Wild Fire Visualization
Group 4

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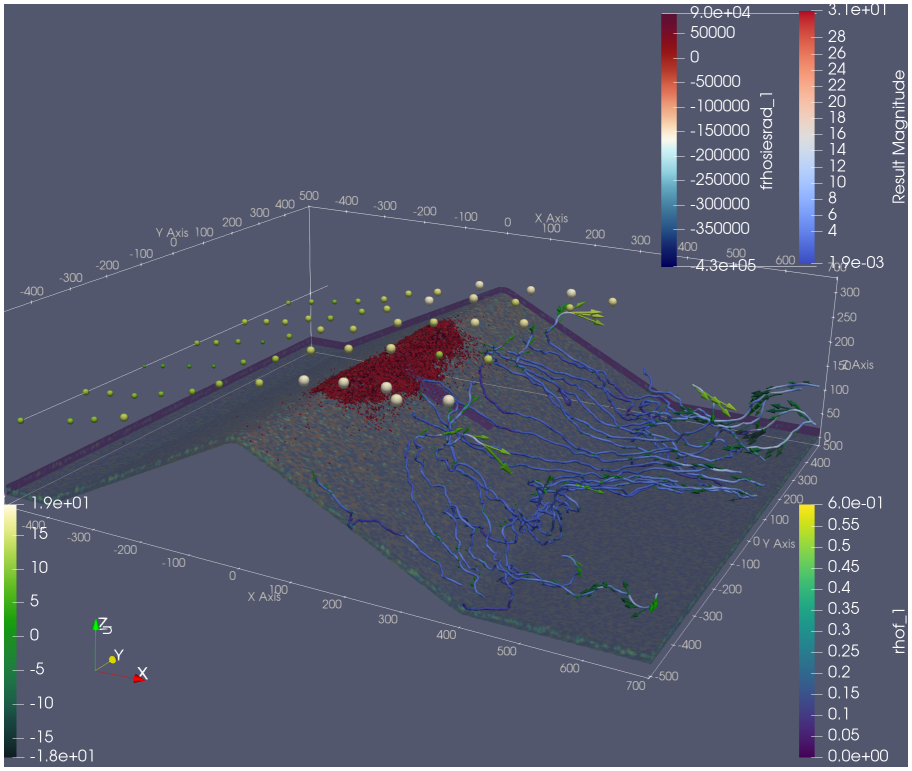

Figure 1: A simulated wildfire using software created by the Los Alamos National Laboratory visualized using ParaView

1 Project Goals

In this project, we are visualizing wild fires in three different situations, head curve and back curve fire on mountains and a fire in a valley. We are going to use the Vorticity-Driven Lateral Spread (VLS) Ensemble data-set [1] which is provided for the SciVis 2022 Contest [2]. The following are tasks that we are aiming to complete are:

- Generate a visual narrative of the events within the time series of one or more simulations.
- Examine the influence of vegetation structure and atmospheric turbulence on fire spread

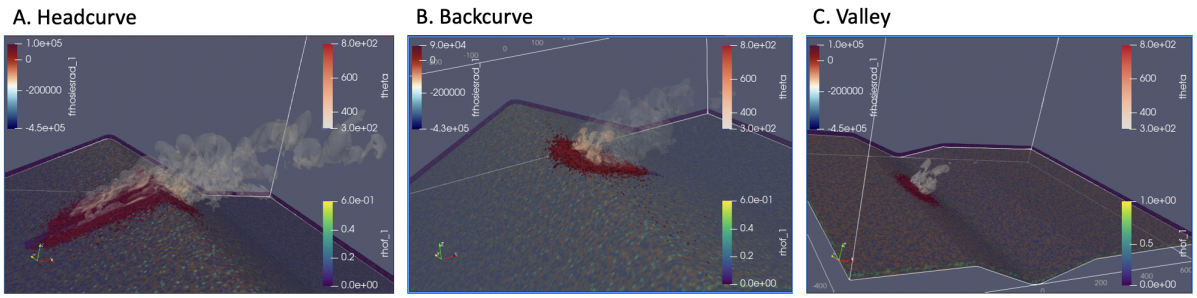

Figure 2: It shows the foliage, fire, and smoke from the three different scenarios at the timestamp 35.

2 Progress So Far

We estimate that we have about 50% of our project completed. We say this because we have been able to download, piece the datasets together, and start doing visualizations. The datasets that we are using are big (∼70GB) so downloading them took time. Once we had the datasets downloaded, piecing them together was easier than we thought it would be. It turns out Paraview will piece dataset time segments together if files have the same name and just different numbers in front. In the previous report, we reported that the dataset has a total of 9 scalar fields which includes theta (temperature), fire-induced radiative heat transfer, bulk density of dry fuel, and three vector components of wind. We have started visualizing how the fire and smoke spreads over time with influence from foliage by visualizing the theta, heat transfer, and dry fuel features (Figure 2). Next, we got the wind vector by joining three vector components of wind and visualized it as shown in Figure 1. We visualize the fire and smoke by using iso-surface of theta when the values are range between 400K and 800K and 300K respectively. The wind vector is visualized via streamlines and particle tracers. The streamlines are the solid line that shows the wind movement over an entire timestep and the particle tracers show the movement of a wind particle over time (the circles in Figure 1). This allows us to interpret how the fire spreads over time with influence from foliage and wind effects. So far, we have only visualized 6 out of the 9 features. Because we have achieved all of these items we estimate that we are around 50% done with our overall project.

3 Future Work

We feel that with the time we have left, we will be able to complete everything we set out to do with this project, thus we do not see the need to modify the scope of our project. To complete our project, we must finalize both of the above-mentioned visualizations and apply them to all three datasets. We'll make a video to demonstrate how the factors we're looking at effect how the fire spreads over time on different terrains once these visualizations are finished. We'll develop our group presentation and final writeup after the video is completed.

To have time to accomplish all this we have set aside this week (4/3-4/9) to finish up our visualizations and will then leave next week (4/10-4/17) to create the videos, final writeup, and presentation so that it can be submitted on 4/19.

References

[1] https://oceans11.lanl.gov/firetec/. https://oceans11.lanl.gov/firetec/. Accessed: 2022-03-14.

[2] Ieee scivis 2022 contest. https://www.lanl.gov/projects/sciviscontest2022/. Accessed: 2022-03-14.