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*Supplement of*

## **Slope–velocity equilibrium and evolution of surface roughness on a stony hillslope**

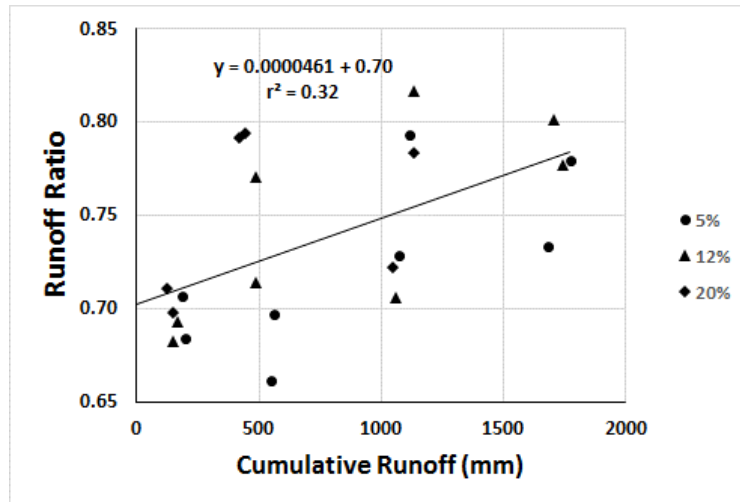
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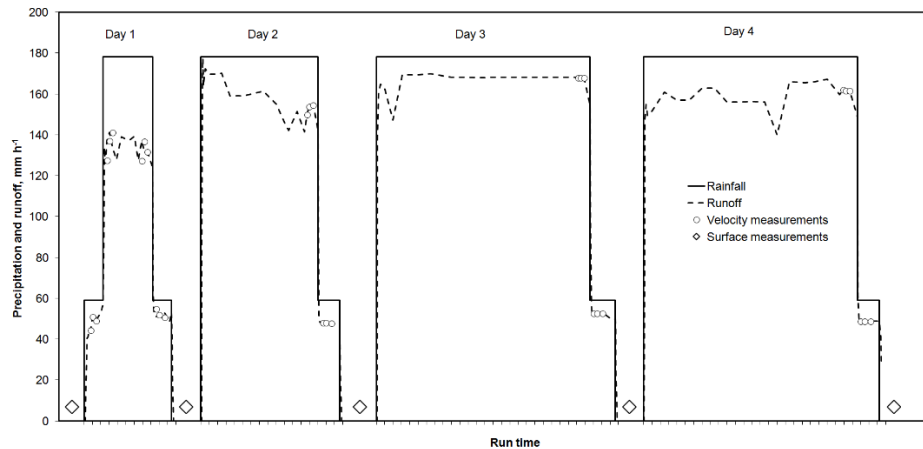
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## Supplement

### 1: Runoff Ratios a function of cumulative runoff.



### 2: Schematic of an experimental sequence for Replication 1 of the 12% slope.



### 3: Photo of the experiment in progress. Taken during run 3 at 20% slope, replication #1.



4: Example of photo of rock cover. Taken after run 3 at 20% slope, replication #2.



