Table S1. Interannual Validation Results of the Global SDR Model for Turbidity Currents in Xiaolangdi Reservoir

Year	Inflow sediment concentration (kg/m^3)	Outflow sediment concentration (kg/m^3)	Inflow discharge (m^3/s)	Outflow discharge (m^3/s)	Water level (m)	Water surface width (m)	Calculated sediment delivery ratio	Measured sediment delivery ratio
2001	76.23	41.80	808.29	209.60	213.53	1188.15	52.98%	54.83%
2002	70.53	8.95	773.39	1775.00	230.86	1237.84	15.39%	12.70%
2003	45.78	1.30	773.25	243.67	225.79	1192.76	1.24%	2.84%
2004	105.50	4.69	547.28	2660.00	231.14	1245.27	1.99%	4.44%
2005	104.29	17.31	634.35	1554.30	224.43	1221.68	17.41%	16.60%
2006	66.53	6.71	73.51	2621.00	226.69	1227.06	2.32%	10.09%
2007	40.96	10.80	1629.11	2232.33	225.45	1196.01	45.08%	26.36%
2008	99.64	40.32	1359.80	2514.00	225.04	1204.18	19.36%	40.47%
2009	122.83	4.29	1062.75	2445.00	223.99	1197.31	0.87%	3.49%
2010	59.57	42.34	1252.00	1891.67	218.55	1168.34	30.57%	71.08%
2011	35.86	30.44	1361.00	1401.17	217.05	1153.52	110.76%	84.89%
2012	27.72	22.02	1817.50	2048.75	218.56	1159.91	58.34%	79.44%
2013	27.02	27.02	2092.36	2092.36	215.94	1137.02	113.47%	100.00%
2014	78.20	25.95	1887.40	2034.00	224.33	864.91	45.31%	33.18%
2015	37.92	25.95	1219.20	2174.00	234.95	1234.73	66.40%	68.42%
2016	67.84	45.58	2398.00	963.80	244.37	1264.35	71.30%	67.19%
2017	70.92	31.51	1815.56	2903.33	219.06	1246.27	37.22%	44.42%
2018	99.72	31.75	2052.73	2909.09	218.16	1165.68	28.90%	31.84%
2019	34.39	27.35	2233.33	3084.44	215.79	1008.23	90.22%	79.55%
2020	117.38	15.21	2131.00	2012.00	210.95	1184.63	11.83%	12.96%

Table S2. Validation of the Equation for the Equilibrium Local SDR of Turbidity Currents at the Flood-Event Scale in Xiaolangdi Reservoir from 2001 to 2020

Year	Velocity (m/s)	Sediment settling velocity (m/s)	Reservoir water level (m)	Hydraulic radius	Wetted perimeter (m)	Calculated sediment delivery ratio	Measured sediment delivery ratio
2001	0.0035	0.00012	213.53	56.01	1057.7	4.90%	14.22%
2002	0.0183	0.00028	230.86	76.39	1272.2	63.56%	61.68%
2003	0.0026	0.00016	225.79	86.49	1080.9	8.71%	0.89%
2003	0.0073	0.00016	244.37	74.76	1765.5	10.72%	20.00%
2004	0.0260	0.00039	231.14	80.92	1264.8	59.17%	42.23%
2005	0.0179	0.00028	224.43	68.85	1258.9	46.07%	40.68%
2006	0.0300	0.00132	226.69	69.23	1264.1	105.48%	100.90%
2007	0.0302	0.00025	225.45	49.77	1484.8	76.91%	69.58%
2008	0.0286	0.00150	225.04	70.45	1248.2	32.65%	34.71%
2009	0.0338	0.00156	223.99	59.65	1211.2	49.67%	35.30%
2010	0.0316	0.00189	218.55	49.89	1201.1	42.18%	47.67%
2011	0.0256	0.00060	217.05	46.01	1188.0	59.53%	58.69%
2012	0.0385	0.00156	218.56	44.48	1196.2	86.36%	89.55%
2013	0.0458	0.00138	215.94	41.50	1099.7	83.24%	74.09%
2014	0.0328	0.00150	224.33	58.34	1063.5	27.64%	35.76%
2015	0.0254	0.00156	234.95	77.14	1110.6	76.39%	87.02%
2016	0.0089	0.00189	236.96	75.30	1293.4	36.78%	48.31%
2017	0.0557	0.00060	219.06	50.59	1030.8	55.89%	71.04%
2018	0.0575	0.00156	218.16	49.42	1022.9	32.96%	45.12%
2019	0.0756	0.00138	215.79	40.72	1001.4	102.02%	109.86%
2020	0.0638	0.00060	210.95	32.33	975.8	21.35%	12.24%

Table S3. Validation of the Non-Equilibrium Local SDR of Turbidity Currents at the Interannual Scale in Xiaolangdi Reservoir from 2001 to 2020

Year	inflow sediment-carrying capacity (kg/m^3)	outflow sediment-carrying capacity (kg/m^3)	Particle size (m)	Sediment settling velocity (m/s)	Inflow velocity (m/s)	Outflow velocity (m/s)	Unit discharge (m^2/s)	Calculated sediment delivery ratio	Measured sediment delivery ratio
2001	3.78	0.48	0.000033	0.00012	1.992	0.0035	0.179	4.64%	14.22%
2002	2.17	0.70	0.000034	0.00028	0.371	0.0183	1.222	64.67%	61.68%
2003	0.98	0.41	0.000035	0.00016	0.051	0.0026	0.205	7.68%	0.89%
2003	4.06	0.63	0.000036	0.00010	2.287	0.0087	0.846	10.35%	20.00%
2004	0.76	0.65	0.000038	0.00039	0.025	0.0162	1.349	93.58%	42.23%
2005	0.80	0.71	0.000036	0.00028	0.029	0.0179	1.305	45.06%	40.68%
2006	0.84	0.71	0.000033	0.00132	0.036	0.0300	2.175	821.52%	100.90%
2007	1.07	0.86	0.000035	0.00025	0.083	0.0302	1.576	78.59%	69.58%
2008	0.86	0.79	0.000038	0.00150	0.042	0.0399	1.927	34.43%	34.71%
2009	1.63	0.73	0.000039	0.00156	0.301	0.0338	2.078	37.27%	35.30%
2010	0.92	0.73	0.000043	0.00189	0.059	0.0319	1.373	49.03%	47.67%
2011	0.96	0.79	0.000042	0.00040	0.059	0.0256	1.223	59.02%	58.69%
2012	1.06	0.78	0.000044	0.00156	0.084	0.0385	1.774	86.07%	89.55%
2013	1.06	0.84	0.000045	0.00138	0.088	0.0458	1.863	84.14%	74.09%
2014	1.08	0.73	0.000034	0.00150	0.068	0.0328	2.352	27.21%	35.76%
2015	0.97	0.65	0.000035	0.00156	0.054	0.0254	1.761	83.18%	87.02%
2016	0.85	0.52	0.000036	0.00189	0.038	0.0122	0.858	41.68%	48.31%
2017	1.05	0.95	0.000038	0.00060	0.075	0.0557	2.491	57.90%	71.04%
2018	1.21	0.87	0.000036	0.00156	0.108	0.0575	2.885	33.63%	45.12%
2019	1.16	0.98	0.000033	0.00138	0.095	0.0756	2.604	106.30%	109.86%
2020	1.15	1.03	0.000035	0.00060	0.095	0.0638	2.097	22.50%	12.24%