

Electronic Appendix 5: Extended Versions of Frequency Ratio Tables

The following tables represent extended versions of the frequency tables in Sect. 5.2. They detail information on the spatial extent of and debris flow counts for the respective factor categories used for computing the frequency ratios. Frequency ratios were calculated separately for debris flow types (SIT ... slide-initiated debris flows, RIT ... runoff-generated debris flows, COMB ... slide-related debris flows) and activity count (DF general ... debris flow inventory, DF events ... active systems (≥ 1 events), > 1 ... multiple event systems). The green colouring highlights ratios greater than 1, with light green marking ratios of 1 to < 2 , grass green 2 to < 3 , and dark green ≥ 3 .

Slope (Table 5.1)

DF general	Slope [°]	Area		DF systems								Frequency Ratio			
		m²	%	TOTAL		SIT		RIT		COMB		TOTAL	SIT	RIT	COMB
					%		%		%		%				
	< 10	1552730	2.33	1	0.07	0	0.00	1	0.08	0	0.00	0.03		0.04	
	10 - 15	2876630	4.32	3	0.20	1	0.65	2	0.16	0	0.00	0.05	0.15	0.04	
	15 - 20	4253180	6.38	17	1.11	3	1.95	8	0.66	6	3.66	0.17	0.31	0.10	0.57
	20 - 25	6651230	9.98	50	3.26	20	12.99	22	1.81	8	4.88	0.33	1.30	0.18	0.49
	25 - 30	10102100	15.16	143	9.32	26	16.88	87	7.15	30	18.29	0.61	1.11	0.47	1.21
	30 - 35	14864000	22.31	398	25.95	48	31.17	296	24.34	54	32.93	1.16	1.40	1.09	1.48
	35 - 40	13626900	20.45	532	34.68	43	27.92	439	36.10	50	30.49	1.70	1.37	1.77	1.49
	40 - 45	7095600	10.65	281	18.32	10	6.49	256	21.05	15	9.15	1.72	0.61	1.98	0.86
	45 - 50	3323250	4.99	84	5.48	2	1.30	81	6.66	1	0.61	1.10	0.26	1.34	0.12
	50 - 55	1461830	2.19	20	1.30	1	0.65	19	1.56	0	0.00	0.59	0.30	0.71	
	55 - 60	620100	0.93	5	0.33	0	0.00	5	0.41	0	0.00	0.35		0.44	
	> 60	194400	0.29	0	0.00	0	0.00	0	0.00	0	0.00				

DF events	Slope [°]	Area		active DF systems								Frequency Ratio						
		m²	%	TOTAL		SIT		RIT		COMB		> 1 ev		TOTAL	SIT	RIT	COMB	> 1 event
					%		%		%		%		%					
	< 10	1552730	2.33	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	10 - 15	2876630	4.32	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	15 - 20	4253180	6.38	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	20 - 25	6651230	9.98	10	4.57	5	16.13	4	2.48	1	0.61	2	11.11	0.46	1.62	0.25	0.37	1.11
	25 - 30	10102100	15.16	20	9.13	6	19.35	11	6.83	3	1.83	2	11.11	0.60	1.28	0.45	0.73	0.73
	30 - 35	14864000	22.31	53	24.20	5	16.13	38	23.60	10	6.10	5	27.78	1.08	0.72	1.06	1.66	1.25
	35 - 40	13626900	20.45	80	36.53	10	32.26	60	37.27	10	6.10	6	33.33	1.79	1.58	1.82	1.81	1.63
	40 - 45	7095600	10.65	37	16.89	3	9.68	31	19.25	3	1.83	1	5.56	1.59	0.91	1.81	1.04	0.52
	45 - 50	3323250	4.99	12	5.48	1	3.23	11	6.83	0	0.00	1	5.56	1.10	0.65	1.37		1.11
	50 - 55	1461830	2.19	6	2.74	1	3.23	5	3.11	0	0.00	1	5.56	1.25	1.47	1.42		2.53
	55 - 60	620100	0.93	1	0.46	0	0.00	1	0.62	0	0.00	0	0.00	0.49		0.67		
	> 60	194400	0.29	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					

Aspect class (Table 5.2)

