remote sensing

MDPI

Supplementary Material

Table S1. Mean (color coded to emphasize high (green shade) and low (pink shade) values) and standard deviations of performance metrics for all algorithms. TSS values are in bold.

			GLM	SVM	BRT	RF	MARS	GAM	CART	FDA	MDA	BIOC	DOM	MAXL	MAHA	RBF	MLP	RPART	MAXENT
MAR	Mean	AUC	0.825	0.969	0.919	1.000	0.961	0.971	0.967	0.830	0.917	0.760	0.834	0.818	0.998	0.821	0.970	0.974	0.958
		COR	0.547	0.849	0.692	0.986	0.848	0.856	0.882	0.546	0.704	0.447	0.551	0.556	0.282	0.517	0.886	0.900	0.814
		TSS	**0.448**	**0.833**	**0.597**	**0.994**	**0.845**	**0.856**	**0.878**	**0.453**	**0.644**	**0.431**	**0.491**	**0.505**	**0.997**	**0.474**	**0.886**	**0.891**	**0.851**
		Kappa	0.425	0.819	0.594	0.993	0.835	0.844	0.866	0.430	0.622	0.408	0.467	0.476	0.996	0.456	0.876	0.882	0.838
	SD	*AUC*	*0.008*	*0.005*	*0.009*	*0.000*	*0.023*	*0.005*	*0.009*	*0.007*	*0.008*	*0.012*	*0.010*	*0.035*	*0.001*	*0.136*	*0.008*	*0.007*	*0.005*
		COR	*0.015*	*0.016*	*0.011*	*0.001*	*0.021*	*0.012*	*0.022*	*0.015*	*0.021*	*0.032*	*0.012*	*0.022*	*0.068*	*0.183*	*0.010*	*0.014*	*0.013*
		TSS	*0.029*	*0.031*	*0.027*	*0.003*	*0.022*	*0.015*	*0.024*	*0.021*	*0.026*	*0.033*	*0.035*	*0.080*	*0.003*	*0.233*	*0.014*	*0.019*	*0.029*
		Kappa	*0.031*	*0.033*	*0.033*	*0.004*	*0.017*	*0.016*	*0.024*	*0.022*	*0.028*	*0.030*	*0.035*	*0.075*	*0.004*	*0.221*	*0.015*	*0.018*	*0.029*
APR	Mean	AUC	0.956	0.987	0.969	1.000	0.991	0.993	0.969	0.955	0.982	0.914	0.977	0.943	0.994	0.867	0.988	0.977	0.988
		COR	0.844	0.963	0.859	0.991	0.958	0.964	0.928	0.837	0.909	0.703	0.853	0.842	0.471	0.672	0.968	0.953	0.947
		TSS	**0.823**	**0.953**	**0.859**	**0.988**	**0.934**	**0.942**	**0.917**	**0.810**	**0.896**	**0.795**	**0.850**	**0.800**	**0.988**	**0.692**	**0.947**	**0.923**	**0.922**
		Kappa	0.798	0.945	0.837	0.987	0.924	0.932	0.906	0.784	0.881	0.740	0.829	0.774	0.992	0.694	0.939	0.914	0.910
	SD	*AUC*	*0.005*	*0.003*	*0.006*	*0.000*	*0.002*	*0.001*	*0.006*	*0.005*	*0.004*	*0.008*	*0.004*	*0.040*	*0.002*	*0.287*	*0.004*	*0.005*	*0.003*
		COR	*0.008*	*0.006*	*0.008*	*0.002*	*0.006*	*0.008*	*0.017*	*0.007*	*0.008*	*0.019*	*0.014*	*0.008*	*0.026*	*0.469*	*0.005*	*0.009*	*0.005*
		TSS	*0.017*	*0.008*	*0.014*	*0.004*	*0.008*	*0.014*	*0.019*	*0.010*	*0.011*	*0.012*	*0.016*	*0.066*	*0.004*	*0.514*	*0.009*	*0.025*	*0.008*
		Kappa	*0.018*	*0.009*	*0.014*	*0.004*	*0.009*	*0.015*	*0.025*	*0.013*	*0.012*	*0.019*	*0.017*	*0.070*	*0.003*	*0.446*	*0.010*	*0.036*	*0.009*
MAY		AUC	0.869	0.969	0.956	1.000	0.974	0.982	0.962	0.867	0.942	0.887	0.939	0.710	0.994	0.861	0.979	0.964	0.975
		COR	0.618	0.878	0.828	0.984	0.888	0.897	0.887	0.613	0.824	0.671	0.765	0.580	0.293	0.612	0.902	0.895	0.864

