

Supplementary table 1. Downstream amplification: Lower-reach runoff (e.g., Huayuankou 50.97 billion m³) exceeds upper reach (e.g., Tangnaihai 10.58 billion m³) by 4.8× in peak years.

Hydrological Station	Hydrological variable	Year																							
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Tangnaihai	Runoff (100 million m³)	154.5	138.1	<u>105.8</u>	171.6	151.3	255	141.3	189	174.6	263.5	197.1	211.2	284.1	194.6	196.6	151.6	136.4	186.1	291.5	310.3	321.6	222.9	170.9	220.7
	Sediment transport (100 million t)	0.0526	0.067	0.081	0.137	0.09	0.111	0.029	0.047	<u>0.028</u>	0.104	0.157	0.08	0.174	0.111	0.064	0.037	0.042	0.073	0.211	0.172	0.188	0.096	0.075	0.125
	Sediment content (kg/m³)	0.34	0.482	0.764	0.798	0.594	0.435	0.207	0.248	<u>0.158</u>	0.395	0.797	0.378	0.612	0.57	0.323	0.241	0.308	0.391	0.724	0.554	0.585	0.432	0.44	0.566
Lanzhou	Runoff (100 million m³)	-	235.6	235.6	<u>219.7</u>	238.5	291.1	298.9	307	285.1	304.7	314	284.1	380.4	328.8	309.3	267.2	235.6	255.5	441.8	477.3	504.5	353.1	301.9	294
	Sediment transport (100 million t)	-	0.217	0.171	0.294	0.195	0.247	0.27	0.314	0.134	0.079	0.122	0.101	0.372	0.134	0.121	0.094	0.154	0.089	0.96	0.21	0.152	<u>0.058</u>	0.247	0.084
	sediment content (kg/m³)	-	0.924	0.727	1.34	0.818	0.849	0.903	1.02	0.47	<u>0.26</u>	0.389	0.356	0.978	0.408	0.391	0.353	0.654	0.347	2.17	0.44	0.301	0.163	0.818	0.286
Toudaoguai	Runoff (100 million m³)	140.2	113.3	122.8	115.6	127.6	150.2	174.9	189.3	164.1	169.6	191.2	162.9	286.2	209.8	175.8	142	<u>113.1</u>	127.9	324.9	353	369.8	222.1	170.2	173.4
	Sediment transport (100 million t)	0.284	0.2	0.268	0.279	0.239	0.404	0.635	0.719	0.476	0.457	0.593	0.391	0.747	0.604	0.4	0.2	<u>0.163</u>	0.188	0.997	1.44	1.41	0.461	0.296	0.239
	sediment content (kg/m³)	2.03	1.76	2.19	2.41	1.87	2.69	3.63	3.8	2.9	2.69	3.1	2.4	2.61	2.88	2.28	1.41	1.44	1.47	3.07	4.08	3.81	2.08	1.74	<u>1.38</u>
Longmen	Runoff (100 million m³)	157.2	<u>139.4</u>	156.6	162.3	158.5	169.2	199.6	205.9	177.6	178.3	207.3	169.4	295.7	243.3	195.3	155.5	139.6	146.7	341.2	380	376.7	237.2	188.8	180
	Sediment transport (100 million t)	2.19	2.364	3.352	1.857	2.327	1.214	1.8	1.44	0.584	0.568	0.778	0.484	1.84	1.86	<u>0.378</u>	0.516	1.19	1.07	3.24	1.25	2.01	0.763	1.71	0.472
	Sediment content (kg/m³)	13.9	17	21.4	11.4	14.7	7.17	9.02	6.99	3.29	3.19	3.75	2.86	6.22	7.64	<u>1.94</u>	3.32	8.52	7.29	9.54	3.29	5.34	3.22	9.06	2.62
Tongguan	Runoff (100 million m³)	186	<u>159</u>	174.7	261.4	197.3	230.8	233.4	250.4	204.8	206.5	262.5	259.6	351.4	304.5	235.1	197.2	165	197.7	414.6	415.6	469.6	395.1	263.8	270.3
