



Supplement of

RTSEvo v1.0: a retrogressive thaw slump evolution model

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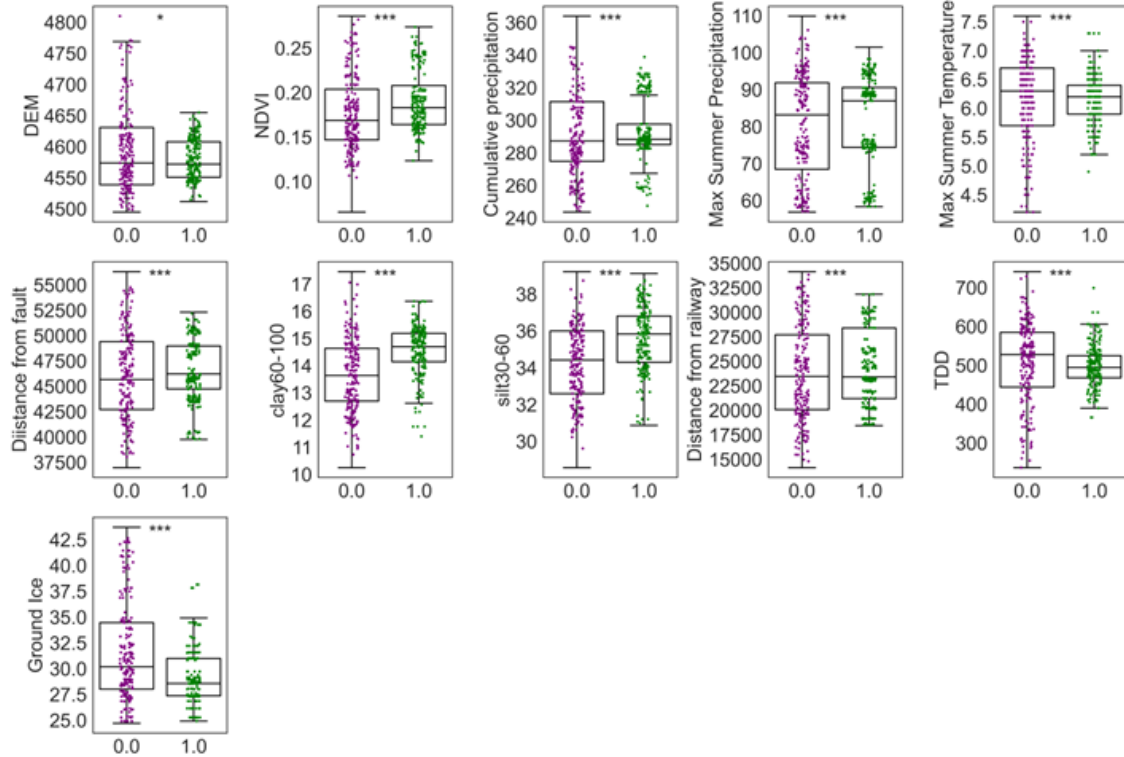


Figure S1. Distribution of numerical predictor variables for RTS versus non-RTS locations within the independent transferability test region (Haiding Nuo'er Subregion). The box-and-whisker plots compare the distributions for zones where RTSs occurred (RTS=1) and where they did not (RTS=0). Significance levels between groups, determined by the Mann-Whitney U test, are indicated as follows: ns, not significant; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

