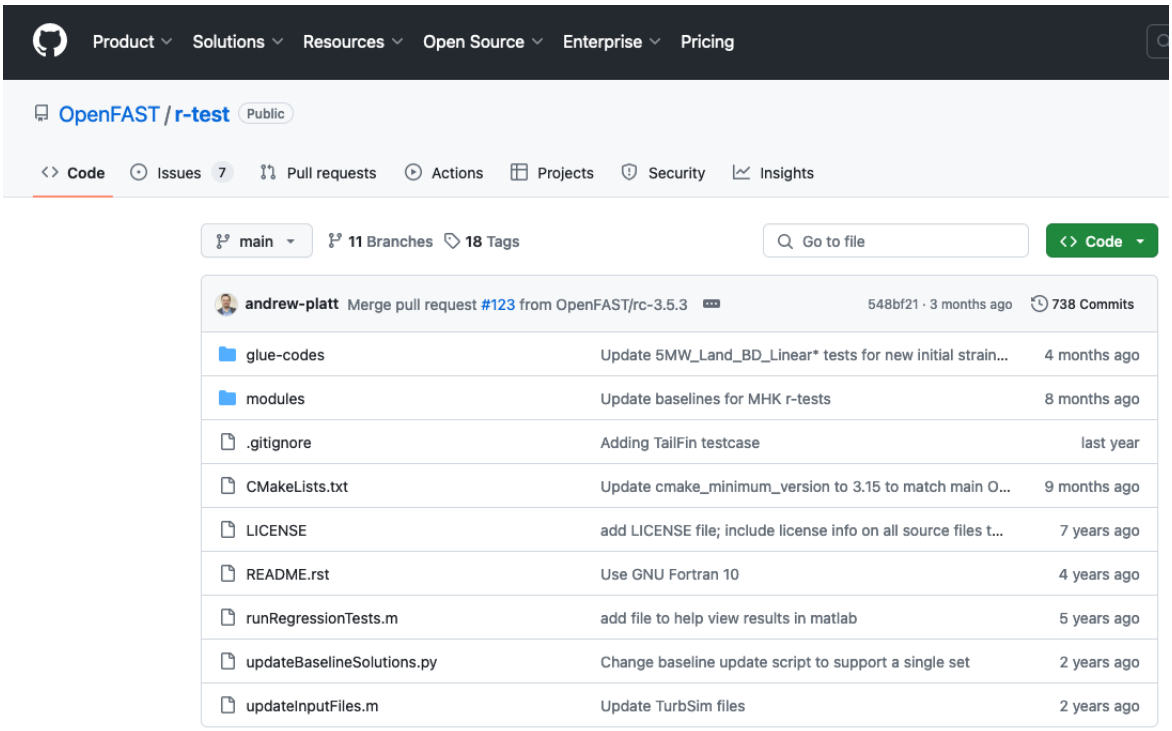
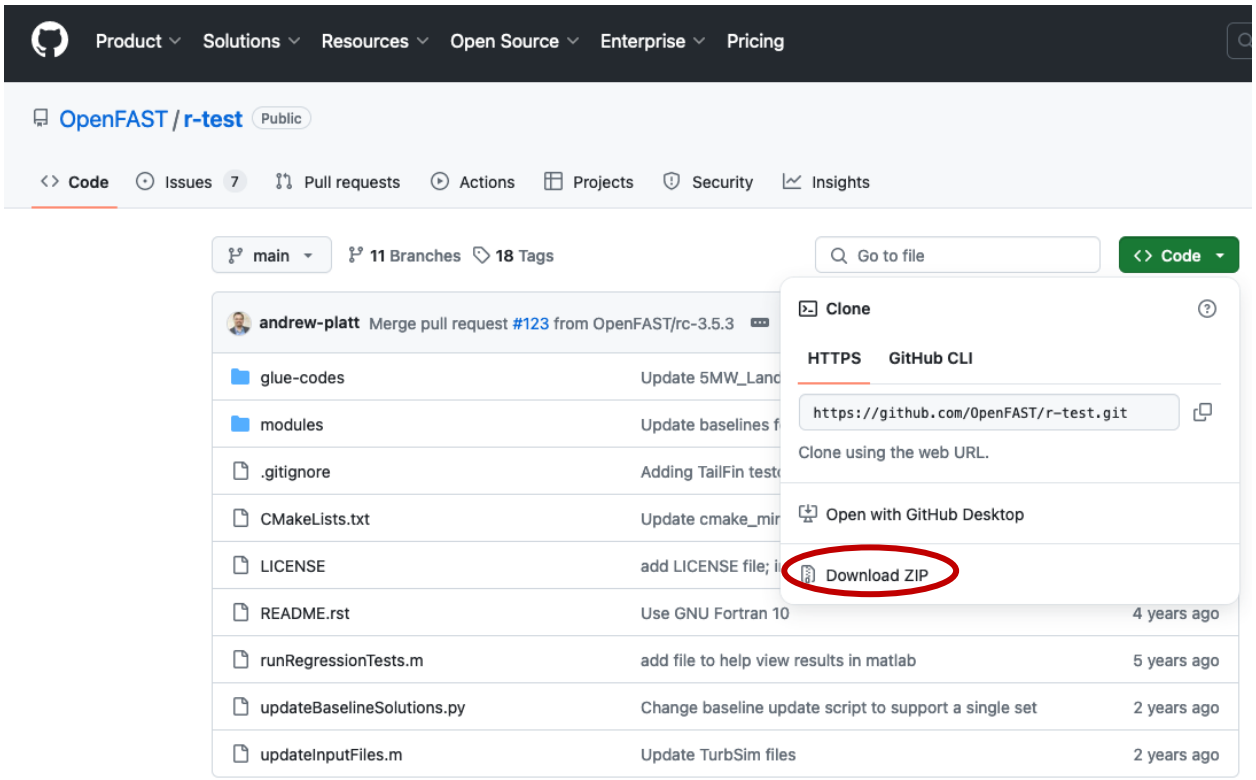
This tutorial will walk through running example cases on all three operating systems. OpenFAST must already be installed.

1. OpenFAST uses regression test to ensure that developers do not unintentionally change the code when adding new features. These tests are mostly used by developers, but they can also serve as example cases. We will use them here to make sure OpenFAST was installed correctly and to demonstrate running the code. Regression tests are hosted on the OpenFAST GitHub page: https://github.com/OpenFAST/r-test/tree/main.

