Natural Hazards
and Earth System
Sciences

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Supplement of

Natural hazard events affecting transportation networks in Switzerland from 2012 to 2016

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Supplementary Material

Table S1: 51 key words (in red) used in the Google Alerts to create the database. The numbers between brackets in the following tables refer to the number of elements considered according to the line or column attribute.

English	French	German	Italian
avalanche	avalanche	Lawinne	valanga
bad weather	intempéries	Unwetter	
flood		Hochwasser	
hail	grêle	Hagel	
heavy rainfall	forte pluies	Heftige Regen	
ice avalanche		Eislawine	
inundation		Überflutung	
inundation	inondation	Überschwemmung	
landslide	glissement de terrain	Erdrutsch	frana
landslide		Hangrutsch	
landslide		Hachrutsche	
landslide		Rüfenniedergang	
landslip	glissement	Rutschung	
mountain	pan de montagne		
mud	boue	Schlamm	
mudflow	coulée de boue	Schlammlawine	
mudslide		Erdlawine	
pirock	caillou	Stein	massi
rockfall		Bergsturz	
rockfall		Felsabbruch	
rockfall	éboulement	Felsbrock	
rockfall	écroulement	Felsbrocken	
rockfall		Felssturz	
rockslide	chute de blocs	Steinschlag	cadono sassi
scree		Geröll	
scree	éboulis	Schutt	
storm	tempête	Sturm	
thunderstorm	orage	Gewitter	
under water	sous l'eau		
wind	vent	Wind	

Table S2: Cost value estimation by square metre for the cost evaluation according to event importance, damage level and transport mode.

Damage level [EUR]	Cost per m^2, small event, road	Cost per m^2, middle event, road	Cost per m^2, large event, road	Cost per m^2, small event, train	Cost per m^2, middle event, train	Cost per m^2, large event, train
No closure	5	5	5	5	5	5
Closure	85	130	170	300	340	385
Partial damage	255	300	340	470	510	555
Total destruction	850	890	980	1065	1105	1145
Unknown damage	130	170	215	255	300	340

Table S3: Distribution of event locations by Swiss geomorphologic-climatic region and event process.

Geomorphologic-climatic region	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Average
Jura (98)	19%	0%	3%	6%	0%	15%	12%
Plateau (371)	57%	4%	42%	6%	0%	79%	44%
Alps (377)	24%	96%	55%	88%	100%	6%	44%
Total (846)	100%	100%	100%	100%	100%	100%	100%

16 *Table S4: Distribution of event locations by event process.*

Event location	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Average
Town (151)	15%	0%	9%	1%	0%	6%	18%
Village (261)	46%	14%	12%	6%	13%	4%	31%
Forest (185)	4%	46%	38%	58%	13%	13%	22%
Unforested (249)	0%	6%	5%	12%	69%	0%	29%
Total (846)	100%	100%	100%	100%	100%	100%	100%

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19 *Table S5: Distribution of slope angle by event process.*

Slope angle	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Average
0°-10° (339)	62%	17%	12%	5%	6%	68%	40%
10°-20° (257)	31%	43%	29%	19%	38%	28%	30%
20°-30° (131)	4%	23%	33%	31%	38%	2%	15%
30°-40° (85)	2%	12%	21%	26%	19%	0%	10%
40°-50° (26)	0%	4%	4%	14%	0%	2%	3%
50°-60° (6)	0%	0%	1%	4%	0%	0%	1%
60 and higher (2)	0%	0%	1%	1%	0%	0%	0%
Total (846)	100%	100%	100%	100%	100%	100%	100%

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22 *Table S6: Distribution of event importance by event process.*

Location of process origin	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Average
Small[1] (804)	100%	78%	96%	24%	81%	100%	95%
Middle[2] (33)	0%	19%	3%	43%	19%	0%	4%
Large[3] (9)	0%	3%	1%	33%	0%	0%	1%
Total (846)	100%	100%	100%	100%	100%	100%	100%

23 [1] Small event: volume of deposit material on the track <10 m^3.
24 [2] Middle event: volume of deposit material on the track of 10-2000 m^3.
25 [3] Large event: volume of deposit material on the track > 2000 m^3.
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28 *Table S7: Distribution of the distance of the process origin by event process.*