## 5: Data

Slope	Rep	Run	Rainfall	Distance	Velocity			Section	Section	Chezy	Manning's	Meas.	Meas.	Interp.	Interp.
%	#	#	Int.	m	Peak	Runoff	Runoff	Peak	Discharge	m <sup>1/2</sup>	s m <sup>-1/3</sup>	Rough.	Rock	Rough	Rock
			mm/h		m/s	l/min	mm	Vel.	l/min	s <sup>-1</sup>		mm	C	mm	%
5	1	0	59	1.65	0.046	8.35	2.6	0.0465	7.22	5.779	0.057	2.09	40	2.06	43
5	1	0	59	3.5	0.036	8.56	5.8	0.0305	4.94	3.706	0.090	2.03	23	2.19	28
5	1	0	59	5.8	0.026	8.72	9.3	0.0177	2.05	2.552	0.123	2.33	32	2.38	35
5	1	0	178	1.65	0.090	25.72	24.4	0.0898	22.23	8.845	0.040	2.09	40	2.00	47
5	1	0	178	3.5	0.072	25.72	29.7	0.0609	14.83	6.046	0.059	2.03	23	2.38	33
5	1	0	178	5.8	0.047	25.72	37.1	0.0305	6.05	3.357	0.102	2.33	32	2.41	38
5	1	1	178	1.65	0.080	26.37	150.9	0.0800	22.79	7.345	0.050	1.77	65	1.86	58
5	1	1	178	3.5	0.068	26.37	155.2	0.0594	15.20	5.756	0.062	3.23	56	2.92	48
5	1	1	178	5.8	0.046	27.34	164.1	0.0314	6.43	3.398	0.102	2.59	53	2.53	48
5	1	1	59	1.65	0.048	9.34	181.8	0.0480	8.08	5.734	0.058	1.77	65	1.82	61
5	1	1	59	3.5	0.039	9.34	185.0	0.0340	5.39	4.188	0.079	3.23	56	3.07	52
5	1	1	59	5.8	0.024	8.64	189.3	0.0155	2.03	2.102	0.153	2.59	53	2.57	51
5	1	2	178	1.65	0.071	25.15	511.6	0.0710	21.73	6.283	0.059	2.68	74	2.49	72
5	1	2	178	3.5	0.062	25.15	516.8	0.0561	14.50	5.401	0.067	2.47	76	2.62	72
5	1	2	178	5.8	0.039	25.15	524.0	0.0245	5.92	2.447	0.145	2.72	83	2.70	77
5	1	2	59	1.65	0.046	9.51	541.0	0.0465	8.22	5.415	0.062	2.68	74	2.57	73
5	1	2	59	3.5	0.034	9.51	544.5	0.0280	5.48	3.105	0.110	2.47	76	2.55	74
5	1	2	59	5.8	0.023	9.21	549.5	0.0156	2.17	2.044	0.159	2.72	83	2.71	81
5	1	3	178	1.65	0.069	26.29	1016.7	0.0688	22.73	5.858	0.064	2.87	74	2.84	74
5	1	3	178	3.5	0.058	26.29	1023.1	0.0514	15.16	4.635	0.079	2.81	75	2.76	75
5	1	3	178	5.8	0.037	26.29	1032.9	0.0242	6.19	2.351	0.153	2.79	82	2.78	82
5	1	3	59	1.65	0.045	9.92	1052.4	0.0446	8.58	4.981	0.069	2.87	74	2.86	74
5	1	3	59	3.5	0.035	9.92	1056.1	0.0289	5.72	3.174	0.108	2.81	75	2.79	75
5	1	3	59	5.8	0.022	9.87	1060.9	0.0144	2.32	1.762	0.188	2.79	82	2.79	82
5	1	4	178	1.65	0.061	26.91	1627.5	0.0611	23.26	4.853	0.079	3.22	90	3.17	88
5	1	4	178	3.5	0.058	26.91	1634.2	0.0548	15.52	5.047	0.072	2.89	92	2.88	90
5	1	4	178	5.8	0.038	26.84	1643.0	0.0247	6.31	2.398	0.150	2.60	88	2.63	87
5	1	4	59	1.65	0.037	9.92	1661.0	0.0368	8.58	3.729	0.095	3.22	90	3.19	89
5	1	4	59	3.5	0.029	9.95	1665.1	0.0247	5.74	2.506	0.141	2.89	92	2.89	91
5	1	4	59	5.8	0.021	9.95	1670.8	0.0145	2.34	1.761	0.189	2.60	88	2.61	88
5	2	0	59	1.65	0.049	7.29	7.3	0.0491	6.30	6.707	0.048	2.65	23	2.59	28
5	2	0	59	3.5	0.045	7.29	9.4	0.0425	4.20	6.630	0.046	2.42	20	2.41	26
5	2	0	59	5.8	0.027	7.29	12.7	0.0168	1.72	2.566	0.120	1.94	38	2.05	40

