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Supplement of

Analysis of the cloud fraction adjustment to aerosols and its dependence on meteorological controls using explainable machine learning

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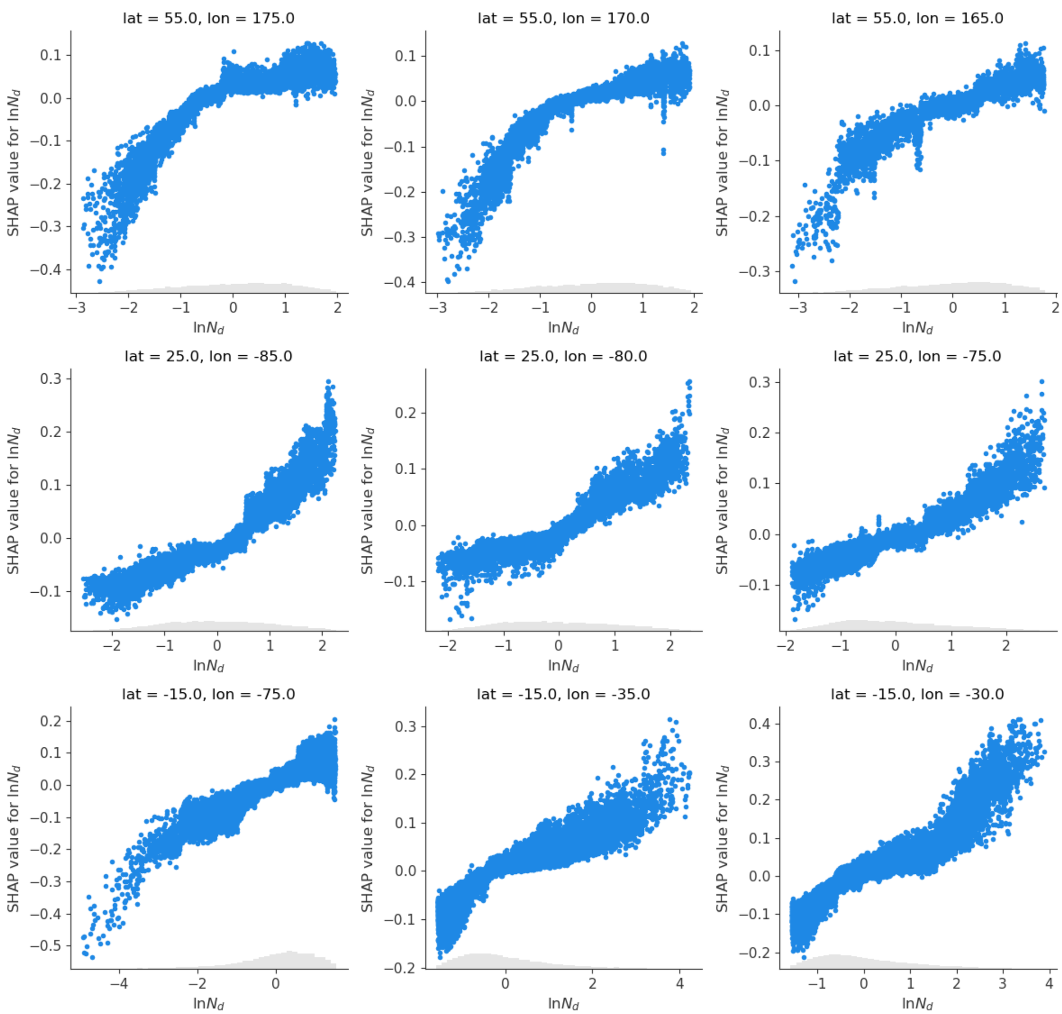

Figure S1. SHAP dependence plots similar to Fig. 1 (b) illustrating relatively nonlinear relationships between $\ln N_d$ SHAP values and feature values (standardized). The latitude and longitude values for each subplot represent the midpoint of each $5^{\circ} \times 5^{\circ}$ geographical window.

