Table S1 River water chemistry of Changjiang River sampled at Nanjing

No	Sampling date	T(℃)	pH	Discharge (m3/s)	Ca (μM)	K (μM)	Mg (μM)	Na (μM)	Sr (μM)	DIC (mM)	Cl (μM)	SO_4 (μM)	NO_3 (μM)	NICB	$^{87}Sr/^{86}Sr$	$\delta^{26}Mg$	2SD	CSI
CJNJ01	2010/5/7	20.5	7.64	33600	nd	59	217	274	1.5	1.54	228	291	126	nd	0.710870±4	-1.23	0.09	nd
CJNJ02	2010/5/22	21.2	7.63	41800	nd	48	284	387	2.1	1.78	299	345	142	nd	0.710669±5	-1.21	0.04	nd
CJNJ03	2010/6/4	22.9	7.54	45800	nd	54	241	299	1.9	1.89	229	304	134	nd	0.710617±5	-1.31	0.05	nd
CJNJ04	2010/7/2	26.6	7.33	63400	nd	53	200	232	1.7	nd	189	242	115	nd	0.710604±4	-1.31	0.05	nd
CJNJ05	2010/7/16	26.5	7.58	61600	820	46	210	268	1.6	1.46	284	279	128	-1.3	0.710535±5	-1.27	0.05	-0.362
CJNJ06	2010/7/28	28.2	7.34	62700	1033	50	300	358	2.2	1.89	308	339	129	1.1	0.710502±6	-1.19	0.05	-0.399
CJNJ07	2010/8/12	30.4	7.53	55800	932	47	254	346	1.9	1.88	352	306	110	-3.3	0.710567±6	-1.29	0.09	-0.209
CJNJ08	2010/8/26	28.2	7.71	43200	838	51	266	393	1.9	1.65	250	241	0	5.4	0.710675±7	-1.24	0.05	-0.143
CJNJ09	2010/9/10	27.6	7.71	42800	896	55	293	405	2	1.88	338	335	38	-1.5	0.710694±5	-1.3	0.04	-0.079
CJNJ10	2010/9/30	24.1	7.98	38300	659	37	216	340	1.5	1.78	369	313	44	-14	0.710683±12	-1.24	0.01	0.003
CJNJ11	2010/10/10	22.7	8.07	34700	658	42	213	343	1.6	1.54	364	312	1	-8.6	0.710780±3	-1.25	0.02	0.015
CJNJ12	2010/10/29	19.1	8.05	26500	766	58	250	367	1.7	1.71	362	325	52	-5.8	0.710819±6	-1.25	0.04	0.045
CJNJ13	2010/11/18	17.1	8.47	15500	782	56	264	460	1.8	1.9	425	370	43	-8.6	0.710766±8	-1.24	0.04	0.477
CJNJ14	2010/11/30	16	7.85	12800	884	60	311	549	2.1	1.98	495	394	46	-4.8	0.710707±4	-1.21	0.03	-0.092
CJNJ15	2010/12/13	14.5	7.92	12900	905	63	316	626	2.2	1.95	557	413	30	-3.3	0.710675±5	-1.21	0.05	-0.043
CJNJ16	2011/1/1	9.4	7.62	15900	762	71	251	467	1.6	1.61	435	352	47	-4.3	0.710968±9	-1.24	0.08	-0.573
CJNJ17	2011/1/17	7.7	7.56	14000	846	60	291	526	1.9	1.77	477	383	44	-3.2	0.710807±5	-1.24	0.05	-0.587
CJNJ18	2011/1/30	8.7	7.55	16200	893	58	306	560	2	2.01	505	408	58	-5.7	0.710729±4	-1.27	0.06	-0.509
CJNJ19	2011/2/18	8.7	8.18	13300	864	54	292	550	2	2.02	500	429	50	-7.8	0.710618±6	-1.27	0.07	0.126
CJNJ20	2011/3/3	10.6	8.2	14000	848	53	284	522	2	2.01	470	426	43	-8.4	0.710648±5	-1.27	0.11	0.167
CJNJ21	2011/3/19	12.8	8.05	13300	868	54	301	537	2.1	2.03	448	431	59	-7.2	0.710630±4	-1.25	0.1	0.064
CJNJ22	2011/4/9	14.6	8.12	15400	881	54	286	531	2	2.02	449	430	70	-7.2	0.710590±6	-1.25	0.13	0.165
CJNJ23	2011/4/21	16.8	7.86	17400	1014	60	339	589	2.3	2.07	421	439	60	-0.7	0.710535±5	-1.27	0.09	0

