

Supplement Materials for “ Topographic Enhancement of Tropical Cyclone Precipitation (TCP) in Eastern Mexico”

**Supplement 1.** Comparison of elevation Standard Deviation for quantile TCP

Category	Daily TCP						Event TCP					
	P <sub>99.9</sub> TCP	Elev Std	P <sub>50</sub> TCP	Elev Std	P <sub>0.1</sub> TCP	Elev Std	P <sub>99.9</sub> TCP	Elev Std	P <sub>50</sub> TCP	Elev Std	P <sub>0.1</sub> TCP	Elev Std
Whole	<b>164.15</b>	<b>105.88</b>	7.99	88.24 <sup>+</sup>	0.01	24.67 <sup>+</sup>	<b>318.09</b>	<b>45.14</b>	15.30	144.29 <sup>*</sup>	0.04	71.34
Cluster 1	<b>176.50</b>	<b>100.03</b>	8.88	24.17 <sup>+</sup>	0.01	20.94 <sup>+</sup>	<b>357.48</b>	<b>34.85</b>	20.43	38.97	0.03	23.73
Cluster 2	<b>122.49</b>	<b>269.30</b>	7.38	163.43 <sup>+</sup>	0.04	210.34 <sup>+</sup>	<b>220.49</b>	<b>235.84</b>	13.20	171.28 <sup>+</sup>	0.07	205.26 <sup>+</sup>

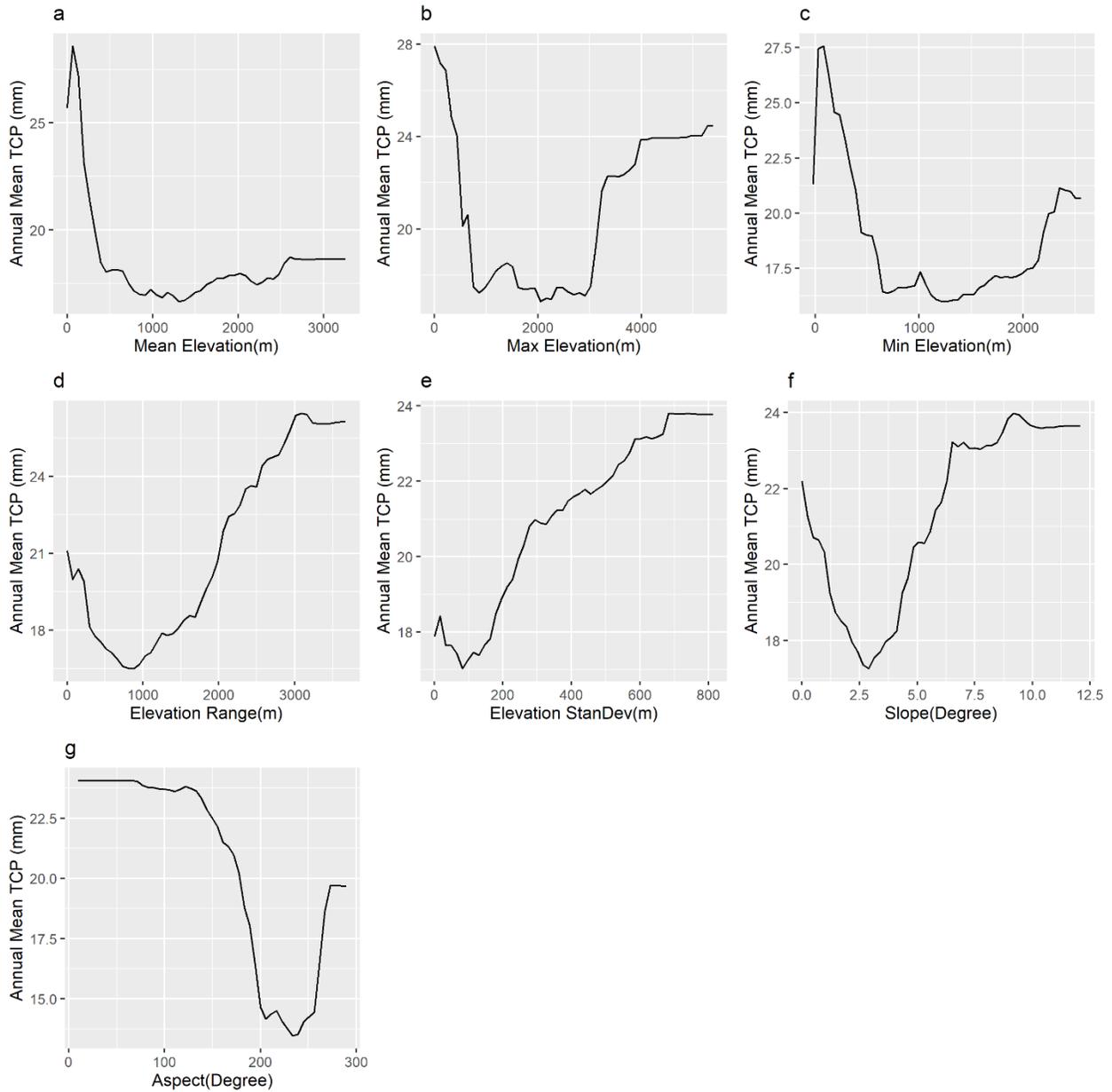
“+” indicates the current Elevation Standard Deviation sample median is smaller than the Elevation Standard Deviation sample for the P<sub>99.9</sub> TCP in the same category, using the Mann-Whitney U-test at the 5% significance level. “\*” indicates the current Elevation Standard Deviation sample median is greater than the Elevation Standard Deviation sample for the P<sub>99.9</sub> TCP in the same category, using the Mann-Whitney U-test at the 5% significance level.