DF general	Aspect class	Area		DF systems								Frequency Ratio			
		m²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	TOTAL	SIT	RIT	COMB
	N	6619500	9.94	147	9.58	23	14.94	105	8.63	19	11.59	0.96	1.50	0.87	1.17
	NE	8845880	13.28	172	11.21	10	6.49	146	12.01	16	9.76	0.84	0.49	0.90	0.73
	E	7872980	11.82	134	8.74	9	5.84	101	8.31	24	14.63	0.74	0.49	0.70	1.24
	SE	12857200	19.30	297	19.36	36	23.38	227	18.67	34	20.73	1.00	1.21	0.97	1.07
	S	10772100	16.17	304	19.82	16	10.39	261	21.46	27	16.46	1.23	0.64	1.33	1.02
	SW	5621630	8.44	136	8.87	15	9.74	107	8.80	14	8.54	1.05	1.15	1.04	1.01
	W	6324080	9.49	167	10.89	11	7.14	141	11.60	15	9.15	1.15	0.75	1.22	0.96
	NW	7707150	11.57	177	11.54	34	22.08	128	10.53	15	9.15	1.00	1.91	0.91	0.79

DF events	Aspect class	Area		active DF systems								Frequency Ratio						
		m²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	> 1 ev	%	TOTAL	SIT	RIT	COMB	> 1 event
	N	6619500	9.94	19	8.68	6	19.35	12	7.45	1	3.70	2	11.11	0.87	1.95	0.75	0.37	1.12
	NE	8845880	13.28	20	9.13	4	12.90	15	9.32	1	3.70	5	27.78	0.69	0.97	0.70	0.28	2.09
	E	7872980	11.82	13	5.94	2	6.45	7	4.35	4	14.81	1	5.56	0.50	0.55	0.37	1.25	0.47
	SE	12857200	19.30	46	21.00	3	9.68	34	21.12	9	33.33	6	33.33	1.09	0.50	1.09	1.73	1.73
	S	10772100	16.17	48	21.92	1	3.23	41	25.47	6	22.22	0	0.00	1.36	0.20	1.57	1.37	0.00
	SW	5621630	8.44	15	6.85	2	6.45	12	7.45	1	3.70	0	0.00	0.81	0.76	0.88	0.44	0.00
	W	6324080	9.49	23	10.50	2	6.45	19	11.80	2	7.41	1	5.56	1.11	0.68	1.24	0.78	0.59
	NW	7707150	11.57	35	15.98	11	35.48	21	13.04	3	11.11	3	16.67	1.38	3.07	1.13	0.96	1.44

Altitude above sea level (Table 5.3)

DF general	Altitude [m]	Area		DF systems								Frequency Ratio			
		m²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	TOTAL	SIT	RIT	COMB
	500 - 600	76500	0.11	0	0.00	0	0.00	0	0.00	0	0.00				
	600 - 700	265275	0.40	0	0.00	0	0.00	0	0.00	0	0.00				
	700 - 800	507150	0.76	2	0.13	1	0.65	1	0.08	0	0.00	0.17	0.85	0.11	
	800 - 900	1152230	1.73	14	0.91	7	4.55	7	0.58	0	0.00	0.53	2.63	0.33	
	900 -1000	2134580	3.20	40	2.61	15	9.74	18	1.48	7	4.27	0.81	3.04	0.46	1.33
	1000 - 1100	3201300	4.81	89	5.80	16	10.39	55	4.52	18	10.98	1.21	2.16	0.94	2.28
	1100 - 1200	4149450	6.23	132	8.60	9	5.84	99	8.14	24	14.63	1.38	0.94	1.31	2.35
	1200 - 1300	4783950	7.18	177	11.54	26	16.88	134	11.02	17	10.37	1.61	2.35	1.53	1.44
	1300 - 1400	5294250	7.95	186	12.13	22	14.29	137	11.27	27	16.46	1.53	1.80	1.42	2.07
	1400 - 1500	5589900	8.39	153	9.97	9	5.84	126	10.36	18	10.98	1.19	0.70	1.23	1.31
	1500 - 1600	6317330	9.48	140	9.13	10	6.49	116	9.54	14	8.54	0.96	0.68	1.01	0.90
	1600 - 1700	6719630	10.09	180	11.73	24	15.58	135	11.10	21	12.80	1.16	1.55	1.10	1.27
	1700 - 1800	7253550	10.89	145	9.45	9	5.84	123	10.12	13	7.93	0.87	0.54	0.93	0.73
	1800 - 1900	6801080	10.21	119	7.76	6	3.90	108	8.88	5	3.05	0.76	0.38	0.87	0.30
	1900 - 2000	5411480	8.12	86	5.61	0	0.00	86	7.07	0	0.00	0.69		0.87	
	2000 - 2100	3951450	5.93	44	2.87	0	0.00	44	3.62	0	0.00	0.48		0.61	
	2100 - 2200	2227950	3.34	23	1.50	0	0.00	23	1.89	0	0.00	0.45		0.57	
	2200 - 2300	641250	0.96	4	0.26	0	0.00	4	0.33	0	0.00	0.27		0.34	
	2300 - 2400	135225	0.20	0	0.00	0	0.00	0	0.00	0	0.00				
	2400 - 2500	8325	0.01	0	0.00	0	0.00	0	0.00	0	0.00				