5	2	0	178	1.65	0.094	26.56	28.7	0.0936	22.96	9.257	0.038	2.65	23	2.51	35
5	2	0	178	3.5	0.083	27.58	34.7	0.0748	15.90	7.945	0.044	2.42	20	2.40	32
5	2	0	178	5.8	0.050	27.58	43.0	0.0313	6.49	3.367	0.103	1.94	38	2.13	41
5	2	1	178	1.65	0.073	24.88	139.7	0.0733	21.50	6.634	0.055	2.24	63	2.36	51
5	2	1	178	3.5	0.069	26.76	145.0	0.0649	15.43	6.523	0.054	2.36	54	2.37	44
5	2	1	178	5.8	0.044	26.76	153.8	0.0281	6.30	2.914	0.120	2.45	45	2.32	43
5	2	1	59	1.65	0.038	8.53	172.1	0.0384	7.38	4.288	0.080	2.24	63	2.31	56
5	2	1	59	3.5	0.038	8.53	175.3	0.0379	4.92	5.163	0.062	2.36	54	2.37	49
5	2	1	59	5.8	0.024	8.53	179.8	0.0154	2.01	2.091	0.153	2.45	45	2.40	44
5	2	2	178	1.65	0.063	23.27	486.1	0.0629	20.11	5.444	0.068	2.51	70	2.44	68
5	2	2	178	3.5	0.057	23.27	492.7	0.0530	13.41	5.168	0.069	2.50	74	2.47	69
5	2	2	178	5.8	0.041	23.45	504.3	0.0287	5.52	3.200	0.107	2.62	65	2.58	61
5	2	2	59	1.65	0.038	9.56	525.1	0.0384	8.27	4.050	0.086	2.51	70	2.47	69
5	2	2	59	3.5	0.035	9.56	529.1	0.0318	5.51	3.746	0.090	2.50	74	2.48	72
5	2	2	59	5.8	0.023	9.56	535.0	0.0148	2.25	1.862	0.177	2.62	65	2.60	63
5	2	3	178	1.65	0.070	25.95	1048.8	0.0698	22.43	6.038	0.062	2.65	78	2.63	76
5	2	3	178	3.5	0.062	29.40	1054.4	0.0561	16.95	4.994	0.074	3.06	76	2.96	76
5	2	3	178	5.8	0.040	29.48	1066.5	0.0256	6.94	2.403	0.151	3.01	74	2.95	72
5	2	3	59	1.65	0.040	9.02	1089.3	0.0405	7.79	4.521	0.076	2.65	78	2.64	77
5	2	3	59	3.5	0.036	10.15	1093.6	0.0320	5.85	3.672	0.092	3.06	76	3.01	76
5	2	3	59	5.8	0.021	9.76	1100.6	0.0128	2.30	1.481	0.228	3.01	74	2.99	73
5	2	4	178	1.65	0.068	29.48	1704.3	0.0677	25.48	5.404	0.071	2.69	81	2.69	81
5	2	4	178	3.5	0.056	29.48	1711.6	0.0489	16.99	4.058	0.093	2.91	76	2.93	76
5	2	4	178	5.8	0.038	29.48	1722.5	0.0253	6.94	2.373	0.153	3.51	81	3.44	80
5	2	4	59	1.65	0.040	9.10	1747.5	0.0405	7.86	4.501	0.076	2.69	81	2.69	81
5	2	4	59	3.5	0.030	9.10	1751.6	0.0244	5.25	2.582	0.135	2.91	76	2.92	76
5	2	4	59	5.8	0.017	9.10	1758.0	0.0105	2.14	1.132	0.305	3.51	81	3.48	80
12	1	0	59	1.65	0.056	8.56	3.7	0.0559	7.40	4.863	0.066	2.87	16	3.05	19
12	1	0	59	3.5	0.049	9.79	5.5	0.0448	5.64	3.999	0.080	2.02	20	2.11	23
12	1	0	59	5.8	0.033	9.45	8.7	0.0219	2.22	2.174	0.141	1.89	11	1.88	15
12	1	0	178	1.65	0.100	24.20	23.5	0.1000	20.92	6.914	0.050	2.87	16	3.47	26
12	1	0	178	3.5	0.092	24.92	29.5	0.0851	14.37	6.545	0.051	2.02	20	2.27	29
12	1	0	178	5.8	0.054	23.60	36.5	0.0337	5.55	2.625	0.127	1.89	11	1.87	21
12	1	1	178	1.65	0.129	24.16	105.0	0.1294	20.88	10.187	0.033	5.18	53	4.36	40
12	1	1	178	3.5	0.082	23.27	110.9	0.0617	13.41	4.181	0.084	2.91	53	2.62	42
12	1	1	178	5.8	0.054	23.20	118.5	0.0355	5.46	2.857	0.115	1.81	43	1.84	34
12	1	1	59	1.65	0.082	9.76	134.5	0.0820	8.43	8.081	0.038	5.18	53	4.74	46
12	1	1	59	3.5	0.046	10.09	137.3	0.0333	5.82	2.523	0.133	2.91	53	2.77	48
12	1	1	59	5.8	0.031	10.15	142.7	0.0204	2.39	1.892	0.166	1.81	43	1.82	40
12	1	2	178	1.65	0.081	26.45	439.3	0.0815	22.86	4.865	0.075	5.16	71	5.16	67