**Supplement 2.** Information about Random Forest Models developed for three TCP variables:

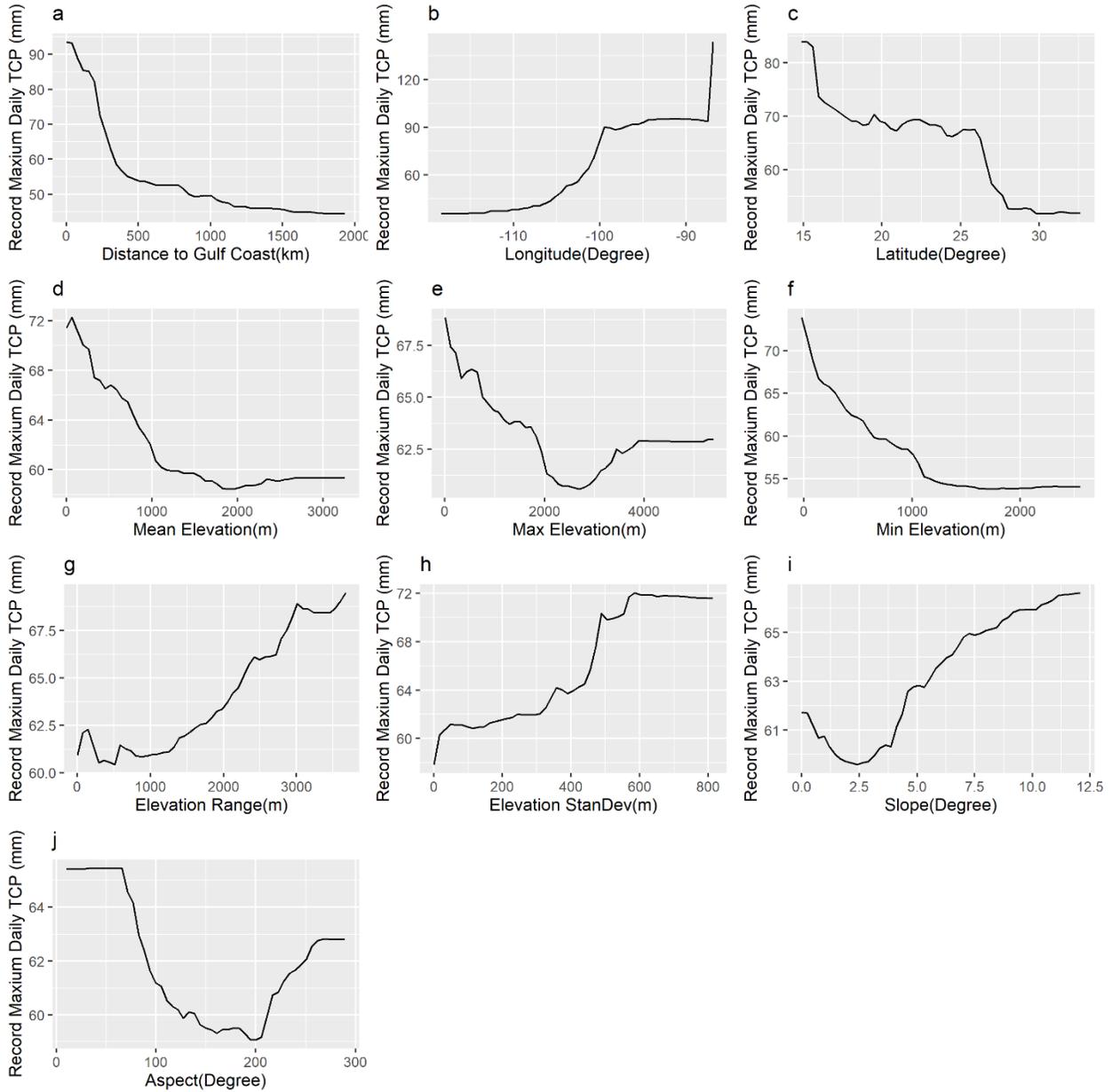
MaxDTCP and DTCPGP95. The importance is calculated as the percentage of increased MSE

