

# Multifrequency Downstream Hydraulic Geometry of Alluvial Mountain Rivers Located on the Qinghai–Tibet Plateau

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## Introduction

The Supporting Information includes one table and one figure. Tables S1 presents the basic information (locations, upstream contributing area, and distance to estuary, bed and bank material) for 129 cross sections. Figure S1 shows the nine scenarios of the convergence of DHG curves.

**Table S1.** Cross sections studied in this research and their locations, slopes, upstream contributing areas, recurrence intervals of bankfull discharge and bed/bank materials.

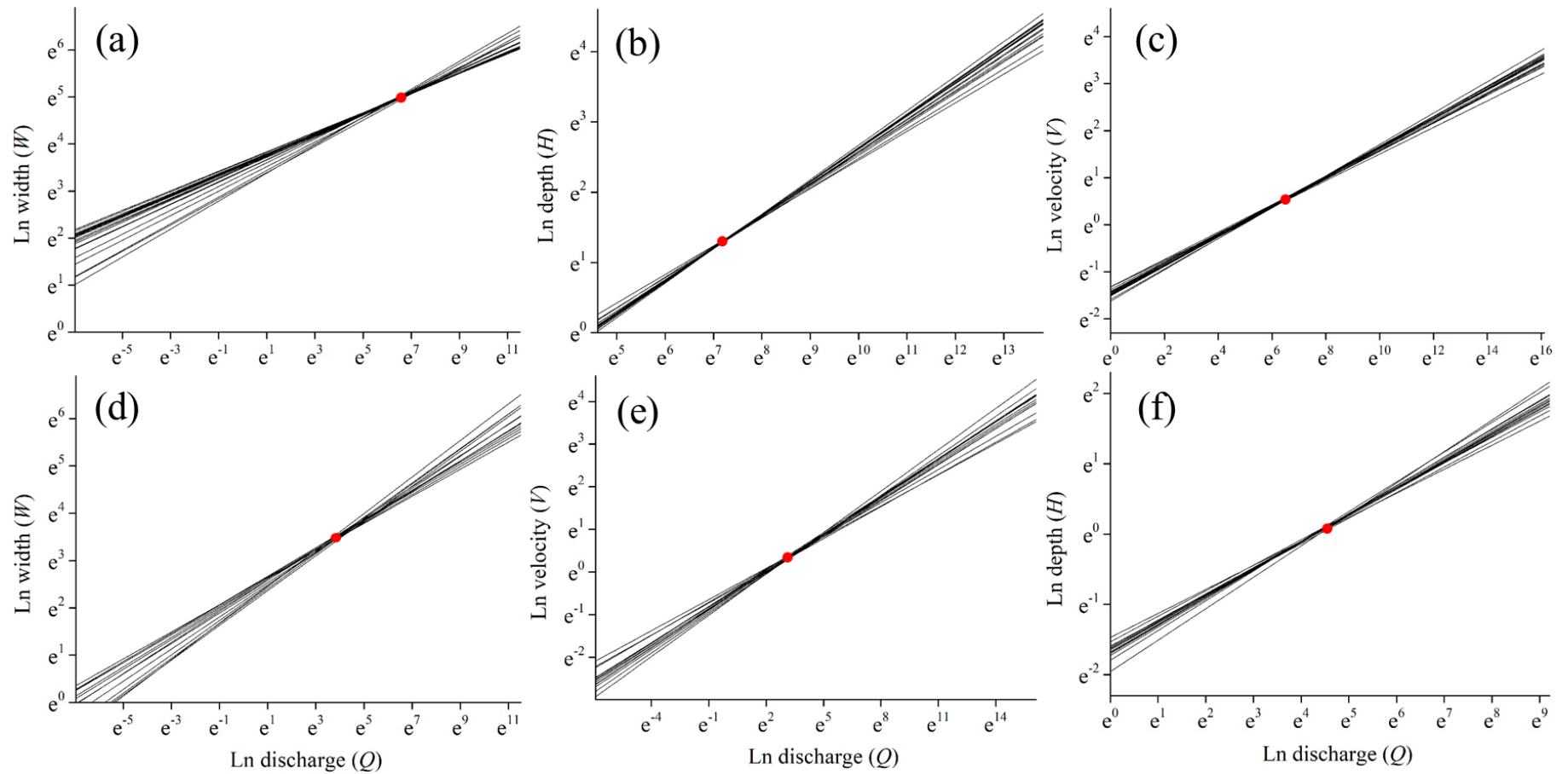
Cross section ID	River system	Full name of cross sections	Flow to	Longitude (°)	Latitude (°)	Altitude (m)	Slope (‰)	Contributing area (10 <sup>4</sup> km <sup>2</sup> )	Recurrence intervals of bankfull discharge	Remarks
1	Yellow River	Heilin River	Beichuan River	101.4	37.083	2760	13.95	0.028	1.63	Inside the QTP; bed: sandy gravel
2	Yellow River	Yellow River1	Bohai Sea	98.169	34.89	4214	2.46	2.093	2.05	Inside the QTP; bed: fine sand
3	Yellow River	Yellow River2	Bohai Sea	99.65	33.767	3959	1.99	4.502	1.15	Inside the QTP; bed: coarse sand
4	Yellow River	Yellow River3	Bohai Sea	101.046	33.767	3636	1.1	5.966	1.15	Inside the QTP; bed: sandy gravel
5	Yellow River	Yellow River4	Bohai Sea	102.083	33.958	3412	1.24	8.605	1.15	Inside the QTP; bed: sandy gravel
6	Yellow River	Yellow River5	Bohai Sea	100.651	34.688	3081	4.41	9.841	1.15	Inside the QTP; bed: sandy gravel
7	Yellow River	Yellow River6	Bohai Sea	100.15	35.5	2689	7.94	12.197	1.15	Inside the QTP; bed: sandy gravel
8	Yellow River	Yellow River7	Bohai Sea	101.405	36.045	2200	8.38	13.365	1.15	Inside the QTP; bed: sandy gravel
9	Yellow River	Yellow River8	Bohai Sea	102.45	35.868	1864	1.71	14.533	1.30	Inside the QTP; bed: sandy gravel
10	Yellow River	Yellow River9	Bohai Sea	103.333	35.933	1631	3.67	18.177	1.20	Transient region; bed: sandy gravel
11	Yellow River	Yellow River10	Bohai Sea	103.245	36.027	1619	3.26	18.282	2.05	Transient region; bed: sandy gravel