DF events	Altitude [m]	Area		active DF systems								Frequency Ratio						
		m²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	> 1 ev	%	TOTAL	SIT	RIT	COMB	> 1 event
	500 - 700	76500	0.11	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	600 - 700	265275	0.40	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	700 - 800	507150	0.76	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	800 - 900	1152230	1.73	6	2.74	4	12.90	2	1.24	0	0.00	1	5.56	1.58	7.46	0.72		3.21
	900 -1000	2134580	3.20	2	0.91	1	3.23	0	0.00	1	3.70	1	5.56	0.29	1.01		1.16	1.73
	1000 - 1100	3201300	4.81	14	6.39	3	9.68	7	4.35	4	14.81	3	16.67	1.33	2.01	0.90	3.08	3.47
	1100 - 1200	4149450	6.23	20	9.13	1	3.23	18	11.18	1	3.70	3	16.67	1.47	0.52	1.80	0.59	2.68
	1200 - 1300	4783950	7.18	37	16.89	8	25.81	22	13.66	7	25.93	6	33.33	2.35	3.59	1.90	3.61	4.64
	1300 - 1400	5294250	7.95	33	15.07	7	22.58	20	12.42	6	22.22	2	11.11	1.90	2.84	1.56	2.80	1.40
	1400 - 1500	5589900	8.39	23	10.50	1	3.23	20	12.42	2	7.41	0	0.00	1.25	0.38	1.48	0.88	
	1500 - 1600	6317330	9.48	18	8.22	0	0.00	18	11.18	0	0.00	1	5.56	0.87		1.18		0.59
	1600 - 1700	6719630	10.09	17	7.76	4	12.90	10	6.21	3	11.11	1	5.56	0.77	1.28	0.62	1.10	0.55
	1700 - 1800	7253550	10.89	21	9.59	0	0.00	19	11.80	2	7.41	0	0.00	0.88		1.08	0.68	
	1800 - 1900	6801080	10.21	14	6.39	2	6.45	11	6.83	1	3.70	0	0.00	0.63	0.63	0.67	0.36	
	1900 - 2000	5411480	8.12	10	4.57	0	0.00	10	6.21	0	0.00	0	0.00	0.56		0.76		
	2000 - 2100	3951450	5.93	4	1.83	0	0.00	4	2.48	0	0.00	0	0.00	0.31		0.42		
	2100 - 2200	2227950	3.34	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	2200 - 2300	641250	0.96	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	2300 - 2400	135225	0.20	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	2400 - 2500	8325	0.01	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					

Lithology class (Table 5.4)

DF general	Lithology	Area		DF systems								Frequency Ratio			
		m²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	TOTAL	SIT	RIT	COMB
	Sandstone	8476607	12.72	305	19.88	30	19.48	233	19.16	42	25.61	1.56	1.53	1.51	2.01
	Greywacke	43380871	65.11	895	58.34	97	62.99	706	58.06	92	56.10	0.90	0.97	0.89	0.86
	Argillite	2642356	3.97	108	7.04	1	0.65	100	8.22	7	4.27	1.78	0.16	2.07	1.08
	Semischist	5122164	7.69	70	4.56	2	1.30	67	5.51	1	0.61	0.59	0.17	0.72	0.08
	GS Melange	569431	0.85	4	0.26	1	0.65	3	0.25	0	0.00	0.31	0.76	0.29	
	Greenschist	962203	1.44	24	1.56	4	2.60	18	1.48	2	1.22	1.08	1.80	1.03	0.84
	Greyschist	5477728	8.22	128	8.34	19	12.34	89	7.32	20	12.20	1.01	1.50	0.89	1.48

DF events	Lithology	Area		active DF systems								Frequency Ratio						
		m²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	> 1 ev	%	TOTAL	SIT	RIT	COMB	> 1 event
	Sandstone	8476607	12.72	37	16.89	3	9.68	30	18.63	4	14.81	1	5.56	1.33	0.76	1.46	1.16	0.44
	Greywacke	43380871	65.11	131	59.82	22	70.97	91	56.52	18	66.67	16	88.89	0.92	1.09	0.87	1.02	1.37
	Argillite	2642356	3.97	25	11.42	0	0.00	24	14.91	1	3.70	1	5.56	2.88		3.76	0.93	1.40
	Semischist	5122164	7.69	10	4.57	0	0.00	9	5.59	1	3.70	0	0.00	0.59		0.73	0.48	
	GS Melange	569431	0.85	1	0.46	1	3.23	0	0.00	0	0.00	0	0.00	0.53	3.77			
	Greenschist	962203	1.44	7	3.20	2	6.45	4	2.48	1	3.70	0	0.00	2.21	4.47	1.72	2.56	
	Greyschist	5477728	8.22	8	3.65	3	9.68	3	1.86	2	7.41	0	0.00	0.44	1.18	0.23	0.90	