	TSS	**0.574**	**0.877**	**0.815**	**0.987**	**0.867**	**0.880**	**0.875**	**0.566**	**0.770**	**0.721**	**0.744**	**0.368**	**0.988**	**0.573**	**0.889**	**0.875**	**0.856**
	Kappa	0.547	0.865	0.813	0.986	0.856	0.868	0.876	0.538	0.750	0.683	0.723	0.404	0.991	0.549	0.887	0.876	0.841
	AUC	*0.007*	*0.005*	*0.006*	*0.000*	*0.017*	*0.003*	*0.004*	*0.007*	*0.007*	*0.006*	*0.007*	*0.098*	*0.002*	*0.111*	*0.003*	*0.003*	*0.003*
	COR	*0.014*	*0.009*	*0.020*	*0.003*	*0.011*	*0.010*	*0.011*	*0.014*	*0.013*	*0.007*	*0.017*	*0.017*	*0.041*	*0.151*	*0.008*	*0.009*	*0.010*
	TSS	*0.017*	*0.011*	*0.074*	*0.006*	*0.013*	*0.008*	*0.011*	*0.018*	*0.026*	*0.022*	*0.017*	*0.183*	*0.005*	*0.191*	*0.007*	*0.011*	*0.017*
	Kappa	*0.016*	*0.011*	*0.093*	*0.006*	*0.013*	*0.008*	*0.010*	*0.017*	*0.026*	*0.018*	*0.016*	*0.198*	*0.004*	*0.185*	*0.007*	*0.010*	*0.018*
JUN	AUC	0.941	0.982	0.953	1.000	0.978	0.979	0.968	0.941	0.966	0.794	0.950	0.941	0.994	0.901	0.972	0.968	0.973
	COR	0.790	0.919	0.825	0.984	0.901	0.905	0.905	0.791	0.854	0.521	0.714	0.775	0.103	0.693	0.910	0.903	0.882
	TSS	**0.803**	**0.909**	**0.827**	**0.986**	**0.890**	**0.891**	**0.899**	**0.796**	**0.832**	**0.583**	**0.851**	**0.798**	**0.988**	**0.741**	**0.903**	**0.898**	**0.890**
	Kappa	0.779	0.896	0.805	0.983	0.875	0.876	0.894	0.771	0.810	0.477	0.832	0.773	0.991	0.725	0.889	0.892	0.875
	AUC	*0.007*	*0.002*	*0.005*	*0.000*	*0.003*	*0.002*	*0.004*	*0.006*	*0.006*	*0.006*	*0.007*	*0.006*	*0.003*	*0.155*	*0.003*	*0.004*	*0.003*
	COR	*0.017*	*0.005*	*0.011*	*0.002*	*0.008*	*0.009*	*0.007*	*0.016*	*0.014*	*0.010*	*0.030*	*0.018*	*0.014*	*0.254*	*0.007*	*0.007*	*0.010*
	TSS	*0.015*	*0.009*	*0.014*	*0.004*	*0.013*	*0.012*	*0.013*	*0.012*	*0.027*	*0.012*	*0.016*	*0.012*	*0.005*	*0.303*	*0.011*	*0.013*	*0.011*
	Kappa	*0.016*	*0.009*	*0.014*	*0.005*	*0.014*	*0.013*	*0.012*	*0.013*	*0.030*	*0.015*	*0.017*	*0.013*	*0.004*	*0.290*	*0.013*	*0.012*	*0.012*
JUL	AUC	0.693	0.970	0.921	1.000	0.974	0.974	0.966	0.693	0.892	0.875	0.872	0.692	0.998	0.793	0.976	0.973	0.963
	COR	0.376	0.863	0.733	0.987	0.881	0.881	0.890	0.376	0.665	0.676	0.603	0.418	0.063	0.466	0.907	0.902	0.837
	TSS	**0.276**	**0.830**	**0.773**	**0.993**	**0.851**	**0.852**	**0.876**	**0.276**	**0.580**	**0.680**	**0.542**	**0.305**	**0.997**	**0.470**	**0.895**	**0.883**	**0.832**
	Kappa	0.273	0.827	0.768	0.993	0.850	0.850	0.874	0.273	0.577	0.678	0.538	0.299	0.996	0.468	0.893	0.881	0.830
	AUC	*0.017*	*0.005*	*0.007*	*0.000*	*0.004*	*0.005*	*0.011*	*0.017*	*0.006*	*0.008*	*0.010*	*0.036*	*0.001*	*0.207*	*0.005*	*0.008*	*0.005*
	COR	*0.032*	*0.011*	*0.015*	*0.001*	*0.013*	*0.015*	*0.019*	*0.032*	*0.015*	*0.013*	*0.019*	*0.076*	*0.028*	*0.334*	*0.015*	*0.013*	*0.011*
	TSS	*0.043*	*0.015*	*0.014*	*0.002*	*0.018*	*0.023*	*0.024*	*0.044*	*0.054*	*0.020*	*0.032*	*0.054*	*0.002*	*0.314*	*0.017*	*0.019*	*0.016*