Distance of the process origin	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Average
Near[1] (185)	0%	52%	33%	6%	100%	35%
Far[2] (146)	100%	11%	43%	94%	0%	39%
Unknown (95)	0%	37%	24%	0%	0%	26%
Total (426)	100%	100%	100%	100%	100%	100%

29 [1] Near: 0-50 m from the track.
30 [2] Far: > 50 m from the track.
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33 *Table S8: Distribution of the location of the process origin by event process.*

Location of process origin	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Average
Above track (339)	100%	60%	89%	100%	100%	80%
Below track (29)	0%	14%	2%	0%	0%	7%
Unknown (58)	0%	26%	9%	0%	0%	14%
Total (426)	100%	100%	100%	100%	100%	100%

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Table S9: Rainfall [mm] during the natural hazard events.

Rainfall* [mm]	Flood	Debris flow	Landslide	Rockfall	Avalanche	Other	Average
Event day	22	14	17	5	4	4	17
Cum. last 5 days[1]	49	32	57	27	32	15	45
Cum. last 10 days[1]	76	55	88	52	46	36	71
Daily rain avg. last 5 days[2]	10	6	11	6	6	3	9
Daily rain avg. last 10 days[2]	7	5	9	5	5	4	7
Max daily rain last 5 days[3]	30	21	32	15	18	11	27
Max daily rain last 10 days[3]	33	26	36	20	21	15	30
Abs max daily rain[4]	100	65	154	42	13	39	-
Abs max daily rain last 5 days[4]	154	75	154	77	140	39	-
Abs max daily rain last 10 days[4]	154	75	154	109	140	39	-

37 * Average by event process except for absolute values (last three lines of the table).
38 [1] Cumulative rainfall 5 and 10 days prior to the event day.
39 [2] Daily rainfall average 5 and 10 days prior to the event day.
40 [3] Maximum daily rainfall 5 and 10 days prior to the event day.
41 [4] Absolute maximum rainfall recorded (i.e., for one event) on the event day, 5 and 10 days prior to the event day.
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43 *Table S10: Monthly distribution of events by event process.*

Year	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Average
January (27)	0%	4%	4%	15%	6%	0%	3%
February (65)	0%	1%	6%	6%	19%	81%	8%
March (26)	1%	0%	2%	13%	50%	2%	3%
April (28)	2%	0%	6%	7%	0%	2%	3%
May (107)	13%	10%	16%	15%	0%	2%	13%
June (253)	41%	16%	29%	7%	0%	8%	30%
July (210)	31%	51%	19%	8%	0%	2%	25%
August (35)	4%	12%	4%	1%	0%	2%	4%
September (14)	1%	6%	2%	2%	0%	0%	2%
October (14)	1%	0%	1%	10%	0%	0%	2%
November (58)	6%	0%	9%	11%	6%	2%	7%
December (9)	0%	0%	1%	4%	19%	0%	1%
Total (846)	100%	100%	100%	100%	100%	100%	100%

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46 *Table S11: Transport mode distribution by event process.*

Transport mode	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Total
Road (747)	53%	9%	20%	10%	1%	7%	100%
Railway (99)	27%	2%	42%	20%	4%	5%	100%

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49 *Table S12: Road class distribution by event process.*

Road class	Flood (393)	Debris flow (67)	Landslide (151)	Rockfall (76)	Avalanche (12)	Other (48)	Average
Highway (34)	7%	0%	2%	1%	10%	2%	5%
Motorway (2)	0%	0%	1%	0%	0%	0%	0%
Major transit road (99)	11%	8%	11%	36%	36%	6%	13%
Regional road (94)	11%	7%	18%	18%	9%	8%	12%
Urban road (426)	65%	37%	48%	38%	36%	82%	57%
Minor road (72)	4%	42%	15%	4%	9%	2%	10%
Forest or land trail (20)	2%	6%	5%	5%	0%	0%	3%
Total (747)	100%	100%	100%	100%	100%	100%	100%

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52 *Table S13: Railway class distribution by event process.*