12	1	2	178	3.5	0.072	27.15	444.8	0.0649	15.65	4.182	0.085	4.24	56	3.93	55
12	1	2	178	5.8	0.050	27.26	456.0	0.0341	6.42	2.483	0.137	2.50	49	2.36	48
12	1	2	59	1.65	0.044	9.23	474.0	0.0442	7.98	3.284	0.103	5.16	71	5.16	69
12	1	2	59	3.5	0.036	9.18	477.0	0.0312	5.29	2.398	0.140	4.24	56	4.09	56
12	1	2	59	5.8	0.026	9.13	481.6	0.0177	2.15	1.604	0.198	2.50	49	2.44	49
12	1	3	178	1.65	0.077	29.64	1072.6	0.0772	25.62	4.236	0.088	5.01	69	5.03	69
12	1	3	178	3.5	0.069	29.64	1079.9	0.0625	17.09	3.776	0.096	5.74	65	5.51	64
12	1	3	178	5.8	0.045	29.64	1090.9	0.0299	6.97	1.960	0.180	4.11	57	3.89	56
12	1	3	59	1.65	0.040	10.15	1112.3	0.0405	8.77	2.751	0.127	5.01	69	5.02	69
12	1	3	59	3.5	0.034	10.15	1116.0	0.0305	5.85	2.197	0.156	5.74	65	5.61	64
12	1	3	59	5.8	0.024	10.15	1121.4	0.0158	2.39	1.291	0.254	4.11	57	4.01	57
12	1	4	178	1.65	0.071	28.60	1682.1	0.0710	24.72	3.802	0.099	4.25	80	4.37	78
12	1	4	178	3.5	0.066	28.52	1689.2	0.0617	16.44	3.776	0.096	5.18	89	5.26	85
12	1	4	178	5.8	0.044	28.52	1700.9	0.0292	6.71	1.927	0.183	3.74	84	3.79	80
12	1	4	59	1.65	0.039	9.37	1726.0	0.0387	8.10	2.677	0.130	4.25	80	4.31	79
12	1	4	59	3.5	0.034	9.37	1729.5	0.0306	5.40	2.307	0.146	5.18	89	5.22	87
12	1	4	59	5.8	0.023	9.37	1735.3	0.0158	2.20	1.333	0.243	3.74	84	3.76	82
12	2	0	59	1.65	0.042	8.72	7.1	0.0424	7.54	3.186	0.106	2.18	36	2.31	40
12	2	0	59	3.5	0.040	9.37	10.1	0.0388	5.40	3.293	0.098	2.73	20	2.96	27
12	2	0	59	5.8	0.032	9.32	15.0	0.0244	2.19	2.580	0.117	2.53	26	2.78	33
12	2	0	178	1.65	0.079	23.64	30.5	0.0786	20.43	4.872	0.074	2.18	36	2.53	46
12	2	0	178	3.5	0.083	23.64	36.4	0.0826	13.63	6.431	0.052	2.73	20	3.26	36
12	2	0	178	5.8	0.052	23.64	44.2	0.0337	5.56	2.622	0.127	2.53	26	2.98	39
12	2	1	178	1.65	0.076	23.83	110.7	0.0759	20.59	4.604	0.079	3.38	69	2.92	56
12	2	1	178	3.5	0.073	23.86	119.5	0.0715	13.76	5.153	0.066	4.40	69	3.83	52
12	2	1	178	5.8	0.047	23.83	129.3	0.0308	5.61	2.285	0.148	3.83	62	3.44	51
12	2	1	59	1.65	0.051	10.86	148.8	0.0514	9.39	3.798	0.089	3.38	69	3.13	62
12	2	1	59	3.5	0.038	11.00	153.9	0.0312	6.34	2.191	0.158	4.40	69	4.13	61
12	2	1	59	5.8	0.027	10.55	159.9	0.0183	2.48	1.573	0.205	3.83	62	3.69	58
12	2	2	178	1.65	0.070	25.34	422.2	0.0699	21.90	3.946	0.094	3.71	89	3.61	83
12	2	2	178	3.5	0.063	24.16	428.3	0.0574	13.93	3.681	0.097	4.70	88	4.62	83
12	2	2	178	5.8	0.045	25.72	438.6	0.0310	6.05	2.215	0.155	2.94	86	3.15	80
12	2	2	59	1.65	0.041	10.89	463.5	0.0413	9.41	2.731	0.129	3.71	89	3.66	86
12	2	2	59	3.5	0.034	10.89	467.5	0.0295	6.28	2.027	0.172	4.70	88	4.66	86
12	2	2	59	5.8	0.025	10.89	474.6	0.0174	2.56	1.431	0.229	2.94	86	3.01	84
12	2	3	178	1.65	0.079	25.30	982.0	0.0786	21.86	4.710	0.077	3.99	83	3.93	84
12	2	3	178	3.5	0.056	24.77	990.2	0.0444	14.28	2.480	0.150	5.70	89	5.52	89
12	2	3	178	5.8	0.043	24.77	1002.4	0.0321	5.83	2.383	0.142	4.00	90	3.83	89
12	2	3	59	1.65	0.038	11.76	1026.4	0.0384	10.17	2.358	0.153	3.99	83	3.96	83
12	2	3	59	3.5	0.034	11.79	1032.2	0.0312	6.80	2.116	0.165	5.70	89	5.60	89

