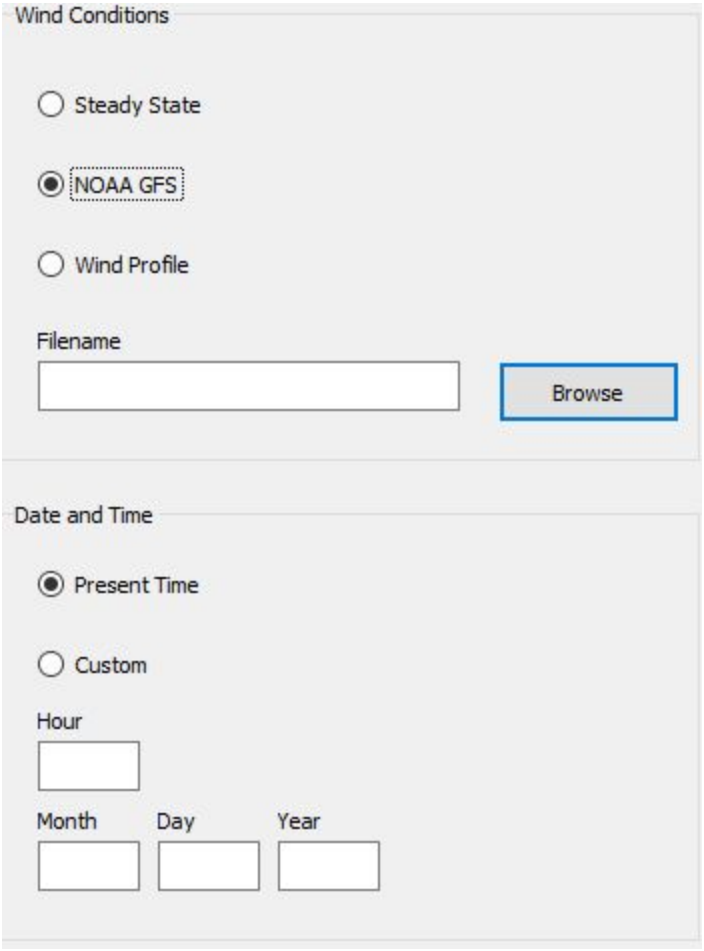

- Text File must be set up as shown in the image below.
    - Data in this format can be found using the “Text: List“ option on http://weather.uwyo.edu/upperair/sounding.html

```
-----------------------------------------------------------------------------
LEV PRES  HGHT  TEMP  DEWP  RH  DD   WETB DIR SPD THETA THE-V THE-W THE-E   W
     mb     m     C     C   %   C     C  deg knt   K     K     K     K    g/kg
-----------------------------------------------------------------------------
  0 1000    83
  1  925   774
SFC  854  1453  14.4  -1.6  33 16.0   6.5 275   3 300.8 301.6 286.4 312.9  3.98
  3  850  1511  15.8  -1.2  31 17.0   7.2 305   8 302.7 303.5 287.2 315.3  4.12
  4  848  1531  16.4  -1.6  29 18.0   7.3 306   9 303.5 304.3 287.3 315.8  4.01
  5  840  1612  17.8  -2.2  26 20.0   7.6 308  12 305.8 306.5 288.0 317.8  3.87
  6  823  1786  17.2  -1.8  27 19.0   7.4 314  19 307.0 307.7 288.6 319.6  4.07
  7  708  3044   6.2  -5.8  42 12.0   0.7 310  24 308.3 309.0 288.5 319.3  3.50
  8  700  3137   5.4  -6.6  42 12.0  -0.0 305  24 308.5 309.1 288.4 318.9  3.33
  9  642  3835  -1.5  -8.5  59  7.0  -4.4 307  28 308.4 308.9 288.2 318.2  3.13
 10  631  3973  -1.9 -11.9  46 10.0  -5.7 305  28 309.4 309.9 287.8 317.2  2.43
 11  611  4228  -4.1 -12.1  54  8.0  -7.1 301  27 309.8 310.2 288.0 317.7  2.47
 12  590  4503  -6.9 -10.7  74  3.8  -8.4 293  26 309.6 310.2 288.3 318.7  2.87
 13  577  4676  -8.3 -13.1  68  4.8 -10.0 287  28 310.0 310.4 288.0 317.7  2.41
 14  567  4812  -8.1 -18.1  44 10.0 -11.2 283  31 311.7 312.1 287.8 317.1  1.62