Figures S2 to S7 illustrate results from the same but non-standardized data sets. Box plots Fig. 3 and Fig. 7 do not have corresponding non-standardized plots here because the magnitudes of the sensitivities and interaction indices are not physically comparable without the standardization process.

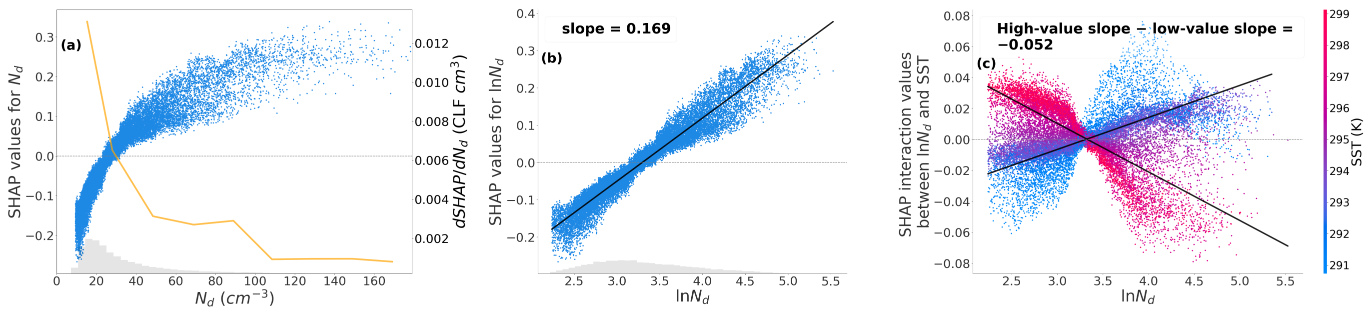

Figure S2. SHAP dependence plots for cloud droplet number concentration (N_d) in the region from 27.5°S to 32.5°S and from 122.5°W to 127.5°W. **Similar to Fig. 1, (a) is the same** while the log-transformed cloud droplet number concentration ($\ln N_d$) and sea surface temperature (SST) **are not standardized in (b) and (c)**.

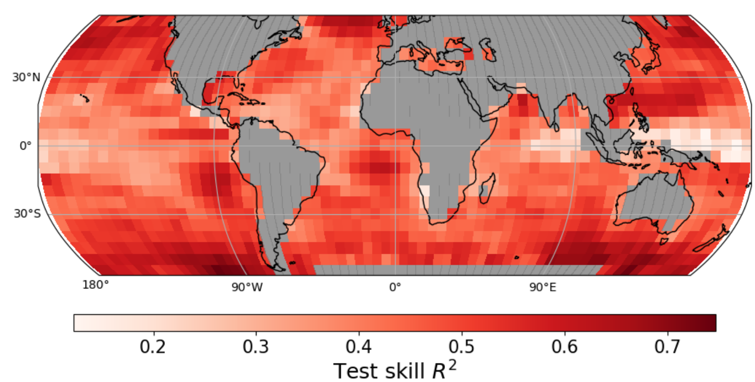

Figure S3. R^2 score of regional Extreme Gradient Boosting models predicting cloud fraction of marine boundary layer clouds in the independent test data set (2017–2019). **Similar to Fig. 2 but predictor variables are not standardized.**

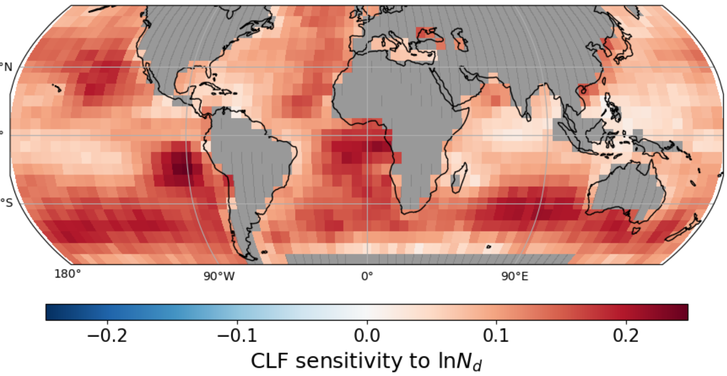

Figure S4. Sensitivity of marine boundary layer cloud fraction to $\ln N_d$. **Similar to Fig. 4 but predictor variables are not standardized.**