12	Yellow River	Yellow River11	Bohai Sea	103.817	36.067	1518	2.25	22.255	1.15	Transient region; bed: sandy gravel
13	Yellow River	Bayan Gou River	Yellow River	102.251	36.1	2796	18.83	0.022	1.72	Inside the QTP; bed: sandy gravel
14	Yellow River	Bai River	Yellow River	102.452	33.417	3428	2.22	0.537	7.19	Inside the QTP; bed: fine sand
15	Yellow River	Daxia River1	Yellow River	102.484	35.182	2957	7.94	0.169	1.27	Inside the QTP; bed: sandy gravel
16	Yellow River	Daxia River2	Yellow River	103.05	35.483	2040	8.01	0.614	1.27	Transient region; bed: sandy gravel
17	Yellow River	Daxia River3	Yellow River	103.26	35.636	1835	5.25	0.684	1.27	Transient region; bed: sandy gravel
18	Yellow River	Hei River1	Yellow River	102.935	33.601	3437	1.73	0.4	4.81	Inside the QTP; bed: fine sand and Rubble
19	Yellow River	Hei River2	Yellow River	102.263	33.99	3427	4.04	0.742	4.81	Inside the QTP; bed: fine sand
20	Yellow River	Huangshui River1	Yellow River	101.015	36.9	2995	4.93	0.138	2.28	Inside the QTP; bed: fine sand
21	Yellow River	Huangshui River2	Yellow River	101.267	36.682	2628	6.03	0.303	2.58	Inside the QTP; bed: fine sand
22	Yellow River	Huangshui River3	Yellow River	101.783	36.632	2226	2.73	0.902	2.34	Inside the QTP; bed: fine sand
23	Yellow River	Huangshui River4	Yellow River	102.424	36.474	1968	3.52	1.303	2.16	Inside the QTP; bed: fine sand
24	Yellow River	Huangshui River5	Yellow River	102.809	36.337	1761	6.32	1.534	2.34	Transient region; bed: sandy gravel
25	Yellow River	Longwu River	Yellow River	102.022	35.516	2482	10.46	0.283	1.43	Inside the QTP; bed: sandy gravel and pebble
26	Yellow River	Qingshui River	Yellow River	102.551	35.834	1884	22.47	0.069	2.02	Inside the QTP; bed: sandy gravel
27	Yellow River	Requ River	Yellow River	98.267	34.6	4209	3.02	0.645	2.15	Inside the QTP; bed: coarse sand
28	Yellow River	Shakequ River	Yellow River	101.491	33.433	3619	2.76	0.125	2.41	Inside the QTP; bed: sandy gravel

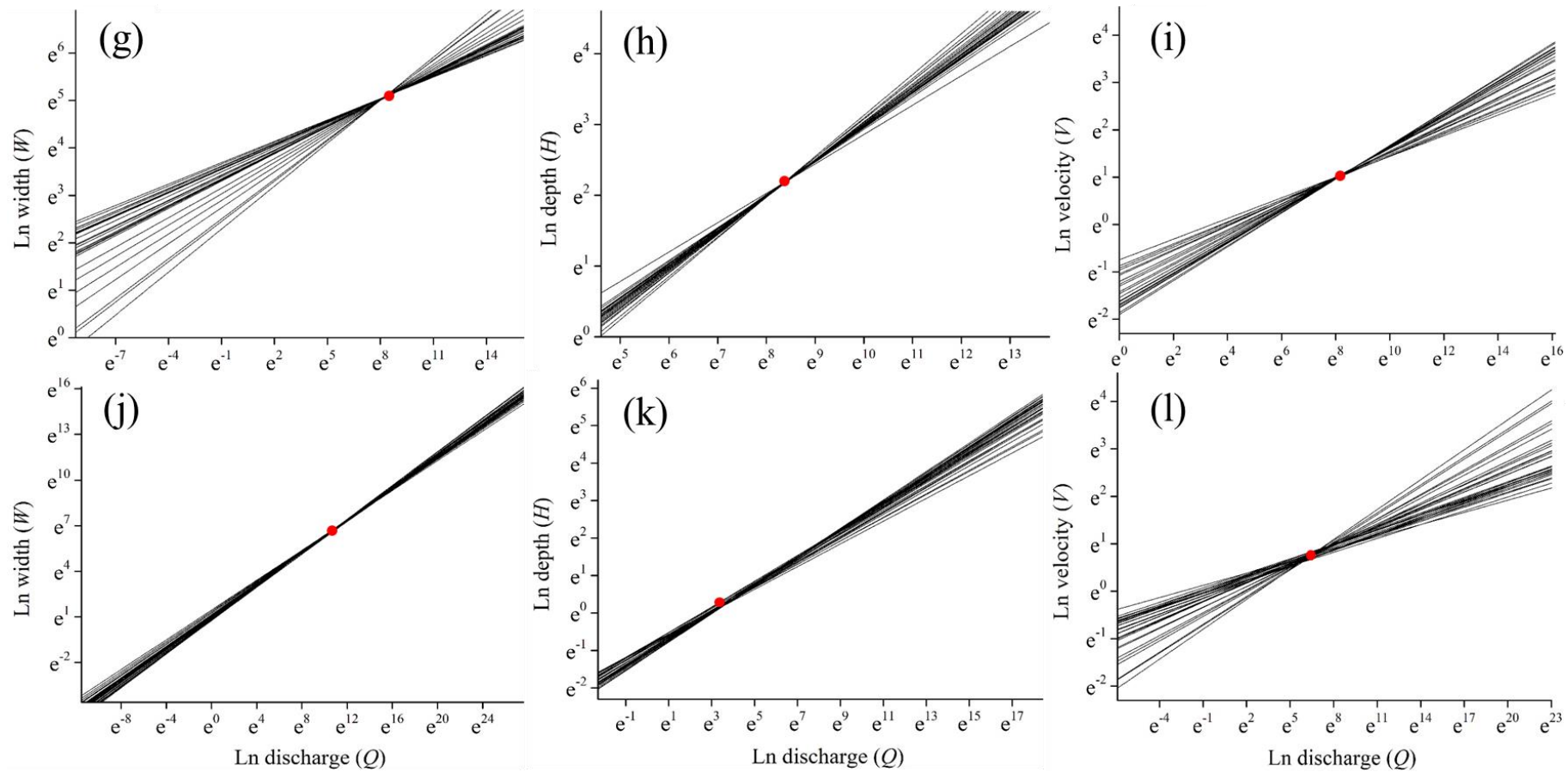
29	Yellow River	Tao River1	Yellow River	102.459	34.601	3121	5.63	0.504	4.85	Inside the QTP; bed: sandy gravel
30	Yellow River	Tao River2	Yellow River	103.567	35.8	1747	1.23	2.497	6.62	Transient region; bed: sandy gravel
