

Response to reviewer: the original reviewer comments are in italic and dark red, while the authors' replies are in black, with highlights in bold. Line references are for the revised manuscript without tracked changes.

Reviewer 1

Dear authors,

Thank you for submitting this interesting manuscript on predicting the risk of individual tree fall along powerlines.

While the current results (in terms of accuracy) may not yet support immediate practical implementation, I believe your work makes a valuable contribution to the ongoing development of methods in this highly relevant field.

You have clearly highlighted and discussed the limitations of your study, which helps clarify the significance of your contribution for fellow researchers.

Overall, the manuscript is well written and well structured. I suggest that you could further improve the Materials and Methods section by including figures that illustrate your approach in greater detail.

Kind regards.

We thank the reviewer for their time reviewing our manuscript. We have created a new figure for the Materials and Methods section to illustrate the entire approach and process in a bit more detail. This figure was presented in the first author comment AC1, 2nd March 2026. We replaced the original Figure 2 in the manuscript with this new figure now placed line 367 and introduced with **“A summary figure of the methodological approach and entire process is described in Figure 2.”** Furthermore, we include another figure, to describe the crown offset methodology in the Appendix A of the revised manuscript (see line 119). This second figure was presented in the co-author

comment CC1, 3rd March 2026. For review, the two figures are shown in this final author comment below:

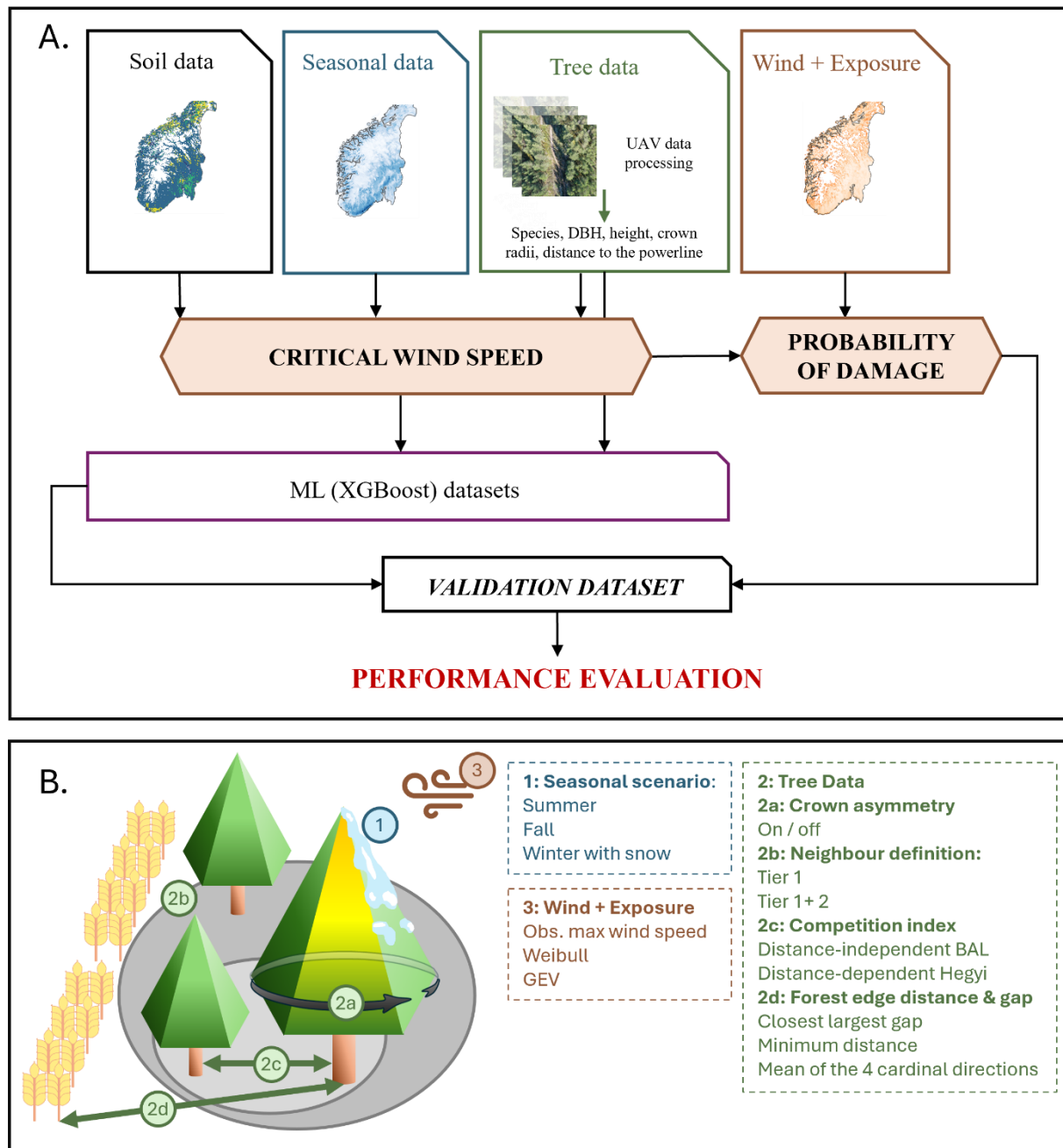
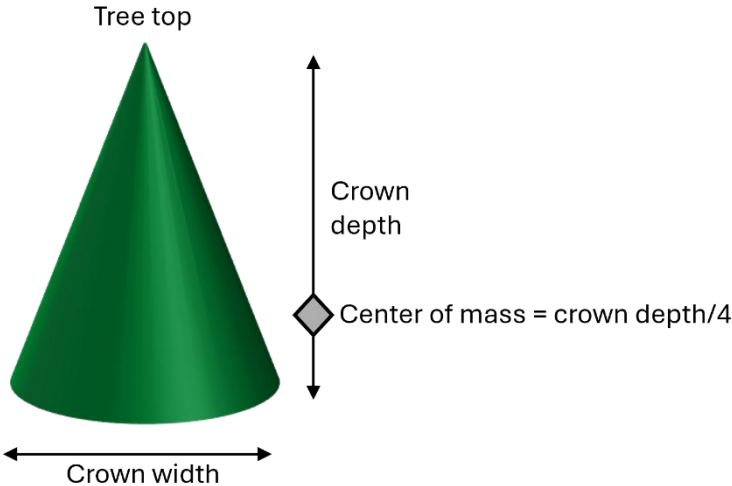


