Overview:

This is a well-written paper that is a significant contribution to forecasting rip-current and shore-break hazards using simple models informed by physics and calibrated with lifeguard observations of hazard levels. The introduction is thorough and logically organized and helpful physical parameter schematics are provided. Visualizations throughout are high quality. Time series of physics-informed parameterizations show remarkable agreement with lifeguard assessments of hazard. I found the idealized analysis showing how the models can be applied to hypothetical conditions to be interesting and informative.

Prior to publication, I think the paper needs to provide more clear derivations and justification of assumptions leading to the new physics-based models; these could appear concisely in the main text or in a more detailed form in supplementary materials. There may be some errors in the rip-current speed and shore-break energy formulas, but it is difficult to assess without seeing more detail in how the authors reached those results. The rip-current hazard formulations based on rip-current speed have previously been derived and compared with lifeguard observations, and the authors derive their result from momentum balances (though more justification is needed). In contrast, the authors note that no theoretical estimate for shore-break hazard yet exists. The proposed shore-break formulation – the product of the Irribarren number and the wave energy – seems highly valuable, but given that it is somewhat ad hoc, maybe it would be more accurately described as semi-empirical or physics-informed rather than physics-based.

The second broader comment I have is that some additional discussion of the limitations of this approach and its applicability to other sites would be helpful. Specifically, this approach seems to apply to sites where channel rips dominate, and the importance of other rip current types should be discussed. In addition, for applicability to other sites, it would be good to discuss how a minimal set of sandbar and beach profile shape parameters could be observed directly or estimated through tuning/calibration with lifeguard data, so that readers can assess feasibility.

Line-by-line comments below indicate specific places where I suggest clarification on the physics-based parameterization and limitations/applicability.

Line-by-line comments:

- L36-38: “The most common rip type” - Clarify, this may be true on some beaches but not others
- L73: “The proposed framework offers new opportunities for forecasting rip-current and shore-break wave hazards at surf beaches with available wave predictions” - Morphology information also is needed, and ideally lifeguard observations for calibration. Consider adding these factors to the sentence.
- L131: “Rip current hazard can be estimated through the rip flow speed.” Discussion section should cover how flow patterns and other factors may also affect hazard.
- L141, L146: “S=0.16*Hs”, “Sb=0.16*Delta-Hsb”, “Sc=0.16*Delta-Hsc” Please clarify under what assumptions these approximations are reasonable to use, and what assumptions are involved to modify the approximation for shoreline setup (as a function of wave height) to estimate setup immediately onshore of the bar and channel (cross-shore change in wave

height)? Does this assume breaking in the channel as well as on the bar? My intuition would say that Sb-Sc would then be independent of the offshore wave height, but the squared wave heigh decay equation suggests otherwise (see next comment). How does this more simplified approximation compare with other formulations that include more parameters, e.g., Moulton et al. 2017 / Casper et al. 2024? A simpler formulation with fewer parameters is ideal for hazard prediction if it is clarified under what conditions it is a reasonable approximation. It seems like this formulation could be roughly a factor of 4 larger than Moulton/Casper, but I'm not completely sure, especially given the complexity of the quadratic delta-H formula.

- L148-151: "Here we consider simple first-pass estimation of the significant wave height decay for irregular waves." – Is there a reference for this? Or provide a derivation or more explanation. Assuming a wave breaking gamma and single wave height, I would expect Delta-Hs to be simply Hs-H, where H=gamma*h for broken waves. Does Equation (2) differ from this due to considering an irregular wavefield, e.g., Rayleigh distributed wave heights?
- L150: It could be worth spelling out the two equations for Hsb and Hsc, so that the dependence of the speed on the bar-channel geometry is clearer
- L152: Please provide references and/or justification for the simplified momentum balance
- L155: I think more justification is needed for these approximations. Is it known that the setup varies over a lengthscale of the width of the channel? Why not a half-width, or a multiple of the width, or something else like the spacing between channels, or a frictional lengthscale? I don't think this is actually known. Similarly, for the advective term, given the argument is that this is a physics-based parameterization, a derivation should be provided. Using the continuity equation with the left-hand side of Equation 3, it is not clear how the 2*V^2*h/w approximation is reached. Are assumptions made about U=V or U=1/2*V or U=2*V? Is the alongshore lengthscale w or ½*w or 2*w? Is it assumed that alongshore depth variations are small (dh/dx * 1/h is small)?
- L157: (Equation 4) I'm not convinced this formula is correct. The Moulton 2017 / Casper 2024 formula would be sqrt(2*g*(Sb-Sc)), which is different from this by a factor of 2. The Sb-Sc formula may have an extra factor of 4 relative to the Moulton 2017 setup difference estimate. Interestingly, these differences would compensate each other. I would have most confidence in a formulation that is consistent with past work that has been compared with field observations of speeds.
- Figure 3: The way S(x) is drawn as a square wave, dS/dx is not differentiable… would it make sense to show linear variations in S from the bar to the channel center instead?
- Figure 3d, 4b: I am confused by the diagrams in Figure 3d and 4b. What are the x and y axes?
- L165: "no theoretical framework to estimate a measure of the shore-break wave energy" – If this is the case, I might describe the following formulations as physics-informed rather than physics-based, but this is a wording nuance
- L186: Does the squared quantity come from the same "decay law" used in the rip-current formulation? Could write this as a 3-part equation for wave-breaking types (subaerial bar, bar-breaking, and shoreline-breaking)?
- L188: Could Z_l be written as z_bar, for consistency with the rip-current formula?