31	Yellow River	Zhuanglang River1	Yellow River	103.187	36.87	2272	13.91	0.2	2.63	Transient region; bed: sandy gravel
32	Yellow River	Zhuanglang River2	Yellow River	103.444	36.184	1571	8.69	0.401	3.66	Transient region; bed: sandy gravel and flagstone
33	Yellow River	Zuli River1	Yellow River	105.05	35.685	1715	14.36	0.099	2.87	Transient region; bed: fine sand
34	Yellow River	Zuli River2	Yellow River	104.88	36.217	1526	4.34	0.547	2.87	Transient region; bed: fine sand
35	Yellow River	Zuli River3	Yellow River	104.66	36.549	1404	2.22	1.065	2.87	Transient region; bed: fine sand
36	Yellow River	Bazhou Gou River	Hungshui River	102.793	36.317	1803	17.32	0.019	2.23	Inside the QTP; bed: sandy gravel
37	Yellow River	Beichuan River1	Hungshui River	101.35	37.256	3007	7.02	0.078	2.41	Inside the QTP; bed: sandy gravel
38	Yellow River	Beichuan River2	Hungshui River	101.684	36.934	2444	5.75	0.277	1.35	Inside the QTP; bed: sandy gravel
39	Yellow River	Datong River1	Hungshui River	100.517	37.749	3448	4	0.458	1.01	Inside the QTP; bed: sandy gravel
40	Yellow River	Datong River2	Hungshui River	101.417	37.458	2935	3.03	0.801	1.16	Inside the QTP; bed: sandy gravel
41	Yellow River	Datong River3	Hungshui River	102.498	36.95	2276	6.75	1.257	1.16	Transient region; bed: sandy gravel
42	Yellow River	Datong River4	Hungshui River	102.817	36.602	1922	7.98	1.391	1.16	Transient region; bed: sandy gravel
43	Yellow River	Nanchuan River	Hungshui River	101.774	36.626	2244	10.99	0.04	6.49	Inside the QTP; bed: sandy gravel
44	Yellow River	Shatang Chuan River	Hungshui River	101.874	36.573	2185	7.77	0.111	2.53	Inside the QTP; bed: sandy gravel
45	Yellow River	Xina Chuan River	Hungshui River	101.483	36.767	2484	25.03	0.081	3.57	Inside the QTP; bed: sandy gravel and pebble
46	Yellow River	Xiaonan Chuan River	Hungshui River	101.936	36.55	2168	13.16	0.037	4.98	Inside the QTP; bed: sandy gravel
47	Yellow River	Yaoshui River	Hungshui River	101.273	36.667	2639	11.99	0.064	3.01	Inside the QTP; bed: sandy gravel
48	Yellow River	Yinsheng Gou River	Hungshui River	102.409	36.517	2066	15.81	0.046	2.23	Inside the QTP; bed: sandy gravel