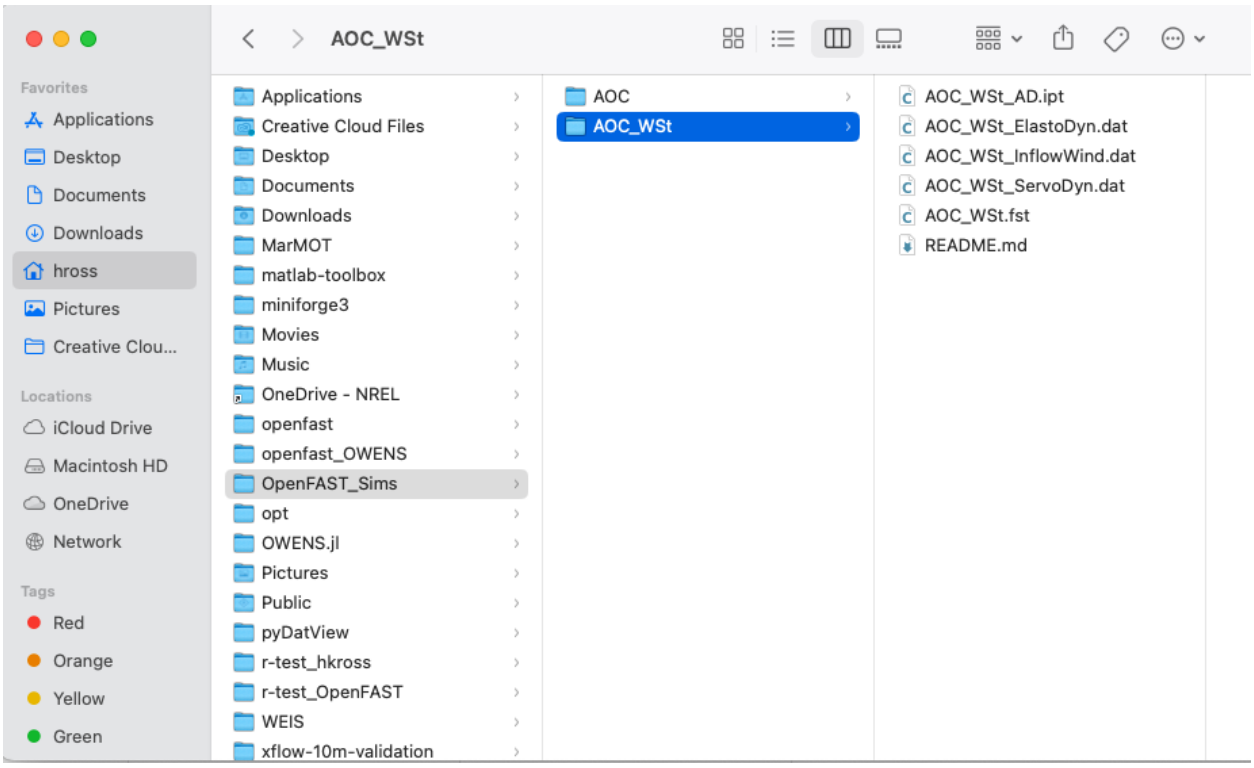


2. We will be using files from this repository, so we need to download the files to our local machine. This is done by clicking on the green “<> Code” button in the upper right corner of the screen and selecting “Download ZIP”.



This will download a zip folder of all the files in this repository.

3. Find the zip file, which will most likely be in your downloads folder, and extract it.
4. We will now copy specific files to the location where you will be running simulations. For Windows users, this should be the folder where the openfast_x64.exe file is located. Mac and Linux users can create a new folder in a preferred location. My folder is named “OpenFAST_Sims”.
5. We will be running two example cases. The first is the “AOC_WSt” test. In the downloads folder, navigate to r-test-main > glue-codes > openfast > AOC_WSt. Copy this folder to the location where you will be running simulations.
6. In your new AOC_WSt folder, select and delete all files ending in .sum, .ech, .log, .out, and .outb. This is not necessary for running the simulation, but OpenFAST generates these files, so it is helpful to make sure they are regenerated when we run the code.
7. The remaining files in this folder are inputs needed for OpenFAST to run. However, this particular case requires a few other inputs that are contained in a different folder. Navigate back to the “r-test-main” folder in Downloads and select r-test-main > glue-codes > openfast > AOC. Copy this folder to the same location as your AOC_WSt folder.

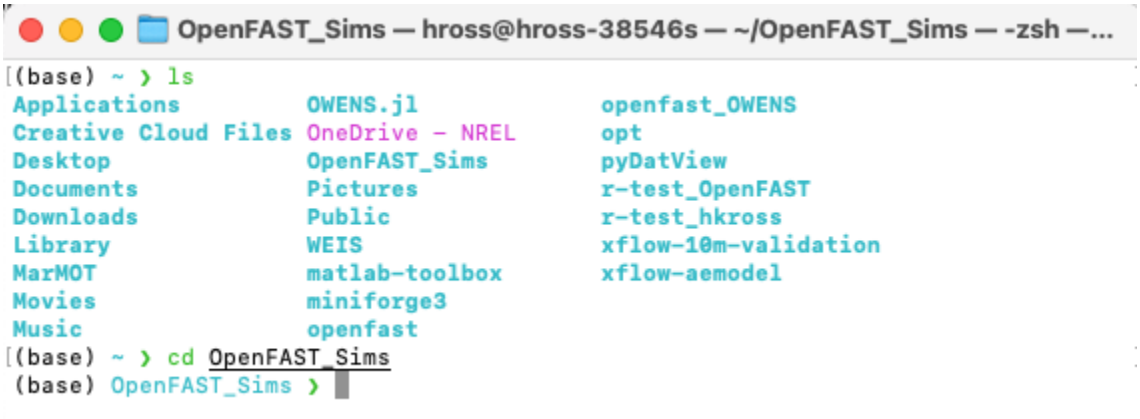


We will now run this simulation, the process for which differs depending on operating system type.

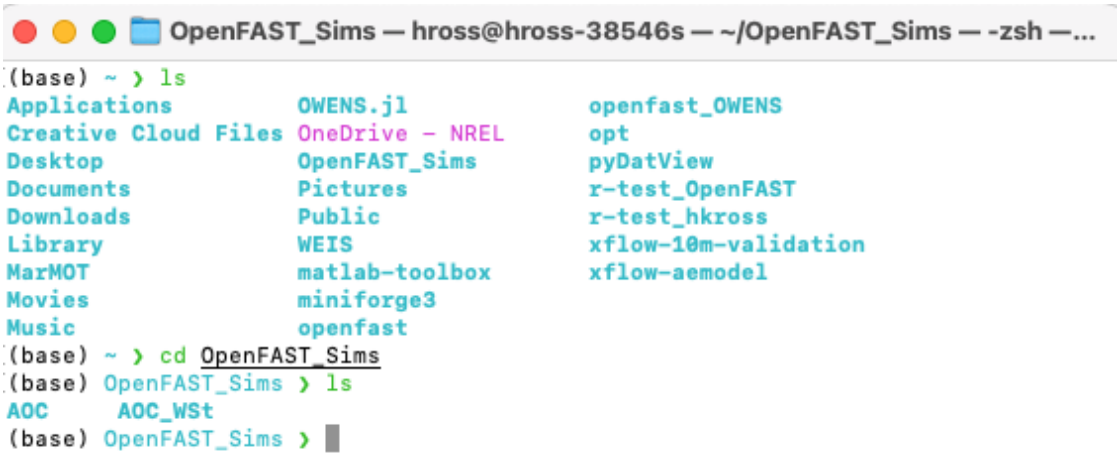
Mac systems

1. To run OpenFAST on a Mac, open a terminal window and navigate to the folder containing your input files. This can be done using the `ls` and `cd` terminal commands. The `ls` command lists all files in the current directory. Running this command shows that my "OpenFAST_Sims" folder is located in my base directory.

