Table S1

Water analyses

Sample	Location*	River	Date	East**	North	Na	K	Ca	Mg	Si	HCO_3	Cl	F	SO_4	NO_3	Sr	$^{87}Sr/^{86}Sr$	pH	T	Catch-
						——————————————————μmol/l ----------										nmol/l			°C	ment
AK259	Lata	Rishi Ganga	04/07/2004	79.6742	30.4852	45	42	546	136	43	846	30	0	281	13	670	0.735986	8.28	13.5	H
AK261	Malari	Dhauli Ganga	04/07/2004	79.8854	30.6944	71	25	524	251	45	1070	18	0	275	8	1498	0.719678	8.25	12.6	TSS
AK273	Birehi	Birehi Ganga	07/07/2004	79.3902	30.4069	65	41	435	191	74	1139	17	1.3	94	12	262	0.759028	7.14	na	LHS
AK293	Nandpryag	Nandakini	10/07/2004	79.3180	30.3311	59	34	325	126	98	848	17	1.2	53	23	284	0.758263	7.90	na	LHS
AK304	Simli	Pindar	13/07/2004	79.2572	30.2299	51	33	438	122	74	1026	13	0.5	75	14	358	0.739227	8.48	na	LHS

These analyses are combined with analyses published by Bickle et al. (2003) and (2005) in this paper. * Location nearest named point, names from US Army map series U502 1:250000, ** Grid reference from GPS WGS84. Analytical methods: Cations Na, K, Ca, Mg, Si, Sr analysed by ICP-AES at Cambridge calibrated against solutions made up from single element standards and adjusted to match standards SPS-SW2 and ION 20. Repeats of previously analyses samples AK136, AK165 and AK167 (methods in Bickle and others, 2003)) deviated less than 2% except for K (mean values 4.6% low) and Si in AK167 3.5% low. Anions analysed by ion chromatography at the British Antarctic Survey, Cambridge and repeats of previously analysed samples were within ± 10% relative. $^{87}Sr/^{86}Sr$ analysed as described in Bickle and others, 2005).

TABLE S2

Analyses of bedloads

Sample Garhwal	East	North	River	Catchment	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	LOI	Total	Sr
					%												ppm
AK5RS	79.2160	30.2625	Pindar	Inner LHS	73.22	0.48	8.69	3.54	0.09	2.05	4.32	1.28	2.00	0.11	3.73	99.52	110
AK10RS	79.3962	30.4041	Birehi Ganga	Inner LHS	62.58	0.58	11.56	4.26	0.06	5.14	4.62	1.67	2.75	0.11	6.39	99.72	88
AK16RS	79.6985	30.4872	Rishi Ganga	HHCS	73.94	0.59	10.34	4.52	0.13	1.47	3.08	1.66	1.97	0.22	2.04	99.98	
AK18RS	79.4944	30.7703	Nadi - Saras	HHCS	75.81	0.20	13.08	1.64	0.04	0.52	1.02	3.35	3.76	0.20	0.49	100.10	73
AK43RS	78.3122	30.1226	Ganges	Alak	75.14	0.49	8.79	3.33	0.09	1.80	3.47	1.71	1.97	0.14	2.91	99.83	100
AK44RS	78.3883	30.1371	Huial	Outer LHS	67.00	0.44	8.81	3.79	0.05	3.61	4.78	0.58	2.13	0.16	8.47	99.81	83
AK51RS	78.7410	30.2150		Outer LHS	76.75	0.55	10.31	4.67	0.07	1.26	0.75	1.04	2.05	0.10	2.14	99.68	66
AK54RS	78.5977	30.1457	Alak +	LHS, HHCS, TSS	80.64	0.28	6.79	2.12	0.05	1.45	2.68	1.20	1.73	0.07	2.81	99.83	73
AK58RS	78.9783	30.2884	Alaknada +	LHS, HHCS, TSS	75.96	0.27	7.59	2.06	0.04	1.94	3.76	1.48	2.00	0.06	4.12	99.29	90
AK59RS	78.9783	30.2884	Mandakini	Inner LHS+HHCS	69.03	0.71	12.27	6.56	0.14	2.17	3.56	2.04	2.07	0.12	0.79	99.46	114
AK60RS	78.9778	30.2869	Alaknada - Trb	LHS, HHCS, TSS	72.89	0.52	7.73	3.69	0.12	1.92	4.66	1.41	1.69	0.13	4.35	99.11	106
AK61RS	78.9556	30.3407	Mandakini	Inner LHS	78.91	0.67	7.96	4.36	0.04	1.63	1.18	1.07	2.15	0.12	1.79	99.89	49
AK64RS	79.0952	30.5399	Manadkini +	Inner LHS	72.87	0.42	12.19	5.20	0.13	1.39	1.56	1.62	2.96	0.09	1.23	99.65	82
AK65RS	79.0946	30.5335	Manadkini -	Inner LHS	70.59	0.47	13.42	7.04	0.23	1.86	3.12	1.57	1.79	0.13	0.45	100.67	96
AK66RS	79.0914	30.2953	Ghatir Gad	Inner LHS	82.39	0.56	5.78	3.61	0.03	2.69	0.41	0.19	1.24	0.06	2.34	99.30	12
AK68RS	79.2113	30.2662	Alaknanda -	LHS, HHCS, TSS	67.56	0.37	7.50	3.75	0.12	3.66	6.11	1.40	1.73	0.07	7.42	99.70	82
AK69RS	79.2160	30.2625	Pindar	LHS-s HHCS	76.99	0.28	7.63	2.10	0.04	1.87	3.50	1.34	2.12	0.06	4.05	99.98	80
AK70RS	79.2160	30.2625	Alaknanda +	LHS, HHCS, TSS	78.72	0.27	7.17	2.02	0.05	1.50	3.30	1.36	1.86	0.07	3.39	99.71	96
AK71RS	79.4460	30.2510	Nandakini	Inner LHS	72.35	0.52	12.57	4.49	0.08	1.39	1.51	2.27	3.43	0.11	1.23	99.95	86
AK72RS	79.4504	30.2591	Nandakini	Inner LHS	66.78	0.51	9.10	4.96	0.12	3.71	4.87	1.20	1.93	0.12	6.82	100.11	75
AK73RS	79.4481	30.2604	Nandakini	Inner LHS	74.60	0.42	9.58	3.16	0.05	2.04	2.36	1.53	2.48	0.10	3.11	99.43	84
AK74RS	79.3181	30.3321	Nandakini	Inner LHS-	77.82	0.38	8.55	2.64	0.05	1.54	2.23	1.86	2.07	0.13	2.35	99.62	80
AK75RS	79.3181	30.3321	Alaknanda +	LHS, HHCS, TSS	69.55	0.36	7.57	3.32	0.10	3.42	5.91	1.44	1.71	0.10	6.81	100.28	99
AK76RS	79.3100	30.3312	Alaknanda -	LHS, HHCS, TSS	71.45	0.37	7.51	2.89	0.08	2.82	5.02	1.45	1.80	0.10	5.89	99.37	95
AK77RS	79.3968	30.4031	Birehi Ganga	Inner LHS	29.37	0.19	3.42	2.91	0.10	14.20	19.56	0.53	0.62	0.04	28.71	99.64	na
AK78RS	79.3976	30.4198	trib	Inner LHS	56.30	0.40	11.73	4.82	0.11	5.40	6.31	0.22	3.17	0.07	12.05	100.59	82
AK79RS	79.4447	30.4610	trib	Inner LHS	36.43	0.26	7.78	3.29	0.05	11.60	13.92	0.10	2.33	0.04	23.28	99.08	20
AK80RS	79.4575	30.4653	Krol	Inner LHS	32.65	0.21	6.17	2.52	0.04	12.09	17.81	0.06	2.22	0.03	27.25	101.06	96
AK81RS	79.4863	30.4873	trib	Inner LHS	52.93	0.65	4.81	3.03	0.07	9.03	10.76	0.49	1.05	0.15	17.04	100.01	na
AK82RS	79.5003	30.5263	Alaknanda	HHCS+TSS	80.71	0.30	7.09	2.72	0.10	0.80	2.88	1.17	1.70	0.11	2.29	99.86	100