Track class	Flood (27)	Debris flow (2)	Landslide (41)	Rockfall (20)	Avalanche (4)	Other (5)	Average
National (29)	37%	0%	32%	30%	0%	0%	29%
Regional (66)	56%	100%	68%	70%	100%	60%	67%
Tram (4)	7%	0%	0%	0%	0%	40%	4%
Total (99)	100%	100%	100%	100%	100%	100%	100%

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54 *Table S14: Distribution of possibility of deviations by event process.*

Possibility of deviation	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Total
Large (342)	63%	17%	15%	8%	0%	52%	40%
Middle (190)	21%	7%	32%	17%	7%	33%	23%
Small (102)	7%	6%	13%	32%	66%	4%	12%
No (212)	9%	70%	40%	43%	27%	11%	25%
Total (846)	100%	100%	100%	100%	100%	100%	100%

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56 *Table S15: Distribution of track damage by event process.*

Damage level	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Total
No closure (149)	34%	0%	1%	3%	6%	4%	18%
Closure (483)	60%	35%	50%	50%	81%	96%	57%
Partial damage (143)	1%	39%	37%	39%	13%	0%	17%
Total destruction (53)	1%	26%	12%	8%	0%	0%	6%
Unknown damage (18)	4%	0%	0%	0%	0%	0%	2%
Total (846)	100%	100%	100%	100%	100%	100%	100%

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58 *Table S16: Distribution of damage and impact on vehicles by event process.*

Damage and impact type on vehicles	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Total
No damage (803)	98%	93%	96%	89%	80%	89%	95%
Vehicle damage: direct impact[1] (25)	1%	7%	1%	7%	7%	7%	3%
Vehicle damage: indirect impact[2] (18)	1%	0%	3%	4%	13%	4%	2%
Total (846)	100%	100%	100%	100%	100%	100%	100%

59 [1] Direct impact: a vehicle is directly affected by a hazard.
60 [2] Indirect impact: a vehicle collides with an event mass already fallen on the track.
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62 *Table S17: Distribution of injury and death by event process.*

Injury and death	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Total
No damage on people (828)	99%	96%	98%	93%	100%	98%	98%
Injury (15)	1%	4%	1%	5%	0%	2%	2%
Death (3)	0%	0%	1%	2%	0%	0%	0%
Total (846)	100%	100%	100%	100%	100%	100%	100%

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64 *Table S18: Distribution of deviation length on roads by event process.*

Deviation length	Flood (383)	Debris flow (21)	Landslide (116)	Rockfall (58)	Avalanche (11)	Other (49)	Mean
0-1 km (255)	58%	29%	12%	9%	0%	12%	40%
2-5 km (102)	14%	38%	16%	3%	0%	39%	16%
6-9 km (57)	9%	10%	9%	7%	0%	14%	9%
10-19 km (100)	9%	5%	34%	21%	0%	22%	16%
20-49 km (63)	5%	0%	17%	26%	45%	8%	10%
50-99 km (24)	3%	5%	5%	12%	0%	0%	4%
100-249 km (30)	2%	14%	6%	17%	18%	4%	5%
250-350 km (7)	0%	0%	0%	5%	36%	0%	1%
Total (638)	100%	100%	100%	100%	100%	100%	100%

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Table S19: Direct damage cost distribution by events type.

Damage level [EUR]	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Total
			Annual cost [EUR]				
No closure (149)	12 665	340	85	765	255	170	14 280
Closure (483)	514 250	71 400	262 650	160 650	28 900	107 950	1 145 800
Partial damage (143)	25 500	127 500	425 000	227 800	40 800	0	846 600
Total destruction (53)	72 250	459 850	528 700	246 500	0	0	1 307 300
Unknown damage (18)	45 900	0	0	0	0	0	45 900
Annual cost [million €]	0.67	0.66	1.22	0.64	0.07	0.11	3.36
Avg. cost by event	8 000	47 800	31 700	33 100	21 900	10 200	19 900

Table S20: Annual distribution of events by event process.