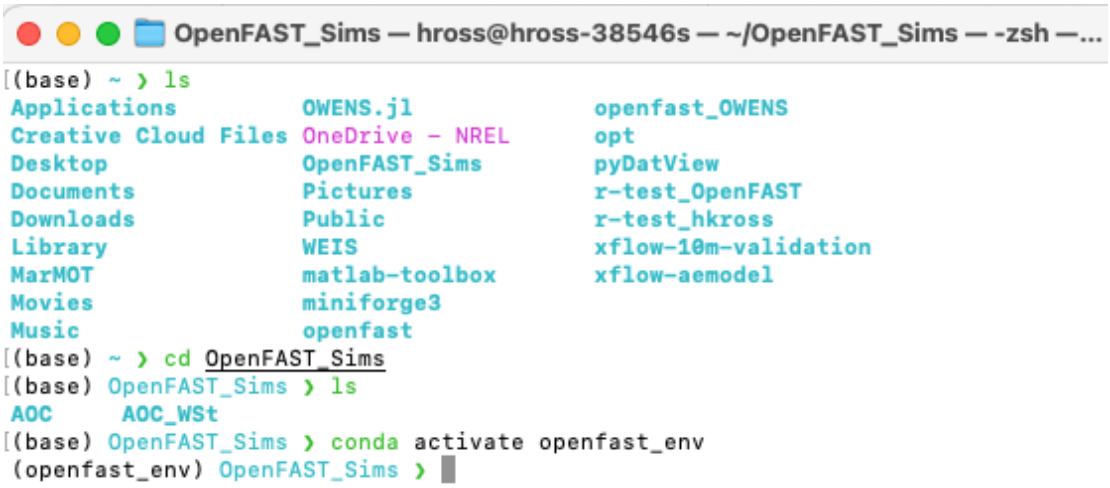
I will navigate to this using the `cd` command: `cd OpenFAST_Sims`



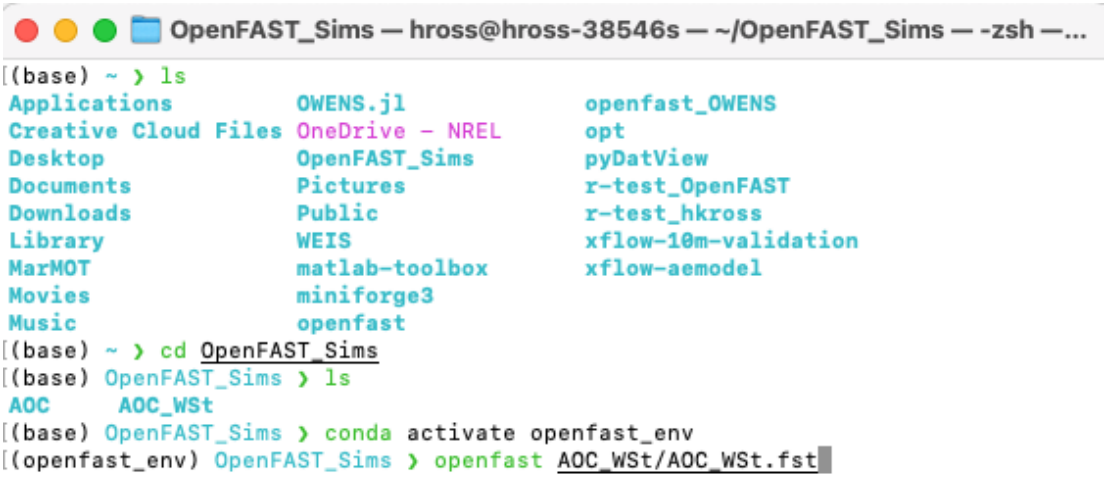
Running `ls` in this folder shows that, as expected, the "AOC" and "AOC_WSt" folders are located here.



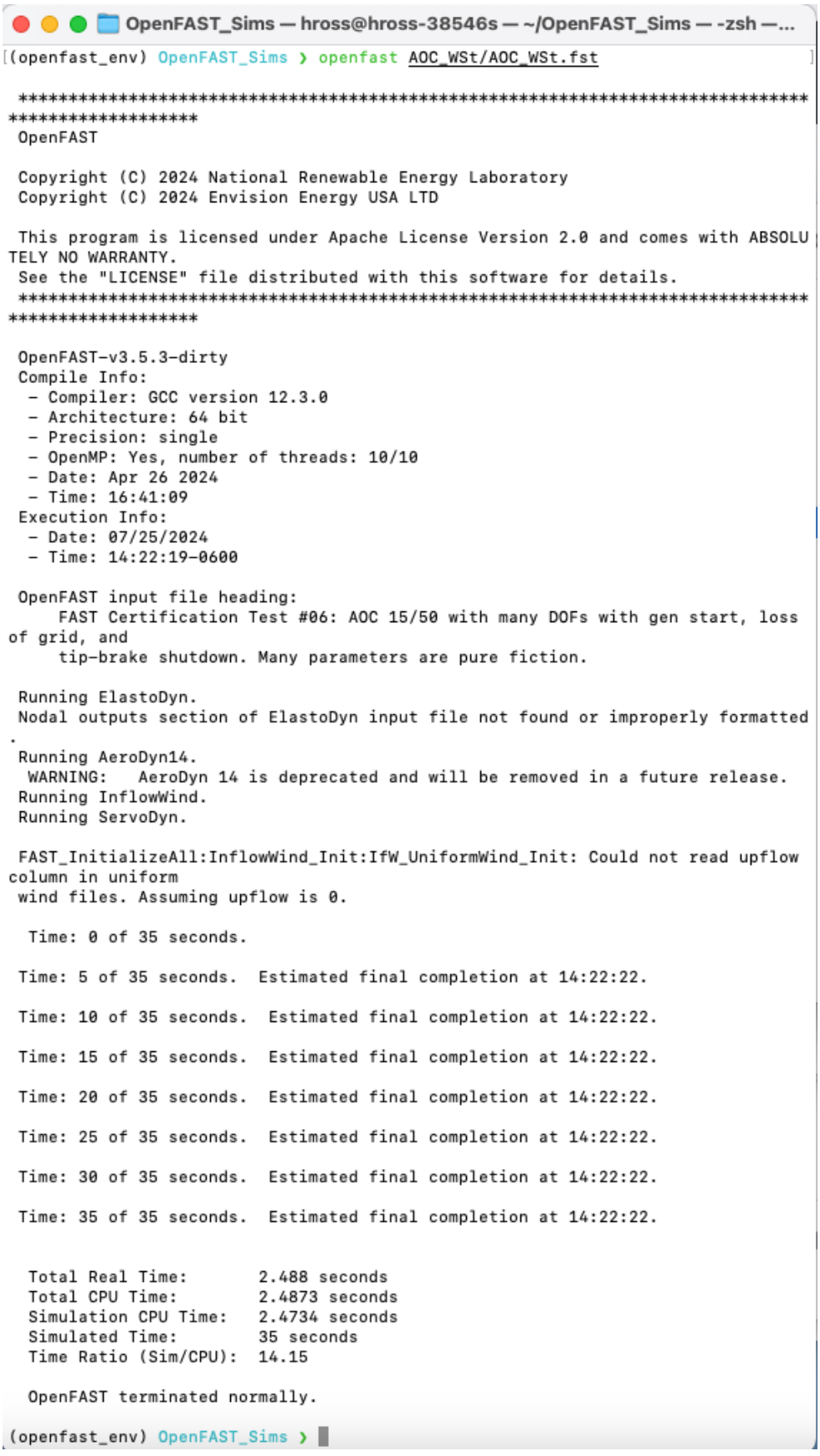
2. We will run OpenFAST within this folder. First, activate the OpenFAST conda environment: `conda activate openfast_env`