Figure 2. Methodological approach used in the study. Box A: The input data (Soil data, Seasonal data, Tree data and Wind + Exposure) are processed and fed into ForestGales to obtain the Critical Wind Speed and subsequently the Probability of Damage. In addition, the input datasets and the Critical Wind Speed datasets are used in a machine learning (ML) algorithm (XGBoost). The ForestGales calculated probability of damage and the machine learning datasets are evaluated against a validation dataset - the recorded tree falls along powerlines during the winter 2020-2021 to assess the performance of the two methods. Box B: Graphical representation of the different model options considered in the study split into three categories: 1. the Seasonal Scenario used (section 2.3.1 in the text), 2. the Tree Data processing (section 2.1.2 in the text) and 3. the use of the Wind and Exposure data (section 2.2 & 2.3.2 in the text).

The text in the manuscript would be altered to this new version lines 129-133: “**The distance to the edge of the forest and the associated forest gap size were**

calculated in four directions – to and from the powerline, and along the powerline direction – using individual tree positions. Three alternatives were retained when calculating the CWS: i. the “closest largest gap” was defined using the linear optimizer function of the lpSolve package in R (Berkelaar, 2024), ii. the “minimum” was simply the closest forest edge and iii. the “mean” the average of the distances to and size of the non-forested gaps in the four considered directions.”