TABLE S2

(continued)

sample Garhwal	East	North	River	Catchment	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	LOI	Total	Sr
					%												ppm
AK83RS	79.5292	30.5283	trib	HHCS	72.33	0.35	11.92	3.13	0.03	1.84	2.58	2.47	2.89	0.09	2.33	99.97	0
AK84RS	79.5086	30.5258	trib	HHCS	71.68	0.53	12.73	4.10	0.04	2.21	0.90	1.82	3.82	0.18	1.65	99.65	80
AK85RS	79.5763	30.5626	Dauli Ganga +	HHCS+TSS	81.06	0.29	6.78	2.26	0.06	0.86	3.26	1.13	1.70	0.07	2.65	100.13	109
AK86RS	79.5763	30.5626	Saraswati	HHCS+TSS	74.88	0.36	8.44	2.84	0.08	1.11	4.36	1.48	1.95	0.13	3.63	99.26	129
AK87RS	79.5542	30.5668	Alaknanda -	HHCS+TSS	74.28	0.47	10.80	5.03	0.15	1.55	2.32	1.93	1.79	0.16	1.33	99.81	109
AK88RS	79.5227	30.5606	Vishna Grad	HHCS	77.05	0.34	9.49	6.37	0.25	1.29	1.31	1.14	1.58	0.09	0.49	99.40	77
AK92RS	79.6907	30.4878	Rishi Ganga	HHCS	76.96	0.45	10.12	3.23	0.07	1.38	2.14	1.60	2.28	0.13	1.69	100.05	109
AK94RS	79.7658	30.5645	Gar Gadera	HHCS	88.68	0.26	5.49	1.44	0.05	0.24	0.30	0.57	1.78	0.06	0.68	99.55	61
AK95RS	79.8322	30.6563	Dauli Ganga	Dauli Ganga	49.30	0.37	7.63	4.05	0.12	2.56	16.27	0.67	2.28	0.09	16.10	99.44	247
AK96RS	79.8322	30.6563	trib	HHCS	58.26	0.42	8.83	2.98	0.06	1.16	12.76	0.96	2.61	0.08	11.28	99.40	334
AK124RS	78.5977	30.1457	Bhagirathi	LHS,HHCS, TSS	74.14	0.51	11.00	3.76	0.06	1.68	2.04	2.00	2.59	0.12	1.70	99.60	62
AK145M*	79.6907	30.4878	Rishi Ganga	HHCS	73.77	na	9.53	3.06	0.05	1.39	3.32	1.65	2.24	na	na		136
AK182RS	78.5891	30.1188	trib from east	Inner LHS	75.90	0.74	10.99	4.84	0.06	1.05	0.23	1.08	2.31	0.11	2.35	99.66	55
AK199RS	79.7422	30.5302	Talma Gad	HHCS	74.24	0.32	13.30	2.60	0.05	0.61	1.03	2.52	4.35	0.24	0.64	99.89	89
AK250RS	79.5455	30.6360	Saraswati	HHCS + TSS	77.39	0.30	10.97	2.30	0.05	0.71	1.34	2.41	2.95	0.14	0.90	99.46	107
AK251RS	79.4954	30.7699	Alaknanda	Alak	80.12	0.09	11.00	0.73	0.02	0.24	0.67	3.50	2.98	0.10	0.53	99.98	57
AK254RS	79.5581	30.6245	Saraswati	HHCS + TSS	83.10	0.17	8.53	1.55	0.05	0.44	0.96	2.14	2.21	0.12	0.42	99.71	67
AK255RS	79.5616	30.6228	Bhunder Ganga	HHCS	86.11	0.21	6.86	1.61	0.02	0.45	0.73	1.19	2.06	0.05	0.39	99.68	101
AK258RS	79.6447	30.4893	Trib to Dhauli	HHCS	89.29	0.19	3.87	2.50	0.07	0.63	1.26	0.17	0.79	0.06	1.22	100.05	23
AK260RS	79.7063	30.4969	Dhauli	Dauli Ganga	68.06	0.24	7.65	2.31	0.07	1.13	9.05	1.25	1.82	0.08	8.26	99.91	237
AK264RS	79.7427	30.5336	Jonj Gad	HHCS	87.35	0.28	6.42	1.64	0.03	0.30	0.21	0.29	2.23	0.04	0.96	99.75	63
AK269RS	79.4879	30.4873	Patal Ganga,	Inner LHS	52.56	0.58	7.16	4.80	0.07	7.64	9.85	0.91	1.57	0.13	14.26	99.53	83
AK278RS	79.3890	30.4097	Alaknanda	Alak	80.99	0.41	7.86	3.41	0.12	0.87	1.83	1.35	1.95	0.13	1.04	99.96	97
AK288RS	79.3225	30.3808	Trib to Alak	Inner LHS	73.65	0.80	10.13	5.31	0.07	2.55	1.92	2.42	1.54	0.09	1.48	99.96	84
AK289RS	79.4514	30.2589	Nandakini	Inner LHS	64.45	0.44	12.16	3.71	0.04	4.17	3.71	1.08	3.35	0.07	6.94	100.12	58
AK290RS	79.4471	30.2559	Chopla Gad,	Inner LHS	78.66	0.62	8.50	3.70	0.04	1.46	1.39	1.34	2.30	0.25	1.17	99.44	59
AK295RS	79.2550	30.2225	Trib to Pindar	Inner LHS	74.29	0.71	8.65	5.87	0.07	3.70	1.14	0.93	1.78	0.08	2.63	99.84	43
AK296RS	79.2774	30.2006	Kuya Nadi,	Inner LHS	77.47	0.65	6.97	6.13	0.06	3.14	0.88	0.67	1.25	0.09	2.06	99.36	30
AK297RS	79.3430	30.1724	Trib to Pindar	Inner LHS	86.36	0.29	5.84	2.32	0.05	0.72	0.77	1.00	1.50	0.05	1.14	100.04	67
AK299RS	79.5844	30.0548	Kali Ganga,	Inner LHS	69.39	0.35	8.99	3.08	0.08	2.28	6.29	1.63	1.80	0.12	5.58	99.59	142
AK310RS	78.9836	30.2874	Alaknanda	Alak	77.20	0.27	7.56	2.11	0.04	1.88	3.35	1.56	1.82	0.09	3.71	99.60	89
AK318RS	79.0790	30.5936	Trib to	HHCS	73.62	0.45	12.30	4.08	0.04	1.25	1.12	1.67	3.78	0.07	1.47	99.85	81