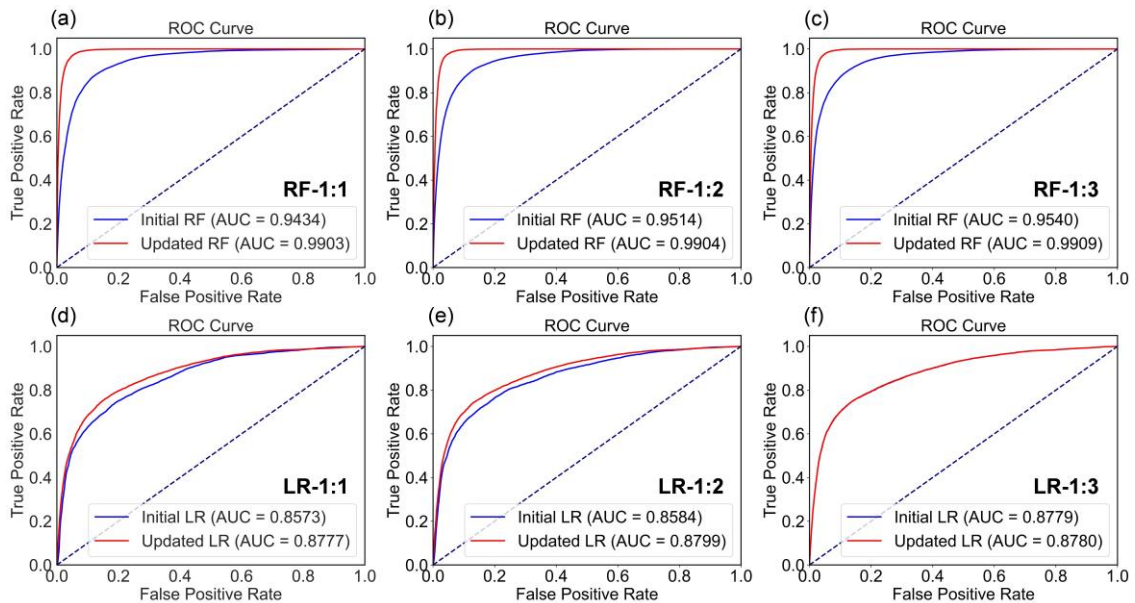


Figure S2. Impact of varying positive-to-negative sample ratios on the predictive accuracy of the Random Forest (RF) and Logistic Regression (LR) models. (a), (b), and (c) show the ROC curves for the RF model under positive-to-negative sample ratios of 1:1, 1:2, and 1:3, respectively (blue lines represent ROC curves before parameter optimization, while red lines indicate those after optimization). (d), (e), and (f) display the corresponding ROC curves for the LR model under the same respective

sample ratios.

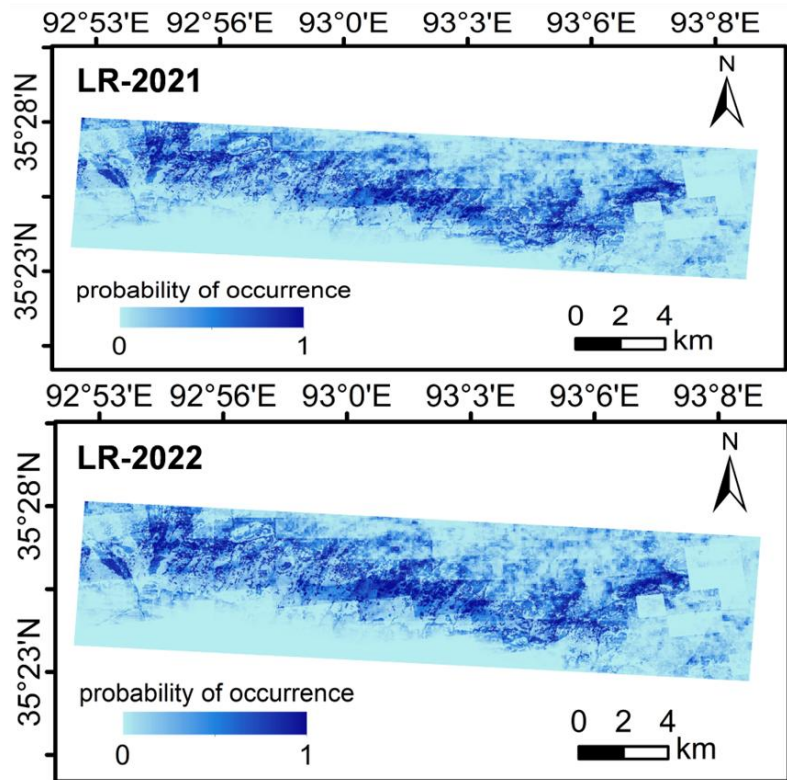


Figure S3. Spatial distribution maps of predicted RTS occurrence probability within the independent transferability test region (Haiding Nuo'er Subregion), generated based on the Logistic Regression (LR) model.

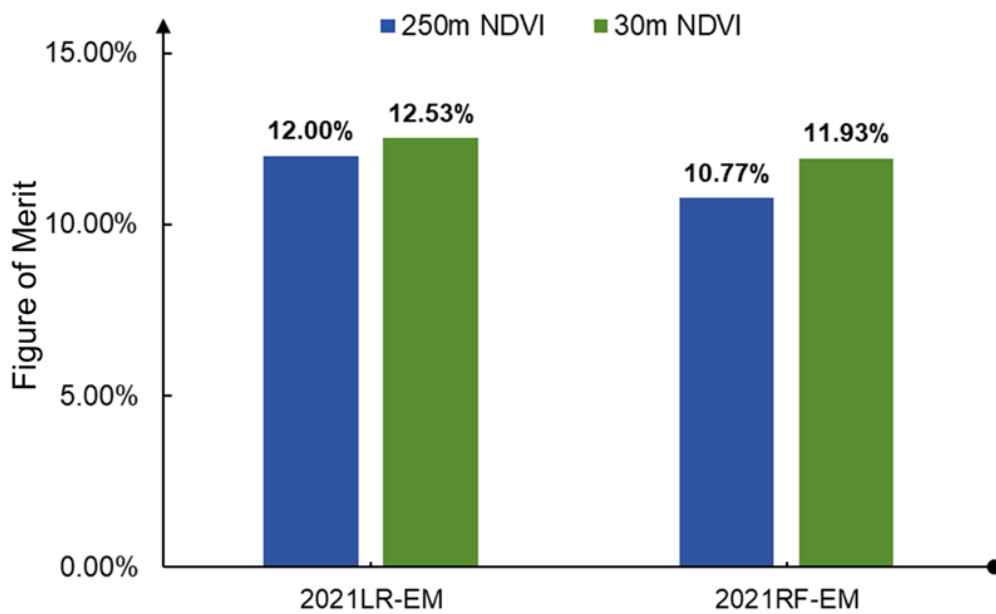


Figure S4. The impact of varying vegetation predictor resolutions on model predictive performance in the Beiluhe Basin (2021).