Lithology class & Quaternary deposits (Table 5.5)

DF general	Category	Area		DF systems								Frequency Ratio			
		m²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	TOTAL	SIT	RIT	COMB
	Sandstone	7600725	11.41	256	16.69	15	9.74	222	18.26	19	11.59	1.46	0.85	1.60	1.02
	Greywacke	40779225	61.22	857	55.87	76	49.35	689	56.66	92	56.10	0.91	0.81	0.93	0.92
	Argillite	2642850	3.97	108	7.04	1	0.65	100	8.22	7	4.27	1.77	0.16	2.07	1.08
	Semischist	4732875	7.11	69	4.50	2	1.30	66	5.43	1	0.61	0.63	0.18	0.76	0.09
	GS Melange	570375	0.86	4	0.26	1	0.65	3	0.25	0	0.00	0.30	0.76	0.29	
	Greenschist	962550	1.45	24	1.56	4	2.60	18	1.48	2	1.22	1.08	1.80	1.02	0.84
	Greyschist	5242050	7.87	128	8.34	19	12.34	89	7.32	20	12.20	1.06	1.57	0.93	1.55
Till	1159650	1.74	20	1.30	11	7.14	9	0.74	0	0.00	0.75	4.10	0.43		
Landslide	231525	0.35	16	1.04	10	6.49	6	0.49	0	0.00	3.00		1.42		
Rockglacier	546750	0.82	3	0.20	0	0.00	3	0.25	0	0.00	0.24		0.30		
Relict talus	873000	1.31	49	3.19	15	9.74	11	0.90	23	14.02	2.44	7.43	0.69	10.70	
Ice	1266750	1.90	0	0.00	0	0.00	0	0.00	0	0.00					

DF events	Category	Area		active DF systems								Frequency Ratio						
		m²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	> 1 ev	%	TOTAL	SIT	RIT	COMB	> 1 event
	Sandstone	7600725	11.41	31	14.16	1	3.23	30	18.63	0	0.00	1	5.56	1.24	0.28	1.63		0.49
	Greywacke	40779225	61.22	123	56.16	18	58.06	87	54.04	18	66.67	14	77.78	0.92	0.95	0.88	1.09	1.27
	Argillite	2642850	3.97	25	11.42	0	0.00	24	14.91	1	3.70	1	5.56	2.88		3.76	0.93	1.40
	Semischist	4732875	7.11	10	4.57	0	0.00	9	5.59	1	3.70	0	0.00	0.64		0.79	0.52	
	GS Melange	570375	0.86	1	0.46	1	3.23	0	0.00	0	0.00	0	0.00	0.53	3.77			
	Greenschist	962550	1.45	7	3.20	2	6.45	4	2.48	1	3.70	0	0.00	2.21	4.46	1.72	2.56	
	Greyschist	5242050	7.87	8	3.65	3	9.68	3	1.86	2	7.41	0	0.00	0.46	1.23	0.24	0.94	
Till	1159650	1.74	2	0.91	2	6.45	0	0.00	0	0.00	0	0.00	0.52	3.71				
Landslide	231525	0.35	4	1.83	2	6.45	2	1.24	0	0.00	2	11.11	5.25	18.56	3.57		31.97	
Rockglacier	546750	0.82	2	0.91	0	0.00	2	1.24	0	0.00	0	0.00	1.11		1.51			
Relict talus	873000	1.31	6	2.74	2	6.45	0	0.00	4	14.81	0	0.00	2.09	4.92		11.30		
Ice	1266750	1.90	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00						

Uplift rate (Table 5.6)

DF general	Uplift [mm a ⁻¹]	Area		DF systems								Frequency Ratio			
		m ²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	TOTAL	SIT	RIT	COMB
	0 - 1	33163200	49.78	615	40.09	36	23.38	502	41.28	77	46.95	0.81	0.47	0.83	0.94
	1 - 2	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1.06	1.88	0.97	0.99
	2 - 3	12661425	19.00	310	20.21	55	35.71	224	18.42	31	18.90	2.15	0.27	2.54	1.03
	3 - 4	1577700	2.37	78	5.08	1	0.65	73	6.00	4	2.44	1.19	2.33	1.12	0.68
	4 - 5	5941800	8.92	163	10.63	32	20.78	121	9.95	10	6.10	0.57		0.72	
	5 - 6	4803975	7.21	63	4.11	0	0.00	63	5.18	0	0.00	0.33		0.27	1.02
	6 - 7	399825	0.60	3	0.20	0	0.00	2	0.16	1	0.61	1.62	1.61	1.57	2.06
	7 - 8	8074125	12.12	302	19.69	30	19.48	231	19.00	41	25.00				