TABLE S2

(continued)

sample	East	North	River	Catch-ment	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	LOI	Total	Sr
Garhwal					---------- % ----------												ppm
AK319RS	79.0798	30.5938	Kali Ganga	HHCS	76.12	0.25	11.89	3.81	0.15	0.89	1.57	1.95	2.40	0.12	0.46	99.59	104
AK334RS	78.4582	30.7589	Mainstem	HHCS + TSS	70.93	0.60	11.52	7.91	0.38	0.99	2.02	2.16	1.82	0.35	0.88	99.56	69
Marsyandi																	
BCT9	84.2598	28.5543	Naur Khola	TSS	50.07	0.43	8.50	3.43	0.05	1.50	16.27	1.05	1.69	0.09	15.04	98.11	303
BCT10	84.2405	28.5524	Marsyandi	TSS	38.03	0.42	7.00	2.90	0.04	1.74	23.55	0.72	1.60	0.05	21.32	97.36	318
BCT13	84.1481	28.6155	Tributary	TSS	35.85	0.44	8.38	3.47	0.04	2.54	27.54	0.48	2.38	0.06	5.84	87.01	400
BCT18	84.0699	28.6451	Tributary	TSS	29.59	0.30	6.08	2.22	0.03	2.23	30.12	0.90	1.46	0.04	26.60	99.58	446
BCT19	84.0279	28.6633	Tributary	TSS	60.18	0.74	13.17	5.41	0.06	1.35	6.82	1.01	2.60	0.11	8.43	99.87	217
BCT21	84.0177	28.6693	Tributary	TSS	60.60	0.69	13.42	5.73	0.06	1.39	5.85	0.98	2.74	0.12	7.74	99.31	193
BCT24	84.0214	28.6637	Marsyandi	TSS	34.51	0.36	6.84	2.18	0.03	1.99	26.31	1.01	1.61	0.05	23.55	98.44	0
BCT26	84.0054	28.6695	Marsyandi	TSS	49.80	0.54	9.31	3.77	0.04	1.37	15.33	0.74	1.71	0.08	15.01	97.69	258
BCT29	84.1553	28.6108	Tributary	TSS	45.46	0.47	8.67	2.90	0.04	2.44	18.66	0.57	2.79	0.07	17.60	99.67	265
BCT30	83.9776	28.6668	Khangsar Khola	TSS	31.16	0.31	5.86	1.84	0.02	2.19	29.72	1.21	1.57	0.04	25.64	99.57	395
BCT31	83.9869	28.6670	Khangsar Khola	TSS	54.24	0.78	15.05	5.54	0.04	1.17	7.30	0.58	3.38	0.11	9.41	97.60	137
BCT36	84.1858	28.5641	Trib. Bratang	TSS	24.68	0.22	4.29	1.85	0.03	2.30	35.46	0.62	1.22	0.05	29.92	100.64	568
BCT39	84.2942	28.5471	Marsyandi	TSS	37.54	0.36	6.62	2.86	0.04	1.99	24.22	0.86	1.54	0.07	21.37	97.47	na
ett7b	84.1730	28.5740	spring	TSS	22.76	0.27	5.00	1.61	0.03	2.22	34.68	0.66	1.37	0.05	29.79	98.44	466
ett8b	84.1793	28.5925	spring	TSS	23.23	0.26	5.38	2.42	0.03	2.45	33.02	0.65	1.24	0.04	29.40	98.13	477
ett10b	84.1630	28.6058	Tributary	TSS	38.28	0.42	8.03	2.52	0.03	1.83	20.52	0.67	1.80	0.06	30.41	104.56	323
ett11b	84.1579	28.6081	Tributary	TSS	25.35	0.23	4.15	1.65	0.03	1.88	35.95	0.70	1.06	0.04	30.43	101.47	451
ett12b	84.1466	28.6166	Chaichanwa Khola	TSS	44.83	0.45	8.29	2.90	0.04	2.41	19.52	0.53	2.65	0.07	18.05	99.73	272
ett14b	84.1379	28.6197	Tributary	TSS	57.76	0.69	14.07	5.62	0.07	1.18	7.08	0.57	3.04	0.10	9.05	99.23	156
ett16b	84.1144	28.6320	Tributary	TSS	64.52	0.76	15.12	5.22	0.05	1.27	3.13	0.63	3.61	0.09	5.59	99.99	102
ett17b	84.1071	28.6329	Tonakyu Khola	TSS	52.53	0.63	15.15	5.32	0.06	1.30	9.85	0.73	2.59	0.12	11.40	99.67	256
ett18b	84.0922	28.6370	Lokan Khola	TSS	44.33	0.53	12.19	4.37	0.05	1.52	16.68	0.74	2.23	0.09	16.51	99.23	318
ett19b	84.0868	28.6398	Tributary	TSS	27.38	0.29	6.18	2.14	0.03	2.25	30.05	0.58	1.47	0.04	27.36	97.78	730
ett20b	84.0700	28.6453	Sabje Khola	TSS	30.38	0.36	7.77	2.61	0.03	2.19	26.32	0.76	1.77	0.05	24.39	96.64	410
ett21b	84.0483	28.6484	Ghatte Khola	TSS	47.70	0.47	9.60	3.20	0.04	2.27	15.51	0.60	2.84	0.08	15.57	97.89	222
ett22b	84.0213	28.6638	Marsyandi t	TSS	36.31	0.39	7.19	2.70	0.03	1.81	23.82	0.79	1.69	0.06	21.93	96.72	346
ett23b	84.0278	28.6634	Ghatte Khola	TSS	59.84	0.73	13.89	5.63	0.05	1.37	5.31	0.94	2.57	0.11	7.22	97.65	225
ett27b	84.0282	28.6587	Tributary	TSS	28.85	0.30	6.49	2.29	0.03	2.27	30.50	0.76	1.51	0.05	26.77	99.83	499