A. ForestGales default crown shape = right circular cone



B. New crown shape = oblique elliptical cone – irregular cone

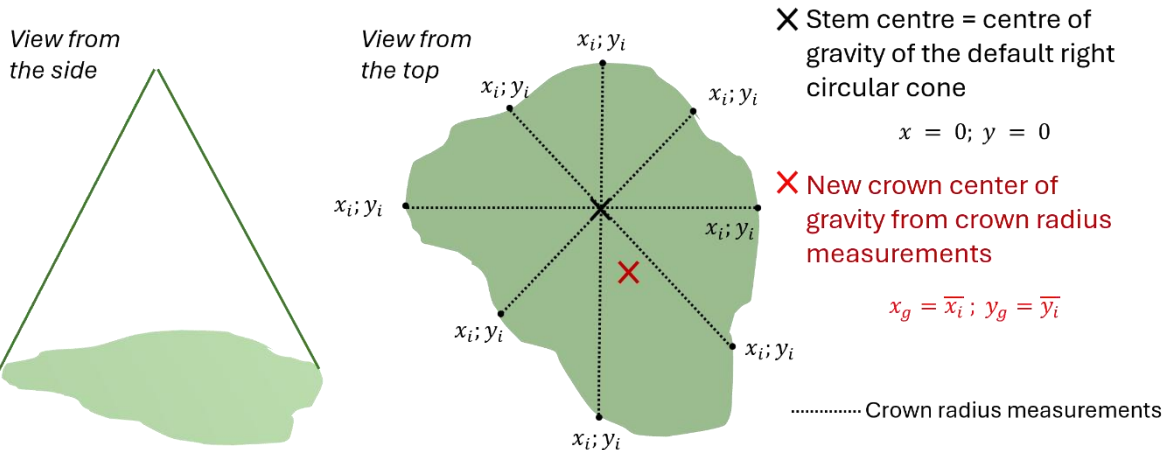


Figure A 1. Description of the changes made in the assumed crown shape in the ForestGALES model to implement a crown center of gravity offset. A: the default crown shape in ForestGALES, a right circular cone. B: the new crown shape to account for an offset in the crown center of gravity – an irregular cone, where the new position of the crown center of gravity is derived from the positions of 8 points at the edge of the crown perimeter. These points were used to obtain the crown radius / diameter measurements from the LiDAR data in the 8 cardinal directions. Under the new crown shape scenario, the assumption that the crown center of mass is at ¼ height of the crown depth still holds.

This figure would be placed in the Appendix A, under the sub-section A.1.2 Displacement of the crown centre of gravity under asymmetry.

Reviewer 2:

Dear Authors,

Thank you for submitting the manuscript. The study addresses an important topic on wind damage modelling and is generally well written, clearly structured, and supported by relevant literature. The integration of field data and modelling approaches provides valuable contributions to improving the understanding of wind risk for individual tree fall along powerlines in Norway using ForestGALES and machine learning.

However, several aspects of the methodology and parameter description require further clarification to ensure transparency, reproducibility, and scientific rigor. Detailed comments and points for clarification are provided in the attached PDF file for your consideration.

Overall, the manuscript has strong potential for publication. Addressing the points raised, particularly those related to methodological clarity and parameter definition, will substantially improve the robustness and reproducibility of the study.

We thank the reviewer for their time reviewing our manuscript. We address the different points raised by the reviewer for clarifying and improving the methodology and parameter description. We thank the reviewer for pointing out these to help us improve the manuscript for publication. The reviewer's original comments are provided in italic, while our replies are provided in normal text. The bold sections in each reply are suggestions for actual manuscript revisions implemented in the revised manuscript.

Detail comments and clarification of the manuscript egosphere-2025-6363:

1. L140–141: Simulation approach a. The manuscript mentions 100 simulations using 180 standing trees, but the methodology is not described. Please clarify the sampling approach assumptions and whether resampling techniques were applied.

We clarify the sampling methodology used to sample 180 standing trees in 100 independent simulations (lines 144-151): “Considering the large imbalance in the sample sizes between the damaged and standing trees, **we used a repeated random subsampling approach for N = 100 simulations. In each of the simulations, all 180 damaged trees were combined with a randomly selected subset of 180 standing trees drawn without replacement to produce balanced datasets. The differences in the characteristics between the standing and damaged trees were evaluated in each simulation, and the results were summarized across the 100 simulations. This approach assumes independence among trees and treats each random subsample of standing trees as an equally plausible representation of the undamaged population. Similar results were obtained when performing the analysis on the complete unbalanced dataset.**”

2. L153–170: Wind speed and wind condition

a. The use of maximum wind speed at 10 m height to calculate damage probability requires further justification. Consideration of wind speeds at different reference heights could help assess whether model performance (e.g., AUC, accuracy, optimal cut-point) can be improved.

The ForestGALES model can indeed calculate the critical wind speed at different heights. Generally, wind climate data is provided at 10m height from weather stations and common raster products in wind climate datasets. Therefore, it is most common to calculate the critical wind speed at the same height for direct comparison with the climate data. This ensures consistency with standard meteorological wind products (such as the one used here). We agree that considering wind speeds at different reference heights could provide additional insight into which height best explains the observed damage patterns and may further improve model performance metrics such as AUC or classification accuracy. It is important to note that the influence of forest and other ground cover further away from the site of interest increases with the height of the wind data used. Since the objective of the study was to assess individual tree risk along powerlines, keeping the calculations as close as possible to the top of the tree – here 10m height above the zero-plane displacement – is most sensible. We acknowledge this question as a relevant and interesting direction for future research, especially when considering storm events with more complex profiles as highlighted by Zubkov et. al 2026 <https://doi.org/10.1016/j.agrformet.2025.110951>. We add two sentences in the manuscript lines 267-269 to address this comment: **“Finally, the CWS is elevated to a reference height of 10 m. The reference height of 10 m was chosen to i) ensure consistency with standard meteorological wind products and ii. to avoid integrating the increasing influence of forest and other ground cover further wat from the site of interest tied with calculating the CWS at higher heights.”**

b. The manuscript focuses on maximum wind speed but does not describe the overall wind conditions during the winter 2020–2021 period. A summary of wind speed distribution (minimum, maximum, mean, and percentiles) would provide important context for interpreting the results.