49	Yellow River	Suji River	Sancha River	103.7	35.375	2005	6.78	0.033	3.11	Transient region; bed: sandy gravel
50	Yellow River	Bola River	Tao River	102.997	34.711	2795	7.53	0.17	2.9	Inside the QTP; bed: sandy gravel
51	Yellow River	Dayu Gou River	Tao River	103.589	34.567	2500	7.58	0.078	1.17	Inside the QTP; bed: Quartzite and sandy gravel
52	Yellow River	Dongyu Gou River1	Tao River	104.052	35.301	2042	7.67	0.027	2.58	Transient region; bed: sandy gravel
53	Yellow River	Dongyu Gou River2	Tao River	103.868	35.401	1881	6.31	0.058	2.58	Transient region; bed: sandy gravel
54	Yellow River	Guangtong River	Tao River	103.733	35.554	1840	3.62	0.152	1.57	Transient region; bed: sandy gravel
55	Yellow River	Manba River	Tao River	103.833	35.248	1936	10.75	0.046	2.79	Transient region; bed: sandy gravel and sandy clay
56	Yellow River	Yemu River	Tao River	103.667	34.961	2182	6.7	0.119	2.9	Transient region; bed: sandy gravel
57	Yellow River	Xinglong River	Wanchuan River	104.064	35.8	2196	41.79	0.008	6.49	Transient region; bed: sandy gravel
58	Jinsha River	Tuotuo River	Tongtian River	92.45	34.217	4533	1.19	1.592	1.94	Inside the QTP; bed: sandy gravel
59	Jinsha River	Tongtian River	Jinsha River	97.217	33.033	3541	1.35	13.77	1.94	Inside the QTP; bed: gravel
60	Jinsha River	Jinsha River3	East Sea	98.583	31.633	3042	1.22	14.907	1.75	Inside the QTP; bed: sandy gravel

61	Jinsha River	Jinsha River4	East Sea	99.017	29.767	2470	0.68	18.006	1.75	Inside the QTP; bed: sandy gravel
62	Jinsha River	Jinsha River5	East Sea	99.283	28.233	2005	1.82	20.332	1.75	Inside the QTP; bed: sandy gravel
63	Jinsha River	Jinsha River6	East Sea	99.933	26.9	1818	0.7	21.418	1.75	Transient region; bed: sandy gravel
64	Jinsha River	Jinsha River7	East Sea	100.5	27.35	1414	1.7	23.54	1.75	Transient region; bed: sandy gravel
65	Jinsha River	Jinsha River8	East Sea	100.433	26.8	1304	2.03	23.985	1.75	Transient region; bed: sandy gravel
66	Jinsha River	Jinsha River9	East Sea	100.417	26.5	1223	1.06	24.145	1.75	Transient region; bed: sandy gravel
67	Jinsha River	Jinsha River10	East Sea	100.55	26.233	1183	1.14	24.449	1.75	Transient region; bed: sandy gravel