(%IncMSE) if the variable is removed

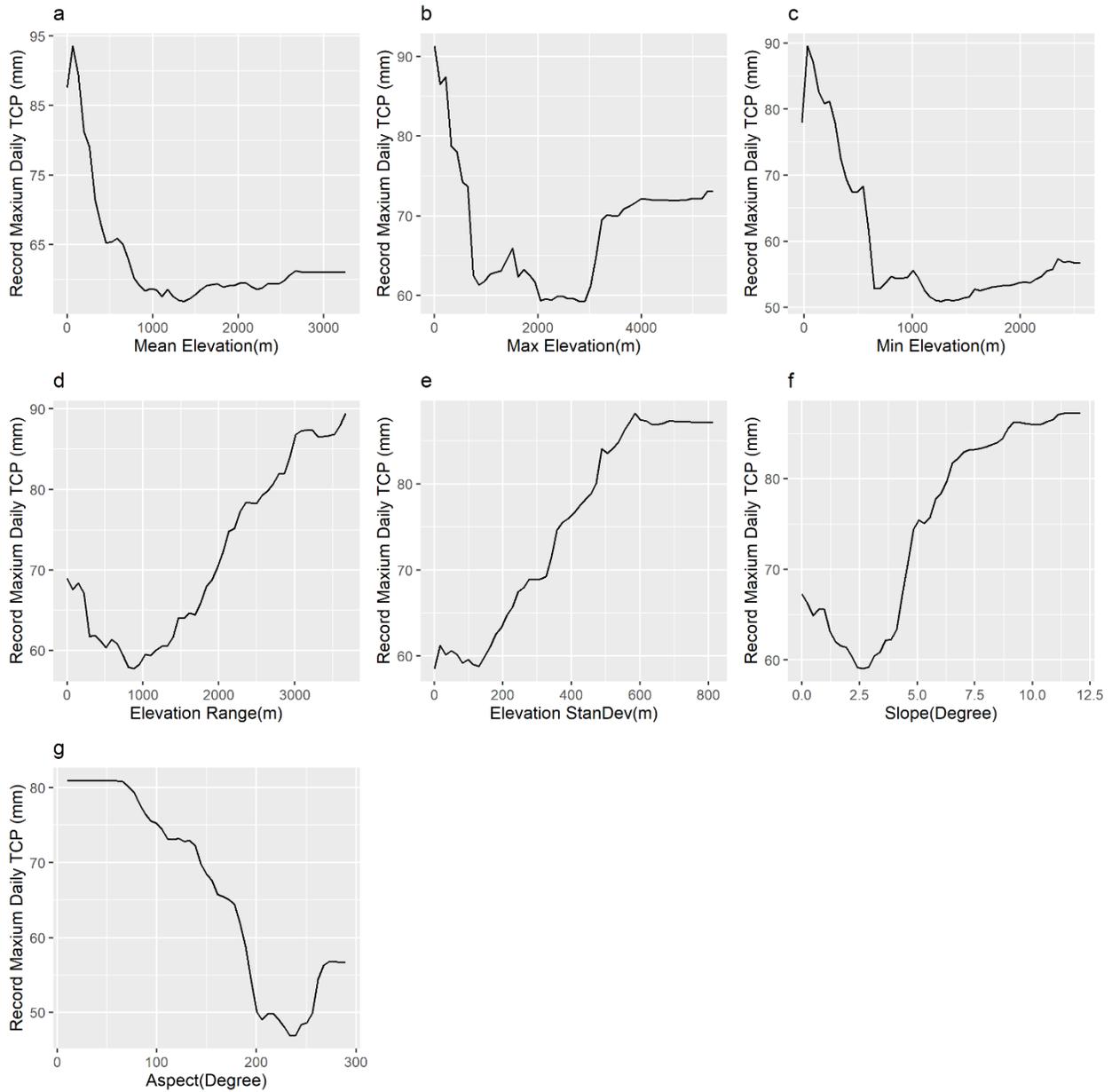
Variance Explained	MaxDTCP		MaxDTCP		DTCPGP95		DTCPGP95	
	Total Model		Topo Model		Total Model		Topo Model	
	80.28%		47.43%		91.05%		52.06%	
Importance Rank	Var Name	%Inc MSE	Var Name	%Inc MSE	Var Name	%Inc MSE	Var Name	%Inc MSE
1	Lon	41.38	Asp	49.22	Lat	45.05	Asp	71.94
2	Lat	40.76	Slope	37.83	Dist	39.21	Slope	41.62
3	Dist	31.80	Range	29.55	Lon	37.83	Std	33.33
4	Min	26.10	Std	29.22	Min	18.79	Range	28.53
5	Mean	23.23	Min	27.88	Range	16.94	Max	24.55
6	Slope	18.85	Mean	27.82	Max	15.91	Mean	22.85
7	Max	18.23	Max	24.23	Std	15.57	Min	20.80
8	Std	17.16			Slope	14.94		
9	Range	16.48			Mean	14.14		
10	Asp	11.44			Asp	14.06		