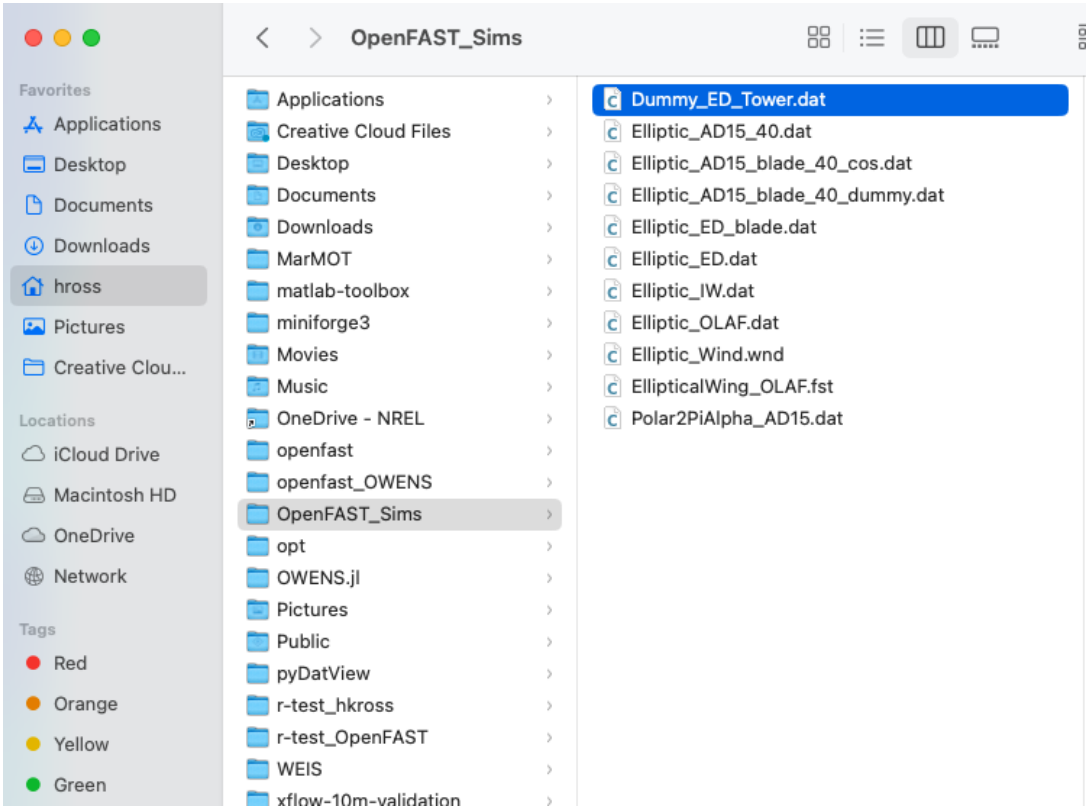
3. Run OpenFAST using the command `openfast path_to_main_input_file`. Here, the location of the main input file will be specified after the `openfast` command. The main, or top-level, input file will have a .fst extension, and all other input files are called from this one. For this case, the main input file is "AOC_WSt.fst" and is located within the AOC_WSt folder. So, our command will be `openfast AOC_WSt/AOC_WSt.fst`.



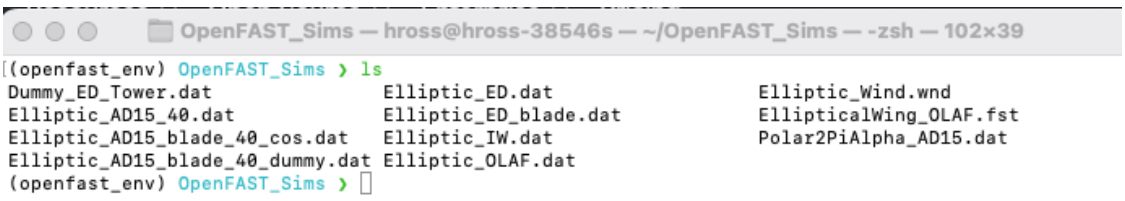
4. Executing this command will run the OpenFAST "AOC_WSt" simulation. If the simulation runs correctly, this command will produce some output text, ending with "OpenFAST terminated normally."


OpenFAST_Sims — hross@hross-38546s — ~/OpenFAST_Sims — -zsh —...
(openfast_env) OpenFAST_Sims ❯ openfast AOC_WSt/AOC_WSt.fst
OpenFAST
Copyright (C) 2024 National Renewable Energy Laboratory
Copyright (C) 2024 Envision Energy USA LTD
This program is licensed under Apache License Version 2.0 and comes with ABSOLUTELY NO WARRANTY.
See the "LICENSE" file distributed with this software for details.
OpenFAST-v3.5.3-dirty
Compile Info:
- Compiler: GCC version 12.3.0
- Architecture: 64 bit
- Precision: single
- OpenMP: Yes, number of threads: 10/10
- Date: Apr 26 2024
- Time: 16:41:09
Execution Info:
- Date: 07/25/2024
- Time: 14:22:19-0600
OpenFAST input file heading:
FAST Certification Test #06: AOC 15/50 with many DOFs with gen start, loss of grid, and
tip-brake shutdown. Many parameters are pure fiction.
Running ElastoDyn.
Nodal outputs section of ElastoDyn input file not found or improperly formatted.
Running AeroDyn14.
WARNING: AeroDyn 14 is deprecated and will be removed in a future release.
Running InflowWind.
Running ServoDyn.
FAST_InitializeAll:InflowWind_Init:IfW_UniformWind_Init: Could not read upflow column in uniform
wind files. Assuming upflow is 0.
Time: 0 of 35 seconds.
Time: 5 of 35 seconds. Estimated final completion at 14:22:22.
Time: 10 of 35 seconds. Estimated final completion at 14:22:22.
Time: 15 of 35 seconds. Estimated final completion at 14:22:22.
Time: 20 of 35 seconds. Estimated final completion at 14:22:22.
Time: 25 of 35 seconds. Estimated final completion at 14:22:22.
Time: 30 of 35 seconds. Estimated final completion at 14:22:22.
Time: 35 of 35 seconds. Estimated final completion at 14:22:22.
Total Real Time: 2.488 seconds
Total CPU Time: 2.4873 seconds
Simulation CPU Time: 2.4734 seconds
Simulated Time: 35 seconds
Time Ratio (Sim/CPU): 14.15
OpenFAST terminated normally.
(openfast_env) OpenFAST_Sims ❯

