Supporting Information for "Conductance Model for Extreme Events : Impact of Auroral Conductance on Space Weather Forecasts"

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1. Tables S1 to S15

Introduction This supporting information provides performance metrics calculated for multiple dB/dt and ΔB thresholds using the Conductance Model for Extreme Events. The metrics used has been listed in Table 2 of the main article. The format of these tables are similar to Tables 4 and 5 of the main article; for more details about those tables, please refer to Sections 3.2 and 3.3 of the main paper. For convenience, the tables have been coloured differently: In the tables, ***italicized-bolded*** *text* is used to denote best performance while *italicized-underlined* *text* is used to denote worst. Usage of the auroral oval and CMEE amounts to an increase in False Negatives (F) in both ΔB and dB/dt

predictions, while improving the rest of the quantities (H, M, N). Due to this reason, the FAR values are higher for oval runs, which results in less predictive score using the TSS metric. The new model (without the oval) has more misses (M) than the older model (without the oval), when predicting ΔB. For dB/dt predictions, the amount of skill lost during quieter activity, when simulating using CMEE, is more than regained with massive improvements for extreme driving, as is seen by Tables S3 to S7.

Table S1. Performance metrics for predicted dB/dt at Threshold = 0.1 nT/s.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	*0.7776*	0.7801	***0.8436***	0.8114	*0.8342*	0.8555	***0.8976***	0.8973
POFD	0.0631	***0.0615***	*0.0903*	0.0744	0.0938	***0.0892***	0.1687	*0.1697*
FAR	0.0431	***0.0419***	*0.0560*	0.0484	0.0587	***0.0547***	0.0944	*0.0950*
MR	*0.2997*	0.2970	***0.2367***	0.2686	*0.2481*	0.2224	***0.1817***	0.1823
TS	*0.7513*	0.7544	***0.8034***	0.7793	*0.7929*	0.8152	***0.8208***	0.8201
*F*1	*0.8580*	0.8600	***0.8910***	0.8760	*0.8845*	0.8982	***0.9016***	0.9012
TSS	*0.6572*	0.6611	***0.7073***	0.6830	*0.6932*	0.7229	***0.7239***	0.7227
HSS	*0.6645*	0.6687	***0.7225***	0.6959	*0.7080*	***0.7381***	0.7263	0.7251

Table S2. Performance metrics for predicted dB/dt at Threshold = 0.3 nT/s.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	0.5814	*0.5628*	***0.6782***	0.6638	*0.6444*	0.6829	0.7970	***0.7979***
POFD	0.0416	***0.0345***	*0.0597*	0.0477	***0.0426***	0.0613	0.1038	*0.1164*
FAR	0.0858	***0.0744***	*0.1034*	0.0861	***0.0797***	0.1053	0.1459	*0.1606*
MR	0.2499	*0.2567*	***0.2070***	0.2121	*0.2207*	0.2049	***0.1473***	0.1485
TS	0.5513	*0.5384*	***0.6290***	0.6248	*0.6103*	0.6321	***0.7015***	0.6922
*F*1	0.7108	*0.7000*	***0.7723***	0.7690	*0.7580*	0.7746	***0.8246***	0.8181
TSS	*0.6644*	0.6689	0.6896	***0.7017***	0.6996	*0.6899*	***0.7068***	0.6909
HSS	0.5642	*0.5541*	***0.6370***	0.6368	*0.6240*	0.6396	***0.6987***	0.6855

Table S3. Performance metrics for predicted dB/dt at Threshold = 0.5 nT/s.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	*0.4812*	0.4840	0.5636	***0.5922***	*0.5496*	0.5989	0.7244	***0.7451***
POFD	0.0331	***0.0302***	*0.0497*	0.0435	***0.0378***	0.0543	0.0926	*0.1076*
FAR	0.1244	***0.1138***	*0.1539*	0.1315	***0.1241***	0.1576	0.2087	*0.2294*
MR	*0.2065*	0.2051	0.1821	***0.1713***	*0.1850*	0.1706	0.1284	***0.1217***
TS	*0.4504*	0.4557	0.5112	***0.5434***	*0.5099*	0.5385	0.6082	***0.6098***
*F*1	*0.6211*	0.6261	0.6765	***0.7042***	*0.6754*	0.7001	0.7564	***0.7576***
TSS	*0.6692*	0.6811	0.6640	***0.6972***	***0.6909***	0.6718	0.6629	*0.6489*
HSS	*0.5069*	0.5139	0.5622	***0.5977***	*0.5661*	0.5883	***0.6458***	0.6430