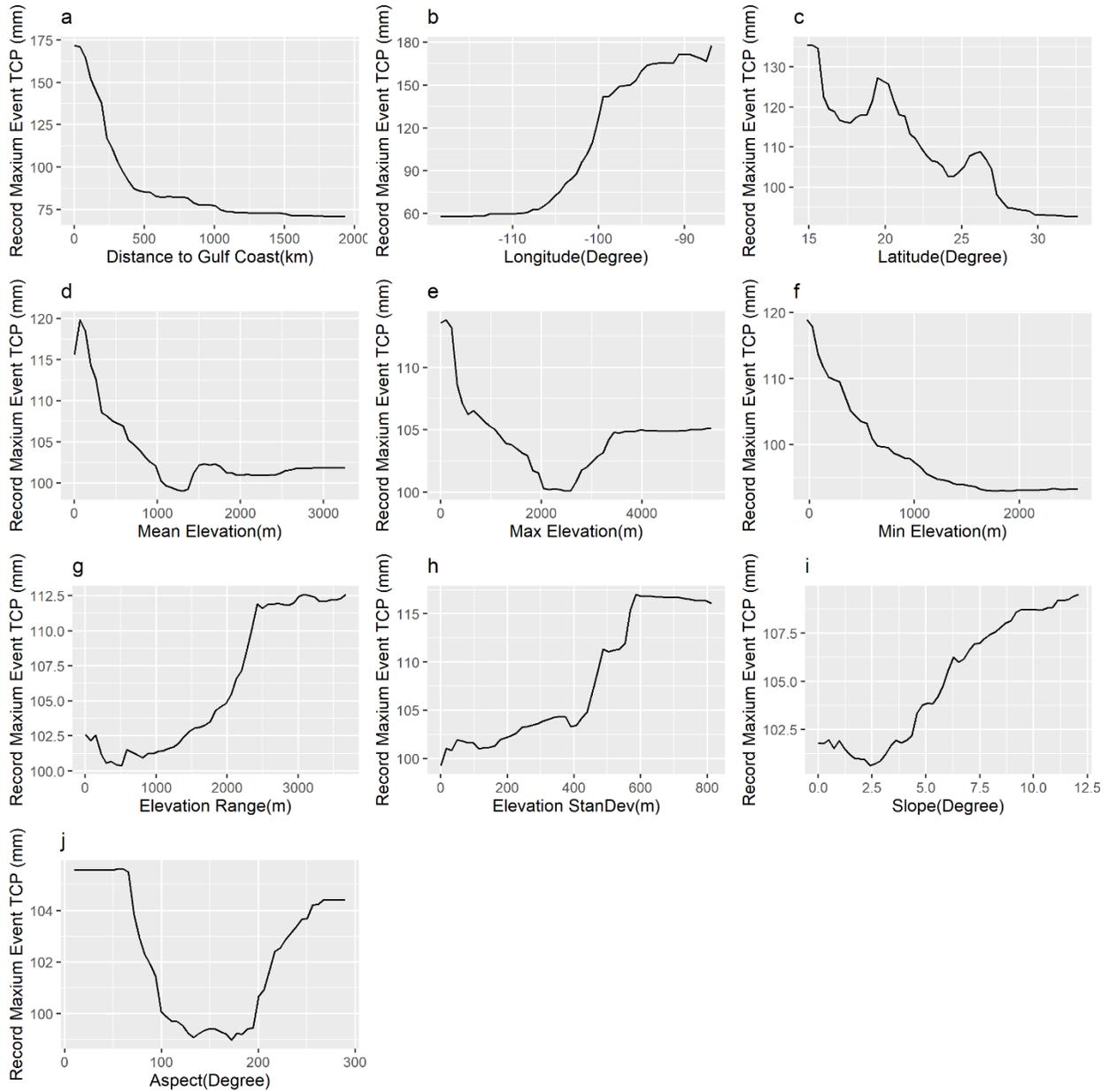
**Supplement 3.** Partial Importance Plot for variables in the topographic RF model for the Annual Mean TCP.



