AGU PUBLICATIONS

Water Resources Research

Supporting Information for

The Timing of Global Floods and its Association with Climate and Topography

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a)

cluster	Ltweight (scaled)	IAweight (scaled)	STweight (scaled)
1	-0.313	1.791	-0.944
2	2.164	-0.463	-0.82
3	-0.405	-0.627	1.142
4	-0.271	-0.033	-0.388

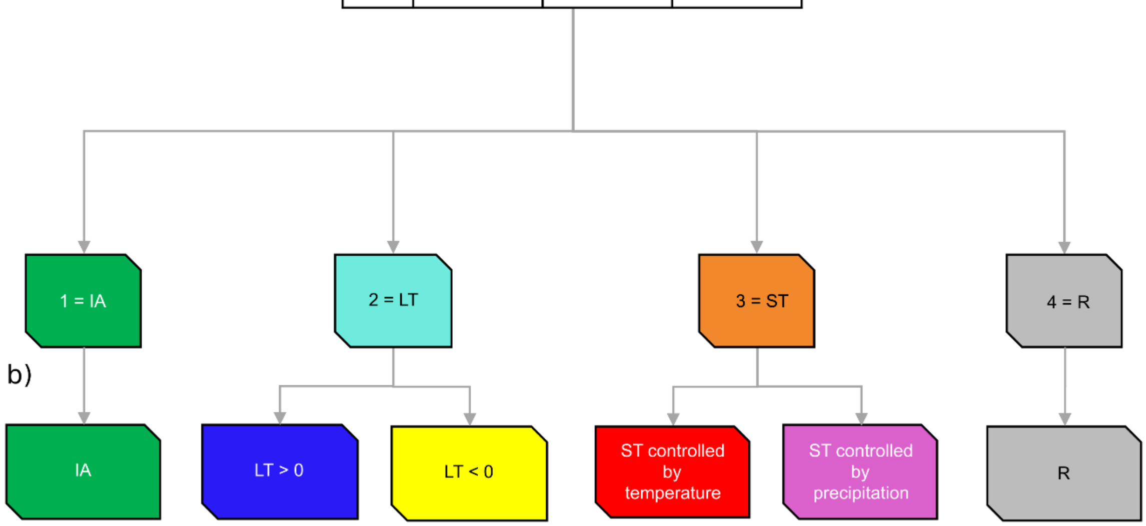

Figure S1. Flood timing classification based on the apportionment of long-term, interannual, and seasonal fluctuations to total temporal variance, and on the direction of change or the main driver of seasonality, where relevant. (a) interpretation of the four resulting classes from a K-means clustering algorithm based on their disposition along the scaled dimensions; (b) further division of long-term and seasonally dominated regimes. The order of the cluster classes shown is random as it changes between runs of the clustering algorithm.