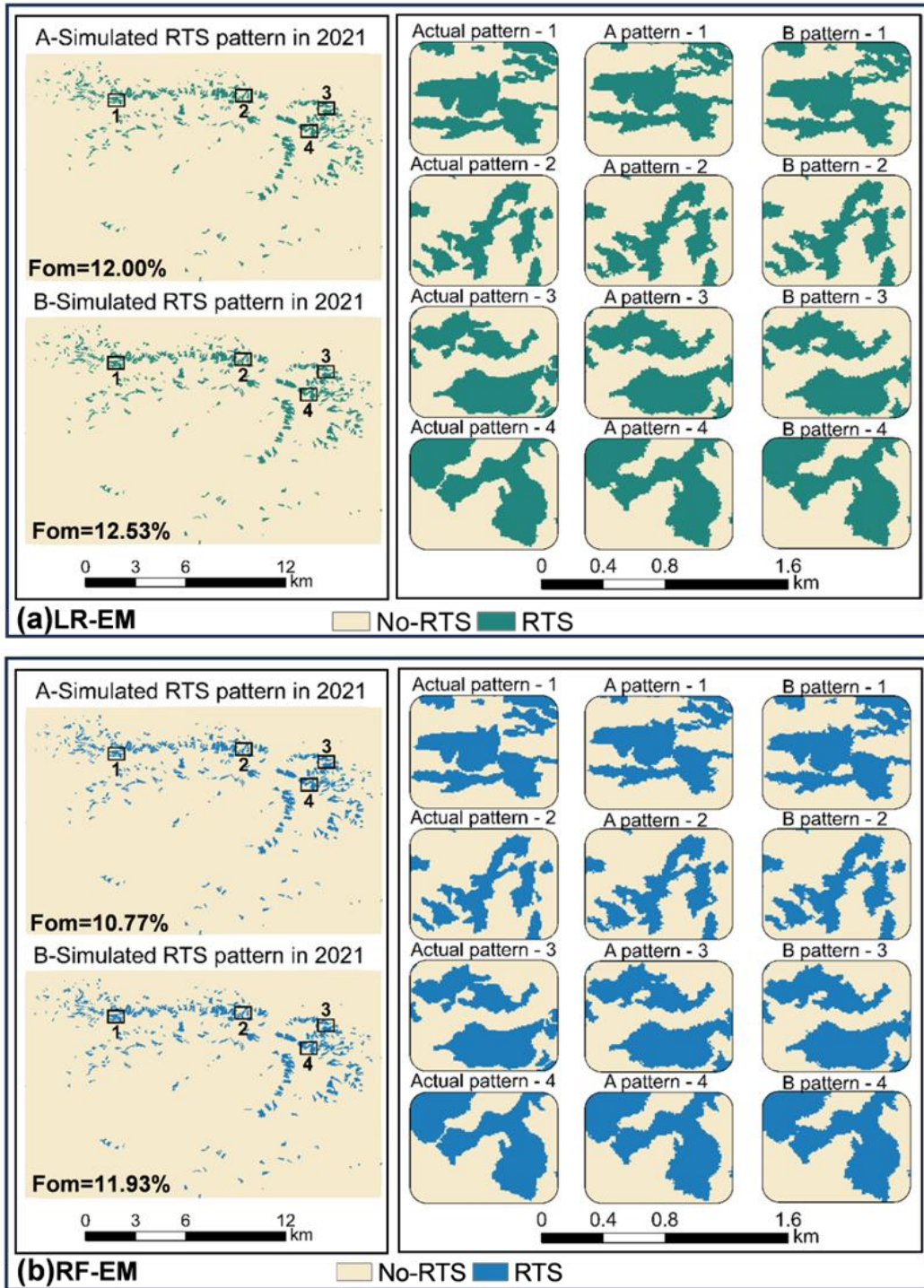


Figure S5. Pixel-level comparison of simulated RTS spatial distributions using different NDVI resolutions in the Beiluhe Basin for the 2021 validation period. (a) The regional and sub-regional results for the LR-EM, and (b) the corresponding results for the RF-EM. "A pattern" refers to the simulated expansions driven by the 250 m MODIS NDVI, and "B pattern" for the higher-resolution 30m Landsat 8 NDVI. The rectangular insets (numbered 1-4) represent four randomly selected sub-regions of intense RTS expansion.