5. Now, we can navigate back to the “AOC_WSt” folder within the Finder window, and we see that new .sum, .ech, .out, and .outb files have been created. These files contain information about the simulation as well as the outputs.
6. We will run one more example case. We can delete the AOC and AOC_WSt folders within OpenFAST_Sims to have a clean start. Now, navigate back to the “r-test-main” folder in Downloads, then select r-test-main > glue-codes > openfast > EllipticalWing_OLAF. Instead of copying the entire folder, we will copy only the files ending in .fst, .dat, and .wnd (11 files total). Copy these files into the OpenFAST_Sims folder.

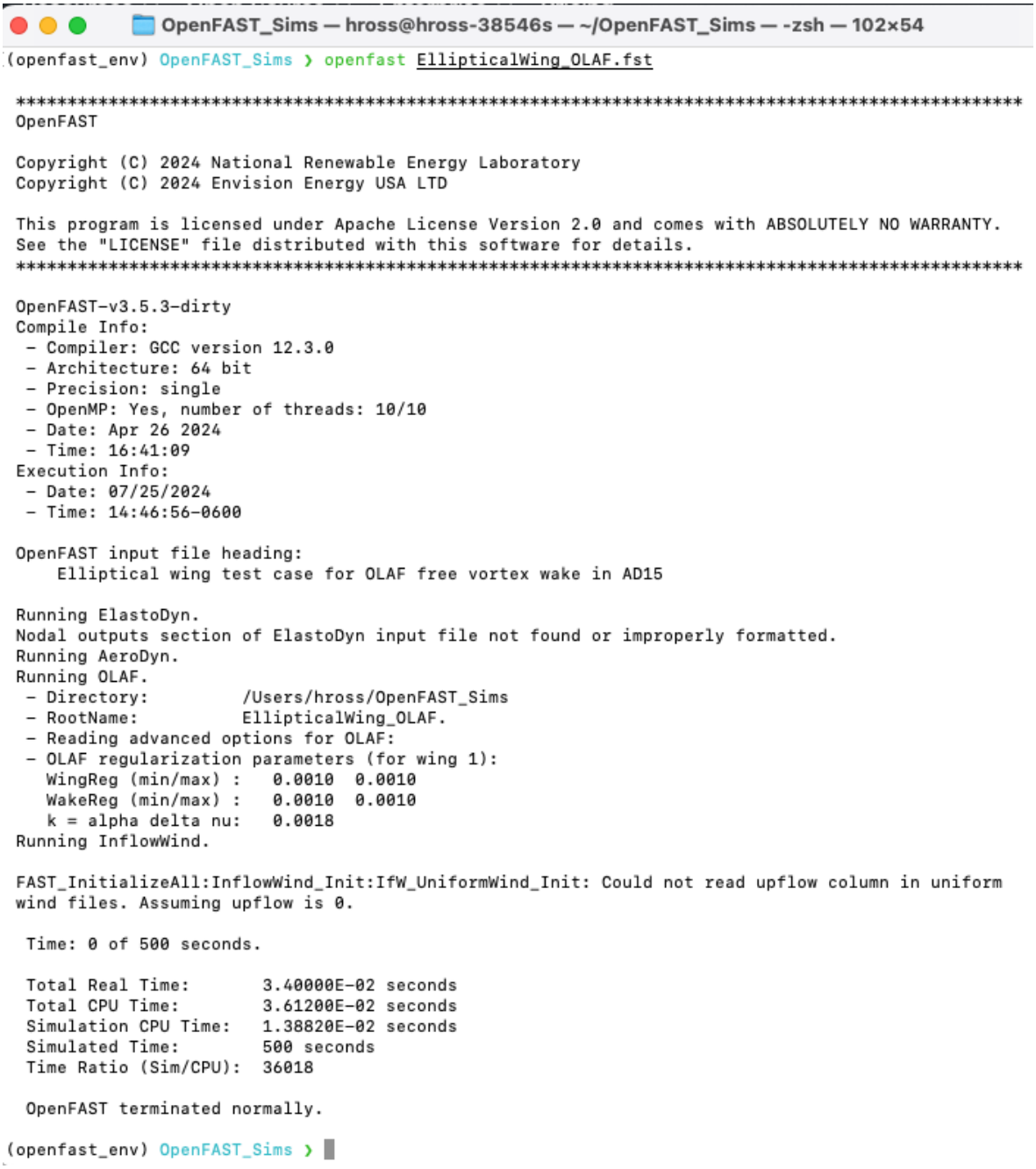


7. Go back to the terminal to run this case. This time, running `ls` reveals that, as expected, the input files are contained directly in the OpenFAST_Sims folder rather than being in a subfolder, which was the case in the previous simulation.



8. To run this simulation, execute the command `openfast EllipticalWing_OLAF.fst`. We again specify the location of the top-level input

file. Because it is contained directly in OpenFAST_Sims, rather than in a subfolder, we only need to type the name of the file after the `openfast` command.