Table S4. Performance metrics for predicted dB/dt at Threshold = 0.7 nT/s.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	*0.3949*	0.4278	0.4661	***0.5305***	*0.4812*	0.5441	0.6537	***0.7057***
POFD	***0.0255***	0.0260	0.0365	*0.0387*	***0.0285***	0.0442	0.0801	*0.0936*
FAR	0.1502	***0.1427***	*0.1765*	0.1667	***0.1395***	0.1821	0.2516	*0.2667*
MR	*0.1847*	0.1765	0.1681	***0.1512***	*0.1630*	0.1482	0.1208	***0.1059***
TS	*0.3692*	0.3994	0.4238	***0.4796***	*0.4463*	0.4853	0.5359	***0.5615***
*F*1	*0.5393*	0.5708	0.5953	***0.6483***	*0.6172*	0.6535	0.6978	***0.7192***
TSS	*0.6651*	0.6809	0.6553	***0.6821***	***0.6974***	0.6697	0.6277	*0.6274*
HSS	*0.4451*	0.4779	0.4983	***0.5559***	*0.5264*	0.5594	0.5975	***0.6195***

Table S5. Performance metrics for predicted dB/dt at Threshold = 1.1 nT/s.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	*0.2920*	0.3310	0.3520	***0.4380***	*0.3770*	0.4440	0.5300	***0.6230***
POFD	***0.0222***	0.0235	0.0284	*0.0372*	***0.0273***	0.0434	0.0687	*0.0914*
FAR	0.2532	***0.2408***	0.2651	*0.2748*	***0.2445***	0.3041	0.3668	*0.3957*
MR	*0.1395*	0.1330	0.1299	***0.1156***	*0.1254*	0.1152	0.1015	***0.0850***
TS	*0.2657*	0.2995	0.3123	***0.3756***	*0.3360*	0.3719	0.4055	***0.4425***
*F*1	*0.4198*	0.4610	0.4760	***0.5461***	*0.5030*	0.5421	0.5770	***0.6135***
TSS	0.6073	***0.6262***	*0.6049*	0.6096	***0.6301***	0.5808	0.5317	*0.5193*
HSS	*0.3533*	0.3936	0.4056	***0.4736***	*0.4341*	0.4660	0.4924	***0.5253***

Table S6. Performance metrics for predicted dB/dt at Threshold = 1.5 nT/s.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	*0.2216*	0.2490	0.2668	***0.3557***	*0.2791*	0.3406	0.4309	***0.5554***
POFD	***0.0169***	0.0194	0.0253	*0.0319*	***0.0262***	0.0378	0.0566	*0.0784*
FAR	***0.3306***	0.3358	*0.3810*	0.3674	***0.3780***	0.4182	0.4597	*0.4775*
MR	*0.1089*	0.1057	0.1041	***0.0932***	*0.1026*	0.0957	0.0852	***0.0693***
TS	*0.1998*	0.2211	0.2291	***0.2948***	*0.2386*	0.2736	0.3153	***0.3684***
*F*1	*0.3330*	0.3622	0.3728	***0.4553***	*0.3853*	0.4297	0.4795	***0.5385***
TSS	***0.5605***	0.5585	*0.5150*	0.5394	***0.5194***	0.4861	0.4551	*0.4532*
HSS	*0.2855*	0.3120	0.3179	***0.3973***	*0.3297*	0.3672	0.4094	***0.4647***

Table S7. Performance metrics for predicted dB/dt at Threshold = 1.7 nT/s.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	*0.1975*	0.2070	0.2389	***0.3264***	*0.2452*	0.3153	0.3838	***0.5207***
POFD	0.0161	***0.0155***	0.0238	*0.0287*	***0.0246***	0.0356	0.0529	*0.0754*
FAR	0.3861	***0.3659***	*0.4340*	0.4041	***0.4359***	0.4649	0.5151	*0.5275*
MR	*0.0957*	0.0947	0.0919	***0.0826***	*0.0913*	0.0844	0.0779	***0.0630***
TS	*0.1756*	0.1849	0.2019	***0.2673***	*0.2062*	0.2475	0.2726	***0.3293***
*F*1	*0.2988*	0.3121	0.3359	***0.4218***	*0.3418*	0.3968	0.4284	***0.4955***
TSS	0.5181	***0.5395***	*0.4741*	0.5133	***0.4728***	0.4508	*0.4070*	0.4095
HSS	*0.2573*	0.2709	0.2874	***0.3706***	*0.2926*	0.3406	0.3639	***0.4264***