This is a good point – we looked further into the overall wind conditions during the winter 2020-2021 period. The wind conditions during the winter 2020-2021 period in the regions of interest were relatively mild as seen below in the figure. Across all locations, the mean and median wind speed at 10m during the winter 2020-2021 (all months between September 2020 and April 2021 were taken into account) were around 3 to 4 m.s⁻¹. The maximum wind speed recorded during this period (and subsequently used in the manuscript) was also quite low, just above 10 m.s⁻¹. We add this information in the revised manuscript in the section 2.2.1. and as a supplementary figure to provide more context as suggested by the reviewer (lines 172-173): **“The wind climate during this period (winter 2020-2021) was relatively mild, with a mean wind speed of**

approximately 3 to 4 m.s⁻¹ and a 95th percentile between 4 and 5 m.s⁻¹. The maximum observed wind speed itself reflected a mild winter, with values around 10 m.s⁻¹ for all locations considered here (see Appendix Figure A 2).”

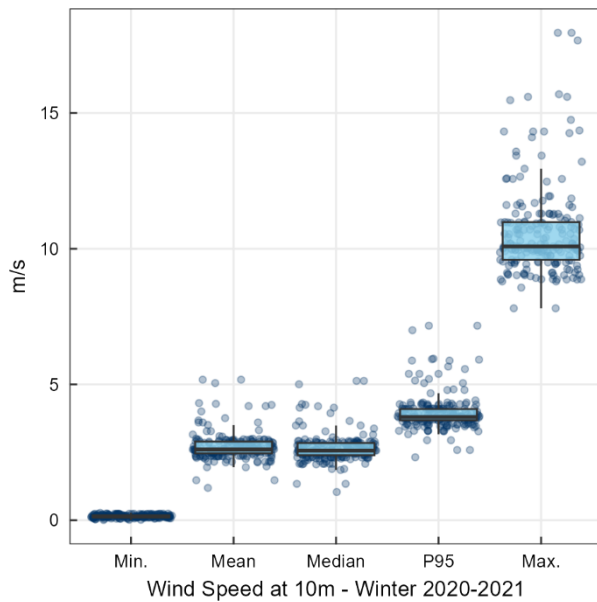


Figure A 2. Statistics of the wind speed at 10m during the winter 2020-2021 (Sept. 2020 to April 2021) at the studied locations. The statistics represented are the minimum wind speed (“Min.”), the mean and median, the 95th percentile (“P95”) and the maximum wind speed (“Max.”). Individual locations are shown in the faded points, while the average over all locations is displayed with the boxplots.

3. L215–229: Model parameter clarification Several key variables require clearer definition to ensure reproducibility:

a. *D*₀ derived from DBH: Clarification is needed on how *D*₀ is derived from DBH, including the underlying equation or assumptions. Please explain why *D*₀ was not directly measured.

In the ForestGALES model, the diameter at the base of the tree *D*₀ is derived from the diameter at breast height (DBH) using a model-internal taper relationship. It is computed as follows:

$$D_0 = DBH \times \left(\frac{H_{wa}}{H_{wa} - 1.3} \right)^{1/3}$$

where *H*_{wa} is the wind action point height defined as:

$$H_{wa} = \begin{cases} H - \frac{cr_{depth}}{2}, & H - \frac{cr_{depth}}{2} > 1.3 \times 2.0 \\ 1.3 \times 2.0, & otherwise \end{cases}$$

With *H* being total tree height and *cr*_{depth} is the crown depth. The two formulas assume that the surface strain and stress from wind are constant between a height of 1.3m and the stem base (first equation), and that the wind load acts in the middle of the crown (second equation).

The diameter at the base of the tree was not directly measured as part of the sampling campaign because the campaign was designed prior to the decision to run the ForestGALES. Base diameter is not a routinely measured tree attribute when recording tree characteristics, whereas DBH is standard practice. We didn't have any other extensive source of data to adjust the default equation to a Norwegian-specific equation, therefore, D_0 was derived using the ForestGALES default equation. In the manuscript, we add line 241-242: **“The diameter at base D_0 was derived from DBH, tree height and crown depth using the ForestGALES default equation (m).”**

b. TMC (turning moment coefficient): The definition remains unclear. Please clarify whether TMC_ratio is used and how it is parameterized.