	Kappa	*0.042*	*0.015*	*0.016*	*0.002*	*0.018*	*0.022*	*0.024*	*0.043*	*0.054*	*0.020*	*0.032*	*0.056*	*0.002*	*0.312*	*0.017*	*0.019*	*0.016*
AUG	AUC	0.792	0.992	0.973	1.000	0.976	0.980	0.967	0.788	0.952	0.941	0.967	0.736	0.997	0.874	0.990	0.976	0.980
	COR	0.536	0.946	0.808	0.990	0.910	0.914	0.928	0.540	0.850	0.769	0.822	0.712	0.112	0.625	0.962	0.938	0.895
	TSS	**0.427**	**0.941**	**0.849**	**0.991**	**0.875**	**0.885**	**0.895**	**0.430**	**0.812**	**0.792**	**0.827**	**0.430**	**0.994**	**0.617**	**0.951**	**0.903**	**0.869**
	Kappa	0.416	0.939	0.847	0.991	0.870	0.880	0.893	0.419	0.805	0.785	0.821	0.419	0.995	0.611	0.949	0.898	0.864
	AUC	*0.015*	*0.003*	*0.010*	*0.000*	*0.005*	*0.005*	*0.007*	*0.015*	*0.009*	*0.009*	*0.005*	*0.015*	*0.002*	*0.230*	*0.004*	*0.006*	*0.004*
	COR	*0.027*	*0.007*	*0.013*	*0.002*	*0.009*	*0.012*	*0.009*	*0.028*	*0.011*	*0.024*	*0.008*	*0.020*	*0.024*	*0.430*	*0.008*	*0.008*	*0.009*
	TSS	*0.029*	*0.007*	*0.012*	*0.006*	*0.018*	*0.019*	*0.013*	*0.036*	*0.025*	*0.020*	*0.008*	*0.031*	*0.004*	*0.372*	*0.012*	*0.011*	*0.008*
	Kappa	*0.030*	*0.008*	*0.011*	*0.006*	*0.018*	*0.020*	*0.014*	*0.037*	*0.026*	*0.021*	*0.008*	*0.031*	*0.003*	*0.362*	*0.013*	*0.012*	*0.009*
SEP	AUC	0.874	0.997	0.977	1.000	0.991	0.994	0.977	0.860	0.962	0.967	0.986	0.843	0.998	0.977	0.993	0.980	0.993
	COR	0.769	0.978	0.879	0.996	0.961	0.975	0.964	0.779	0.915	0.782	0.929	0.809	0.664	0.834	0.983	0.966	0.951
	TSS	**0.667**	**0.979**	**0.932**	**0.996**	**0.944**	**0.960**	**0.953**	**0.637**	**0.829**	**0.914**	**0.915**	**0.672**	**0.997**	**0.857**	**0.968**	**0.953**	**0.940**
	Kappa	0.626	0.975	0.929	0.996	0.936	0.953	0.963	0.593	0.801	0.896	0.899	0.703	0.998	0.835	0.962	0.959	0.928
	AUC	*0.012*	*0.003*	*0.007*	*0.000*	*0.009*	*0.001*	*0.004*	*0.013*	*0.006*	*0.005*	*0.003*	*0.035*	*0.001*	*0.008*	*0.003*	*0.004*	*0.003*
	COR	*0.015*	*0.003*	*0.008*	*0.001*	*0.009*	*0.004*	*0.005*	*0.015*	*0.014*	*0.010*	*0.006*	*0.017*	*0.069*	*0.022*	*0.004*	*0.005*	*0.004*
	TSS	*0.023*	*0.005*	*0.011*	*0.002*	*0.010*	*0.007*	*0.008*	*0.038*	*0.028*	*0.012*	*0.006*	*0.091*	*0.002*	*0.024*	*0.017*	*0.014*	*0.007*
	Kappa	*0.025*	*0.007*	*0.014*	*0.002*	*0.011*	*0.010*	*0.005*	*0.042*	*0.032*	*0.014*	*0.007*	*0.139*	*0.002*	*0.028*	*0.021*	*0.022*	*0.008*
OCT	AUC	0.794	0.990	0.968	1.000	0.982	0.986	0.976	0.781	0.945	0.856	0.962	0.814	0.999	0.859	0.983	0.976	0.982
	COR	0.555	0.950	0.821	0.993	0.911	0.925	0.929	0.562	0.829	0.654	0.802	0.753	0.072	0.610	0.957	0.929	0.903
	TSS	**0.516**	**0.949**	**0.864**	**0.997**	**0.876**	**0.901**	**0.912**	**0.504**	**0.776**	**0.688**	**0.801**	**0.543**	**0.998**	**0.642**	**0.941**	**0.910**	**0.891**
	Kappa	0.502	0.946	0.870	0.997	0.870	0.895	0.913	0.490	0.767	0.641	0.792	0.528	0.998	0.643	0.938	0.910	0.886