68	Jinsha River	Jinsha River11	East Sea	101.717	26.583	987	1.88	25.918	1.75	Transient region; bed: rocky sand
69	Jinsha River	Batang River	Jinsha River	97.05	33.017	3657	5.12	0.23	1.57	Inside the QTP; bed: gravel
70	Jinsha River	Chongjiang River	Jinsha River	99.933	26.85	1839	4.03	0.1	1.94	Transient region; bed: sandy gravel; Width AHG was not used.
71	Jinsha River	Wulang River	Jinsha River	100.567	26.8	1589	1.11	0.208	2.53	Transient region; bed: sandy gravel
72	Jinsha River	Lapu River	Jinsha River	99.4	27.6	2011	6.1	0.072	1.94	Transient region; bed: sandy gravel
73	Jinsha River	Luolou River	Jinsha River	100.367	26.083	1346	7.9	0.083	1.94	Transient region; bed: sandy gravel
74	Jinsha River	Maguo River	Jinsha River	101	26.483	1353	11.98	0.085	1.94	Transient region; bed: sandy gravel
75	Jinsha River	Pao River	Jinsha River	101	25.683	1576	6.68	0.195	1.94	Transient region; bed: sandy gravel
76	Jinsha River	Sangyuan River	Jinsha River	100.55	25.95	1389	5.8	0.157	1.43	Transient region; bed: sandy gravel
77	Jinsha River	Shuoduogang River	Jinsha River	100.05	27.183	1834	17.92	0.192	1.94	Transient region; bed: sandy gravel
78	Jinsha River	Songmai River	Jinsha River	99.25	28.417	2087	2.45	1.216	1.94	Transient region; bed: sandy gravel
79	Jinsha River	Wanma River	Jinsha River	101.417	26.167	1569	11.24	0.053	1.94	Transient region; bed: bed rock with fine sand
80	Jinsha River	Xinzhuang River	Jinsha River	101.367	26.6	1074	6.77	0.091	1.94	Transient region; bed: sandy gravel
81	Jinsha River	Yanggong River1	Jinsha River	100.283	26.8	2363	0.65	0.054	1.94	Transient region; bed: sandy gravel
82	Jinsha River	Yanggong River2	Jinsha River	100.217	26.5	2198	13.47	0.121	1.94	Transient region; bed: fine sand
83	Yalong River	Sunshui River	Anning River	102.2	28.3	1634	7.06	0.161	2.66	Transient region; bed: gravel with fine sand
84	Yalong River	Yalong River1	Jinsha River	99.967	31.617	3347	1.96	3.293	2.66	Inside the QTP; bed: sandy gravel
85	Yalong River	Yalong River2	Jinsha River	101.017	30.033	2566	6.74	6.687	2.66	Inside the QTP; bed: gravel