	Sediment transport (100 million t)	3.41	3.423	4.496	6.179	2.993	3.28	2.47	2.54	1.3	1.12	2.27	1.32	2.06	3.05	0.691	<u>0.55</u>	1.08	1.3	3.73	1.68	2.4	1.71	2.03	0.953
	sediment content (kg/m³)	18.3	21.6	25.7	23.6	15.2	14.2	10.6	10.1	6.3	5.42	8.65	5.08	5.86	10	2.94	<u>2.79</u>	6.55	6.58	9.01	4.04	5.11	4.33	7.7	3.53
Huayuankou	Runoff (100 million m3)	<u>165.3</u>	165.5	195.6	272.7	240.5	257	281.1	269.7	236.1	232.2	276.3	287.1	388	327.5	231	247.6	178.8	193.5	448	457.6	487.1	509.7	321.7	307.1
	Sediment transport (100 million t)	0.835	0.657	1.16	1.97	2.04	1.05	0.837	0.843	0.614	0.269	1.24	0.609	1.38	1.17	0.325	0.129	0.06	<u>0.058</u>	3.44	3.28	3.24	1.77	1.55	1.23
	Sediment content (kg/m³)	5.05	3.97	5.93	7.22	8.48	4.09	2.98	3.13	2.6	1.16	4.28	2.12	3.56	3.57	1.41	0.521	<u>0.3</u>	<u>0.3</u>	7.68	7.17	6.65	3.47	4.82	4.01
Gaocun	Runoff (100 million m³)	-	<u>129.5</u>	157.7	257.6	231	243.4	265.9	259.8	220.8	208.9	258.3	262.3	362.8	313.5	206.1	224.3	154.7	167	410.1	407.8	450.8	483.4	296.4	281.9
	Sediment transport (100 million t)	-	0.841	1.23	2.75	2.36	1.64	1.44	1.29	0.886	0.608	1.57	0.956	1.8	1.73	0.535	0.417	<u>0.177</u>	0.187	3.15	3.3	4.01	2.68	1.6	1.27
	Sediment content (kg/m³)	-	6.5	7.8	10.7	10.2	6.74	5.42	4.97	4.01	2.91	6.08	3.64	4.96	5.52	2.6	1.86	1.14	<u>1.12</u>	7.68	8.09	8.9	5.54	5.4	4.51
Aishan	Runoff (100 million m³)	-	<u>99.79</u>	107.9	240	233.7	245.4	246.6	248.7	197.1	187.9	242	238.6	336.5	290.8	180.7	196.5	133.5	142.2	376.3	369.5	419.9	480.4	292.3	266.2
	Sediment transport (100 million t)	-	0.596	1.017	3.63	2.71	2	1.65	1.52	0.945	0.635	1.69	1.13	1.99	1.89	0.578	0.535	<u>0.195</u>	0.209	3.17	3.17	3.72	2.67	1.51	1.13
	Sediment content (kg/m³)	-	5.97	9.43	15.1	11.6	8.15	6.69	6.11	4.79	3.38	6.98	4.74	5.91	6.5	3.2	2.72	<u>1.46</u>	1.47	8.42	8.58	8.86	5.56	5.17	4.24
Lijin	Runoff (100 million m³)	48.6	<u>46.53</u>	41.9	192.6	198.8	206.8	191.7	204	145.6	132.9	193	184.2	282.5	236.9	114.3	133.6	81.88	89.58	333.8	312.2	359.6	441.1	260.9	226.5
	Sediment transport (100 million t)	0.222	0.197	0.543	3.69	2.58	1.91	1.49	1.47	0.771	0.561	1.67	0.926	1.83	1.73	0.301	0.314	0.106	<u>0.077</u>	2.97	2.71	3.14	2.43	1.25	0.969
	Sediment content (kg/m³)	4.57	4.24	12.9	19.2	13	9.24	7.77	7.21	5.3	4.22	8.66	5.03	6.48	7.3	2.63	2.35	1.29	<u>0.86</u>	8.89	8.68	8.73	5.51	4.79	4.28

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The bolded numbers in the table represent the maximum values over the years, while the underlined data represents the minimum values over the years.