	AUC	*0.015*	*0.003*	*0.014*	*0.000*	*0.002*	*0.003*	*0.005*	*0.014*	*0.009*	*0.009*	*0.005*	*0.013*	*0.001*	*0.250*	*0.003*	*0.006*	*0.002*
	COR	*0.021*	*0.006*	*0.007*	*0.001*	*0.007*	*0.008*	*0.007*	*0.023*	*0.012*	*0.019*	*0.011*	*0.012*	*0.023*	*0.497*	*0.007*	*0.006*	*0.005*
	TSS	*0.029*	*0.010*	*0.013*	*0.002*	*0.017*	*0.016*	*0.012*	*0.029*	*0.015*	*0.020*	*0.026*	*0.038*	*0.002*	*0.473*	*0.009*	*0.012*	*0.012*
	Kappa	*0.028*	*0.011*	*0.016*	*0.002*	*0.017*	*0.016*	*0.016*	*0.031*	*0.015*	*0.025*	*0.027*	*0.039*	*0.002*	*0.450*	*0.010*	*0.018*	*0.012*
NOV	AUC	0.817	0.984	0.967	1.000	0.984	0.997	0.980	0.832	0.954	0.781	0.989	0.849	1.000	0.941	0.993	0.986	0.994
	COR	0.273	0.902	0.662	0.989	0.917	0.939	0.941	0.243	0.669	0.683	0.785	0.493	0.244	0.550	0.943	0.915	0.895
	TSS	**0.517**	**0.905**	**0.752**	**0.999**	**0.930**	**0.960**	**0.922**	**0.603**	**0.836**	**0.561**	**0.898**	**0.678**	**0.999**	**0.807**	**0.949**	**0.929**	**0.934**
	Kappa	0.288	0.789	0.530	0.997	0.867	0.896	0.884	0.360	0.648	0.674	0.781	0.409	0.997	0.620	0.880	0.864	0.837
	AUC	*0.018*	*0.008*	*0.010*	*0.000*	*0.039*	*0.002*	*0.018*	*0.027*	*0.017*	*0.084*	*0.004*	*0.043*	*0.001*	*0.015*	*0.006*	*0.010*	*0.003*
	COR	*0.053*	*0.035*	*0.021*	*0.005*	*0.046*	*0.037*	*0.023*	*0.036*	*0.073*	*0.094*	*0.080*	*0.064*	*0.094*	*0.048*	*0.022*	*0.028*	*0.022*
	TSS	*0.054*	*0.040*	*0.040*	*0.002*	*0.067*	*0.029*	*0.063*	*0.090*	*0.064*	*0.167*	*0.032*	*0.081*	*0.002*	*0.064*	*0.033*	*0.036*	*0.018*
	Kappa	*0.038*	*0.079*	*0.052*	*0.008*	*0.049*	*0.068*	*0.118*	*0.078*	*0.090*	*0.132*	*0.058*	*0.105*	*0.008*	*0.102*	*0.077*	*0.055*	*0.046*