TABLE S2
(continued)

sample Marsyandi	East	North	River	Catch-ment	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	LOI	Total	Sr ppm
ett28b	84.0182	28.6642	Gangapurna Tal	TSS	34.68	0.35	7.01	2.51	0.04	2.59	25.66	0.69	1.95	0.06	23.69	99.24	371
ett29b	84.0176	28.6700	Syaktan Khola	TSS	59.80	0.79	14.18	5.76	0.07	1.49	5.45	1.10	2.66	0.11	7.32	98.73	218
ett30b	84.0044	28.6683	Kangsar Khola	TSS	35.16	0.37	6.89	2.67	0.03	2.02	25.01	0.87	1.77	0.06	22.23	97.08	358
ett35b	83.9766	28.7184	Tributary	TSS	62.44	0.69	14.33	5.71	0.05	1.27	5.01	1.48	2.67	0.20	6.75	100.60	137
ett36b	83.9742	28.7217	Tributary	TSS	55.01	0.75	15.48	6.18	0.06	1.56	7.18	1.40	2.58	0.11	9.33	99.63	290
ett38b	83.9739	28.7366	Tributary	TSS	47.54	0.51	8.45	3.56	0.04	1.51	19.02	0.99	1.51	0.06	17.32	100.51	206
ett41b	83.9706	28.7472	small spring	TSS	65.95	0.74	15.09	7.00	0.05	1.24	1.12	1.47	2.44	0.08	4.36	99.54	124
ett43b	83.9732	28.7835	Tributary	TSS	37.48	0.43	5.65	2.32	0.02	1.36	28.98	0.28	1.00	0.07	24.69	102.28	351
ett50b	84.0831	28.6503	Chhetaji Khola	TSS	58.62	0.69	15.64	6.28	0.05	1.58	5.10	0.88	3.11	0.14	7.73	99.81	171
ett53b	84.0991	28.6505	Tributary	TSS	60.63	0.70	14.23	4.82	0.05	1.41	5.73	0.65	4.21	0.08	7.44	99.96	95
ett54b	84.1047	28.6484	Tributary	TSS	61.48	0.68	13.43	4.42	0.05	1.42	6.27	0.79	3.94	0.09	7.63	100.21	110
ett58b	84.1305	28.6390	Tributary	TSS	20.23	0.21	4.85	1.90	0.04	1.77	37.58	0.40	1.36	0.05	32.10	100.49	485
ett59b	84.1356	28.6348	Tributary	TSS	16.08	0.17	3.95	1.65	0.03	1.57	41.15	0.36	0.96	0.04	34.87	100.84	587
ett61b	84.1628	28.6117	Tributary	TSS	16.70	0.17	3.58	1.42	0.04	1.78	41.22	0.52	0.91	0.04	34.65	101.03	564
ett63b	84.1874	28.5716	Tributary	TSS	26.60	0.26	6.00	1.94	0.03	2.54	32.87	0.79	1.50	0.04	27.73	100.31	552
ett65b	0.0000	0.0000	Spring	TSS	23.57	0.26	5.05	1.53	0.02	2.38	34.58	0.88	1.21	0.03	30.24	99.74	486

Analytical methods: Major-element compositions were determined by wavelength-dispersive X-ray fluorescence (XRF) spectrometry on fused discs at the Open University using a 3-kW Rh-anode endwindow X-ray tube. Element intensities were corrected for background and known peak-overlap interferences and drift monitored. Matrix corrections employed the empirical Traill-Lachance procedure. Sr was analysed on powder pellets calibrated against USGS standards with a 2σ precision of 5% and standard concentrations analysed as unknowns all lay within 4% of the calibration.

TABLE S3

Analyses of bedloads and leaches and residues of bedloads

Alaknanda Samples	Catchment	Na	K	Ca	Mg	Al	Fe	Mn	Sr*	$^{87}Sr/^{86}Sr$	1σ
		---------- mmole per kg of rock leached ----------							μmole/kg		
AK 16 RS HAc	Lata, HHCS sandy bedload	1.090	6.95	209	21.4	13.8	15.2	1.51	135.6	0.723780	6
AK 16 RS HCl		2.155	33.6	47	58.7	88.7	75.6	0.70	31.4	0.741472	10
AK16 RS Crb		1.090	23.98	244	67.4	13.8	68.0	1.51	166.9	0.727105	12
AK 16 RS Res		473.6	345.5	237	266.4	1849.7	475.4	16.80	1232.2	0.744765	6
AK 16 RS WR**		536.0	419.2	549	363.5	2029.1	566.5	18.70	1314.8	0.741857	7
AK 43 RS HAc	Head waters of Ganges at Rishikesh	1.193	8.76	333	144.2	14.0	17.8	1.26	135.3	0.722662	6
AK 43 RS HCl		1.335	23.2	32	60.4	69.5	62.3	0.68	16.4	0.764693	8
AK 43 RS Crb		1.193	16.7	356	195.1	14.0	65.9	1.26	151.8	0.727212	10
AK 43 RS Res		420.4	320.2	199	199.9	1456.9	297.3	8.74	946.8	0.774146	7
AK 43 RS WR**		551.8	418.3	619	446.4	1724.5	417.0	11.98	1139.6	0.766043	6
AK 69 RS HAc	Pinda catchment - 80% LHS, 20% HHCS	0.843	7.95	411	173.5	9.83	13.9	1.51	64.4	0.727775	8
AK 69 RS HCl		0.838	18.6	37	69.8	65.1	56.1	0.60	16.7	0.772352	10
AK 69 RS Crb		0.843	9.2	442	234.3	9.8	61.3	1.5	81.1	0.736945	13
AK 69 RS Res		357.0	365.2	128	188.9	1368.1	182.6	3.18	762.0	0.811418	6
AK 69 RS WR**		432.4	450.1	624	463.8	1497.0	263.0	5.92	898.6	0.799690	7
AK 74 RS HAc	Nandakini catchment - 95% LHS, 5% HHCS	0.889	7.40	180	97.0	12.7	10.6	0.54	71.3	0.733471	8
AK 74 RS HCl		0.832	20.7	31	57.8	66.6	61.8	0.61	13.1	0.829520	9
AK 74 RS Crb		0.889	12.1	204	146.1	12.7	61.1	0.54	84.4	0.748804	12
AK 74 RS Res		502.0	362.1	149	196.7	1508.3	255.7	5.15	739.5	0.829423	6
AK 74 RS WR**		600.2	439.5	398	381.9	1677.5	330.6	6.63	939.5	0.822264	8
AK 77 RS HAc	Birehi catchement, Deoban LHS	0.492	4.59	2437	2308.0	3.90	37.7	4.77	155.3	0.732608	6
AK 77 RS HCl		0.528	8.49	736	874.3	23.7	44.6	1.44	38.5	0.732652	8
AK 77 RS Crb		0.492	9.1	3171	3171.6	3.9	72.5	4.8	193.8	0.732617	10
AK 77 RS Res		103.2	99.1	57	269.4	596.3	246.2	7.06	192.0	0.800731	6
AK 77 RS WR**		171.0	131.6	3488	3521.8	671.0	364.4	13.67	368.6	0.766178	10
AK 82 RS HAc	Helong, MCT Alaknada	0.916	6.47	349	34.7	10.9	15.7	1.17	343.4	0.713631	10
AK 82 RS HCl		0.868	14.8	20	25.7	48.5	46.0	0.51	24.5	0.749131	13
AK 82 RS Crb		0.916	10.2	366	55.8	10.9	51.7	1.2	367.9	0.715993	16
AK 82 RS Res		332.9	300.5	113	125.2	1317.3	271.1	12.17	724.3	0.753636	9
AK 82 RS WR**		374.8	358.4	512	196.5	1399.9	342.4	13.81	1142.2	0.741044	13
AK 86 RS HAc	Saraswati catchment - HHCS, little TSS	1.022	6.75	572	53.0	10.9	21.2	1.78	581.6	0.713153	7
AK 86 RS HCl		1.293	20.9	27	41.9	64.4	55.8	0.53	24.8	0.738601	7
AK 86 RS Crb		1.02	13.5	593	88.1	10.9	65.9	1.8	606.4	0.714194	10
AK 86 RS Res		401.9	334.5	150	160.2	1526.2	265.0	8.30	899.7	0.750963	7
AK 86 RS WR**		477.6	414.0	777	275.3	1655.9	355.7	11.14	1475.5	0.736234	7
AK 95 RS HAc	Alaknanda close to exit from TSS	1.414	6.47	2363	382.9	10.0	135.8	10.23	1962.3	0.716654	9
AK 95 RS HCl		0.928	8.42	225	163.6	36.1	98.0	3.05	88.6	0.723230	11
AK 95 RS Crb		1.41	3.9	2587	543.2	10.0	226.4	10.2	2050.9	0.716938	14
AK 95 RS Res		152.8	396.7	24	117.0	1299.1	266.4	4.33	315.8	0.758403	9
AK 95 RS WR**		215.9	484.3	2901	744.4	1497.6	506.9	16.29	3013.5	0.722263	9
AK 145M HAc	Lata, HHCS mud from suspended load	3.351	14.2	380	41.1	28.9	25.6	2.27	252.9	0.723637	8
AK 145M HCl		3.304	36.8	25	62.1	102.9	77.6	0.68	26.8	0.745193	7
AK 145M Crb		3.35	28.0	396	90.3	28.9	88.1	2.3	279.7	0.725702	11
AK 145M Res		474.5	381.1	159	213.0	1702.2	249.1	3.85	976.2	0.745875	4
AK 145M WR**		532.2	476.3	591	343.7	1870.1	382.7	7.31	1549.3	0.741388	5