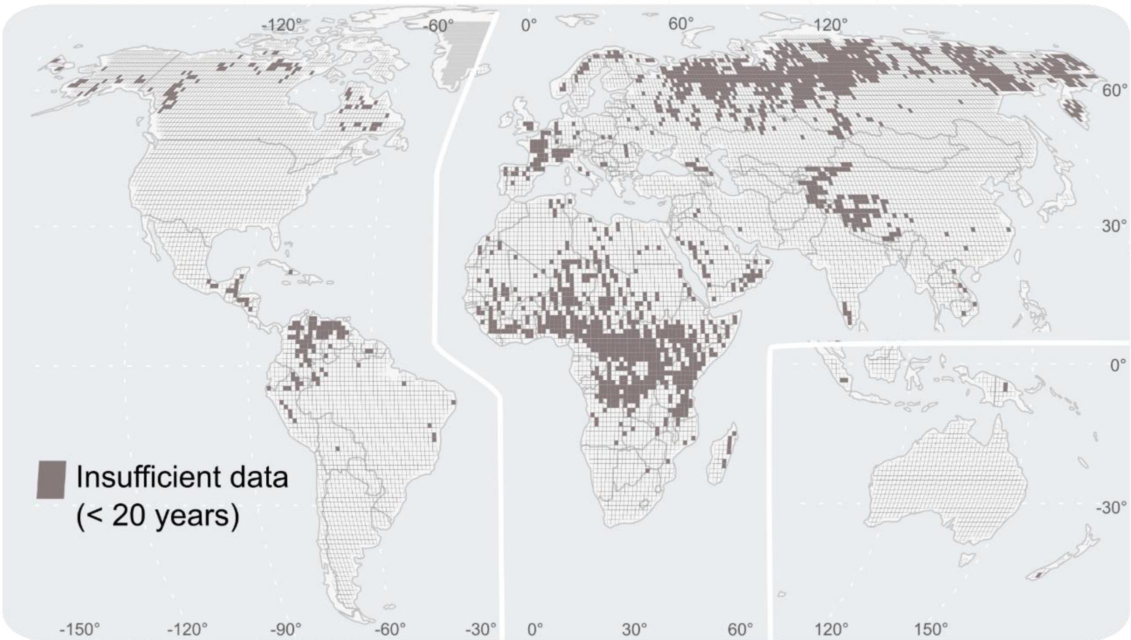

Figure S2. Location of "blind spots" for which we could not explore long-term trends due to the poor availability of remotely sensed time series.