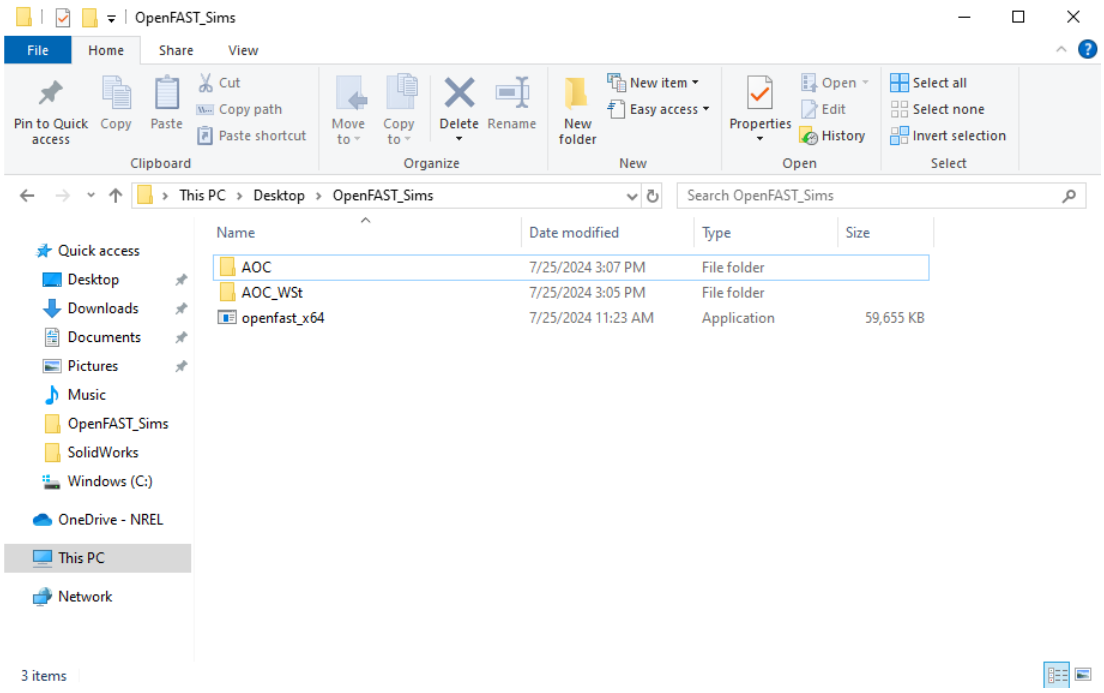


9. Now, we can navigate back to the “OpenFAST_Sims” folder within the Finder window, and we see that .sum, .ech, .out, and .outb files have been created. These files contain information about the simulation as well as the outputs.

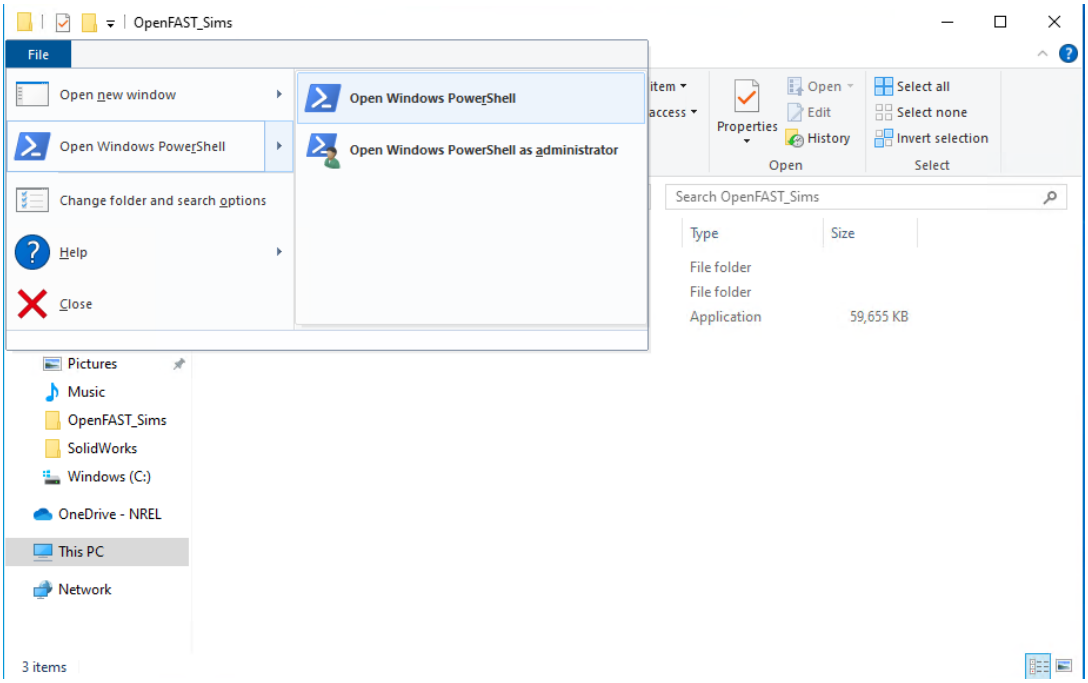
10. If preferred, you can now delete the “r-test-main” folder in Downloads, unless you would like to practice running more example cases.

Windows systems

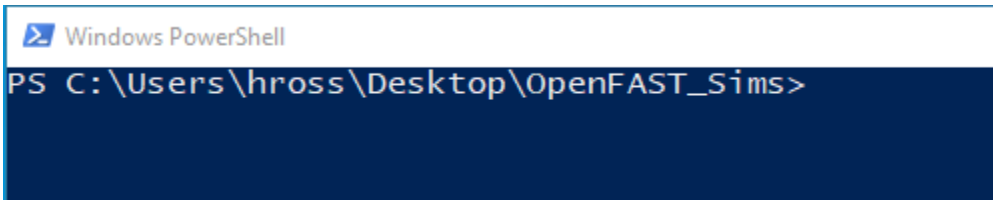
1. To run OpenFAST on a Windows system, first navigate into the folder where your openfast_x64.exe and AOC folders are stored.



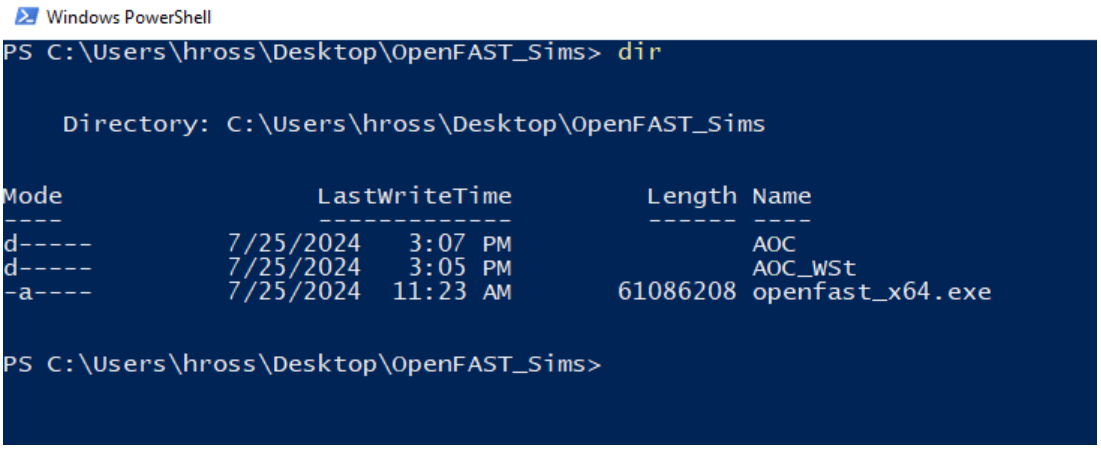
2. Open a terminal in this folder by selecting File > Open Windows PowerShell > Open Windows PowerShell.



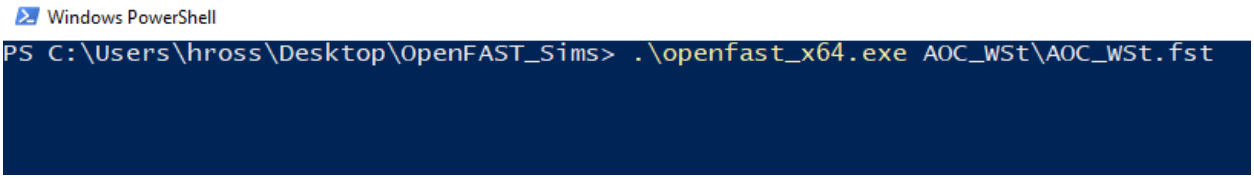
You should already be in the correct folder, which in this example is the "OpenFAST_Sims" folder on the Desktop.