TABLE S3 (continued)

Masyandi Samples	Catchment	Na	K	Ca	Mg	Al	Fe	Mn	Sr***	$^{87}Sr/^{86}Sr$	1σ
BCT 9 HAc	Nar, drains northern TSS	3.329	11.7	3055	162.1	34.1	61.6	4.37	2263.5	0.712048	9
BCT 9 HCl		2.557	11.6	36	41.8	92.1	85.9	0.55	67.3	0.719403	11
BCT 9 Crb		3.33	11.7	3085	192.9	34.1	127.2	4.4	2330.8	0.712260	14
BCT 9 Res		320.8	341.7	72	155.1	1298.5	285.0	1.28	648.4	0.723550	9
BCT 9 WR*		356.0	361.6	2932	373.4	1683.1	433.1	5.88	3544.2	0.714767	9
BCT 10 HAc	Chame on Marsyandi, close to where it leaves TSS	0.787	5.22	3414	141.8	7.43	43.4	2.89	2134.0	0.713574	10
BCT 10 HCl		0.507	8.56	45	57.7	42.7	47.4	0.24	37.9	0.719847	9
BCT 10 Crb		0.79	5.22	3458	194.3	7.4	82.5	2.9	2171.9	0.713598	14
BCT 10 Res		212.5	328.6	21	149.7	1235.3	239.7	0.55	304.1	0.731106	10
BCT 10 WR*		232.4	506.1	4199	430.4	1373.0	363.3	4.74	4015.7	0.715440	10
ETT 22bHac	TSS: Marsyandi at Manang Bridge September 2002	1.672	9.93	4502	204.8	17.6	50.0	3.01	3713.5	0.712627	11
ETT 22bHCl		0.662	11.3	40	68.7	66.2	66.0	0.31	44.3	0.721993	6
ETT 22b Crb		1.67	9.93	4542	266.8	17.6	104.8	3.0	3757.8	0.712643	13
ETT 22bRes		199.4	313.4	3	122.6	1202.1	203.1	0.40	227.3	0.740950	6
ETT 22bWR*		253.6	359.2	4248	449.9	1411.6	337.5	4.34	3738.4	0.714534	8
BCT 24HAc	TSS: Marsyandi at Manang Bridge May 2002	1.579	9.41	4481	196.7	13.5	45.5	2.66	3576.0	0.712944	5
BCT 24HCl		0.527	12.9	66	97.3	63.0	58.7	0.26	54.1	0.719255	5
BCT 24 Crb		1.58	9.41	4547	287.3	13.5	96.3	2.7	3630.1	0.712967	7
BCT 24res		236.2	291.5	3	117.8	1098.8	138.0	0.30	173.0	0.738952	5
BCT 24WR*		324.6	341.7	4691	494.3	1341.8	273.1	4.06	4079.1	0.714534	8
BCT 26HAc	Marsyandi above confluence with Khangsar Khola	1.322	3.19	2690	126.7	17.2	30.4	3.33	2047.7	0.711112	5
BCT 26HCl		0.729	3.61	22	22.8	55.7	70.1	0.30	49.7	0.718242	5
BCT 26 Crb		1.32	3.19	2712	144.2	17.2	87.7	3.3	2097.5	0.711187	7
BCT26res		240.9	373.9	6	170.2	1818.1	415.6	1.05	466.9	0.725024	6
BCT 26WR*		238.3	362.6	2733	339.9	1827.1	471.7	5.17	2895.1	0.714073	5
BCT 30HAc	Khangsar Khola - southern TSS	1.027	11.3	5328	241.8	9.47	56.8	2.57	3916.8	0.713354	7
BCT 30HCl		0.371	14.1	68	103.0	51.0	49.5	0.23	45.3	0.718982	5
BCT 30 Crb		1.03	11.3	5396	338.8	9.5	101.2	2.6	3962.1	0.713366	9
BCT 30Res		246.5	279.8	3	112.4	955.5	96.4	0.12	88.7	0.757502	5
BCT 30WR*		390.5	334.2	5299	543.0	1149.3	230.8	3.48	4090.2	0.714743	8
BCT 39HAc	Marsyandi Latamanang	1.162	6.82	4290	194.4	8.96	49.0	3.24	3269.4	0.712473	4
BCT 39HCl		0.836	10.2	80	89.5	52.6	60.9	0.50	69.1	0.718504	5
BCT 39 Crb		1.16	6.82	4367	276.7	9.0	99.2	3.2	3338.5	0.712499	6
BCT 39Res		206.9	277.6	69	148.6	1082.2	220.2	0.89	421.9	0.728561	4
BCT 39WR*		276.4	326.1	4319	494.2	1299.3	358.1	5.59	3624.4	0.714441	4