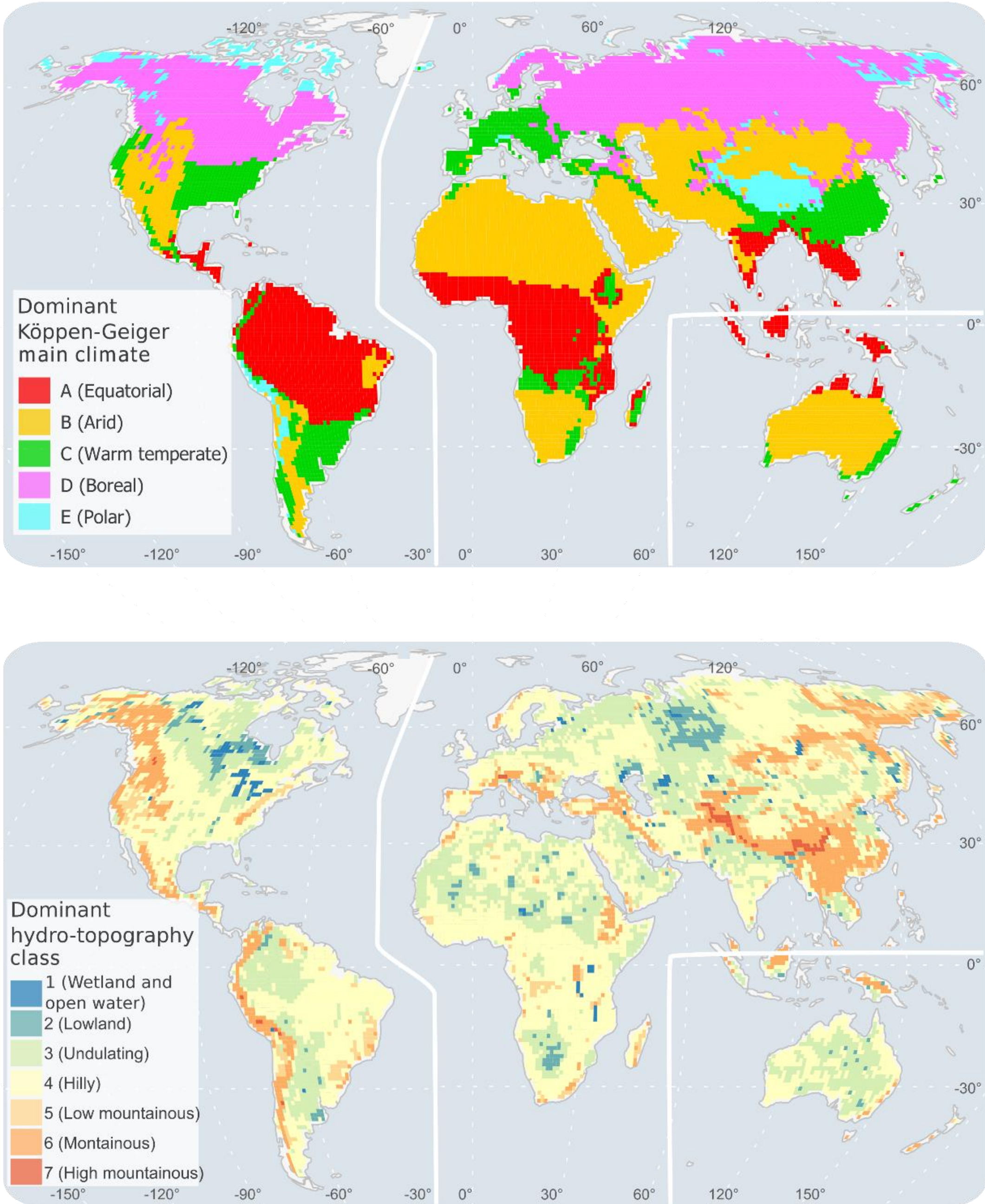

Figure S3. Dominant Köppen-Geiger main climate class (top) and hydro-topography class (bottom) per 1-degree gridded cell.

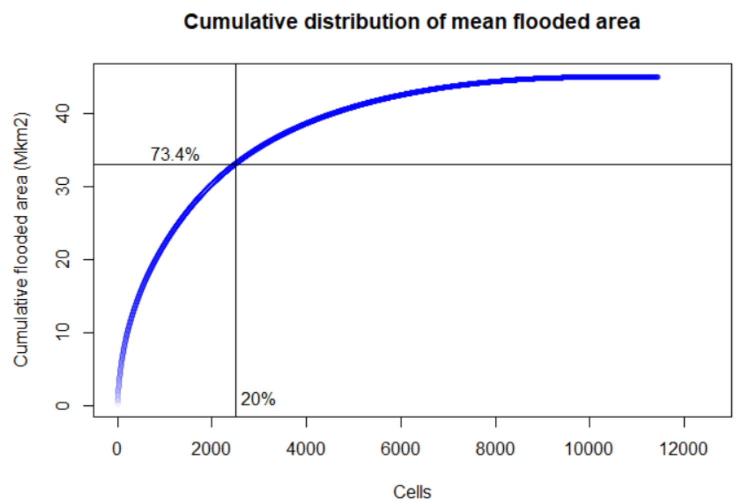

Figure S4. Cumulative histogram of flooded area (in MKm^2) across 1-degree landscape cells.