86	Yalong River	Yalong River3	Jinsha River	101.867	28.45	1433	1.54	10.808	2.66	Transient region; bed: sandy gravel
87	Yalong River	Yalong River4	Jinsha River	101.85	26.683	992	1.49	12.836	2.66	Transient region; bed: sandy gravel
88	Yalong River	Ninglang River	Qiansuo River	100.867	27.283	2254	4.14	0.084	2.66	Inside the QTP; bed: sandy gravel
89	Yalong River	Niqu River	Xianhui River	100.683	31.433	3177	3.66	0.686	2.66	Inside the QTP; bed: sandy gravel
90	Yalong River	Anning River	Yalong River	102.183	28.3	1621	2.46	0.209	2.66	Transient region; bed: sandy gravel
91	Yalong River	Jiulong River	Yalong River	101.65	28.65	2042	35.79	0.241	2.66	Transient region; bed: sandy gravel
92	Yalong River	Litang River1	Yalong River	100.383	29.7	3651	6.58	0.31	2.66	Inside the QTP; bed: sandy gravel
93	Yalong River	Litang River2	Yalong River	101.017	27.95	1894	4.97	0.916	2.66	Transient region; bed: sandy gravel

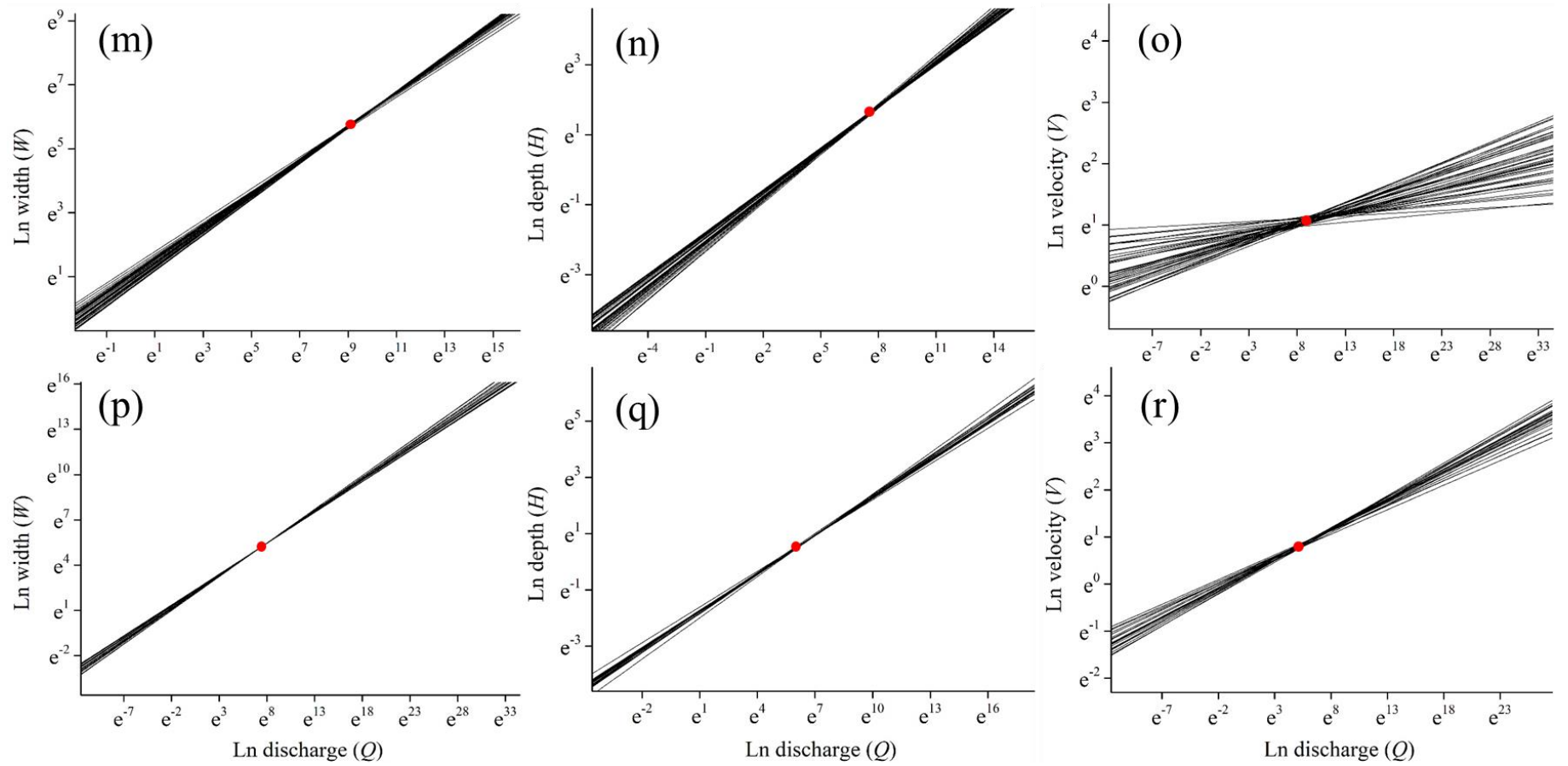
94	Yalong River	Xianshui River	Yalong River	101.067	31.033	2975	2.2	1.447	2.66	Inside the QTP; bed: sandy gravel
95	Yalong River	Xiaojin River	Yalong River	101.267	27.833	1772	2.18	1.781	2.66	Transient region; bed: sandy gravel
96	Lantsang River	Bi River	Lantsang River	99.4	26.4	2265	8.77	0.045	3.13	Transient region; bed: sandy gravel; banks: clay and gravel
97	Lantsang River	Buyuan River	Lantsang River	101.266	21.917	539	5.96	0.621	2.72	Transient region; bed: pebble; banks: sandy loam
98	Lantsang River	Heihui River1	Lantsang River	99.909	26.454	2193	2.24	0.092	2.72	Transient region; bed: clay; banks: loose soil
99	Lantsang River	Heihui River2	Lantsang River	100	25.65	1505	6.85	0.433	2.72	Transient region; bed: sandy clay; banks: sandy soil
100	Lantsang River	Heihui River3	Lantsang River	100.01	25.351	1226	10.71	0.939	2.72	Transient region; bed: gravel sand; banks: bare rock
101	Lantsang River	Heijiang River	Lantsang River	100.4	22.859	1033	7.83	0.845	2.72	Transient region; banks: pebble
102	Lantsang River	Liusha River	Lantsang River	100.417	21.953	1170	6.52	0.103	2.05	Transient region; bed: pebble and mud; banks: sandy loam
