Comment on nhess-2021-171

Anonymous Referee #2

Referee comment on "Nowcasting thunderstorm hazards using machine learning: the impact of data sources on performance" by Jussi Leinonen et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2021-171-RC2, 2021

This paper presents an analysis of the utility of different data within a Machine learning nowcasting tool for thunderstorm hazards. ML techniques have improved and become more usual in the last decades with the advances in computer resources and the increasing of high temporal and spatial resolution observations.

In concrete, this paper explores the role in hazard forecasting of ground-based radar, different satellite data (lightning, DEM, and imagery), and numerical weather prediction using a gradient tree-boosted machine learning algorithm. It especially emphasizes the role of the satellite data, and it tests the results in an area in the northeast of the USA, with similar climatology as areas in central Europe, so the technique can be extrapolated to other regions. It also uses open-source data, which makes the research here presented even more valuable for the scientific community around the world, allowing other researchers to reproduce their experiments and/or continue the research.

I congratulate the authors since the paper is well-written, clear, and brief, and it allows a good understanding of the authors' findings through clear and complete figures, which makes it clear for non-ML experts too. Results are well described with a comprehensive discussion and supported by scientific evidence.

Nevertheless, I suggest some tiny inclusions in the conclusion section which I believe will give more emphasis to the importance of the research here presented. Those comments /suggestions are described below.

General comments:

The authors state that the objective of the project is " *to provide a systematic assessment of the value of various data sources for nowcasting hazards caused by thunderstorms using a ML approach.*" Particularly: " *we seek to understand the impact on thunderstorm nowcasting from the new generation of geostationary satellites, which, compared to the previous generation, provide higher resolution imagery, additional image channels and lightning data.*"

However, although discussed in the results, I think that the conclusions could benefit from an explicit mention of the findings regarding that data source, reinforcing that, although the best results are obtained through the NEXRAD data, GLM has a positive impact

offshore or in areas without radar coverage. It could be good to slightly mention the importance of satellite methods in areas without a good radar coverage nowadays, such, for instance, Africa, on which the new EUMETSAT generation data -and derived products will be also available in the future, and for which maybe ML techniques could be implemented if computational resources are available.

I strongly believe that adding such tiny discussion, and some numbers regarding the computational costs of running this ML algorithm, would give the readers and possible future researchers/operational-tools developers a better idea of whether ML would improve their hazardous thunderstorms nowcasting tools, or if it is better to remain with ground-based instrumentation data and NWP (for those regions where no such data is available).

Technical comments:

L65: Please, change to read "as well as a region of the Atlantic.."

L135: Please, change to read "as well as their energies..."

L156: Is "elevation gradient" and "Surface gradient" here used indistinctly? Please, clarify.

L366 and L375: Should this be "1.2%" and "4.6%", perhaps?

L427: Please, change to read: "may also expose the training process to the problem of overfitting..."