nd: not determined

Table S2. $\delta^{26}Mg$ value of geological standards measured in this study

Standard	Measured	2sd	n	Recommended	References
BCR-2	-0.19	0.08	3	-0.16	An et al. (2014)
DNC-1	-0.26	0.09	3	-0.22	An et al. (2014)
DST-2	-0.33	0.11	5	-0.32	Teng et al. (2015)
AVG-2	-0.25	0.06	3	-0.12	An et al. (2014)
BIR	-0.23	0.12	5	-0.22	An et al. (2014)
GSP-2	-0.05	0.16	5	0.04	An et al. (2014)
W-2	-0.17	0.06	3	-0.15	An et al. (2014)
IAPSO seawater	-0.79	0.07	5	-0.83	Ling et al. (2011)
HPS932001	-2.89	0.10	15	-2.92 (Isopro) -2.92(Nu Plasma II)	Li et al. (2014)

Table S3 Seasonal variations in chemical weathering rates and CO_2 consumption rates (with 2sd error)

Sample	Sampling date	Silicates				Carbonates		
		ϕ sil ($t/km^2/yr$)	Cat sil ($10^6 t/yr$)	Ca+Mg (10^9 mol/yr)	CO_2 consumption ($10^9 mol/yr$)	ϕ carb ($t/km^2/yr$)	Ca+Mg+CO_3 carb($10^6 t/yr$)	CO_2 consumption ($10^9 mol/yr$)
CJNJ05	07/16/2010	5.8±2.4	9.9±4.0	111±48	455±186	31±5	142±19	1470±197
CJNJ06	07/28/2010	8.5±2.9	14.5±4.9	167±62	677±230	41±6	188±25	1955±257
CJNJ07	08/12/2010	6.2±2.6	10.5±4.4	122±56	490±209	33±4	148±15	1542±155
CJNJ08	08/26/2010	5.0±2.4	8.6±4.2	100±54	402±198	20±3	92±12	960±126
CJNJ09	09/10/2010	4.6±2.3	7.8±4.0	91±51	365±189	24±3	108±11	1131±112
CJNJ10	09/30/2010	4.3±2.7	7.3±4.6	85±71	342±233	19±2	87±11	902±117
CJNJ11	10/10/2010	3.1±2.2	5.2±3.8	61±52	246±184	15±2	69±9	722±93
CJNJ12	10/29/2010	2.8±1.5	4.7±2.6	54±32	220±121	13±1	59±6	615±61
CJNJ13	11/18/2010	2.1±1.0	3.6±1.8	42±26	169±87	8±1	36±4	381±44
CJNJ14	11/30/2010	1.8±1.0	3.1±1.7	36±23	145±82	7±1	32±4	332±42
CJNJ15	12/13/2010	1.8±1.1	3.1±1.9	37±26	148±93	7±1	31±5	325±47
CJNJ16	01/01/2011	2.1±1.1	3.5±1.9	41±25	165±92	7±1	31±5	327±47
CJNJ17	01/17/2011	1.7±1.1	3.0±1.8	34±24	139±88	7±1	31±4	328±45
CJNJ18	01/30/2011	2.4±1.1	4.1±1.9	48±26	191±92	9±1	40±5	424±49
CJNJ19	02/18/2011	1.9±0.9	3.2±1.6	38±23	153±78	7±1	33±4	350±41
CJNJ20	03/03/2011	2.0±1.0	3.4±1.6	40±24	160±81	8±1	35±4	367±42
CJNJ21	03/19/2011	2.1±0.7	3.6±1.3	42±18	170±61	7±1	33±3	348±34
CJNJ22	04/09/2011	2.4±0.7	4.1±1.2	49±17	194±57	8±1	38±3	401±34
CJNJ23	04/21/2011	3.1±0.9	5.3±1.5	63±20	250±71	10±1	46±6	477±57
Average	-	3.5±1.6	5.7±2.7	66±36	267±128	15±2	67±8	703±84