103	Lantsang River	Nanla River	Lantsang River	101.55	21.433	623	2.73	0.131	3.39	Transient region; bed: pebble; banks: loose sandy loam
104	Lantsang River	Shundian River	Lantsang River	100.298	24.493	1044	8.5	0.291	2.72	Transient region; bed: sandy gravel; left bank: decayed rock; right bank: rock with soil
105	Lantsang River	Yin River	Lantsang River	99.539	25.419	1578	5.85	0.038	2.72	Transient region; bed: sandy gravel; left bank: farmland; right bank: high mountains
106	Lantsang River	Yongchun River	Lantsang River	99.322	27.152	2254	28.42	0.02	2.72	Transient region; bed: pebble
107	Lantsang River	Zaqu River	Lantsang River	96.538	32.154	3609	8.03	1.791	2.72	Inside the QTP; bed: sandy gravel; left bank: steep rock; right bank: farmland
108	Lantsang River	Lantsang River1	Mekong River	97.187	31.183	3251	9.61	5.38	2.72	Inside the QTP; bed: big pebble
109	Lantsang River	Lantsang River2	Mekong River	99.219	25.783	1292	6.24	8.805	2.72	Transient region; bed: sandy gravel; banks: sandy soil with gravel
110	Lantsang River	Lantsang River3	Mekong River	100.498	24.534	897	9.56	10.853	2.72	Transient region; bed: bed rock; right bank: freestone
111	Lantsang River	Lantsang River4	Mekong River	100.169	23.55	748	9.6	11.589	2.72	Transient region; bed: sandy gravel; banks: bed rock and gravel
112	Lantsang River	Lantsang River5	Mekong River	100.785	22.035	535	1.89	14.178	2.72	Transient region; bed: fine sand and pebble

113	Nu River	Kuke River	Mengboluo River	99.429	24.885	962	5.46	0.176	2.92	Transient region; bed: sandy gravel
114	Nu River	Yongkang River	Mengboluo River	99.368	24.084	846	5.77	0.053	2.92	Transient region; bed: fine sand and pebble; left bank: sloping farmland; right bank: hills
115	Nu River	Mengboluo River	Nu River	99.259	24.442	636	8.51	0.631	2.92	Transient region; bed: sandy gravel; banks: sand and Rubble
116	Nu River	Nu River1	Salween River	96.207	30.875	3160	6.78	6.938	2.92	Inside the QTP; bed: bed rock; banks: rocks and pebble
117	Nu River	Nu River2	Salween River	98.883	24.983	664	1.98	11.022	2.92	Transient region; bed: bed rock; right bank: fine sandy soil; left bank: limestone
118	Yarlung Zangbo River	Yarlung Zangbo River1	Brahmaputra River	87.679	29.166	3973	2.05	4.937	2.51	Inside the QTP; bed: sandy gravel