- L169: “deep water wavelength” - Is it possible that the wave condition upon shore-breaking deviates from the deep-water wavelength, since breaking on the bar could filter out some frequencies given differences in steepening and breaking? Particularly for wavefields with broad or multi-peaked frequency spectra. Could you comment on when using offshore wavelength is relevant?
- L169: Should this be Tp squared?
- L173: Is a factor of sqrt(2*pi) missing in the equation?
- L195: “thresholds were computed in order to obtain the same number of modelled hazard levels” – does it need to be exactly the same number? You could allow some uncertainty to avoid overfitting / specify confidence intervals on this choice of ranges. I doubt the confidence is reflected in the significant digits shown, with 1 cm/s and 0.01 m^2 resolution.
- L200: “daily-mean” – Is the mean, max, or median most relevant for hazard? I would think maximum may be most relevant. Daily is somewhat coarse. I wonder about having at least having morning and afternoon to capture some of the tidal variability, and could be relevant for shift staffing by lifeguards.
- L208-211: “by merging […] into low-hazard […and…] moderate- to high-hazard hours […], the accuracy increases” – It would be worth discussing here or in the Discussion why the 5-level scale did not perform well. Was it because there wasn’t enough data or that the parameterizations capture a clear enough relationship between inputs and outputs to predict hazard on a finer scale?
- L230: “outliers” – Might these be worth discussing further since hazardous events that are “outliers” and not well forecast could be dangerous.
- Figure 6,9: Since panels a and b are duplicated in these two figures, consider merging these in one figure with both of the full the rip current and shore-break time series, which may be interesting to show how they vary differently with conditions (similar to Figure 11). The example shorter time window in panels d-i could be two separate figures for rip currents and shore-break. Just a suggestion.
- Figure 7,10: Would a bin average help to show if the model tends to be over- or under-forecasting at different hazard levels?
- L269: “should be tested elsewhere” – Here or in the Discussion (could go with paragraph beginning on line 295 in the Discussion), it would be good to discuss how the sandbar elevation and beach profile shape parameters can be inferred, and/or the need to get these morphology parameters through tuning/calibration with lifeguard data, which is also hard to get. In addition, note that this approach assumes that the beach is always channeled, and that channel rips are the strongest rips, as opposed to transient rip currents, structural rips, etc.
- L283: “daily-mean lifeguard perceived hazards” - Would daily max be better for hazard preparation, given that the mean could obscure a brief but high-risk time period? Or split into morning vs afternoon max or mean?
- Figure 12: Why is the Dean profile so different from the measured profile?
- L322: “weak but significant” - Is this statistically significant?

- L366: “only a few basic beach morphology metrics” - This may be a little vague and subjective use of “basic,” clarify.
- L299-L305: d=6.5 m seems like an unrealistically deep channel. Did you consider constraining the parameter range in the fit to physically realistic values? The skill was similar for more realistic values so this would not change the results much but could provide more realistic predictions for future conditions.

Minor typographic suggestions:

- L2: change “can expose to” to “can be exposed”
- L5: change “allow to compute” to “can be used to compute the time”
- L8: August date missing, August 31?
- L12: change “where wave forecast is available” to “where wave forecasts are available”
- L14: remove “e.g.”
- L17: remove “been” in “have been greatly increased”
- L18: remove “e.g.”
- L43: lengthy paragraph- could start a new paragraph at “Shore-break”
- L69: change “estimate” to “estimates”
- L70: add “an” before “associated 5-level scale”
- L71: change “can be either given thanks to” to “either be given based on”
- L71: remove “e.g.”
- L103: change “surf-zone hazard forecast” to “surf-zone hazard forecasts”
- L104: change “numerical wave hindcast instead” to “numerical wave hindcast data instead”
- L104: change “consisted in an analysis” or “consisted of an analysis”
- L108: change “as unified” to “including unified”
- L111: change “was assumed representative” to “was assumed to be representative”
- L126: here “RH_l” and “SH_l” have a “l” subscript- correct typos throughout the manuscript where “l” is not subscripted- same comment for “m” subscript
- L135: notation- consider using x as cross-shore coordinate and y as alongshore coordinate for consistency with most of the surfzone literature, also consider eta-bar for setup instead of S, which is typically used for radiation stress
- Figure 3: Hard to see the red text on the blue background in panel a.
- Figure 4: Consider changing the notation for the terrace elevation, Z_l, elsewhere “l” is used for lifeguard.
- L171: Should the subscript be ssb for H?
- Figure 5,8: is it typical for the y axis to be flipped like this in the confusion matrix?
- Figure 11: hard to see the difference between the dark pink and red, could switch to red-blue colors in panel d or other colorblind friendly palette
- L285: add “indicating” after “notation”
- Figure 12: consider switching to a colorblind friendly colorbar, caption unclear- suggest rephrasing to “with the blue solid (dotted) lines depicting…”
- L332-L334: remove unnecessary use of “e.g.”
- L336: change “model” to “models”