12	2	3	59	5.8	0.025	10.86	1041.0	0.0173	2.56	1.421	0.231	4.00	90	3.94	90
12	2	4	178	1.65	0.066	29.04	1619.2	0.0657	25.10	3.358	0.114	5.11	90	4.86	88
12	2	4	178	3.5	0.062	28.17	1628.6	0.0587	16.24	3.532	0.103	5.39	88	5.45	88
12	2	4	178	5.8	0.042	29.52	1642.8	0.0278	6.95	1.754	0.204	4.42	92	4.34	91
12	2	4	59	1.65	0.036	11.59	1672.1	0.0365	10.02	2.200	0.165	5.11	90	4.95	89
12	2	4	59	3.5	0.031	10.49	1679.8	0.0280	6.05	1.908	0.183	5.39	88	5.43	88
12	2	4	59	5.8	0.020	10.26	1692.6	0.0131	2.41	0.961	0.353	4.42	92	4.39	92
20	1	0	59	1.65	0.059	10.98	5.4	0.0590	9.49	3.604	0.092	2.73	16	3.35	20
20	1	0	59	3.5	0.054	9.81	7.1	0.0498	5.66	3.617	0.087	3.55	10	3.80	14
20	1	0	59	5.8	0.041	9.65	11.1	0.0305	2.27	2.741	0.107	2.20	18	2.39	22
20	1	0	178	1.65	0.129	29.40	26.3	0.1294	25.41	7.154	0.048	2.73	16	4.50	26
20	1	0	178	3.5	0.095	26.68	30.8	0.0771	15.38	4.227	0.081	3.55	10	4.19	20
20	1	0	178	5.8	0.066	27.97	38.6	0.0454	6.58	2.923	0.112	2.20	18	2.58	27
20	1	1	178	1.65	0.119	23.98	81.7	0.1189	20.72	6.974	0.048	8.56	48	6.14	35
20	1	1	178	3.5	0.086	23.98	87.6	0.0695	13.82	3.817	0.090	5.53	42	4.77	30
20	1	1	178	5.8	0.057	23.57	95.4	0.0372	5.55	2.357	0.139	3.25	42	2.89	34
20	1	1	59	1.65	0.071	8.56	109.7	0.0713	7.40	5.426	0.057	8.56	48	7.20	40
20	1	1	59	3.5	0.043	8.85	112.5	0.0316	5.10	1.928	0.172	5.53	42	5.15	36
20	1	1	59	5.8	0.027	8.24	117.5	0.0171	1.94	1.247	0.251	3.25	42	3.12	39
20	1	2	178	1.65	0.100	28.29	350.3	0.1000	24.45	4.954	0.072	7.72	58	8.01	54
20	1	2	178	3.5	0.074	28.29	357.3	0.0602	16.31	2.831	0.128	7.32	71	6.74	62
20	1	2	178	5.8	0.051	28.25	371.2	0.0348	6.65	1.955	0.175	4.08	67	3.85	60
20	1	2	59	1.65	0.055	9.40	396.3	0.0545	8.12	3.462	0.095	7.72	58	7.87	56
20	1	2	59	3.5	0.037	9.67	401.0	0.0292	5.58	1.636	0.209	7.32	71	7.07	67
20	1	2	59	5.8	0.024	9.87	408.2	0.0157	2.32	0.999	0.328	4.08	67	4.02	65
20	1	3	178	1.65	0.069	25.53	983.8	0.0688	22.06	2.973	0.125	6.31	78	6.52	74
20	1	3	178	3.5	0.061	24.39	990.9	0.0554	14.06	2.695	0.133	6.01	80	6.19	79
20	1	3	178	5.8	0.043	27.11	1001.5	0.0299	6.38	1.587	0.219	5.93	75	5.70	74
20	1	3	59	1.65	0.033	9.45	1024.1	0.0334	8.17	1.656	0.215	6.31	78	6.43	76
20	1	3	59	3.5	0.028	9.79	1028.9	0.0249	5.64	1.282	0.274	6.01	80	6.10	79
20	1	3	59	5.8	0.020	9.92	1034.9	0.0138	2.34	0.823	0.407	5.93	75	5.85	74
20	2	0	59	1.65	0.053	8.80	6.4	0.0526	7.61	3.386	0.096	3.34	38	3.28	42
20	2	0	59	3.5	0.047	10.12	10.7	0.0437	5.83	2.926	0.110	2.19	33	2.61	40
20	2	0	59	5.8	0.031	10.18	15.7	0.0205	2.39	1.471	0.214	2.04	50	2.44	53
20	2	0	178	1.65	0.098	26.26	25.6	0.0977	22.69	4.969	0.071	3.34	38	3.17	49
20	2	0	178	3.5	0.081	26.56	31.0	0.0705	15.31	3.705	0.094	2.19	33	3.06	47
20	2	0	178	5.8	0.054	24.24	46.7	0.0359	5.70	2.203	0.150	2.04	50	2.79	56
20	2	1	178	1.65	0.082	23.34	98.5	0.0815	20.18	4.012	0.089	2.80	75	3.00	61
20	2	1	178	3.5	0.064	23.34	104.3	0.0536	13.46	2.621	0.136	4.80	76	3.90	61
20	2	1	178	5.8	0.044	23.34	112.9	0.0298	5.49	1.704	0.199	3.91	65	3.34	60