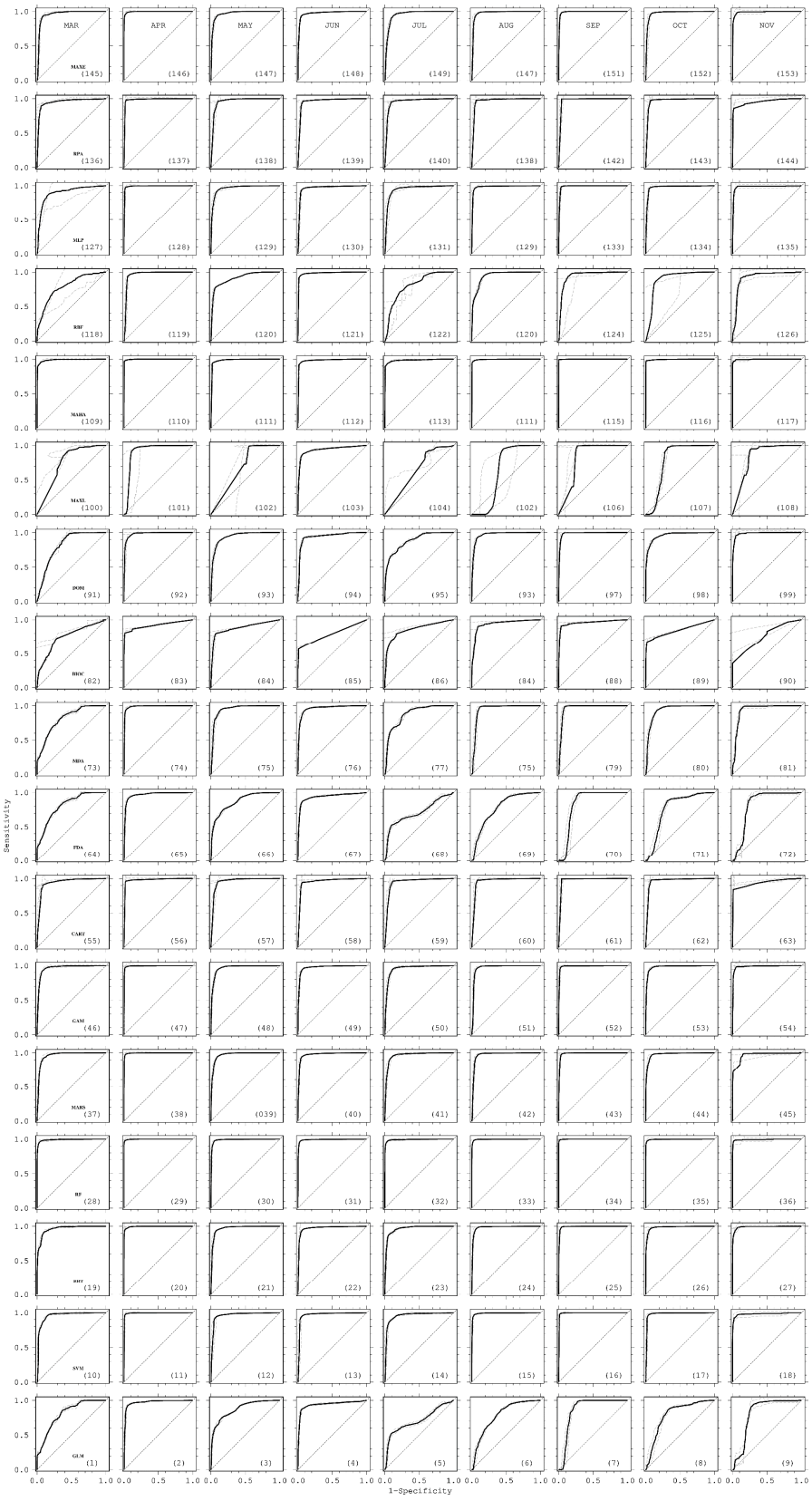

Figure S1. Receiver operating characteristic (ROC) curves for 17 presence-only models, March to November. The continuous black line indicates the mean ROC for 10 runs while the dotted gray lines show 2 standard deviations of the mean.