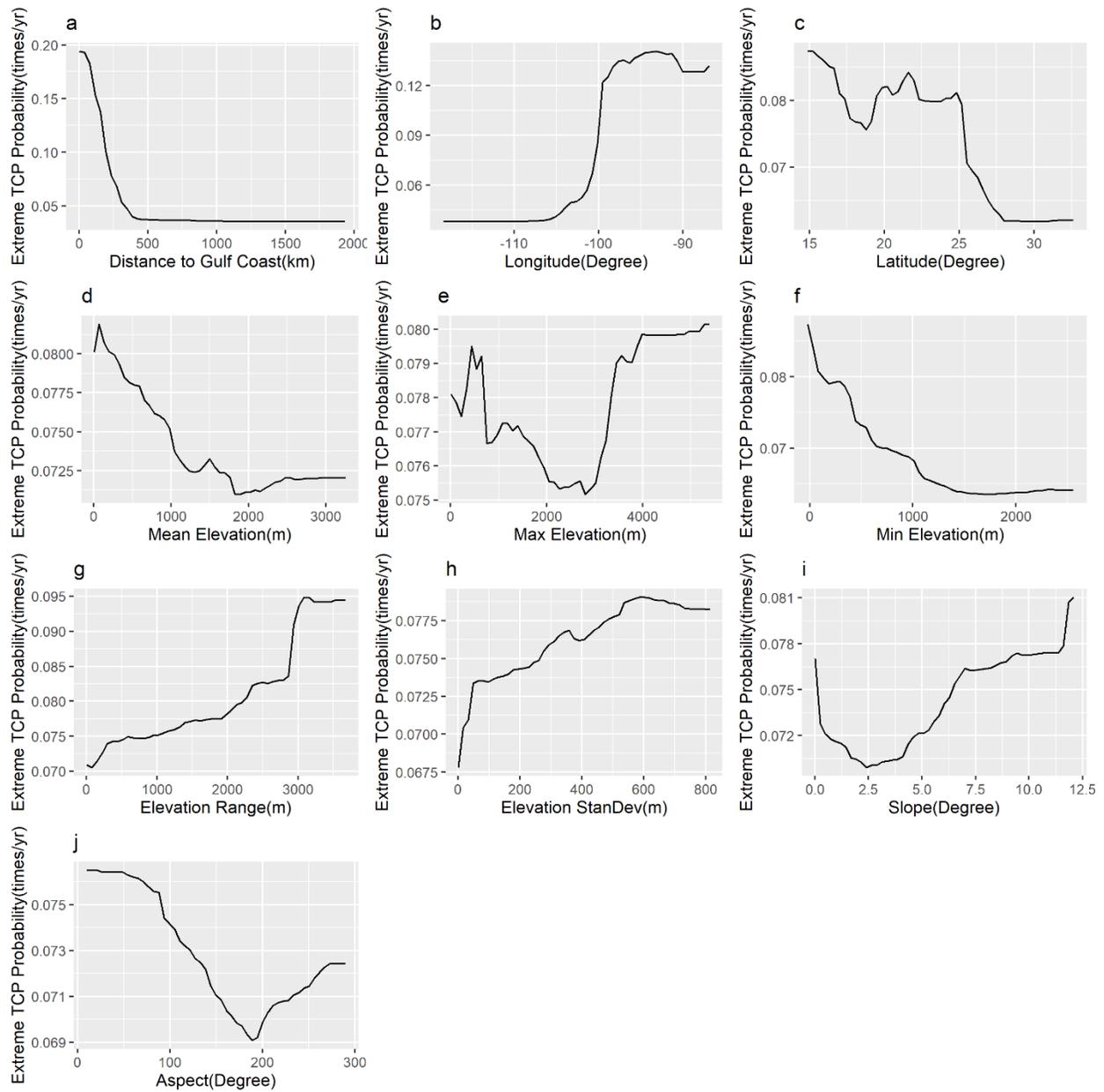
**Supplement 4.** Partial Importance Plot for variables in the total RF model for the Maximum Daily TCP.