DF events	Uplift [mm a ⁻¹]	Area		active DF systems								Frequency Ratio						
		m ²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	> 1 ev	%	TOTAL	SIT	RIT	COMB	> 1 event
	0 - 1	33163200	49.78	97	44.29	14	45.16	70	43.48	13	48.15	11	61.11	0.89	0.91	0.87	0.97	1.23
	1 - 2	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.79	1.19	0.65	1.17	
	2 - 3	12661425	19.00	33	15.07	7	22.58	20	12.42	6	22.22	0	0.00	1.74		2.36		
	3 - 4	1577700	2.37	9	4.11	0	0.00	9	5.59	0	0.00	0	0.00	2.20	2.53	2.23	1.66	3.74
	4 - 5	5941800	8.92	43	19.63	7	22.58	32	19.88	4	14.81	6	33.33					
	5 - 6	4803975	7.21	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	6 - 7	399825	0.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	7 - 8	8074125	12.12	37	16.89	3	9.68	30	18.63	4	14.81	1	5.56	1.39	0.80	1.54	1.22	0.46

Permafrost probability within debris flow initiation area (Table 5.8)

DF general	PF prob	Area		DF systems								Frequency Ratio			
		m²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	TOTAL	SIT	RIT	COMB
	0 - 0.1	44872200	87.42	1247	89.39	151	100.00	938	86.37	158	100.00	1.02	1.14	0.99	1.14
	0.1 - 0.2	1029375	2.01	21	1.51	0	0.00	21	1.93	0	0.00	0.75		0.96	
	0.2 - 0.3	645975	1.26	11	0.79	0	0.00	11	1.01	0	0.00	0.63		0.80	
	0.3 - 0.4	485100	0.95	9	0.65	0	0.00	9	0.83	0	0.00	0.68		0.88	
	0.4 - 0.5	407025	0.79	9	0.65	0	0.00	9	0.83	0	0.00	0.81		1.05	
	0.5 - 0.6	348075	0.68	4	0.29	0	0.00	4	0.37	0	0.00	0.42		0.54	
	0.6 - 0.7	365175	0.71	7	0.50	0	0.00	7	0.64	0	0.00	0.71		0.91	
	0.7 - 0.8	420525	0.82	8	0.57	0	0.00	8	0.74	0	0.00	0.70		0.90	
	0.8 - 0.9	521325	1.02	12	0.86	0	0.00	12	1.10	0	0.00	0.85		1.09	
	0.9 - 1.0	2234025	4.35	67	4.80	0	0.00	67	6.17	0	0.00	1.10		1.42	

DF events	PF prob	Area		active DF systems								Frequency Ratio						
		m²	%	TOTAL	%	SIT	%	RIT	%	COMB	%	> 1 ev	%	TOTAL	SIT	RIT	COMB	> 1 event
	0 - 0.1	44872200	87.42	185	92.04	28	100.00	133	89.26	24	100.00	14	100.00	1.05	1.14	1.02	1.14	1.14
	0.1 - 0.2	1029375	2.01	3	1.49	0	0.00	3	2.01	0	0.00	0	0.00	0.74		1.00		
	0.2 - 0.3	645975	1.26	1	0.50	0	0.00	1	0.67	0	0.00	0	0.00	0.40		0.53		
	0.3 - 0.4	485100	0.95	2	1.00	0	0.00	2	1.34	0	0.00	0	0.00	1.05		1.42		
	0.4 - 0.5	407025	0.79	1	0.50	0	0.00	1	0.67	0	0.00	0	0.00	0.63		0.85		
	0.5 - 0.6	348075	0.68	2	1.00	0	0.00	2	1.34	0	0.00	0	0.00	1.47		1.98		
	0.6 - 0.7	365175	0.71	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	0.7 - 0.8	420525	0.82	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00					
	0.8 - 0.9	521325	1.02	2	1.00	0	0.00	2	1.34	0	0.00	0	0.00	0.98		1.32		
	0.9 - 1.0	2234025	4.35	5	2.49	0	0.00	5	3.36	0	0.00	0	0.00	0.57		0.77		