 15  539  5204 -11.3 -21.3  43 10.0 -14.1 285  36 312.5 312.7 287.7 316.8  1.29
 16  535  5261 -10.5 -26.5  26 16.0 -14.4 286  36 314.1 314.3 287.7 316.9  0.82
 17  526  5391 -11.3 -28.3  23 17.0 -15.2 288  37 314.7 314.8 287.8 317.1  0.71
 18  518  5509 -11.9 -24.9  33 13.0 -15.2 290  39 315.3 315.5 288.3 318.7  0.98
 19  511  5613 -11.5 -23.5  36 12.0 -14.7 292  39 317.0 317.3 289.0 320.9  1.12
 20  500  5780 -12.5 -24.5  36 12.0 -15.6 295  41 317.8 318.0 289.2 321.4  1.05
 21  476  6152 -15.5 -26.5  38 11.0 -18.1 295  41 318.6 318.8 289.3 321.8  0.92
 22  446  6639 -18.1 -33.1  26 15.0 -20.9 299  45 321.3 321.4 289.8 323.2  0.53
 23  434  6841 -19.9 -29.9  41 10.0 -21.9 300  47 321.5 321.7 290.0 324.1  0.74
 24  421  7066 -21.3 -34.3  30 13.0 -23.5 302  49 322.6 322.6 290.1 324.4  0.50
 25  410  7260 -22.5 -31.5  44  9.0 -24.2 304  50 323.5 323.6 290.5 325.9  0.67
 26  400  7440 -23.9 -35.9  32 12.0 -25.8 305  52 323.9 324.0 290.5 325.6  0.45
 27  395  7532 -24.3 -41.3  19 17.0 -26.5 307  53 324.6 324.6 290.5 325.6  0.26
 28  375  7909 -27.5 -48.5  12 21.0 -29.5 313  56 325.2 325.2 290.5 325.7  0.12
 29  344  8524 -33.3 -49.3  19 16.0 -34.6 319  61 325.4 325.5 290.6 325.9  0.12
```

- Once file is selected hit the “Run” button
- Simulation is completed when Time Aloft in minutes is displayed and graph is shown

## Running Simulation Using NOAA GFS (Present Day)

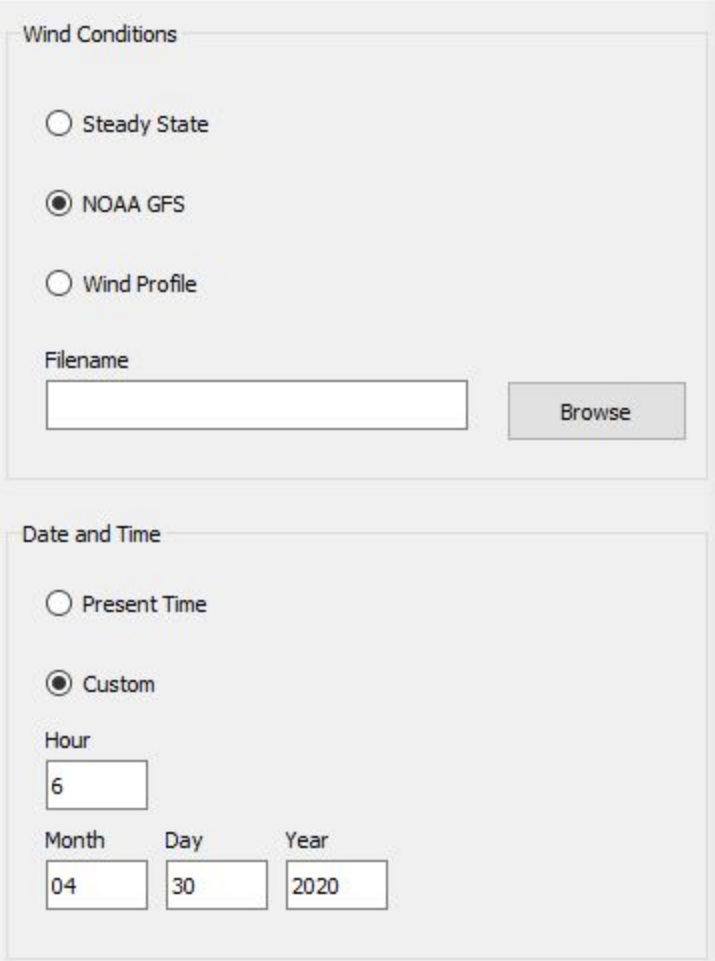
- Input starting and desired ending coordinates and starting altitude
- Select the “NOAA GFS” option and select “Present Time” under “Date and Time”




