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Mechanisms and scenarios of the unprecedent flooding event in South Brazil 2024

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Supplementary Material

Table S1. Gauge (upstream) and Tide (downstream) stations description. The stations were used to define the boundary conditions of the 2D hydrodynamic model.

Boundary condition	Section	Gauge/Tide station	Source	Longitude	Latitude
Upstream	Taquari River	Estrela (86879300)	ANA	-51.962	-29.473
	Jacuí River	Rio Pardo (85900000)	ANA	-52.375	-29.995
	Caí River	Barca do Caí (87170000)	ANA	-51.383	-29.590
	Gravataí River	Passo das Canoas (87399000)	ANA	-50.977	-29.964
	Sinos River	Campo Bom (87380000)	ANA	-51.046	-29.691
	Camaquã	Passo do Mendonça (87905000)	ANA	-52.052	-31.011
Downstream	Patos lagoon	Rio Grande 2	SIMCosta	-52.094	-32.167

Table S2: Set of Manning's values evaluated for the 2D hydrodynamic model. Values were based on pre-evaluated values from previous studies.

	Main channel							Floodplain						
Group	Taquari River	Jacuí River	Guaíba River	Sinos River	Gravataí River	Caí River	Patos Lagoon	Taquari River	Jacuí River	Guaíba River	Sinos River	Gravataí River	Caí River	Patos Lagoon
1	0.03	0.035	0.035	0.02	0.025	0.035	0.025	0.11	0.06	0.08	0.12	0.10	0.150	0.08
2	0.025	0.03	0.03	0.015	0.02	0.03	0.02	0.105	0.055	0.075	0.115	0.095	0.145	0.075
3	0.035	0.04	0.04	0.025	0.03	0.04	0.03	0.115	0.065	0.085	0.125	0.105	0.140	0.085
4	0.04	0.045	0.045	0.03	0.035	0.045	0.035	0.12	0.07	0.09	0.13	0.11	0.150	0.09
5	0.05	0.055	0.055	0.04	0.045	0.055	0.045	0.13	0.08	0.1	0.14	0.12	0.145	0.10
6	0.02	0.025	0.025	0.01	0.015	0.025	0.015	0.1	0.05	0.07	0.11	0.09	0.140	0.07
7	0.04	0.045	0.045	0.03	0.035	0.045	0.035	0.12	0.07	0.09	0.13	0.11	0.150	0.09
8	0.01	0.015	0.015	0.02	0.005	0.015	0.005	0.09	0.04	0.06	0.10	0.08	0.145	0.06
9	0.02	0.025	0.025	0.01	0.015	0.025	0.015	0.1	0.05	0.07	0.11	0.09	0.140	0.07

Figure S1: Results of Root Mean Square Error (RMSE) and Bias for the Manning's groups evaluated for the study.

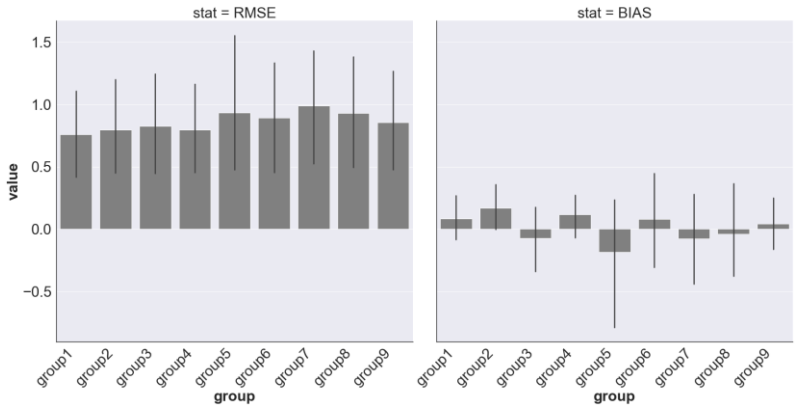

Table S3. Gauge station used for validation of the model as well as its location.

Gauge station	Section	Longitude	Latitude
Bom Retiro Montante (86881000)	Taquari River	-51.951	-29.608
Taquari (86950000)		-51.876	-29.806
Porto Mariante (86895000)		-51.970	-29.692
São Jerônimo (87035000)	Jacuí River	-51.696	-29.941
Corsan (87401750)	Gravataí River	-51.036	-29.968
Passo Montenegro (87270000)	Caí River	-51.441	-29.701
São Leopoldo (87382000)	Sinos River	-51.148	-29.758
Cais Mauá (87450004)	Guaíba River	-51.241	-30.034
CatSul – Guaíba (87242000)		-51.311	-30.107
São Lourenço (87921000)	Patos Lagoon	-51.958	-31.377
Laranjal (87955000)		-52.225	-31.772
Rio Grande - FURG (87991100)		-52.101	-32.027

Note. After May 2, gauge station 87450004 was damaged by the flood and was temporarily replaced by a new gauge (87444000), located 2 km downstream.

Table S4: Gauge station used for calibration of the model as well as its location. Source: Silva et al. (2024) and Andrade et al. (2024).

Date	Streamflow (m^3/s)	Cross section
5 May 2024	30,180	Ponta da cadeia
6 May 2024	29,852	Ponta da cadeia
9 May 2024	23,000	Ponta do Dionísio
15 May 2024	22,069	Ponta do Dionísio
22 May 2024	8,355	Ponta do Dionísio
31 May 2024	7,989	Ponta do Dionísio