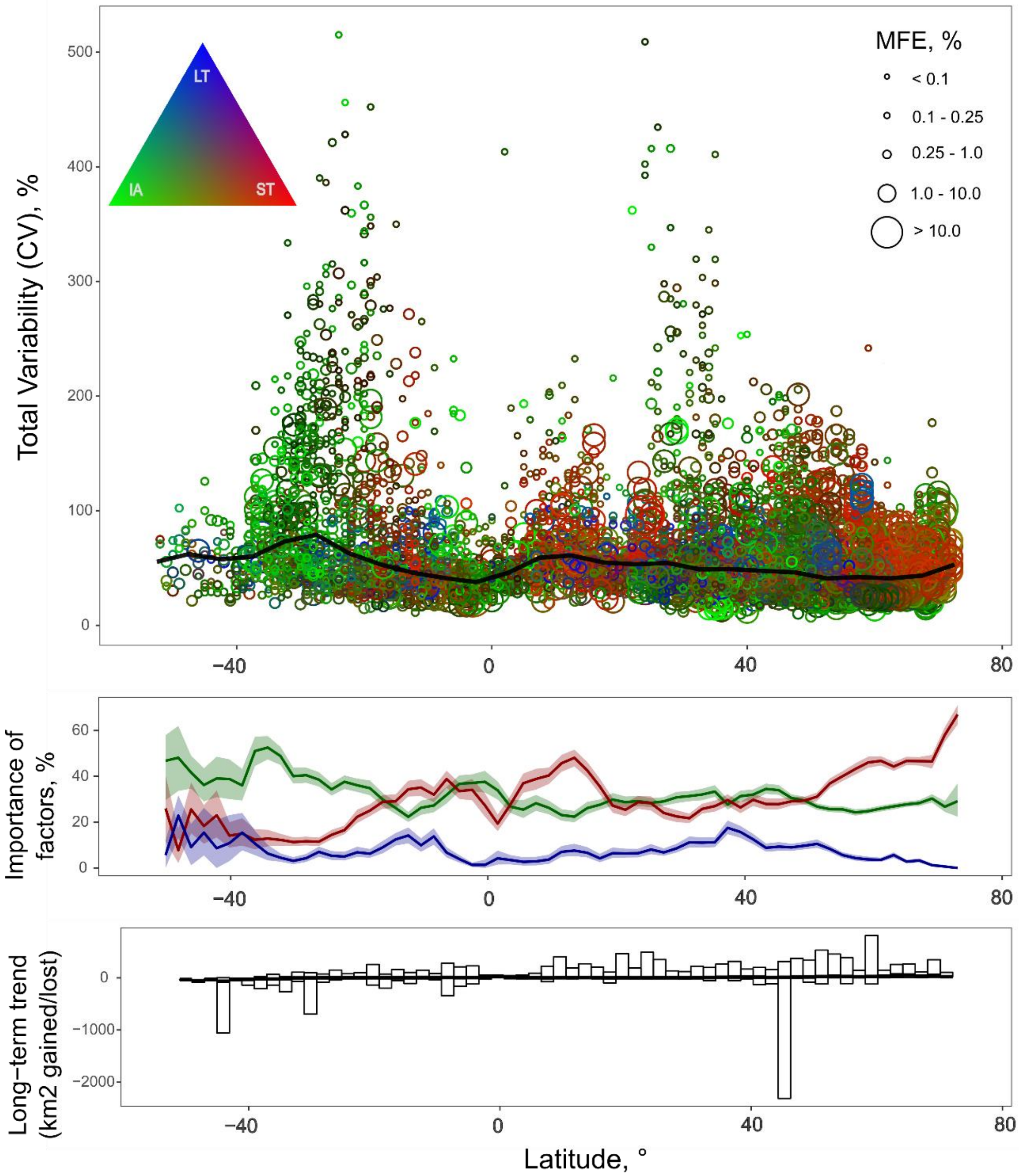

Figure S5. Latitudinal distribution of the variables mapped in Figure 3. (A) total variability, where bubble size indicates mean flooded extent (MFE) and color shows the dominant temporal component of variance. The black line corresponds to median variability binned by two latitudinal degrees. (B) median percentage explained by each component binned by two latitudinal degrees. (C) magnitude of change range (95% confidence interval) in cells dominated by a long-term trend component, binned by two latitudinal degrees. The black line corresponds to the median change magnitude binned by two latitudinal degrees.