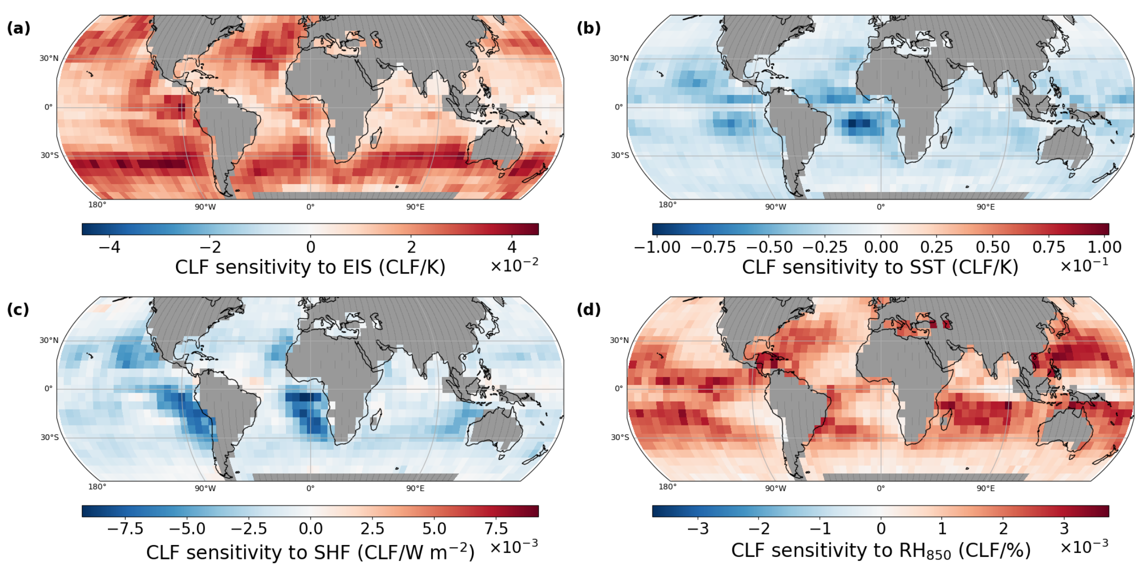

Figure S5. Sensitivity of marine boundary layer cloud fraction to the estimated inversion strength (EIS), sea surface temperature (SST), sensible heat flux (SHF) and relative humidity at 850 hPa (RH_{850}). **Similar to Fig. 5 but predictor variables are not standardized**, and thus the units and ranges of colourbars vary.