HAc = acetic leach, HCl = HCl leach, Crb = HAc leach plus HCl leach with silicate fraction removed calculated assuming silicate has cation/Al ratios of residue and Al in HCl is from silicate. Res = residue from leaching, WR = whole rock (XRF)

Analyses of acetic acid leach, 1M HCl leach and residue from leaching by atomic emmission spectroscopy (AES, methods detailed in table A1). * Whole rock analysed by XRF (see table 2), ** Whole rock analysed by HF dissolution and atomic emmission spectroscopy. *** Sr concentrations and $^{87}Sr/^{86}Sr$ isotopic ratios analysed after spiking with 99.6% enriched ^{84}Sr except Sr concentration in AK86 analysed by AES. The mean differences between analyses of whole bedload samples by XRF and AES are 9.1 % (Na), -8.7% (K), 2.1% (Ca), 4.4% (Mg), 8.9% (Al), -3.1% (Fe), 0.3% (Mn) and 3.5% (Sr). The sum of leach and residue compositions differ from the whole bedload analyses by -8.2% (Na), -18.7% (K), -2.0% (Ca), -4.4% (Mg), 2.4% (Al), -7.6% (Fe), -7.1% (Mn) and -3.4% (Sr). The average ~6% deficit in the sum of leach and residues is attributed to sample loss during the many stages. The AES analyses of the major cations are thought to be with ± 5% for Na, Ca, Mg and Sr from reproducibility of standards.

TABLE S4

Average detrital mineral compositions BCT9

	Biotite/ vermiculite 22 oxygens	1σ	Chlorite 28 oxygens	1σ	Muscovite 22 oxygens	1σ	Calcite 3 oxygens	1σ
No*	7		5		35		76	
Si	5.79	0.33	5.18	0.17	6.80	0.61		
Ti	0.11	0.14	0.01	0.01	0.07	0.13		
Al	4.51	0.34	6.10	0.30	4.63	0.79		
Fe	1.66	0.64	5.86	0.78	0.27	0.15		
Mn	0.00	0.00	0.01	0.01	0.00	0.00		
Mg	1.24	1.14	2.55	0.70	0.24	0.14	0.02	0.01
Ca	0.01	0.01	0.00	0.00	0.01	0.00	0.96	0.03
Na	0.06	0.10	0.01	0.01	0.16	0.19		
K	1.00	0.49	0.08	0.10	1.44	0.38		

Also haematite, quartz, K-spar, albite (An 5), oligoclase/andesine (An30), epidote, clinopyroxene, kaolinite.

Average detrital mineral compositions BCT10

	Biotite 22 oxygens	1σ	Vermiculite (K<0.7) 22 oxygens	1σ	Chlorite 28 oxygens	1σ	Muscovite 22 oxygens	1σ	all biotite/ vermiculite 22 oxygens	1σ	Calcite 3 oxygens	1σ
No*	28		3		5		39		15		71	
Si	5.16	0.68	4.95	0.60	6.14	0.96	6.53	0.48	5.14	0.42		
Ti	0.13	0.09	0.16	0.13	0.03	0.05	0.07	0.06	0.14	0.11		
Al	4.74	1.37	4.28	1.03	5.61	0.30	4.87	0.63	4.70	1.02		
Fe	1.90	0.69	3.24	0.57	4.80	0.57	0.33	0.23	2.03	0.85	0.009	0.006
Mn	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00		
Mg	1.68	1.37	1.78	0.18	2.12	1.71	0.30	0.15	1.69	1.02	0.018	0.007
Ca	0.02	0.02	0.11	0.17	0.22	0.43	0.03	0.06	0.03	0.15	0.971	0.010
Na	0.08	0.14	0.04	0.02	0.03	0.03	0.12	0.11	0.08	0.14		
K	1.34	0.36	0.44	0.16	0.17	0.17	1.54	0.35	1.25	0.51		

Also haematite, quartz, garnet, paragonite, rutile

Average detrital mineral compositions BCT26

	Biotite 22 oxygens	1σ	Vermiculite (K<0.7)	1σ	Chlorite 28 oxygens	1σ	Muscovite 22 oxygens	1σ	Calcite 3 oxygens	1σ
No*	8		6		3		31		52	
Si	5.41	0.52	4.99	0.69	6.36	1.38	6.64	0.56		
Ti	0.10	0.10	0.09	0.11	0.03	0.02	0.06	0.06		
Al	4.47	0.53	5.01	0.81	5.78	0.29	4.73	0.77		
Fe	2.78	0.71	2.74	1.38	4.55	1.84	0.44	0.34		
Mn	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00		
Mg	0.93	0.65	1.40	0.95	1.93	0.68	0.29	0.10	0.013	0.007
Ca	0.04	0.03	0.04	0.05	0.04	0.03	0.02	0.01	0.958	0.049
Na	0.07	0.07	0.05	0.05	0.01	0.01	0.14	0.14		
K	0.94	0.30	0.24	0.15	0.05	0.05	1.38	0.39		

Also K-spar, albite, haematite, quartz

Table S4
(continued)
Average detrital mineral compositions BCT30

	Biotite/ vermiculite 22 oxygens	1σ	Chlorite 28 oxygens	1σ	Muscovite 22 oxygens	1σ	Calcite 3 oxygens	1σ
No*	17		5		26		46	
Si	5.49	0.55	5.46	0.31	6.28	0.40		
Ti	0.14	0.29	0.01	0.00	0.11	0.16		
Al	4.23	1.00	5.62	0.40	5.19	0.53		
Fe	2.15	1.07	4.89	1.36	0.26	0.19		
Mn	0.00	0.00	0.00	0.00	0.00	0.00		
Mg	1.66	1.38	3.73	1.91	0.25	0.24	0.021	0.018
Ca	0.02	0.02	0.01	0.00	0.01	0.01	0.029	0.029
Na	0.06	0.07	0.00	0.01	0.15	0.11		
K	1.12	0.49	0.04	0.04	1.67	0.24		

Also haematite, quartz, Mg-Fe amphibole, albite

Electron microprobe analyses were determined using a 5-spectrometer CamecaSX-100 electron microprobe at the University of Cambridge (15kV, 10 nA for Na, Si, Ca, K, Al and 100 nA for Mn, Fe, Ti and Mg; beam diameter 5 μm) standardised with Na on Jadeite, Si, Ca on Diopside, K on K-feldspar, Al on Corundum, Mn on pure Mn, Fe on Fayalite, Ti on Rutile, Mg on periclase. * number of grains analysed.

