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Supplement of

Residential flood loss estimated from Bayesian multilevel models

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Table S1. Comparison of candidate models of each variants by their difference in the expected log pointwise predictive density (elpd) to first model (fit1) and the standard error of the differences; model candidates with cumulative predictors from 1 to 12

Single-level				Flood Type				Region				Event				Predictors
Model	elpd_ loo	elpd_ diff	se_ diff	Model	elpd_ loo	elpd_ diff	se_ diff	Model	elpd_ loo	elpd_ diff	se_ diff	Model	elpd_ loo	elpd_ diff	se_ diff	
fit1	1986.4	0	0	fit1	2018.68	0	0	fit1	2002.60	0	0	fit1	2036.28	0	0	WD
fit2	2033.8	47.34	9.56	fit2	2057.33	38.65	8.72	fit2	2041.76	39.16	8.60	fit2	2074.17	37.89	8.55	WD+BA
fit3	2079.6	93.15	13.88	fit3	2093.22	74.54	12.45	fit3	2085.28	82.67	13.14	fit3	2109.95	73.67	13.26	WD+BA+Con
fit4	2092.3	105.81	15.3	fit4	2098.06	79.37	12.84	fit4	2094.31	91.71	14.49	fit4	2122.40	86.13	14.51	WD+BA+Con+Dur
fit5	2109.8	123.33	16.11	fit5	2113.37	94.69	13.62	fit5	2107.96	105.36	15.14	fit5	2126.39	90.11	14.95	WD+BA+Con+Dur+Pre
fit6	2118.1	131.61	16.41	fit6	2124.02	105.34	14.10	fit6	2111.94	109.33	15.50	fit6	2130.38	94.11	15.46	WD+BA+Con+Dur+Pre+Ins
fit7	2122.9	136.47	16.68	fit7*	2127.00	108.32	14.50	fit7	2115.93	113.32	15.68	fit7*	2132.51	96.23	15.72	WD+BA+Con+Dur+Pre+Ins+Eff
fit8*	2122.0	135.54	16.65	fit8*	2125.44	106.76	14.53	fit8*	2115.38	112.78	15.66	fit8*	2130.47	94.19	15.69	WD+BA+Con+Dur+Pre+Ins+Eff+Eme
fit9*	2124.0	137.5	16.93	fit9*	2126.19	107.51	14.82	fit9*	2117.35	114.75	16.19	fit9*	2132.64	96.36	15.43	WD+BA+Con+Dur+Pre+Ins+Eff+Eme+Cel
fit10*	2125.1	138.69	16.88	fit10*	2125.88	107.20	14.78	fit10*	2120.50	117.90	16.25	fit10*	2133.34	97.06	15.64	WD+BA+Con+Dur+Pre+Ins+Eff+Eme+Cel+Vel
fit11	2130.5	144.02	16.91	fit11	2131.83	113.15	15.11	fit11*	2122.01	119.40	16.23	fit11*	2133.62	97.34	15.61	WD+BA+Con+Dur+Pre+Ins+Eff+Eme+Cel+Vel+Exp
fit12	2134.6	148.14	16.99	fit12*	2134.26	115.58	15.26	fit12*	2125.23	122.62	16.26	fit12*	2134.36	98.08	15.72	WD+BA+Con+Dur+Pre+Ins+Eff+Eme+Cel+Vel+Exp+BQ

* model complexity after which little gain is observed (elpd_diff <4)

Table S2. Comparison of candidate models of each variants by their difference in the expected log pointwise predictive density (elpd) to the reference model fit6 (by each model variant) and the standard error of the differences; model candidates with predictors 1 to 6 plus one of the remaining predictors