Year	Flood (420)	Debris flow (69)	Landslide (192)	Rockfall (96)	Avalanche (16)	Other (53)	Average
2012 (60)	5%	3%	7%	17%	25%	2%	7%
2013 (99)	11%	10%	16%	14%	6%	2%	12%
2014 (173)	20%	10%	30%	20%	25%	0%	20%
2015 (245)	25%	49%	22%	17%	25%	77%	29%
2016 (269)	38%	28%	24%	33%	19%	19%	32%
Total (846)	100%	100%	100%	100%	100%	100%	100%

72   *Table S21: Summary of event process key features.*

Attribute (with values of the greatest occurrence)	Flood	Debris flow	Landslide	Rockfall	Avalanche	Other	Mean
Event importance	Small	Small	Small	Small	Small	Small	Small
Yearly number of events	84	14	38	19	3	11	169
Months	6, 7	7, 6	6, 7, 5	1, 5, 3, 11, 10	3	2	6, 7
Season	Spring	Summer	Spring	Spring, Winter	Winter	Winter	Spring
Time of day	Afternoon	Afternoon	All day	All day	Morning	All day	Afternoon
Hour	12-19	15-19	0-24	0-24	8-13	0-24	14-19
Region	Plateau	Alps	Alps	Alps	Alps	Plateau	Alps, Plateau
Canton	Bern	Graubünden	Valais	Valais	Valais	Vaud	Bern
Slope angle	0-10	10-20	20-30	20-30	10-20	0-10	0-10
Slope orientation	S	W	S	W	N-W	S-E	S, S-W and W
Location	Village	Forest	Forest	Forest	Mountain	Country	Village
Damage on track	Closure	Partial dam.	Closure	Closure	Closure	Closure	Closure
Direct costs per event (Euro)	6 900	39 000	25 700	261 000	155 000	8 600	16 000
Track geometry	Str. line	Wide curve	Wide curve	Wide curve	Wide curve	S. line & w. curve	Wide curve
Crossing	Near	No	No	No	No	No	No
Closure duration	3 hours	1 week	1 day	3 hours	1-2 days	3 hours	3 hours
Possibility of deviation	Large	No	No	No	Small	Middle	Large
Deviation length	0-1 km	No deviation	No deviation	No deviation	250-350 km	2-5 km	0-1 km
Event origin distance	-	Far	Near	Far	Far	Near	Near
Event above below	-	Up	Up	Up	Up	Up	Up
Altitude [m a.s.l.]	525	1139	809	897	1274	614	701
Track type	Road	Road	Road	Road	Road	Road	Road
Track importance	Minor	Minor	Minor	Minor	Minor	Minor	Minor
Rainfall event day [mm]	22	14	171	5	4	4	17

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74 *Figure S1: Attributes of the database.*

EventID | Date — Number of attributes: 15

Category	EventID	DATE													
Attribute	EventID	D_IDdate	D_Year	D_Month	D_Day	D_MonthWeek	D_DayName	D_Season	D_Hour	D_HourPrecise	D_DayPart	D_IDDay	D_IDEventSameDay	D_SameClimLongPeriod	D_SameClimShortPeriod	MuenichRe
Description	Unique ID for each event	Unique ID for each event containing the date	Year of the event	Month of the event	Day of the event	Month divided into 4 quarters	Name of the day of the event	Season of the event	Hour of the event hourly rounded	Hour of the event	Day part of the event	Unique ID for each event day (same ID when >1 event per day)	Unique ID for event occured the same day	Long time period in which the event is included	Short time period in which the event is included	Period given by MünichRe in which the event is included
Unit	-	y m d XX	year	month	day	-	-	-	h:m:s	h:m:s	-	y m d	-	y.m.d-y.m.d	y.m.d-y.m.d	y.m.d-y.m.d
Exemple	431	2015050400	2015	5	4	5-1	Monday	Spring	10:00:00	10:15:00	Morning	20150504	2	2015.04.27-2015.07.25	2015.04.27-2015.05.07	2014.06.03-2014.06.12
Comment	-	-	From 2011 to 2015	-	-	First quarter (1) of the 5th month (5)	Useful to categorise business day and weekend	-	-	-	5 parts: morning, afternoon, evening, night and unknown	Allow to recognise the day when with several events	The maximal ID by event day gives the nb of events during this day			From MuenichRe yearly natural catastrophes analysis
Source	-	-	Online article	Online article	Online article	Online article	Online article	Online article	Online article	Online article	Online article	-	-	-	-	MünichRe
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Location — Number of attributes: 21