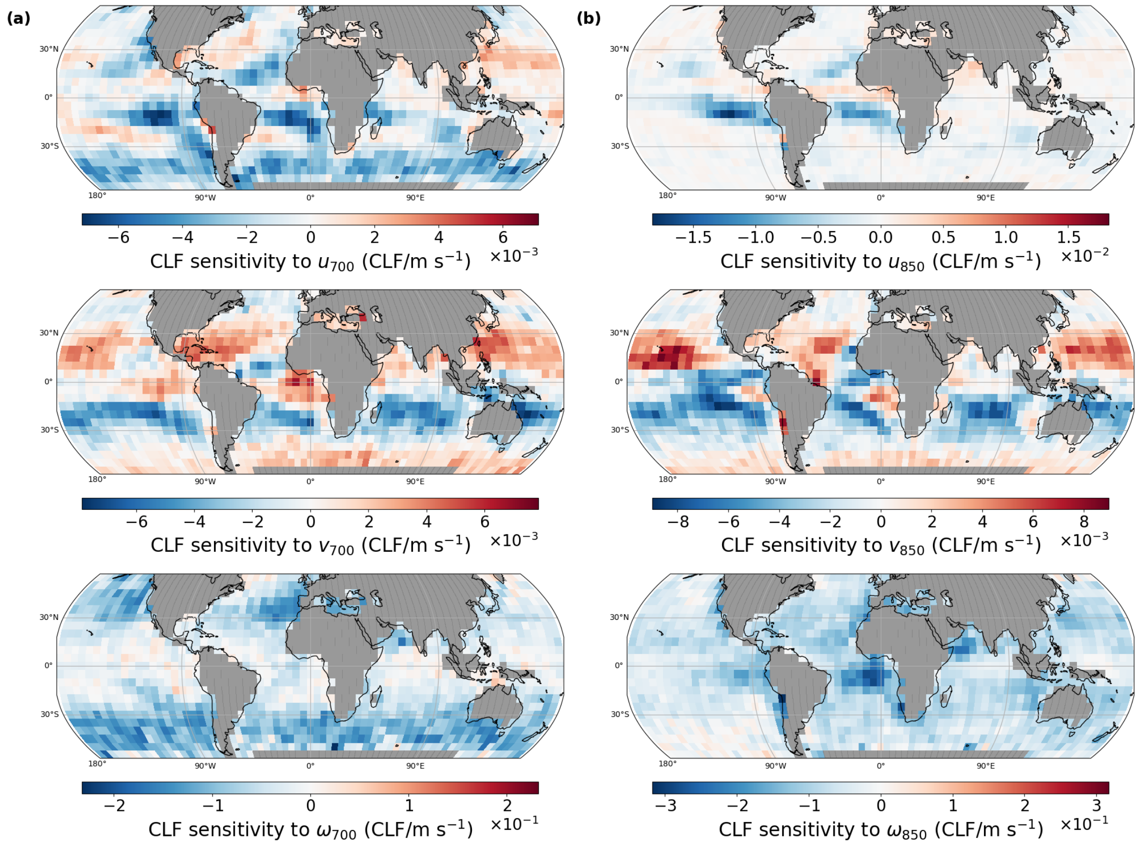

Figure S6. Sensitivity of cloud fraction to u, v wind component vectors and vertical velocities at 700 hPa (column (a)) and 850 hPa (column (b)). **Similar to Fig. 6 but predictor variables are not standardized**, and thus the units and ranges of colourbars vary.

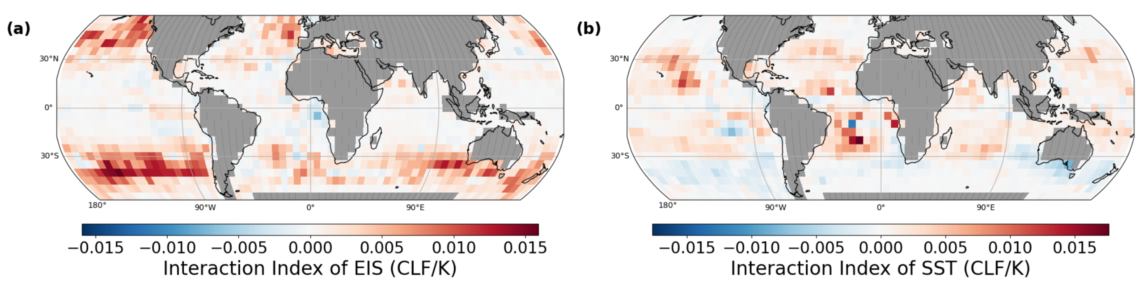

Figure S7. Patterns of the Interaction Index showing the dependence of the $\ln N_d$–CLF relationship on estimated inversion strength (EIS) (a) and sea surface temperature (SST) (b). **Similar to Fig. 8 but predictor variables are not standardized**.