Table S8. Performance metrics for predicted ΔB at Threshold = 100 nT.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	*0.7293*	0.7918	***0.8099***	0.7879	0.8603	*0.8373*	***0.8882***	0.8740
POF	***0.1882***	0.2296	*0.3074*	0.2836	0.3388	***0.3199***	*0.4442*	0.4003
FAR	***0.1013***	0.1124	*0.1422*	0.1358	0.1467	***0.1430***	*0.1792*	0.1667
MR	*0.4330*	***0.3823***	0.3860	0.4040	0.3261	*0.3540*	***0.3153***	0.3249
TS	*0.6739*	***0.7196***	0.7140	0.7011	***0.7494***	*0.7346*	0.7439	0.7439
*F*1	*0.8052*	***0.8370***	0.8331	0.8243	***0.8568***	*0.8470*	0.8532	0.8532
TSS	0.4658	***0.5053***	0.4718	*0.4602*	***0.5272***	*0.5030*	0.5055	0.5085
HSS	0.4825	***0.5256***	0.4850	*0.4772*	***0.5243***	0.5097	*0.4689*	0.4891

Table S9. Performance metrics for predicted ΔB at Threshold = 150 nT.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	*0.6803*	0.7440	***0.7534***	0.7460	0.8184	*0.7842*	***0.8599***	0.8432
POF	***0.1186***	0.1460	*0.2487*	0.2186	0.2743	***0.2469***	*0.3823*	0.3354
FAR	***0.1166***	0.1294	*0.2000*	0.1816	0.2025	***0.1925***	*0.2519*	0.2315
MR	*0.3238*	***0.2836***	0.3024	0.3003	0.2484	*0.2745*	***0.2304***	0.2376
TS	*0.6242*	***0.6699***	0.6340	0.6400	***0.6776***	*0.6606*	0.6668	0.6724
*F*1	*0.7686*	***0.8023***	0.7760	0.7805	***0.8078***	*0.7956*	0.8001	0.8041
TSS	0.5595	***0.5870***	*0.4976*	0.5181	***0.5491***	0.5329	*0.5177*	0.5309
HSS	0.5418	***0.5843***	*0.5000*	0.5200	***0.5463***	0.5348	*0.4893*	0.5158

Table S10. Performance metrics for predicted ΔB at Threshold = 200 nT.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	*0.6331*	0.6846	***0.7241***	0.7128	0.7812	*0.7466*	***0.8142***	0.8045
POF	***0.0711***	0.1117	*0.1697*	0.1523	0.2059	***0.1929***	*0.3183*	0.2683
FAR	***0.1107***	0.1532	*0.2063*	0.1916	0.2263	***0.2228***	*0.3025*	0.2701
MR	*0.2625*	0.2424	***0.2305***	0.2339	0.1990	*0.2206*	0.1973	***0.1941***
TS	*0.5869*	0.6092	0.6093	***0.6098***	***0.6359***	0.6150	*0.6017*	0.6200
*F*1	*0.7397*	0.7571	0.7573	***0.7576***	***0.7774***	0.7616	*0.7513*	0.7654
TSS	***0.6267***	0.6043	*0.5631*	0.5744	***0.5747***	0.5566	*0.5002*	0.5358
HSS	0.5702	***0.5784***	*0.5568*	0.5638	***0.5750***	0.5548	*0.4918*	0.5335

Table S11. Performance metrics for predicted ΔB at Threshold = 250 nT.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	*0.5774*	0.6071	***0.6998***	0.6692	0.7686	*0.7180*	0.7830	***0.7887***
POF	***0.0527***	0.0799	*0.1231*	0.1129	***0.1504***	***0.1504***	*0.2621*	0.2265
FAR	***0.1208***	0.1656	*0.2095*	0.2027	***0.2277***	0.2399	*0.3352*	0.3020
MR	*0.2284*	0.2208	***0.1851***	0.1984	***0.1531***	*0.1805*	0.1633	0.1535
TS	*0.5350*	0.5418	***0.5903***	0.5719	***0.6267***	0.5853	*0.5613*	0.5880
*F*1	*0.6971*	0.7028	***0.7424***	0.7277	***0.7705***	0.7384	*0.7191*	0.7406
TSS	***0.6508***	0.6136	*0.6054*	0.5989	***0.6193***	0.5796	*0.5015*	0.5445
HSS	0.5569	*0.5524*	***0.5881***	0.5717	***0.6188***	0.5729	*0.5058*	0.5502