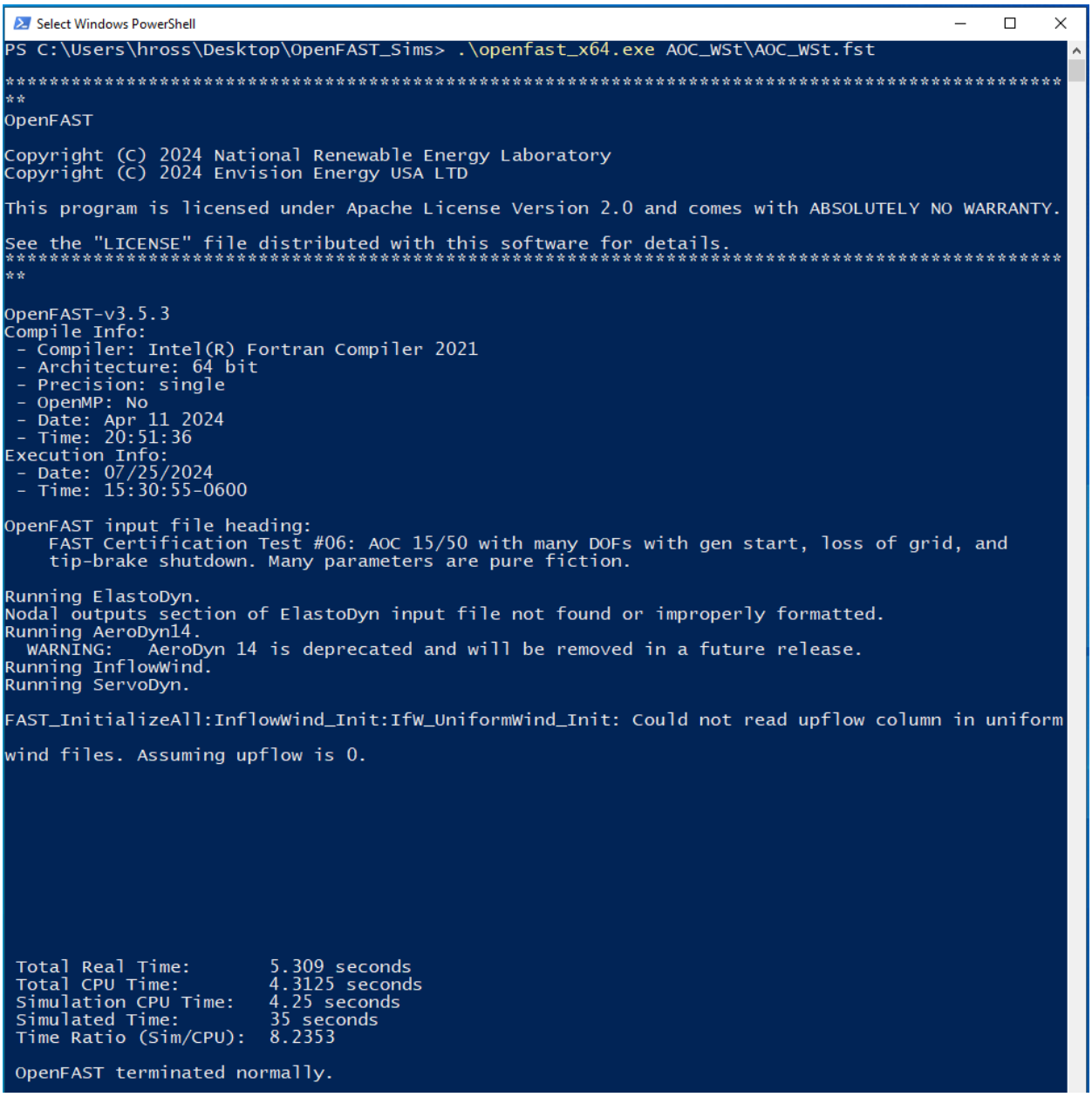
3. Within PowerShell, type `dir` to display the contents of the current folder. As expected, the "AOC" and "AOC_WSt" folders are located here, as well as the OpenFAST executable.



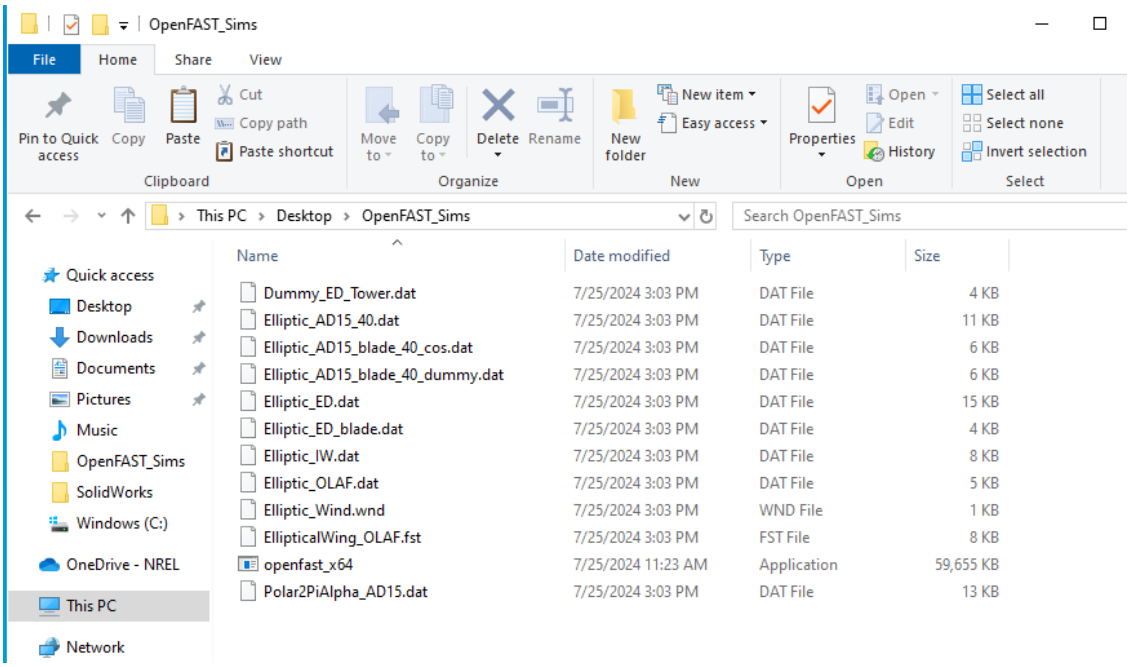
4. We will run OpenFAST within this folder using the command `.\openfast_x64.exe` *`path_to_main_input_file`*. Here, the location of the main input file will be specified after the `openfast` command. The main, or top-level, input file will have a .fst extension, and all other input files are called from this one. For this case, the main input file is "AOC_WSt.fst" and is located within the AOC_WSt folder. So, our command will be `.\openfast_x64.exe AOC_WSt\AOC_WSt.fst`



5. Executing this command will run the OpenFAST "AOC_WSt" simulation. If the simulation runs correctly, this command will produce some output text, ending with "OpenFAST terminated normally."