Thank you for highlighting this point. The turning moment coefficient (TMC) is a model-derived parameter in ForestGALES. It quantifies the mechanical leverage of wind loading on an individual tree and incorporates tree size and competitive effects. In our study, we used the standard ForestGALES formulation described in the fgr package (Locatelli et al., 2022):

1. When no competition index is used:

$$T_C = 111.573 \times H \times \left(\frac{DBH}{100}\right)^2$$

2. With the BAL competition index:

$$T_C = 113.54 \times H \times \left(\frac{DBH}{100}\right)^2 - 20.494 \times C_{BAL}$$

3. With the Hegyi competition index:

$$T_C = 3.86 \times C_{HEG} + 124.252 \times H \times \left(\frac{DBH}{100}\right)^2 - 17.282 \times H \times \left(\frac{DBH}{100}\right)^2 \times C_{BAL}$$

If the competition-aware definitions of T_C yield $T_C = 0$, then T_C reverts back to the first definition, where no competition index is used. These equations are well defined in the fgr package, and thus we do not repeat them in the manuscript or the Appendices. The manuscript would however be improved by adding lines 235-237: **“ T_C is the turning moment coefficient as defined in ForestGALES. It is a dimensionless parameter that represents the wind-induced turning moment acting on an individual tree, accounting for tree size and competitive environment. Further details on the calculation of T_C can be found in the fgr R package (Locatelli et al., 2022).”** In our study, no thinning operations were conducted prior to the observed damage, therefore the spacing between trees remained constant, and the TMC_ratio, i.e. the ratio of the turning moment coefficient after and before thinning, was set to 1. The manuscript now reads lines 237-241: **“The T_C can further be modified following recent (less than 5 years) thinning operations via the TMC_ratio accounting for differences in the**

spacing between trees before and after thinning operations. Since the model was run at a single point in time with no thinning operations conducted in the 5 years prior, the TMC_ratio was set to 1.0.”

c. MOE and MOR moisture condition:

- *The moisture condition of the wood is not specified. Indicate whether values correspond to green or air-dried conditions (e.g., 12% MC).*
- *If dry values are used, clarification is needed on whether conversion to green conditions was applied, as wind damage occurs under green conditions. Reference to established conversion approaches (e.g., Unterwieser and Schickhofer, 2011) would strengthen this section.*

We thank the reviewer for pointing out the missing information. The MOE and MOR values used in the study were adapted to the Norwegian conditions in the same way as in Merlin et al. (2025), using values from the Norwegian and Fennoscandian literature. In short, lines 242-247, “**The wood parameters MOR: modulus of rupture (MPa), MOE: modulus of elasticity (Pa) were extracted from (Fischer et al., 2016) and (Høibø and Vestøl, 2010) for spruce and pine growing in Norway and from (Peltola et al., 2000) for birch. The spruce and pine values were obtained from dry boards (spruce) and logs (pine) at 12 % moisture content. The conversion to green wood values used in the ForestGALES model was made following the method of (Unterwieser and Schickhofer, 2011) used by (Locatelli et al., 2016). The new values are summarized in the Appendix A Table A 3, along with the equations for the dry to greenwood conversion**”. We present the equations here:

$$MOE_{greenwood} = \frac{MOE_{MC_{test}}}{1 - 0.00825 \cdot (MC_{test} - FSP)}$$

$$MOR_{greenwood} = MOR_{MC_{test}} - \left(MOR_{MC_{test}} \frac{FSP - MC_{test}}{100} \right)$$

Table A 3. Modulus of Rupture (MOR) and Modulus of Elasticity (MOE) values used in the Norwegian (NO) parametrization of ForestGALES.

Species	MOR (kN/mm ²)		MOE (N/mm ²)	
	default	new value	default	new value
Norway spruce	36	41.2 (Fischer et al., 2016)	6.3	11.8 (Fischer et al., 2016)
Scots pine	46	55.0 (Høibø and Vestøl, 2010)	7.3	12.1 (Høibø and Vestøl, 2010)
Birch	63	53.6 (Peltola et al., 2000)	9.9	11.06 (Peltola et al., 2000)

d. f_{knot} parameter: The magnitude and derivation of f_{knot} are not described. Provide typical values or ranges and clarify whether this factor is measured, empirically derived, or sourced from literature.