- Once this is completed hit the “Run” button
- Simulation is completed when Time Aloft in minutes is displayed and graph is shown
    - **NOTICE:** NOAA GFS runs can take up to 30 minutes to simulate

**Running Simulation Using NOAA GFS (Future/Past Forecasting)**

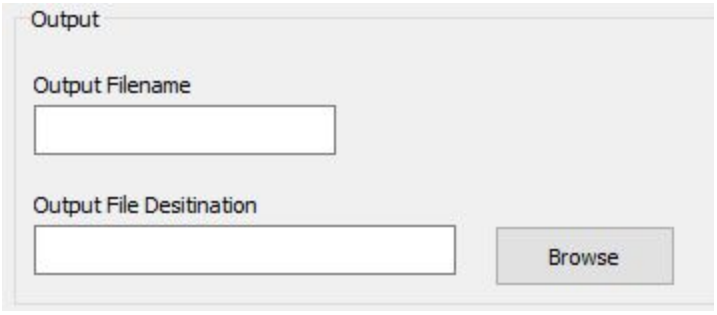
- Input starting and desired ending coordinates and starting altitude
- Select the "NOAA GFS" option and select "Custom" under "Date and Time"
    - **NOTICE:** Date Input can only be up to 3 days prior to present day or up to 16 days after present day.
    - For the "Hour" input put closest integer hour in UTC time (0-23)



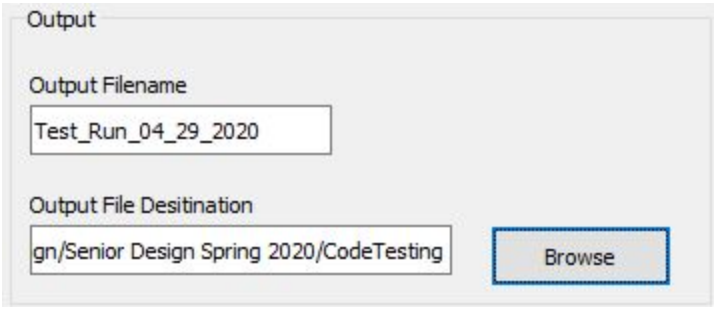

- Once this is completed hit the "Run" button
- Simulation is completed when Time Aloft in minutes is displayed and graph is shown
    - **NOTICE:** NOAA GFS runs can take up to 30 minutes to simulate

## Saving Waypoint and Winds-Aloft Output File

- For any simulation conditions output files can be saved using the “Output” section on the GUI
- Select the “Browse” button next to the “Output File Destination” box.




- Selected desired output file destination
- If desired, input a filename in the “Output Filename” box. This will add a file name to make it easier to find and ensure no overwriting of files.




- Run desired simulation type. Once complete, the files can be found in the folder that was selected for the “Output File Destination”