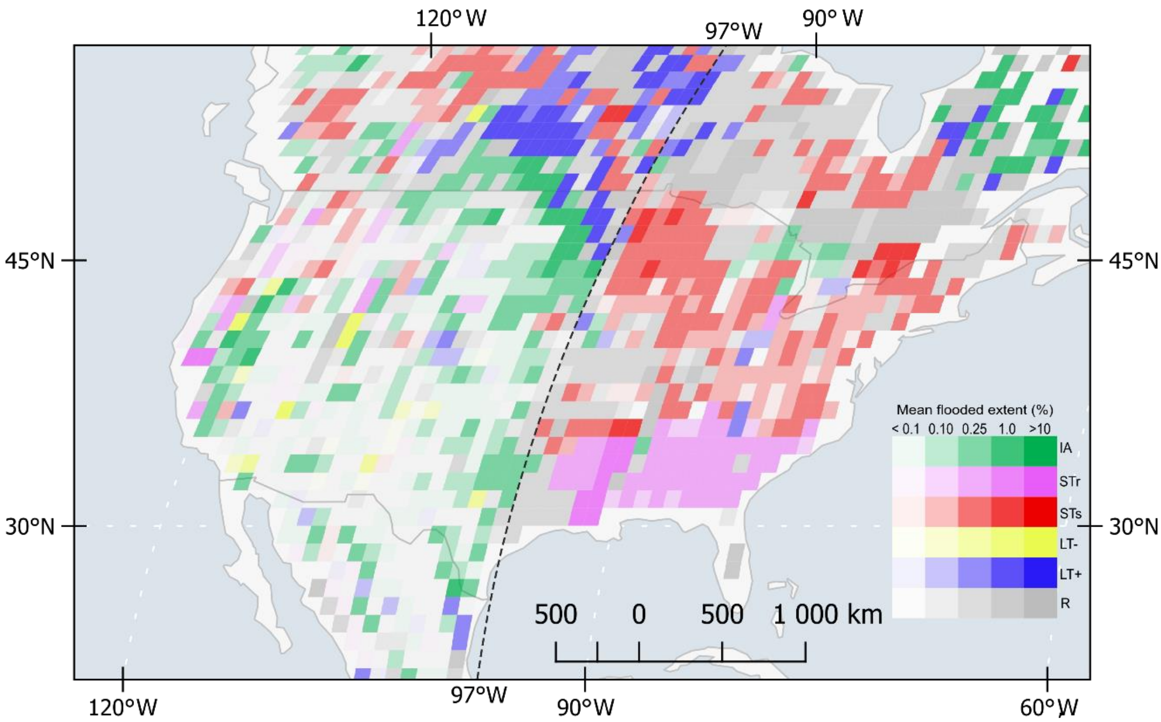

Figure S6. Extract from Figure 4 showing the transition from seasonal- to interannual-dominated flood timings in the contiguous United States.