20	2	1	59	1.65	0.047	9.23	129.2	0.0470	7.98	2.791	0.120	2.80	75	2.91	67
20	2	1	59	3.5	0.035	9.23	133.0	0.0287	5.32	1.631	0.209	4.80	76	4.36	69
20	2	1	59	5.8	0.025	9.23	137.9	0.0175	2.17	1.214	0.262	3.91	65	3.70	63
20	2	2	178	1.65	0.076	24.84	374.9	0.0759	21.47	3.493	0.104	5.43	76	4.44	76
20	2	2	178	3.5	0.063	24.77	383.1	0.0554	14.28	2.675	0.134	4.91	84	4.87	81
20	2	2	178	5.8	0.044	24.77	394.3	0.0304	5.83	1.698	0.201	3.79	76	3.83	73
20	2	2	59	1.65	0.038	10.01	415.0	0.0384	8.65	1.980	0.177	5.43	76	4.83	76
20	2	2	59	3.5	0.032	10.01	420.7	0.0273	5.77	1.451	0.240	4.91	84	4.89	83
20	2	2	59	5.8	0.022	10.01	430.6	0.0147	2.35	0.900	0.368	3.79	76	3.80	75
20	2	3	178	1.65	0.056	28.44	1055.3	0.0564	24.58	2.093	0.187	6.50	90	6.30	88
20	2	3	178	3.5	0.063	28.44	1078.8	0.0635	16.40	3.061	0.117	6.62	89	6.37	88
20	2	3	178	5.8	0.044	28.52	1064.7	0.0302	6.71	1.570	0.223	5.75	85	5.42	84
20	2	3	59	1.65	0.036	11.24	1105.3	0.0365	9.71	1.731	0.209	6.50	90	6.38	89
20	2	3	59	3.5	0.032	10.52	1111.5	0.0292	6.06	1.569	0.221	6.62	89	6.48	89
20	2	3	59	5.8	0.019	10.46	1119.7	0.0122	2.46	0.662	0.521	5.75	85	5.64	85

The velocities measured are from the points indicated (1.65, 3.5, & 5.8) to bottom of flume

Sectional Velocity and discharge is relative to within each of the three sections (upper, mid, and lower)

Interpolated random roughness and rock covers are based on time of measurement of velocities for each section vs. time actually measured.