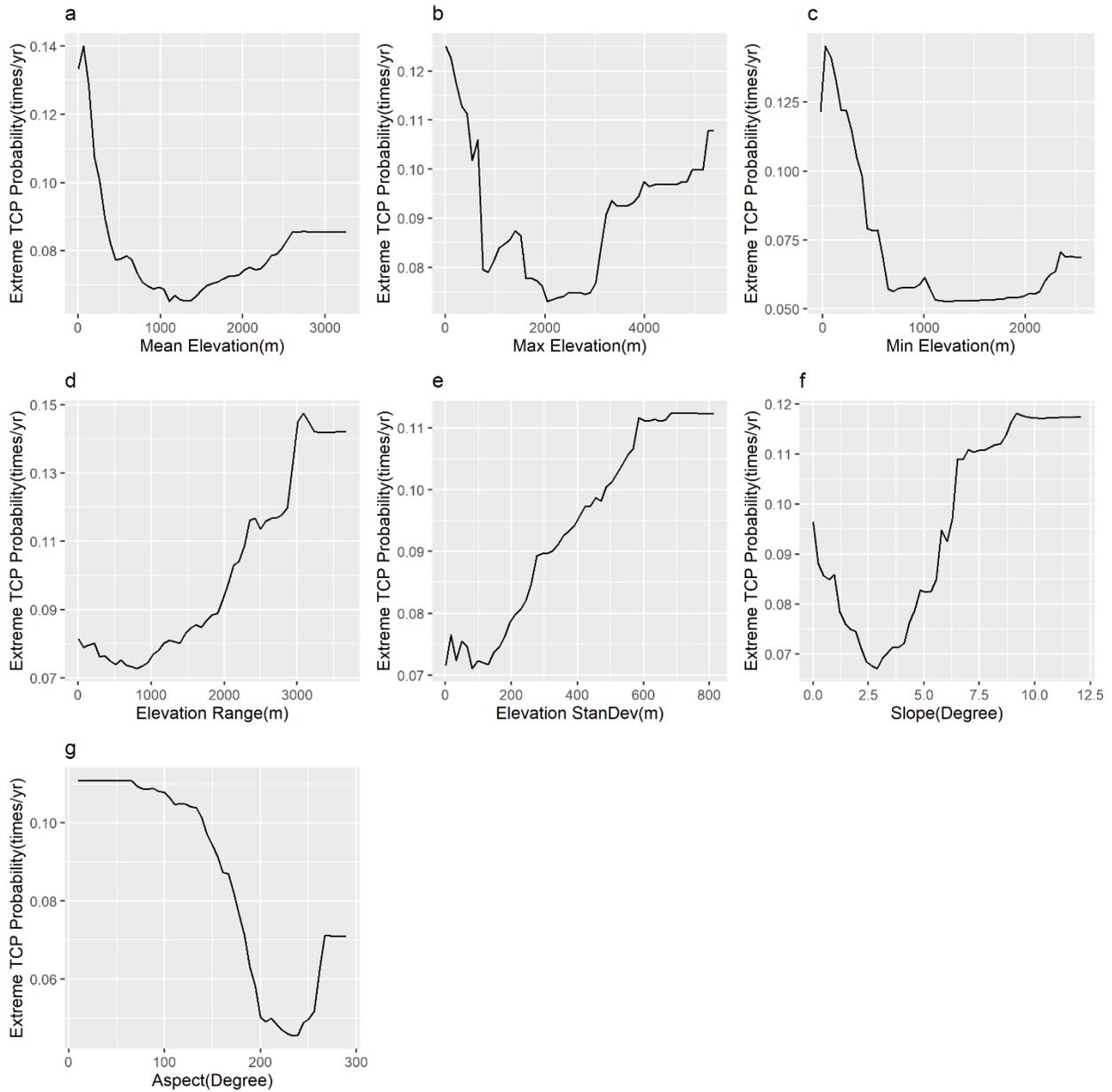
**Supplement 5.** Partial Importance Plot for variables in the Topographic RF model for the Maximum Daily TCP.