The parameter f_{knot} is a species-specific factor accounting for the reduction in wood strength due to the presence of knots. This parameter is not measured at the individual tree level. In this study, the f_{knot} values used in this study were the default values from the ForestGALES model and documentation, with no further modifications to the Norwegian conditions. Quantitative data describing knot characteristics of individual trees in Norway and their relationship to wind vulnerability within the ForestGALES framework was not explored in this study and are likely unavailable. Using the default values avoided introducing poorly defined values. The default f_{knot} values are as follows: 0.9 for Norway spruce, 0.85 for Scots pine and 1.0 for birch. In the manuscript, we add lines 247-249: **“The parameter f_{knot} is a species-specific factor accounting for the reduction in wood strength due to the presence of knots. The default value from the ForestGALES model for each of the species considered was used here, namely 0.9 for Norway spruce, 0.85 for Scots pine and 1.0 for birch.”**

e. W_{stem} definition: The definition of W_{stem} is unclear. Specify whether it represents total stem weight or a defined portion (e.g., merchantable stem). Please clarify whether it is directly measured or estimated using empirical models.

We thank the reviewer for pointing this gap in the variable definition. We add lines 233-235: **“The W_{stem} is the total stem weight defined as the total stem volume multiplied by the stem density. The stem volume was estimated using species-specific models defined and routinely used by the Norwegian National Forest Inventory. The equations are detailed in the Appendix A Table A 2.”** We display the added appendix table below:

Table A 1. Norwegian specific allometric and dendrometric equations for estimating mean stem volume and crown depth. Stem volume is calculated following the equations used in the Norwegian National Forest Inventory (Braastad, 1966; Brantseg, 1969; Vestjordet, 1967). The crown depth equations were based on the latest available complete NFI dataset (2016-2020 period).

Tree variable	Species	Region	DBH class	Equations	Parameter values
Stem volume (m ³)	Norway spruce	West		$V_{stem} = \frac{1}{1000} (a_0 \cdot h^{a_1} \cdot DBH^{a_2} \cdot (h - 1.3)^{a_3} \cdot (DBH + 40)^{a_4})$	$a_0 = 0.6844; a_1 = 3.0296; a_2 = 2.056; a_3 = -1.7377; a_4 = -0.9756$
			Small (< 10.1 cm in DBH)	$V_{stem} = \frac{1}{1000} (a_0 + a_1 \cdot DBH^2 \cdot h + a_2 \cdot DBH \cdot h^2 + a_3 \cdot h^2 + a_4 \cdot h \cdot DBH)$	$a_0 = 0.52; a_1 = 0.02403; a_2 = 0.01463; a_3 = -0.10983; a_4 = 0.15195$
		Other	Medium	$V_{stem} = \frac{1}{1000} (a_0 + a_1 \cdot DBH \cdot h^2 + a_2 \cdot h^2 + a_3 \cdot DBH \cdot h + a_4 \cdot h + a_5 \cdot DBH)$	$a_0 = -31.57; a_1 = 0.0016; a_2 = 0.0186; a_3 = 0.63; a_4 = -2.34; a_5 = 3.2$
			Large (≥ 12.9 cm in DBH)	$V_{stem} = \frac{1}{1000} (a_0 + a_1 \cdot DBH^2 \cdot h + a_2 \cdot DBH \cdot h^2 + a_3 \cdot h^2 + a_4 \cdot h \cdot DBH)$	$a_0 = 10.14; a_1 = 0.0124; a_2 = 0.03117; a_3 = -0.36381; a_4 = 0.28578$
		West		$V_{stem} = \frac{1}{1000} (a_0 \cdot h^{a_1} \cdot DBH^{a_2} \cdot (h - 1.3)^{a_3} \cdot (DBH + 100)^{a_4})$	$a_0 = 0.1424; a_1 = 2.0786; a_2 = 1.9028; a_3 = -1.0259; a_4 = -0.264$
	Scots pine		Small (< 11.1 cm in DBH)	$V_{stem} = \frac{1}{1000} (a_0 + a_1 \cdot DBH^2 + a_2 \cdot DBH^2 \cdot h + a_3 \cdot DBH \cdot h^2)$	$a_0 = 0.6716; a_1 = 0.075708; a_2 = 0.029679; a_3 = 0.004341;$
		Other	Large (≥ 11.1 cm in DBH)	$V_{stem} = \frac{1}{1000} \left(a_0 + a_1 \cdot DBH^2 + a_2 \cdot DBH^2 \cdot h + a_3 \cdot DBH^2 \cdot \left(3.17935 + 1.0289 \cdot DBH - 0.27023 \cdot \frac{DBH}{h} \right) \right)$	$a_0 = -6.3954; a_1 = 0.178053; a_2 = 0.03317; a_3 = -0.003008;$
	Birch			$V_{stem} = \frac{a_0}{1000} (a_1 + a_2 \cdot DBH^2 + a_3 \cdot DBH^2 \cdot h + a_4 \cdot DBH \cdot h^2 + a_5 \cdot h^2)$	$a_0 = 0.1; a_1 = -18.6827; a_2 = 2.1461; a_3 = 0.1283; a_4 = 0.138; a_5 = -0.6311$