Category	L_Canton	L_Commune	L_Detail	L_Precision	L_SitGeo	L_OriSlope	L_Urbanity	L_Slope	L_SlopeRound	L_Lanscape
Attribute	L_Canton	L_Commune	L_Detail	L_Precision	L_SitGeo	L_OriSlope	L_Urbanity	L_Slope	L_SlopeRound	L_Lanscape
Description	Canton where occurs the event	Commune where occurs the event	Detail to help the location	Precision of the location	Geographical situation of the event	If slope: orientation of the slope	Urbanity of the event	Slope angle average in an 25 meter radius around the event	Slope angle rounded to the nearest ten	Lanscape of the event locaiotn
Unit	-	-	-	-	-	-	-	[°]	[°]	
Exemple	Valais	Bagnes	-	Accurate	Slope	North-East	Forest	13	13	Dry mountainous landscape of western central Alps
Comment	-	-	-	Three levels of accuracy: accurate, middle and communal accuracy	Four classes: plain, ridge, slope and valley bottom	Nine classes: north, north-east, south-east, south, south-west, west, noth-west and any slope	Seven classes: mountain, forest, country, hamlet, village, agglomeration and town	From 0 ° to 56°	From 0 ° to 60°	36 types
Source	Online article	Online article	Online article	Online article and map	Map	Map	Map	GIS	GIS	GIS
	17	18	19	20	21	22	23	24	25	26

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LOCATION										
L_Areas	L_Area_reg	L_MN03_X	L_MN03_Y	L_MN03_Z	L_MN95_X	L_MN95_Y	L_MN95_Z	L_WGS84_Lo	L_WGS84_La	L_WGS84_Z
Areas of the event location	Regional area of the location	X coordinates in CH1903 coordinate system	Y coordinates in CH1903 coordinate system	Z coordinates in CH1903 coordinate system	X coordinates in CH1903+ coordinate system	Y coordinates in CH1903+ coordinate system	Z coordinates in CH1903+ coordinate system	Longitude in WGS84 coordinate system	Latitude in WGS84 coordinate system	ALtitude in WGS84 coordinate system
		[m]	[m]	[m]	[m]	[m]	[m]	[°]	[°]	[m]
Alpine region	Alps	588456	98247	1377	2588455	1098247	1377	7.289538659	46.03566307	1431
5 types: Alpine region, Swiss Plateau, Tabular Jura, Folded Jura and Independent	3 types: Jura, Plateau and Alps	-	-	-	-	-	-	-	-	-
GIS	Map	GIS	GIS	GIS	GIS	GIS	GIS	GIS	GIS	GIS
27	28	29	30	31	32	33	34	35	36	37

Event characterization Number of attributes: 12

Category	Event characterization											
Attribute	E_Type	E_TypePrec	E_UpDownst	E_UpDownst Risk	E_Provenan	E_Volume	E_Masse	E_Width	E_Importan	E_Other	E_PictureName	E_Picture
Description	Type of natural hazard event	Precise type of natural hazard event	Origin up or downstream of the natural hazard event	Origin up, downstream or only risk of the event	Estimation of the distance of the event origin	Volume of the event	Masse of the event	Width of the event mass on the track	Importance of the event	Other information	Picture name of the event	Picture
Unit	-	-	-	-	[m] or -	[m³]	[kg]	[m]	-	-	-	-
Exemple	Landslide	Landslide	-	-	-	-	-	-	Small	-	2015050400.jpg	-
Comment	6 types: rockfall, debris flow, landslide, avalanche, flood, other	8 types: rockfall, debris flow, landslide, avalanche, flood, hail, snowdrift, falling tree	3 classes: upstream, downstream and unknown	4 classes: upstream, downstream, risk (no event, only preventive closure) and unknown	3 classes: near (few meters to 10 meters, far (> 10 m) or prevention (only preventive closure)	Estimation of the falled volume on the track of the event	Masse of the event (only for rockfall)	-	3 classes: small, middle, big (huge event)	-	-	-
Source	Online article	Online article	Online article	Online article	Online article	Online article	Online article	Online article	Online article	Online article	Online article	Online article or field visit
	38	39	40	41	42	43	44	45	46	47	48	49