Table S5: Water compositions corrected for rain and spring inputs used in regressions and for mineral mode calculations. Concentrations μmol/L except Sr in nmol/L

Marsyandi at Koto Time series samples

Sample	Na	1σ	K	1σ	Ca	1σ	Mg	1σ	Si	1σ	Sr	1σ	$^{87}Sr/^{86}Sr$	1σ
CT10	89.6	5.9	25.6	1.6	892.3	45.8	479.0	24.1	42.0	2.2	2391	121	0.719179	236
MT65	32.3	4.4	21.7	1.4	701.9	36.2	253.3	12.8	23.8	1.3	1486	76	0.717571	149
MT66	28.1	3.8	20.5	1.3	698.8	36.0	246.3	12.4	22.8	1.3	1469	75	0.717369	131
MT67	35.2	4.8	20.3	1.3	717.5	36.9	231.1	11.7	24.0	1.3	1485	76	0.716709	164
MT17	61.3	4.8	29.1	1.8	759.8	39.2	277.3	14.0	24.5	1.4	1734	89	0.716670	364
MT18	79.3	6.0	27.2	1.7	808.3	41.7	304.8	15.4	25.4	1.5	2032	104	0.715855	387
MT19	60.3	5.2	24.0	1.6	812.6	41.9	334.7	16.9	29.3	1.7	2029	104	0.716896	389
MT20	72.4	5.1	25.5	1.6	868.5	44.6	352.6	17.8	27.5	1.5	2312	118	0.716111	249
MT21	88.6	6.3	24.5	1.6	859.7	44.2	346.9	17.5	26.4	1.5	2198	112	0.716255	327
MT22	82.8	5.9	25.2	1.6	937.6	48.1	442.7	22.3	36.6	2.0	2603	132	0.716978	267
MT23	94.3	6.5	24.7	1.6	950.4	48.7	470.1	23.6	36.4	2.0	2816	143	0.716651	262
MT24	107.2	8.3	26.3	1.7	945.7	48.7	472.2	23.8	41.0	2.3	2565	132	0.717716	456
ett69	70.7	5.8	24.6	1.6	923.7	47.4	454.7	22.9	42.7	2.3	2616	133	0.718336	332
MT26	94.9	7.2	26.0	1.7	989.7	50.8	535.7	26.9	50.3	2.7	2767	141	0.718231	348
MT27	96.0	7.7	27.8	1.8	961.8	49.5	515.5	25.9	52.2	2.8	2631	135	0.718406	433
MT28	102.0	8.0	26.6	1.7	984.2	50.6	545.7	27.4	53.6	2.9	2834	145	0.718294	403
MT29	112.2	8.8	27.7	1.8	1010.8	52.0	599.5	30.1	57.2	3.1	3012	154	0.718318	427
MT30	116.4	9.7	28.2	1.9	1009.3	52.0	610.2	30.7	59.8	3.3	3046	157	0.718368	499
MT31	144.7	12.0	27.4	2.0	1017.4	52.5	623.7	31.4	58.8	3.3	3095	160	0.718141	622
MT32	140.4	12.4	28.0	2.1	992.8	51.4	614.1	30.9	58.8	3.4	3010	156	0.718419	703
MT107	146.7	15.1	35.2	2.6	862.5	45.2	603.4	30.4	59.4	3.6	2979	157	0.718602	990
MT108	122.7	10.1	36.4	2.3	891.8	46.1	671.8	33.8	54.4	3.0	3323	171	0.718706	482
MT109	127.0	15.8	37.0	2.8	860.8	45.4	609.7	30.7	56.4	3.6	3022	161	0.718558	1134
MT110	76.1	10.0	27.3	2.1	789.6	41.3	502.8	25.3	44.3	2.7	2513	132	0.718986	870
MT111	63.1	6.5	27.6	1.8	726.8	37.8	419.1	21.1	31.3	1.8	2159	112	0.718815	560
MT112	58.6	8.1	24.9	1.8	705.2	36.9	391.1	19.7	32.4	2.0	1990	105	0.718748	893
MT155	68.8	6.2	25.6	1.7	779.8	40.3	331.3	16.7	28.6	1.7	2048	106	0.716643	491
MT156	55.1	4.4	22.7	1.5	725.5	37.5	278.4	14.1	27.7	1.5	1739	89	0.717094	334
MT157	80.7	12.3	24.1	1.9	833.8	43.0	374.1	18.8	30.5	1.9	2457	126	0.715470	326
MT158	65.9	5.3	24.2	1.6	727.7	37.6	284.1	14.3	27.1	1.5	1752	90	0.717564	424
MT159	68.2	5.9	26.2	1.7	763.9	39.5	345.4	17.4	31.6	1.8	2071	106	0.717408	450
MT160	66.6	5.6	28.4	1.8	770.1	39.8	317.9	16.0	30.1	1.7	1920	99	0.717234	440
MT161	84.0	6.5	26.5	1.7	784.9	40.5	364.8	18.4	34.8	1.9	2124	109	0.717651	413

Nar at Koto: Time series samples

CT9	160.6	9.4	25.4	1.6	1295.6	65.9	790.3	39.6	58.7	3.1	3900	197	0.715098	167
MT63	91.1	5.0	26.2	1.5	849.0	43.4	392.1	19.7	28.2	1.5	2824	142	0.714008	102
MT64	106.3	6.0	28.3	1.6	867.7	44.4	343.3	17.3	27.4	1.5	3296	166	0.712790	109
MT1	121.3	7.3	27.6	1.7	952.1	48.7	426.7	21.5	27.6	1.5	3181	161	0.713620	170
MT2	85.0	5.2	24.0	1.5	877.1	44.9	334.9	16.9	23.4	1.3	2462	124	0.714122	156
MT3	107.1	6.2	22.8	1.4	1014.8	51.8	464.1	23.3	28.4	1.5	3288	166	0.713969	125
MT4	103.5	6.5	23.1	1.5	1042.7	53.3	510.1	25.6	28.6	1.6	3502	177	0.713794	164
MT5	139.2	8.5	25.7	1.6	1105.7	56.5	542.6	27.3	28.4	1.6	3698	187	0.713645	194
MT6	151.2	8.5	26.1	1.6	1250.9	63.6	702.9	35.3	36.1	1.9	4608	232	0.714379	117
MT7	117.9	10.2	22.2	1.7	1248.6	64.0	727.5	36.5	33.3	2.0	4786	244	0.714133	363
MT8	183.5	10.8	26.1	1.6	1288.0	65.6	781.8	39.2	43.8	2.3	4541	229	0.713622	179

