Natural Hazards and Earth System Sciences Discussions

Nat. Hazards Earth Syst. Sci. Discuss., author comment AC2
https://doi.org/10.5194/nhess-2021-171-AC2, 2021

Reply on RC2

Jussi Leinonen et al.

Author 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-AC2, 2021

Dear Reviewer 2,

We thank you for your constructive comments. Please find below our answers to your comments. The original comments are posted in italic font and the point-by-point responses are under each comment in normal font. The specific changes made to the manuscript in response to the comment are described in **bold** font.

Best Regards,

Jussi Leinonen (on behalf of all authors)

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.

We agree that this could have been emphasized more and **have added a discussion of it in the third paragraph of the conclusions. It is now stated: "The GLM lightning data are highly useful for lightning prediction; for other targets, they provide more modest benefits, although they can still provide improvements to nowcasting performance particularly when radar data are not available. More generally, the results confirm that satellite data can be used to provide ML-based**

nowcasts in areas without radar coverage, such as over the oceans and in less-developed regions lacking ground-based radar networks."

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).

In addition to the changes mentioned in our previous response, we have also added a paragraph at the end of section 3.4 describing the computational costs of training and evaluation.

Technical comments:

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

This was corrected as indicated by the reviewer.

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

Also corrected as requested.

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

Yes, we have changed both mentions to "elevation gradient" to remove the ambiguity.

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

We think it is more correct and less ambiguous to use the term "percentage points" in these cases where we are comparing two percentage values. For instance, in the case of L366, the difference of 15.3% and 14.1% is 1.2 percentage points, but expressed in percent it could also be the relative difference of those values (8.5%).

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

We thank the reviewer for pointing this out, corrected.