Track caracterization — Number of attributes: 17

Category							Track caracterization										
Attribute	T_Type	T_TrainClasses	T_RoadClasses	T_MajorMin	T_Closure	T_DetailClosure	T_ClosureDuration	T_ClosureDurationRound	T_Deviation	T_DistDev	T_DistDevRound	T_DevDetail	T_PossDevi	T_PopDirAf	T_PopIndAf	T_Sinuosity	T_crossing
Description	Distinction between road and railway	Classes of the affected train tracks	Classes of the affected road tracks	Simplified classification of track importance	Track closure or not	Detail of the track closure	Time of track closure in hours	Ronded time of track closure in hours	Deviation or not	Distance of the deviation path	Rounded distance of the deviation path	Deviation detail	Capacity to have other deviation paths	Population directly affected by the track closure	Population indirectly affected by the track closure	Sinuosity og the affected track	Crossing near of the event or not
Unit	-	-	-	-	-	-	[h]	[h]	-	[km]	[km]	-	-	-	-	-	-
Exemple	Road	White	White	Minor	Yes	-	23	24	-	8	10	-	Large	Any	Small	NSC	NO
Comment	2 types: road or railwa	3 classes: national, regional, tram	8classes: highway, semi-highway, red, yellow, white, white dash and black	2 classes: minor and major	Three classes: yes, no, unknown	-	-	-	2 classes: yes or no	-	-	-	4 classes: large, middle, small, any	5 classes: very large, large, middle, small, any	5 classes: very large, large, middle, small, any	6 types: Straight Line, Wide Curve, Tight Curve, Near Wide Curve, Near Tight Curve	4 types: IN a crossing, NEAR a crossing, NO crossinf in the area and unknown (not enough location accuravy
Source	Online article	Map	Map	Map	Online article	Online article	Online article	Online article	Map	Map	Map	Map	Map	Map	Map	Map	Map
	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66

Damage — Number of attributes: 11

Category					Damage						
Attribute	D_Form	D_Injured	D_InjuredNb	D_Death	D_DeathNb	D_Vehicle	D_ImpactTy	D_VehiType	D_VehiNb	D_TrackDetail	D_Infras_type
Description	Form of track damage	Injured people?	Number of injured people	Killed people?	Number of killed people	Damage to vehicle	Type of impact between vehicle and event	Type of damaged vehicle	Number of damaged vehicle	Detail of track damage	Type of instrastructure damage
Unit	-	-	-	-	-	-	-	-	-		-
Exemple	?	No	-	No	-	No	-	-	-		-
Comment	6 classes: ? (unknown), NC (no closure), C (closure due to sedimentation), P (partial damage), T (total destruction), and not studied	2 types: yes or no	-	2 types: yes or no	-	2 types: yes or no	Three types: no impact, direct impact or indirect impact	-			-
Source	Online article	Online article	Online article	Online article	Online article	Online article	Online article	Online article	Online article		Online article
	67	68	69	70	71	72	73	74	75	76	77

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Weather — Number of attributes: 68

Category																			
Attribute	M_Meteo	M_Sun	M_Sun_avg_5d	M_Sun_avg_10d	M_Sun_max_5d	M_Sun_max_10d	M_Sun_min_5d	M_Sun_min_10d	M_Rain	M_Rain_5d_cum	M_Rain_10d_cum	M_Rain_max_daily_5d	M_Rain_max_daily_10d	M_Rain_avg_daily_5d	M_Rain_avg_daily_10d	M_Storm_near	M_Storm_near_sum_5d	M_Storm_near_sum_10d	M_Storm_near_max_daily_5d
Description	Rain information for a given time period	Percentage of sun during the event day	Percentage of sun of the last 5 days from event	Percentage of sun of the last 10 days from event	Maximum percentage of sun of the last 5 days from event	Maximum percentage of sun of the last 10 days from event	Minimum percentage of sun of the last 5 days from event	Maximum percentage of sun of the last 10 days from event	Rain the event day	Cumulative rain of the last 5 days from event	Cumulative rain of the last 10 days from event	Maximum daily rain of the last 5 days from event	Maximum daily rain of the last 10 days from event	Average daily rain of the last 5 days from event	Average daily rain of the last 10 days from event	Number of near storms the event day	Number of near storms of the 5 days from event	Number of near storms of the 10 days from event	Maximum daily number of near storms of the 5 days from event
Unit		%	%	%	%	%	%	%	mm	mm	mm	mm	mm	mm	mm	-	-	-	-
Exemple	-	4	29.4	34.1	77	98	0	0	0.2	28.7	38.4	19.9	19.9	5.74	3.84	0	0	0	0
Comment	Only for som events	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Near storm: <3 km around the weather station	Near storm: <3 km around the weather station	Near storm: <3 km around the weather station	Near storm: <3 km around the weather station
Source	Sturmarchiv	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss
	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96