	Norway spruce		$b_0 = 6.747673534; b_1 = 0.009887979; b_2 = 0.013019764; b_3 = 0$
Crown depth (m)	Scots pine	$l = \frac{1}{10}(b_0 + b_1 \cdot DBH + b_2 \cdot h + b_3 \cdot DBH^2 + b_4 \cdot h^2)^2$ <p>Note that $l = h$ if $\frac{1}{10}(b_0 + b_1 \cdot DBH + b_2 \cdot h + b_3 \cdot DBH^2 + b_4 \cdot h^2)^2 > h$</p>	$b_0 = 5.202627248; b_1 = 0.003258464; b_2 = 0.026770534; b_3 = 0; b_4 = -3.27 \cdot 10^{-5}$
	Birch		$b_0 = 3.825279667; b_1 = 0.021639414; b_2 = 0.018076998; b_3 = -2.44 \cdot 10^{-5}$

Braastad, H., 1966. Volumtabeller for bjørk [Volume tables for birch] (No. 21: 23-78), Meddelelser fra Det norske Skogforsøksvesen.

Brantseg, A., 1969. Furu sønnafjells. Kubering av stående skog. Funksjoner og tabeller [Volume functions and tables for Scots Pine. South Norway] (No. 22: 695-739), Meddelelser fra Det norske Skogforsøksvesen. Det norske skogforsøksvesen.

Vestjordet, E., 1967. Funksjoner og tabeller for kubering av stående gran [Functions and tables for volume of standing trees. Norway spruce] (No. 22), Meddelelser fra Det norske Skogforsøksvesen.

4. *L280: Please add a dot between 0.1 and the cut-point.*

We make the change in the manuscript (line 301).

5. *L288–289: Model performance assessment*

a. The procedure for conducting 100 repetitions of balanced damaged and undamaged samples is not clearly described. Please clarify how datasets were balanced and whether resampling or cross-validation was applied in the AUC assessment.

As described in the reply to a similar point (see point 1.), we used a repeated random subsampling approach, but no cross-validation. We update the manuscript to use a more consistent terminology of “repeated assessments” rather than “simulations” and add lines 310-316: **“For each of the N = 100 repeated assessments, all 180 damaged trees were combined with a randomly selected subset of 180 standing trees drawn without replacement to produce balanced datasets. The model performance was evaluated in each assessment using ROC analysis, and the results (AUC and other performance metrics) were summarized across the 100 repeated assessments. This approach did not involve cross-validation, instead using a repeated random subsampling (Monte Carlo resampling). It treats each random subsample of standing trees as an equally plausible representation of the undamaged population. Similar results were obtained when performing the analysis on the complete unbalanced dataset.”** We used repeated random subsampling rather than cross-validation because the goal was to assess the robustness of the model discrimination in the study’s conditions, under a strong class imbalance.

6. *L359–363 (Table 1): Please include the number of trees for damaged and standing categories for each species.*

We add the number of trees for damaged and standing categories for each of the species in Table 1:

Variable	Species	Damaged	Standing	U value	p-value	Comment
Number of trees	all	180	18189			
	Birch	48	8106			
	Norway spruce	76	4873			
	Scots pine	56	5210			
Tree height	all	14.05 (5.09)	18.36 (4.79)	8803.6	***	Damaged trees are smaller
	Birch	13.89 (5.07)	18.77 (4.44)	844.2	***	
	Norway spruce	15.85 (5.39)	18.41 (4.88)	1519.4	*	
	Scots pine	12.62 (4.25)	17.95 (5.01)	580.1	***	
Tree DBH	all	20.93 (9.96)	27.23 (11.56)	8940.3	*	Damaged trees are thinner
	Birch	20.79 (13.15)	31.12 (17.87)	792.3	*	
	Norway spruce	18.58 (5.09)	21.74 (4.72)	1338.7	**	
	Scots pine	23.33 (6.52)	31.35 (7.74)	579.6	***	

	all	0.71 (0.17)	0.69 (0.16)	15375	ns	
	Birch	0.66 (0.12)	0.69 (0.15)	2027.1	ns	
H/d ratio	Norway spruce	0.84 (0.12)	0.84 (0.11)	1952.6	ns	No difference
	Scots pine	0.58 (0.11)	0.54 (0.09)	1011.4	ns	