6. Now, we can navigate back to the “AOC_WSt” folder within the File Explorer, and we see that new .sum, .ech, .out, and .outb files have been created. These files contain information about the simulation as well as the outputs.
7. We will run one more example case. We can delete the AOC and AOC_WSt folders within OpenFAST_Sims to have a clean start. Make sure not to delete the openfast_x64.exe file. Now, navigate back to the “r-test-main” folder in Downloads, then select r-test-main > glue-codes > openfast > EllipticalWing_OLAF. Instead of copying the entire folder, we will copy only the files ending in .fst, .dat, and .wnd (11 files total). Copy these files into the OpenFAST_Sims folder.



8. Go back to the PowerShell to run this case. This time, running `dir` reveals that, as expected, the input files are contained directly in the OpenFAST_Sims folder rather than being in a subfolder, which was the case in the previous simulation.

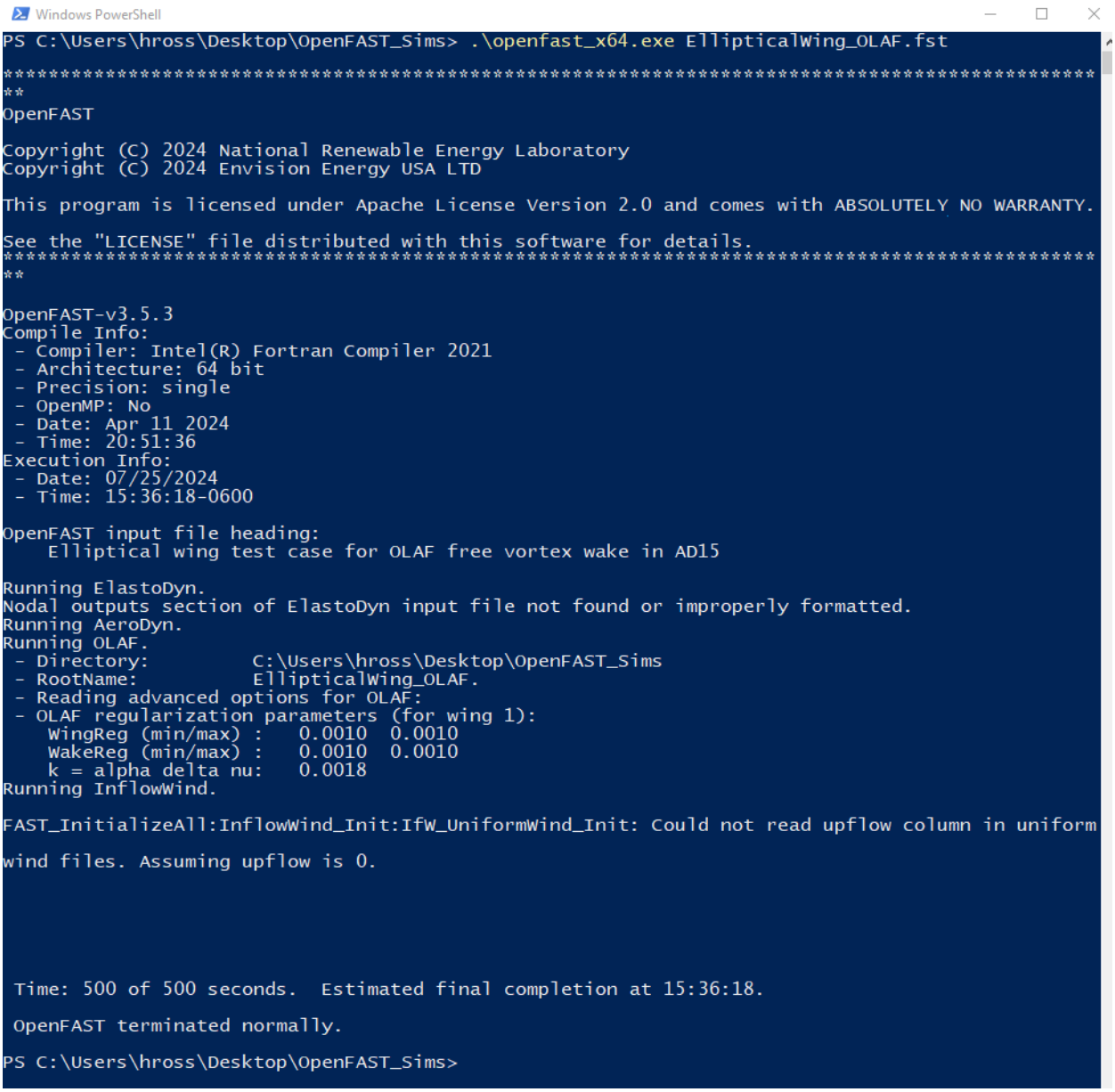
```
Windows PowerShell
PS C:\Users\hross\Desktop\OpenFAST_Sims> ls


    Directory: C:\Users\hross\Desktop\OpenFAST_Sims


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
-a----         7/25/2024   3:03 PM           3226 Dummy_ED_Tower.dat
-a----         7/25/2024   3:03 PM           7397 EllipticalWing_OLAF.fst
-a----         7/25/2024   3:03 PM          11034 Elliptic_AD15_40.dat
-a----         7/25/2024   3:03 PM           6038 Elliptic_AD15_blade_40_cos.dat
-a----         7/25/2024   3:03 PM           5580 Elliptic_AD15_blade_40_dummy.dat
-a----         7/25/2024   3:03 PM          14703 Elliptic_ED.dat
-a----         7/25/2024   3:03 PM           3761 Elliptic_ED_blade.dat
-a----         7/25/2024   3:03 PM           7444 Elliptic_IW.dat
-a----         7/25/2024   3:03 PM           4925 Elliptic_OLAF.dat
-a----         7/25/2024   3:03 PM            308 Elliptic_Wind.wnd
-a----         7/25/2024  11:23 AM       61086208 openfast_x64.exe
-a----         7/25/2024   3:03 PM          12781 Polar2PiAlpha_AD15.dat


PS C:\Users\hross\Desktop\OpenFAST_Sims>
```

9. To run this simulation, execute the command `.\openfast_x64.exe EllipticalWing_OLAF.fst`. We again specify the location of the top-level input file. Because it is contained directly in OpenFAST_Sims, rather than in a subfolder, we only need to type the name of the file after `.\openfast_x64.exe`.



10. Now, we can navigate back to the “OpenFAST_Sims” folder within the File Explorer, and we see that .sum, .ech, .out, and .outb files have been created. These files contain information about the simulation as well as the outputs.

    If preferred, you can now delete the “r-test-main” folder in Downloads, unless you would like to practice running more example cases.