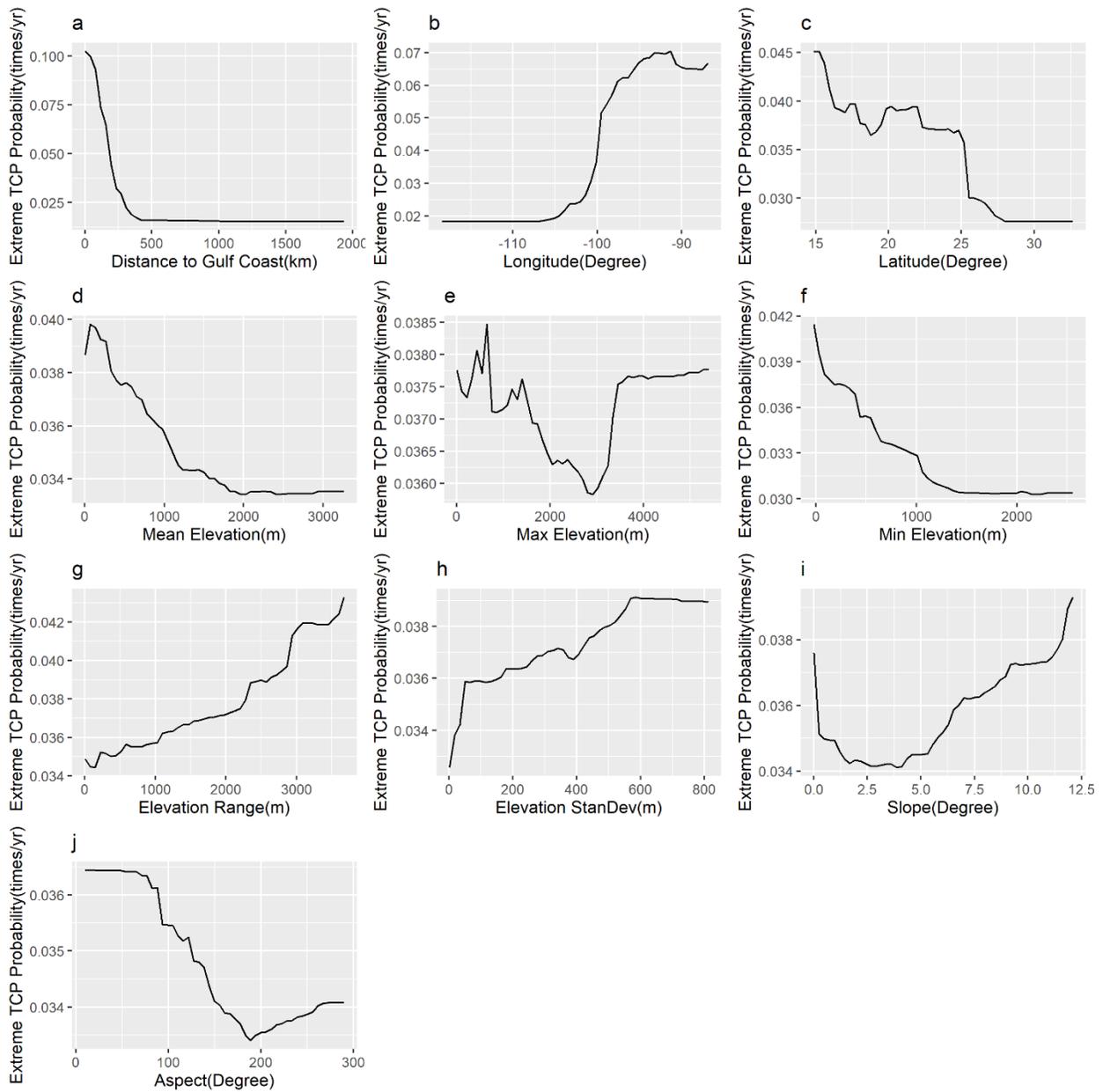
**Supplement 6.** Partial Importance Plot for variables in the Total RF model for the Maximum Events TCP.