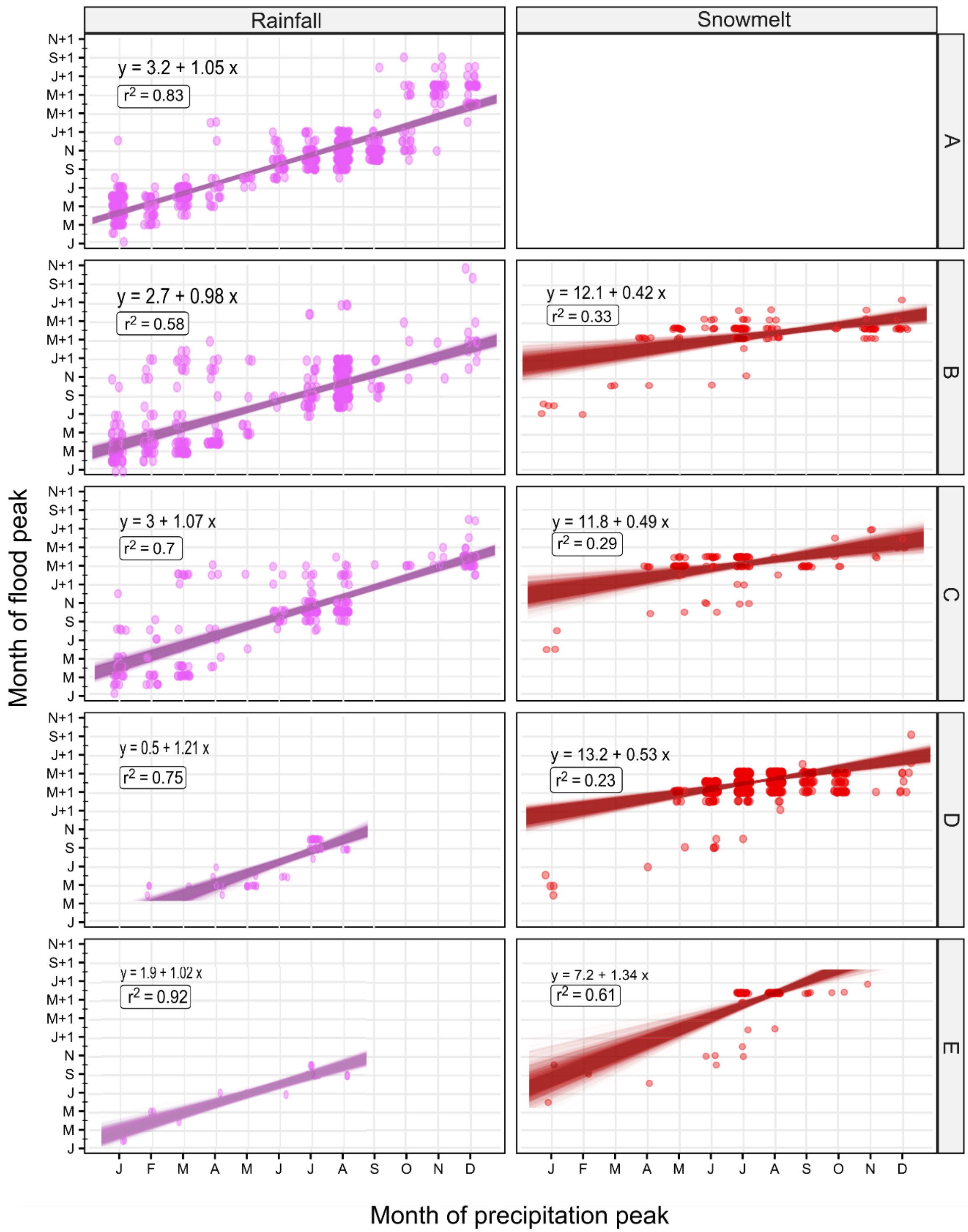

Figure S7. Bootstrapped linear regressions, based on 5000 permutated samples, of flood peak timing in response to precipitation peak timing (in months) across main Köppen-Geiger climates (A = Equatorial, B = Arid, C = warm Temperate, D = Boreal, and E = Polar), differentiating rainfall-driven floods (magenta) from snowmelt-driven floods (red). Where floods peak on the following calendar year in respect to precipitation, “+1” is indicated. Jitter does not suggest exact dates but is used for a better display of the data.