7. L395–399 (Table 2): Please include the number of samples used for each model and the associated damage threshold.

The table 2 shows the average of the 100 repeated assessments of the AUC, accuracy and cutpoint of the best global and species-specific models as written in the table caption. Each assessment was done on a balanced subsample of $N_{damaged} = 180 = N_{standing}$ – this detail is added for clarity in the table caption line 430. Since we worked at the individual tree scale, with a simple binary outcome of Damaged / Undamaged, we did not use a damage threshold (as defined as when working at the stand level where we need to set a damage threshold to decide when the stand is damaged). If the reviewer means the cutpoint; the probability threshold at which Sensitivity and Specificity are equal, it was defined for each of the 100 repeated assessments and the average reported in Table 2. We clarify this in the manuscript, in the table caption (lines 432-433), with “**Accuracy of the model is calculated at the cutpoint, i.e the probability threshold where model Sensitivity and Specificity are equal**”.

8. L401 (Figure 3): Please provide the total number of samples for each model, including cutpoint and damage threshold, within the performance metrics.

The Figure 3 in the manuscript showed the Receiver Operator Characteristic (ROC) curve and performance metrics for each of the best models (global and species-specific) when considering the entire dataset as described in the original figure caption: “All samples were used in this figure ($N_{damaged} = 180$; $N_{standing} = 18,189$). This is slightly different than the results presented in Table 2 where the model performance reported there are the average of the 100 repeated assessments on the balanced subsamples of $N = 180$ for each of the categories (damaged and standing). It is important to note that the ROC and AUC routines in R are quite robust against unbalanced datasets, so the results using the entire dataset or the 100 repeated assessments of the balanced subsamples are very similar. Nevertheless, to improve the consistency of the methods and results in the manuscript, we update Figure 3 using the averaged results from the 100 repeated assessments. The new figure is shown here and added in the revised manuscript line 437:

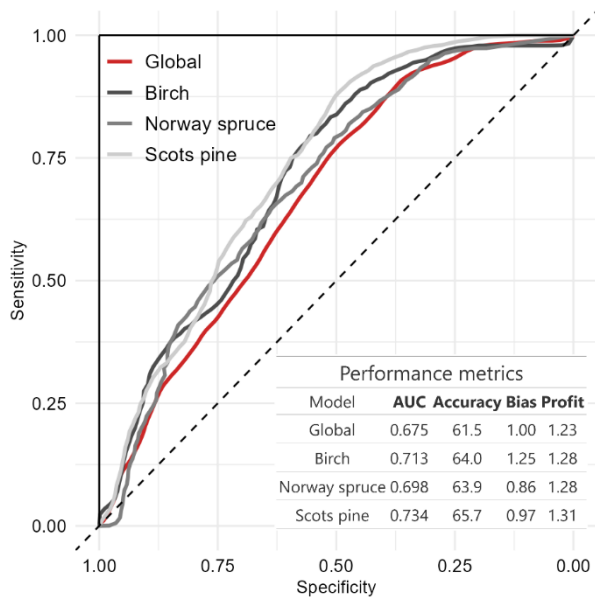


Figure 3. Receiver Operator Characteristic (ROC) curve and performance metrics for the prediction of the probability of tree damage during the winter 2020-2021 using the best global and species-specific model options (see Table 2). The average of the 100 repeated assessments using balanced sample of $N_{damaged} = N_{standing} = 180$ was used for the figure. The AUC is shown in the table, along with the summary of the average performance metrics (Accuracy in percentage, Bias, and Profit scores) for the cutpoint at which Sensitivity = Specificity.

References used in the reply to reviewers:

Braastad, H.: Volumtabeller for bjørk, 1966.

Brantseg, A.: Furu sønnafjells. Kubering av stående skog. Funksjoner og tabeller, Det norske skogforsøksvesen, 1969.

Fischer, C., Vestøl, G. I., and Høibø, O.: Modelling the variability of density and bending properties of Norway spruce structural timber, *Can. J. For. Res.*, 46, 978–985, <https://doi.org/10.1139/cjfr-2016-0022>, 2016.

Høibø, O. and Vestøl, G. I.: Modelling the variation in modulus of elasticity and modulus of rupture of Scots pine round timber, *Can. J. For. Res.*, 40, 668–678, <https://doi.org/10.1139/X10-021>, 2010.

Locatelli, T., Gardiner, B., Tarantola, S., Nicoll, B., Bonnefond, J.-M., Garrigou, D., Kamimura, K., and Patenaude, G.: Modelling wind risk to *Eucalyptus globulus* (Labill.) stands, *Forest Ecology and Management*, 365, 159–173, <https://doi.org/10.1016/j.foreco.2015.12.035>, 2016.

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