Single-level				Flood Type				Region				Event				Predictors (for Event model variant)
Model	elpd_loo	elpd_diff	se_diff	Model	elpd_loo	elpd_diff	se_diff	Model	elpd_loo	elpd_diff	se_diff	Model	elpd_loo	elpd_diff	se_diff	
fit6+8	2117.3	-0.8	0.2	fit6+8	2122.3	-1.7	0.5	fit6+8	2111.7	-0.3	1.1	fit6+8	2129.0	-1.4	0.4	WD+BA+Con+Dur+Pre+Ins+Eme
fit6	2118.1	0	0	fit6+10	2123.2	-0.9	1.4	fit6	2111.9	0	0	fit6+11	2130.0	-0.3	1.7	WD+BA+Con+Dur+Pre+Ins+Exp
fit6+10	2118.9	0.8	2.1	fit6	2124.0	0	0	fit6+12	2113.2	1.2	2.4	fit6	2130.4	0	0	WD+BA+Con+Dur+Pre+Ins
fit6+9	2119.9	1.9	2.6	fit6+12	2124.2	0.2	2.0	fit6+9	2114.7	2.7	3.3	fit6+10	2131.1	0.7	2.1	WD+BA+Con+Dur+Pre+Ins+Vel
fit6+12	2121.3	3.3	2.9	fit6+9	2124.4	0.3	2.0	fit6+11	2115.0	3.1	2.8	fit6+12	2131.2	0.8	2.1	WD+BA+Con+Dur+Pre+Ins+BQ
fit6+7 *	2122.9	4.9	3.6	fit6+7	2127.0	3.0	3.5	fit6+10	2115.6	3.6	3.2	fit6+9	2132.1	1.7	3.0	WD+BA+Con+Dur+Pre+Ins+Cel
fit6+11*	2123.0	5.0	3.3	fit6+11*	2130.8	6.7	3.9	fit6+7*	2115.9	4.0	3.4	fit6+7	2132.5	2.1	3.0	WD+BA+Con+Dur+Pre+Ins+Eff

* model with relevant improvement compared to others (elpd_diff > 4 and elpd_diff > se_diff)

Table S3. Comparison of candidate models of each variants by their difference in the expected log pointwise predictive density (elpd) to the reference model (fit6) and the standard error of the differences; model candidates with predictors 1 to 5 plus a combination of predictors 6, 7, and 11

Single-Level				Flood Type				Region				Event				Predictor (for Event variant)
Model	elpd_diff	se_diff	elpd_loo	Model	elpd_diff	se_diff	elpd_loo	Model	elpd_diff	se_diff	elpd_loo	Model	elpd_diff	se_diff	elpd_loo	
fit5+7*	-3.6	5.7	2114.5	fit5+7	-6.2	6.1	2117.8	fit5+11*	-0.9	4.2	2111.0	fit5+11	-4.3	4.0	2126.1	WD+BA+Con+Dur+Pre+Exp
fit5+11*	-3.1	5.5	2115.0	fit5+11*	-3.5	6.4	2120.5	fit5+7*	-0.2	4.7	2111.7	fit5+7*	-2.3	4.6	2128.1	WD+BA+Con+Dur+Pre+Eff
fit6*	0	0	2118.1	fit6*	0	0	2124.0	fit6*	0	0	2111.9	fit5+7+11*	-1.4	5.0	2129.0	WD+BA+Con+Dur+Pre+Eff+Exp
fit5+7+11*	1.6	6.7	2119.7	fit5+7+11*	0.1	7.4	2124.1	fit5+7+11*	2.3	5.5	2114.2	fit6+11*	-0.3	1.7	2130.0	WD+BA+Con+Dur+Pre+Ins+Exp
fit6+7	4.9	3.5	2122.9	fit6+7*	3.0	3.5	2127.0	fit6+11*	3.1	2.8	2115.0	fit6*	0	0	2130.4	WD+BA+Con+Dur+Pre+Ins
fit6+11	5.0	3.3	2123.0	fit6+11	6.7	3.9	2130.8	fit6+7	4.0	3.4	2115.9	fit6+7+11*	1.5	3.5	2131.9	WD+BA+Con+Dur+Pre+Ins+Eff+Exp
fit6+7+11	9.6	4.8	2127.6	fit6+7+11	9.6	5.4	2133.6	fit6+7+11	6.4	4.3	2118.3	fit6+7*	2.1	3.0	2132.5	WD+BA+Con+Dur+Pre+Ins+Eff

*models with predictive accuracy that is indistinguishable from that of the reference model fit6

Table S4. Central values of each variable per event grouped by similarity after post hoc tests with a significance of 0.05 (central value is the average of numeric Variables, the mode of nominal variables)

EVENT	2002		2005		2006		2010		2011		2013	
n	1697		305		156		440		218		1652	
Water depth	64.212	a	-19.351	b	18.816	b,c	24.669	c	-23.271	b,c	53.526	d
Duration	142.89	a	52.371	b	146.18	c	57.962	b	101.21	a	206.04	d
Velocity	32.326	a	29.304	a,b	26.533	b,c	33.535	a	23.876	b,c	24.833	c
Contamination	0.67265	a	0.27	b	0.35099	b,c	0.54801	d	0.25463	b,c	0.45702	c
Loss ratio	0.12262	a	0.040601	b	0.069922	b,c	0.077278	c	0.019505	d	0.11732	a

(a–d) Notation of subsamples that are statistically similar to each other; same letters mean similar subsamples; two letters next to a central value means it is similar to both letters' groups (see text for reading example).