Table S5 (continued) Nar time series samples

Sample	Na	1σ	K	1σ	Ca	1σ	Mg	1σ	Si	1σ	Sr	1σ	$^{87}Sr/^{86}Sr$	1σ
ett74	132.6	8.5	23.7	1.5	1413.4	71.9	831.6	41.7	46.9	2.5	5137	259	0.714274	175
MT9	169.3	9.9	23.6	1.5	1260.1	64.2	774.6	38.9	45.4	2.4	4412	223	0.714297	166
MT10	175.5	9.6	27.8	1.6	1402.1	71.1	901.0	45.2	57.7	3.0	4912	247	0.714695	111
MT11	167.4	9.4	27.3	1.6	1370.0	69.6	863.2	43.3	57.3	3.0	4674	235	0.714624	124
MT12	157.1	8.9	26.4	1.6	1300.4	66.1	809.5	40.6	55.8	2.9	4429	223	0.714688	132
MT13	162.0	10.5	27.0	1.7	1420.6	72.3	945.5	47.4	63.7	3.4	5057	256	0.714575	220
MT14	181.9	10.2	28.8	1.7	1409.6	71.6	956.6	48.0	67.5	3.5	4964	250	0.714825	130
MT15	208.4	12.2	27.4	1.7	1379.2	70.2	941.4	47.2	66.1	3.5	4895	247	0.714807	186
MT16	208.5	12.6	28.6	1.8	1410.9	71.8	972.4	48.8	68.4	3.6	4941	250	0.714857	214
MT116	174.4	10.6	29.9	1.8	1096.3	56.1	851.1	42.7	66.9	3.5	4466	226	0.715336	202
MT115	172.7	10.6	30.1	1.8	1186.4	60.6	924.9	46.4	76.0	4.0	4775	241	0.715437	197
MT162	98.1	5.2	22.4	1.3	837.0	42.6	386.7	19.4	30.3	1.6	2728	137	0.714315	101
MT163	76.5	6.9	19.9	1.5	866.1	44.7	402.7	20.3	28.4	1.7	2705	139	0.713971	428
MT164	120.5	6.5	24.3	1.4	928.5	47.4	461.7	23.2	31.5	1.6	3299	166	0.713823	103
MT165	110.1	6.1	21.5	1.3	857.0	43.9	413.5	20.8	30.4	1.6	2939	148	0.713987	106
MT166	139.6	7.2	26.8	1.4	991.7	50.0	553.6	27.7	36.2	1.8	3844	192	0.713857	100
MT167	101.9	5.6	22.9	1.4	912.7	46.6	452.1	22.7	31.5	1.6	2969	149	0.714322	102
MT168	154.7	8.6	26.9	1.6	1110.1	56.6	647.4	32.5	39.3	2.1	4125	208	0.714043	121
MT113	175.1	10.8	29.9	1.8	1187.5	60.6	913.3	45.8	74.5	3.9	4908	248	0.715262	199
MT114	137.8	12.4	32.0	2.3	1301.5	66.8	931.4	46.8	103.5	5.6	4940	253	0.714884	446
MT114	137.8	12.4	32.0	2.3	1301.5	66.8	931.4	46.8	103.5	5.6	4940	253	0.714884	446
Upper Marsyandi Samples at Manang and in Marsyandi above Marsyandi-Khangsar Khola confluence														
ett22	114.9	6.7	27.9	1.7	1126.7	57.4	605.7	30.4	37.8	2.0	3518	177	0.717500	134
CT24	115.9	6.4	29.1	1.7	1030.4	52.5	715.5	35.9	48.3	2.5	3398	171	0.719053	106
CT20	124.5	6.8	28.1	1.7	1065.8	54.5	703.2	35.3	48.7	2.5	3459	174	0.718835	103
CT26	207.2	11.6	20.3	1.3	1467.9	74.5	850.8	42.7	56.5	2.9	5695	287	0.714433	133
Alaknada: Rishi Ganga HHCS catchment sampled near Lata														
AK16	27.9	2.8	58.5	3.2	468.2	24.9	152.0	7.8	70.5	3.6	669	35	0.736149	528
AK92	70.0	4.0	55.3	3.0	575.2	30.0	211.8	10.7	80.4	4.1	817	42	0.742088	126
AK114	43.5	3.3	50.5	2.8	431.0	23.0	174.2	8.9	73.5	3.8	784	41	0.737887	326
AK145	26.3	2.0	36.4	2.1	436.7	23.2	146.5	7.5	52.0	2.7	586	30	0.738774	153
AK200	34.9	2.0	41.6	2.2	537.8	27.5	158.4	8.0	50.4	2.6	730	37	0.736192	109
AK259	20.7	2.9	38.9	2.3	520.2	27.5	132.7	6.8	40.5	2.2	632	34	0.735484	767
Alaknada: Lesser Himalayan Catchments: Pinda														
AK5	33.7	3.4	43.6	2.9	480.1	27.0	180.0	9.3	73.9	3.9	446	25	0.740834	416
AK69	59.2	4.7	39.2	2.7	471.1	26.6	197.9	10.2	90.6	4.7	411	24	0.745789	642
AK132	39.2	3.4	31.0	2.3	394.9	22.9	176.1	9.1	109.5	5.6	315	19	0.746383	428
AK156	51.6	3.4	35.1	2.1	409.4	22.4	188.6	9.6	122.3	6.2	336	18	0.746615	276
AK304	33.8	2.9	29.4	2.1	398.2	22.6	117.2	6.1	72.7	3.8	329	19	0.741419	364

Table S5 (continued)

Alaknada: Lesser Himalayan Catchments: Nandakini

Sample	Na	1σ	K	1σ	Ca	1σ	Mg	1σ	Si	1σ	Sr	1σ	$^{87}Sr/^{86}Sr$	1σ
AK7	60.7	4.4	48.0	3.0	481.8	27.1	212.5	10.9	116.3	5.9	415	23	0.766924	335
AK74	84.4	5.7	44.1	2.9	472.4	26.7	208.1	10.7	114.6	5.9	400	23	0.768897	505
AK117	66.0	5.6	55.4	3.4	412.8	23.9	209.4	10.8	110.5	5.7	387	23	0.760656	1296
AK128	55.9	4.0	38.1	2.5	322.8	19.0	129.2	6.7	130.2	6.6	319	18	0.758534	380
AK190	51.7	3.7	36.0	2.4	339.3	19.7	121.5	6.3	119.3	6.1	317	18	0.756203	370
AK293	37.6	3.4	29.2	2.3	280.0	17.5	120.3	6.3	96.3	5.0	249	16	0.763951	571
Alaknada: Lesser Himalayan Catchments: Birehi														
AK10	122.6	8.3	69.5	3.9	562.7	30.2	356.4	18.0	99.3	5.1	323	20	0.783451	2194
AK77	149.2	9.3	62.5	3.5	594.0	31.7	375.5	19.0	93.8	4.9	327	20	0.783968	1838
AK141	48.9	3.3	41.0	2.4	470.1	25.4	354.3	17.9	100.6	5.1	260	15	0.776796	351
AK149	48.1	3.4	42.0	2.5	463.6	25.1	336.2	17.0	98.4	5.0	257	15	0.775331	442
AK273	45.2	3.5	37.8	2.3	403.1	22.1	187.3	9.6	72.9	3.8	231	14	0.762959	960