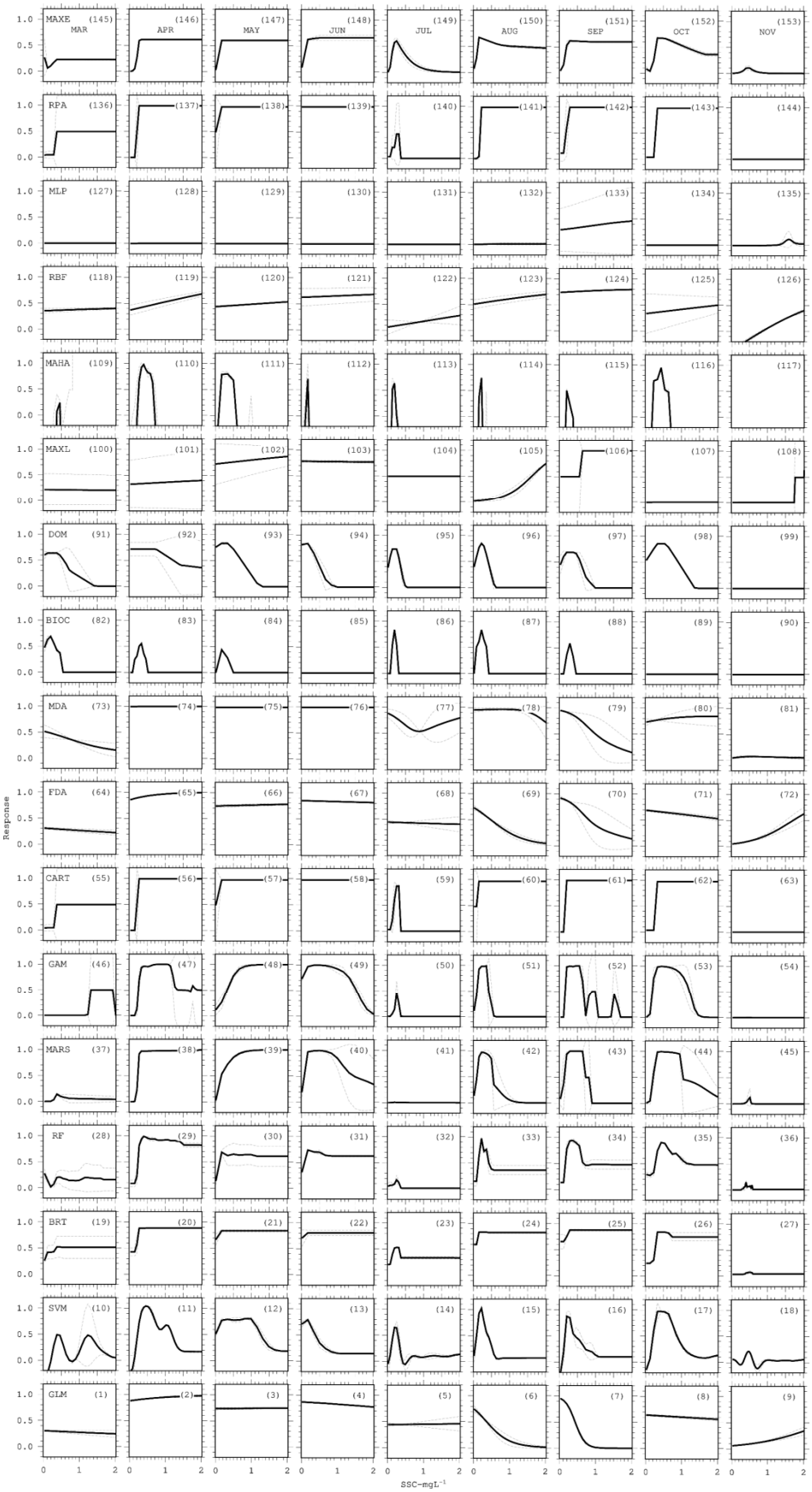

Figure S2. Mean response curves for SSC from 17 presence-only algorithms for 10 runs, March to November.