119	Yarlung Zangbo River	Yarlung Zangbo River2	Brahmaputra River	89.712	29.33	3769	2.17	10.638	2.51	Inside the QTP; bed: sandy gravel; left bank: big freestone
120	Yarlung Zangbo River	Yarlung Zangbo River3	Brahmaputra River	91.883	29.276	3543	1.84	15.319	2.51	Inside the QTP; bed: sandy gravel; banks: hillslope
121	Yarlung Zangbo River	Yarlung Zangbo River4	Brahmaputra River	94.567	29.459	2918	0.63	18.984	2.51	Inside the QTP; bed: fine sand; right bank: pebble; left bank: bed rock
122	Yarlung Zangbo River	Duiling Qu River	Lhasa River	90.55	30.083	4269	7.32	0.263	1.99	Inside the QTP; bed: sandy gravel and freestone
123	Yarlung Zangbo River	Lasa River1	Yarlung Zangbo River	91.382	30.141	4017	4.79	1.637	2.08	Inside the QTP; bed: sand and small gravel
124	Yarlung Zangbo River	Lasa River2	Yarlung Zangbo River	91.781	29.888	3826	3.6	2.037	1.96	Inside the QTP; bed: sandy gravel
125	Yarlung Zangbo River	Lasa River3	Yarlung Zangbo River	91.148	29.639	3653	2.38	2.623	1.90	Inside the QTP; bed: sandy gravel
126	Yarlung Zangbo River	Niyang River1	Yarlung Zangbo River	93.25	29.885	3414	3.02	0.642	1.99	Inside the QTP; bed: sandy gravel and freestone
127	Yarlung Zangbo River	Niyang River2	Yarlung Zangbo River	94.15	29.742	3060	2.57	1.56	1.99	Inside the QTP; bed: sandy gravel and freestone
128	Yarlung Zangbo River	Nianchu River1	Yarlung Zangbo River	89.604	28.903	4025	4.02	0.622	1.98	Inside the QTP; bed: sandy gravel
129	Yarlung Zangbo River	Nianchu River2	Yarlung Zangbo River	88.89	29.283	3833	2.03	1.112	2.12	Inside the QTP; bed: sandy gravel









**Figure S1.** Convergence of DHG curves of the main stream of the upper Yellow River (a-c), the mainstream of the Huangshui River (d-f), the mainstream of the upper Jinsha River (g-i), the tributaries of the Lantsang River (j-l), the mainstream and the tributaries of the Nu River (m-o), the mainstream and the tributaries of the Yarlung Zangbo River (p-r) under multiple discharge frequencies. Red dots represent the congruent discharge which indicate the convergence of individual DHG curves.