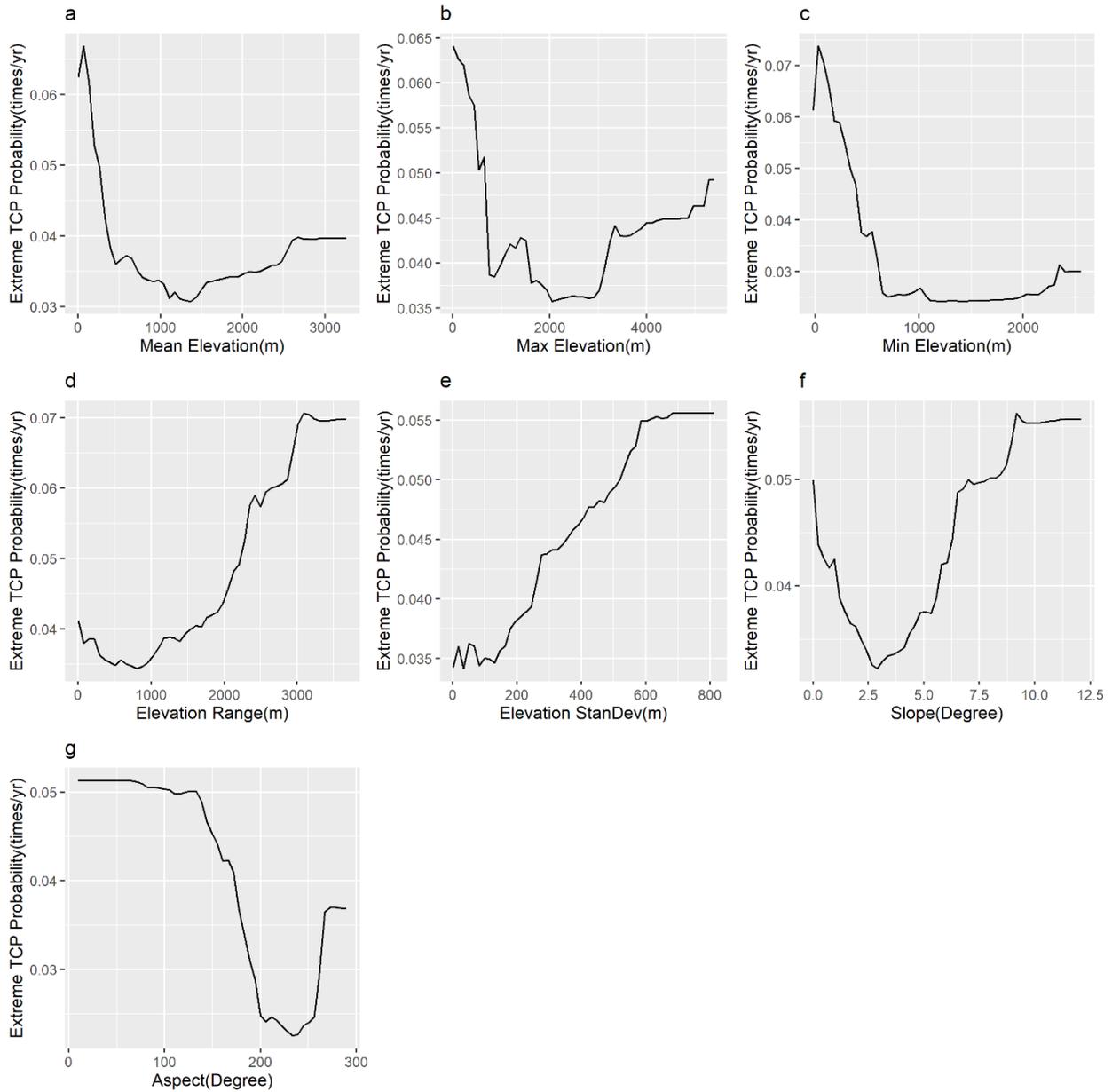
**Supplement 7.** Partial Importance Plot for variables in the Total RF model for the Probability of Daily TCP with greater than the  $P_{95}$ .



**Supplement 8.** Partial Importance Plot for variables in the Topographic RF model for the Probability of Daily TCP with greater than the  $P_{95}$ .



**Supplement 9.** Partial Importance Plot for variables in the Total RF model for the Probability of Event TCP with greater than the  $P_{95}$ .



**Supplement 10.** Partial Importance Plot for variables in the Topographic RF model for the Probability of Event TCP with greater than the  $P_{95}$ .

**Supplement 11.** Comparison of elevation standard deviation for quantile locations TCP for three most intense storms

Storm	Hurricane Alex				Hurricane Igrid				Hurricane Beulah			
	P <sub>90</sub> TCP		P <sub>45</sub> to P <sub>55</sub> TCP		P <sub>90</sub> TCP		P <sub>45</sub> to P <sub>55</sub> TCP		P <sub>90</sub> TCP		P <sub>45</sub> to P <sub>55</sub> TCP	
Category	TCP	Elev Std	TCP	Elev Std	TCP	Elev Std	TCP	Elev Std	TCP	Elev Std	TCP	Elev Std
Cluster 1	<b>164.89</b>	23.50	76.80	26.48	197.41	192.13	62.02	68.65 <sup>+</sup>	238.84	27.85	217.70	18.71 <sup>+</sup>
Cluster 2	<b>162.87</b>	<b>217.64</b>	43.66	121.08 <sup>+</sup>	107.69	263.22	31.95	169.46 <sup>+</sup>	66.71	189.11	67.02	159.51

“+” indicates the Elevation Range sample median for P<sub>45</sub> to P<sub>55</sub> TCP locations is smaller than the Elevation Range sample for the P<sub>90</sub> TCP locations, using the Mann-Whitney U-test at the 5% significance level. TCP has unit of mm and Elevation Range has unit of meter