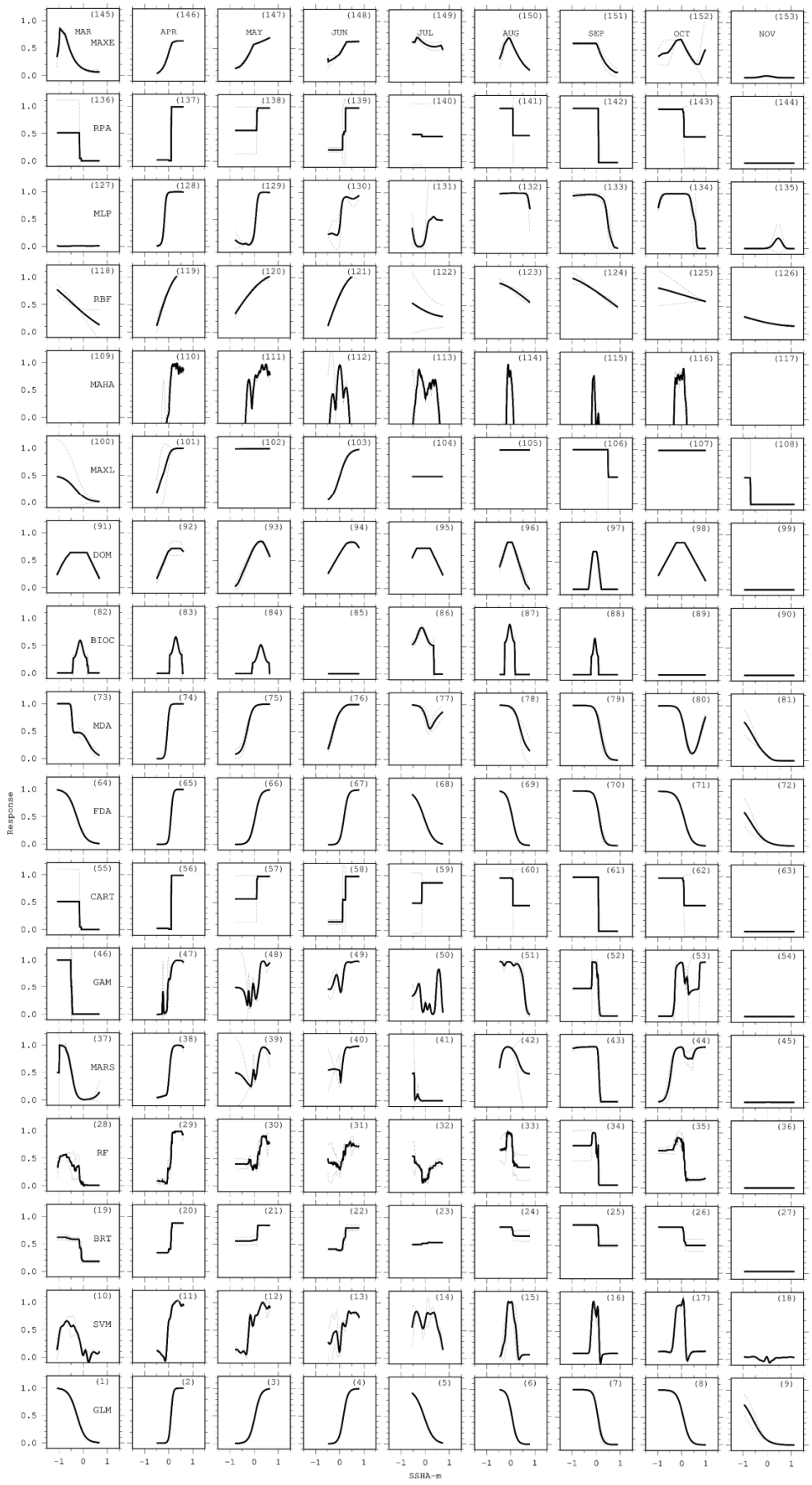

Figure S3. Mean response curves for SSHA from 17 presence-only algorithms for 10 runs, March to November.

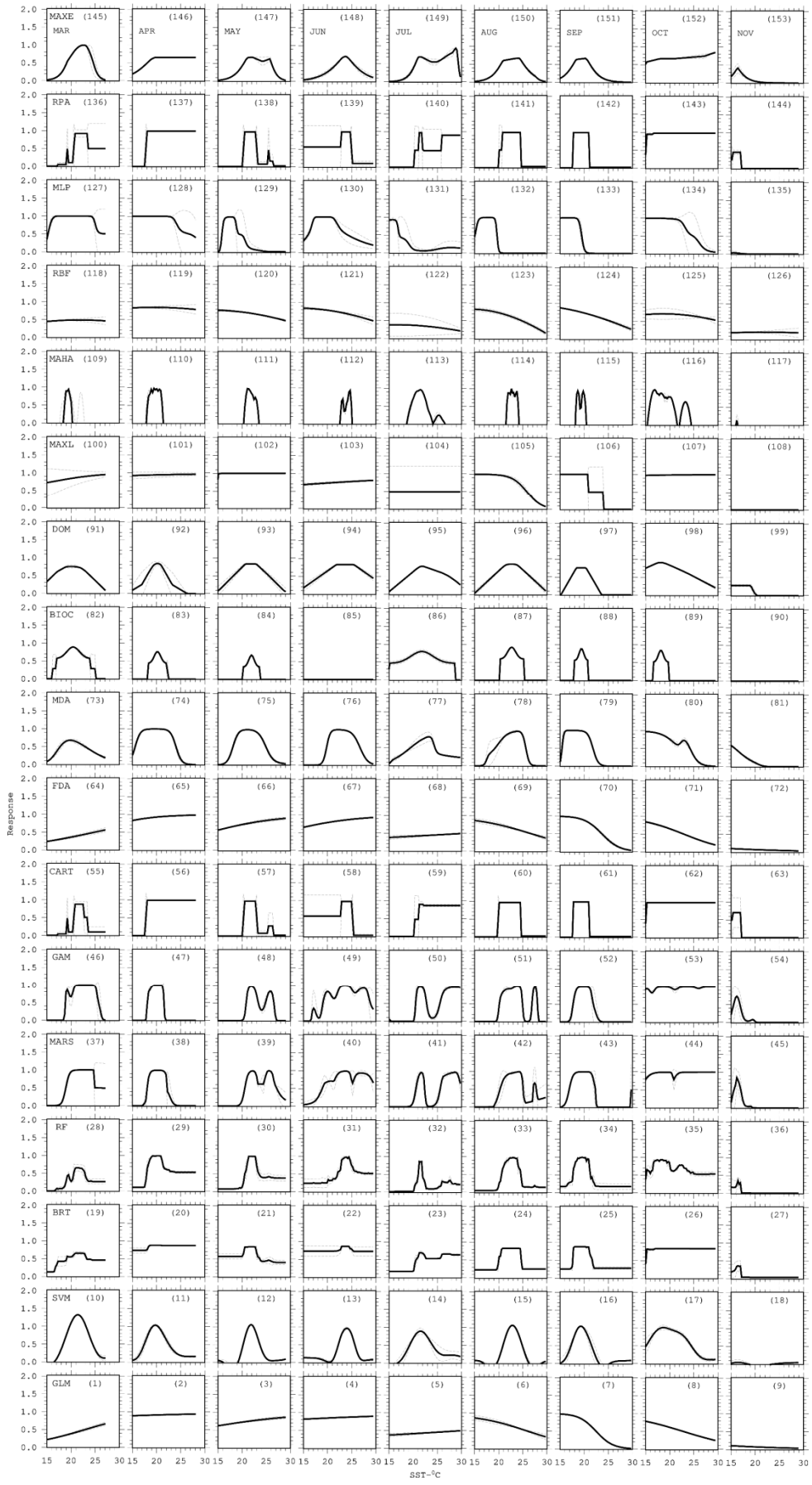

Figure S4. Mean response curves for SST from 17 presence-only algorithms for 10 runs, March to November.