Table S12. Performance metrics for predicted ΔB at Threshold = 300 nT.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	0.5553	*0.5422*	***0.6254***	0.6145	0.7021	*0.6703*	0.7393	***0.7426***
POF	***0.0456***	0.0562	*0.0960*	0.0866	***0.1194***	0.1229	*0.2054*	0.1949
FAR	***0.1333***	0.1624	*0.2231*	0.2087	***0.2414***	0.2555	*0.3421*	0.3294
MR	0.1993	*0.2058*	***0.1812***	0.1840	0.1531	*0.1672*	0.1491	***0.1459***
TS	0.5116	*0.4906*	***0.5302***	0.5287	***0.5739***	0.5450	*0.5340*	0.5441
*F*1	0.6769	*0.6582*	***0.6930***	0.6917	***0.7292***	0.7055	*0.6962*	0.7048
TSS	***0.6674***	0.6318	*0.5956*	0.6073	***0.6055***	0.5773	*0.5088*	0.5248
HSS	0.5562	*0.5295*	0.5546	***0.5568***	***0.5930***	0.5604	*0.5190*	0.5344

Table S13. Performance metrics for predicted ΔB at Threshold = 350 nT.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	0.5076	*0.4810*	***0.5711***	0.5698	0.6345	*0.6193*	0.6904	***0.6967***
POF	0.0529	***0.0507***	*0.0752*	0.0725	***0.1041***	0.1052	*0.1750*	0.1696
FAR	***0.1952***	0.1970	*0.2347*	0.2285	***0.2764***	0.2834	*0.3711*	0.3616
MR	0.1826	*0.1902*	***0.1662***	***0.1662***	0.1491	*0.1546*	0.1389	***0.1356***
TS	0.4520	*0.4302*	0.4860	***0.4875***	***0.5107***	0.4975	*0.4905*	0.4995
*F*1	0.6226	*0.6016*	0.6541	***0.6555***	***0.6761***	0.6644	*0.6582*	0.6663
TSS	***0.6222***	0.6127	*0.5991*	0.6053	***0.5744***	0.5620	*0.4900*	0.5027
HSS	0.5082	*0.4858*	0.5345	***0.5373***	***0.5497***	0.5348	*0.5014*	0.5137

Table S14. Performance metrics for predicted ΔB at Threshold = 400 nT.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	0.4602	*0.4385*	0.5123	***0.5224***	0.5687	*0.5485*	0.6440	***0.6671***
POF	0.0575	***0.0523***	0.0616	*0.0658*	***0.0865***	0.0901	0.1393	*0.1429*
FAR	0.2587	***0.2500***	0.2516	*0.2602*	***0.2982***	0.3146	*0.3768*	0.3745
MR	0.1701	*0.1749*	0.1568	***0.1546***	0.1445	*0.1508*	0.1289	***0.1220***
TS	0.3965	*0.3826*	0.4370	***0.4413***	0.4580	*0.4382*	0.4635	***0.4767***
*F*1	0.5679	*0.5534*	0.6082	***0.6124***	0.6283	*0.6093*	0.6335	***0.6457***
TSS	*0.5712*	0.5751	***0.5916***	0.5851	***0.5573***	0.5346	*0.4943*	0.5035
HSS	0.4585	*0.4456*	0.5015	***0.5042***	***0.5135***	*0.4898*	0.4994	0.5132

Table S15. Performance metrics for predicted ΔB at Threshold = 450 nT.

Metric	*SETA*	*SETB*	*SETC*	*SETD*	*SETE*	*SETF*	*SETG*	*SETH*
POD	*0.4211*	0.4243	0.4589	***0.4803***	0.5230	*0.4901*	0.5855	***0.6184***
POF	0.0487	***0.0482***	0.0536	*0.0601*	0.0715	***0.0690***	0.1127	*0.1246*
FAR	0.2768	***0.2732***	0.2791	*0.2930*	***0.3117***	0.3181	0.3894	*0.4003*
MR	*0.1552*	0.1544	0.1472	***0.1431***	0.1343	*0.1419*	0.1236	***0.1163***
TS	*0.3626*	0.3660	0.3897	***0.4005***	*0.4229*	0.3989	0.4263	***0.4377***
*F*1	*0.5322*	0.5358	0.5608	***0.5720***	0.5944	*0.5703*	0.5978	***0.6089***
TSS	0.5680	0.5724	***0.5737***	*0.5640*	***0.5541***	0.5400	0.4870	*0.4834*
HSS	*0.4360*	0.4401	0.4641	***0.4732***	***0.4928***	*0.4670*	0.4797	0.4885