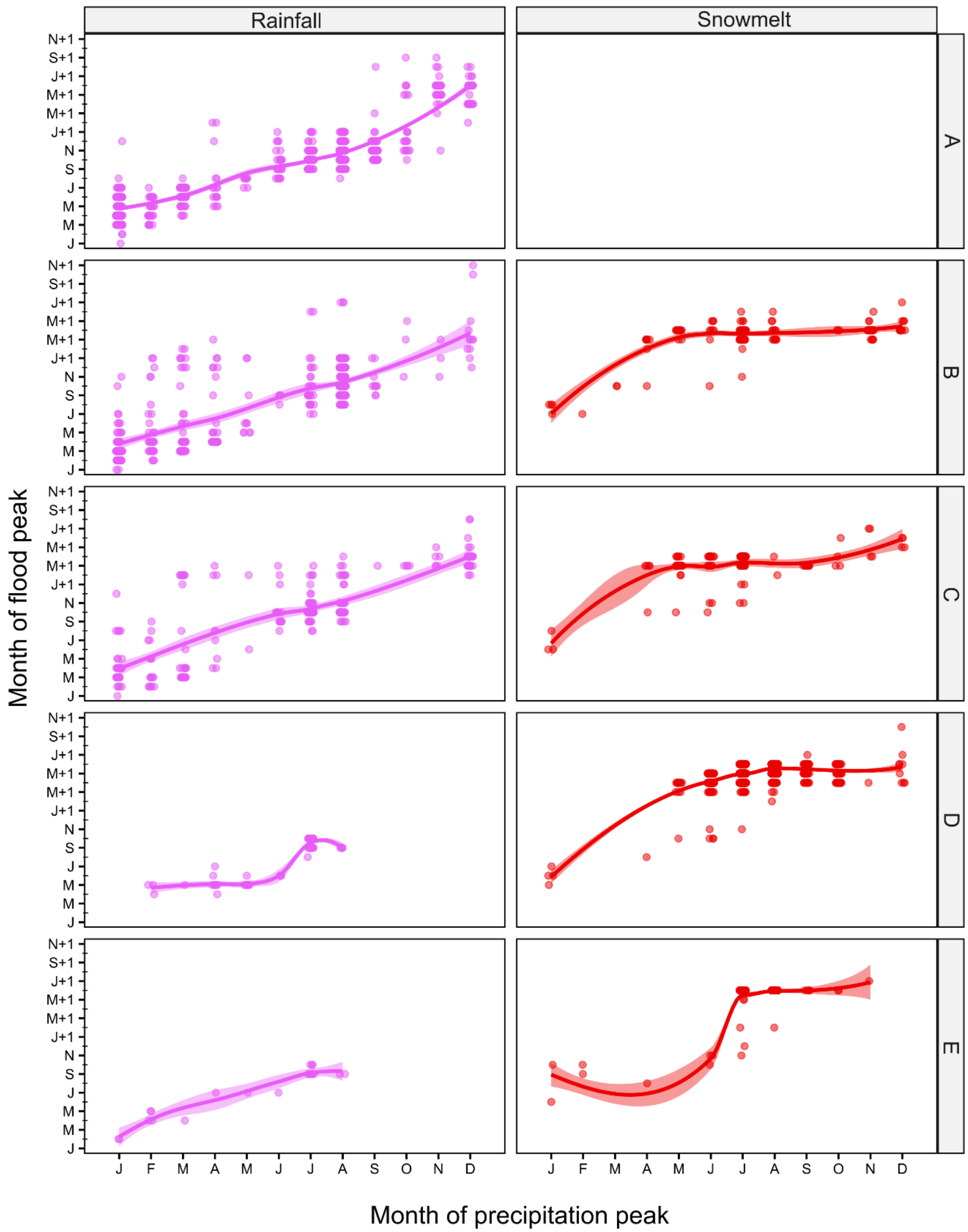

Figure S8. LOESS-smoothed functions of flood peak timing in response to precipitation peak timing (in months) across main Köppen-Geiger climates (A = Equatorial, B = Arid, C = warm Temperate, D = Boreal, and E = Polar), differentiating rainfall-driven floods (magenta) from snowmelt-driven floods (red). Where floods peak on the following calendar year in respect to precipitation, "+1" is indicated. Jitter does not suggest exact dates but is used for a better display of the data.

	A	B	C	D	E	Flooded area	Land area
1	0.000	0.012	0.001	0.006	0.000	4.31%	0.99%
2	0.004	0.004	0.005	0.022	0.000	7.69%	3.50%
3	0.032	0.041	0.024	0.077	0.003	39.45%	27.40%
4	0.045	0.033	0.025	0.062	0.009	38.72%	48.48%
5	0.002	0.002	0.004	0.005	0.002	3.14%	5.79%
6	0.004	0.003	0.011	0.008	0.004	6.51%	12.53%
7	0.000	0.000	0.000	0.000	0.000	0.17%	0.60%
Flooded area	19.31%	21.07%	15.68%	40.00%	3.93%		
Land area	20.39%	35.49%	14.42%	24.77%	4.94%		

Table S1. Summary of flooded area extent (in MKm^2) across main Köpper-Geiger climate classes (A = Equatorial, B = Arid, C = warm Temperate, D = Boreal, and E = Polar) and hydro-topography classes (1 = open water and wetland, 2 = lowland, 3 = undulating, 4 = hilly, 5 = low mountainous, 6 = mountainous, 7 = high mountainous), as well as fraction of total flooded and total land area aggregated by climate or hydro-topography. The reader is referred to Figure S3 for the distribution of the different climatic and hydro-topographic dominating 1-degree cells.