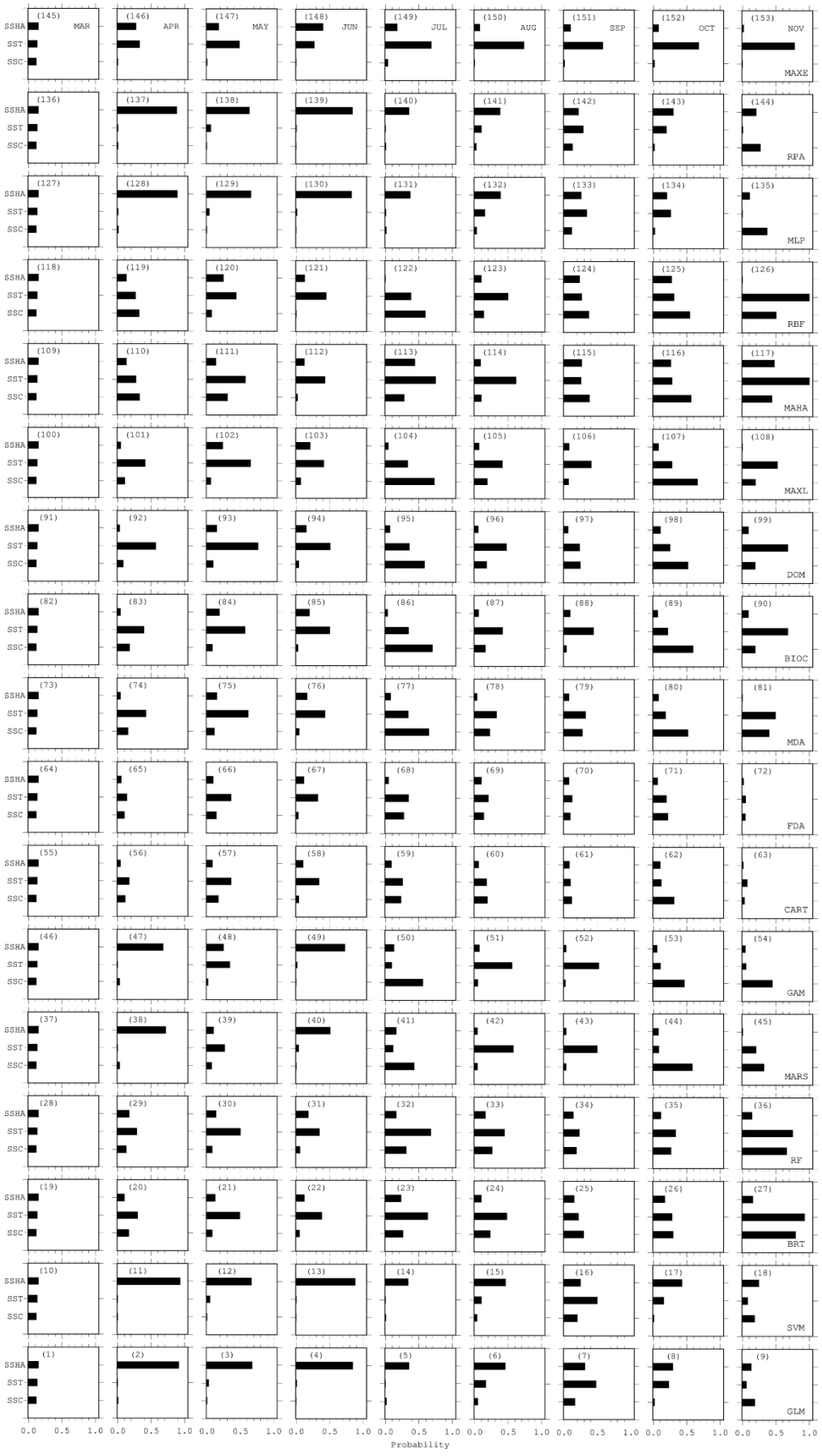

Figure S5. Variable importance of SST, SSC, and SSHA over 9 months, using 17 presence-only algorithms.