Weather																			
M_Storm_near_max_daily_5d	M_Storm_near_max_daily_10d	M_Storm_far	M_Storm_far_sum_5d	M_Storm_far_sum_10d	M_Storm_far_max_daily_5d	M_Storm_far_max_daily_10d	M_Storm_all	M_Storm_all_sum_5d	M_Storm_all_sum_10d	M_Storm_all_max_daily_5d	M_Storm_all_max_daily_10d	M_Temp_min	M_Temp_min_5d	M_Temp_min_10d	M_Temp_max	M_Temp_max_5d	M_Temp_max_10d	M_Temp_avg	M_Temp_avg_5d
Maximum daily number of near storms of the 5 days from event	Maximum daily number of near storms of the 10 days from event	Number of far storms the event day	Number of far storms of the 5 days from event	Number of far storms of the 10 days from event	Maximum daily number of far storms of the 5 days from event	Maximum daily number of far storms of the 10 days from event	Number of all storms the event day	Number of all storms of the 5 days from event	Number of all storms of the 10 days from event	Maximum daily number of allstorms of the 5 days from event	Maximum daily number of all storms of the 10 days from event	Minimum temperature the event day	Minimum temperature the last 5 days from event	Minimum temperature the last 10 days from event	Maximum temperature the event day	Maximum temperature the last 5 days from event	Maximum temperature the last 10 days from event	Average temperature the event day	Average temperature the last 5 days from event
-	-	-	-	-	-	-	-	-	-	-	-	[°C]	[°C]	[°C]	[°C]	[°C]	[°C]	[°C]	[°C]
0	0	0	0	2	0	1	2	3	10	1	5	7	1	-3	14	14	15	10	7
Near storm: <3 km around the weather station	Near storm: <3 km around the weather station	Far storm: >3 km around the weather station	Far storm: >3 km around the weather station	Far storm: >3 km around the weather station	Far storm: >3 km around the weather station	Far storm: >3 km around the weather station		-	-	-	-	-	-	-	-	-	-	-	-
MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss
96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115

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M_Temp_avg_10d	M_Temp_min_Corr	M_Temp_min_5d_Corr	M_Temp_min_10d_Corr	M_Temp_max_Corr	M_Temp_max_5d_Corr	M_Temp_max_10d_Corr	M_Temp_avg_Corr	M_Temp_avg_5d_Corr	M_Temp_avg_10d_Corr	M_Temp_amp_Corr	M_Temp_amp_5d_Corr	M_Temp_amp_10d_Corr	M_Wind_avg
Average temperature the last 10 days from event	Corrected minimum temperature the event day	Corrected minimum temperature the last 5 days from event	Corrected minimum temperature the last 10 days from event	Corrected maximum temperature the event day	Corrected maximum temperature the last 5 days from event	Corrected maximum temperature the last 10 days from event	Corrected average temperature the event day	Corrected average temperature the last 5 days from event	Corrected average temperature the last 10 days from event	Ttemperature amplitude the event day	Temperature amplitude the last 10 days from the event	Temperature amplitude the last 5 days from the event	Average wind speed the event day
[°C]	[°C]	[°C]	[°C]	[°C]	[°C]	[°C]	[°C]	[°C]	[°C]	[°C]	[°C]	[°C]	[km/h]
7	9	3	-1	16	16	17	12	9	9	9	12	15	8
-	Correction with height difference bewteen weather station and event location with lapse rate of -0.65 °C for + 100m altitude	Correction with height difference bewteen weather station and event location with lapse rate of -0.65 °C for + 100m altitude	Correction with height difference bewteen weather station and event location with lapse rate of -0.65 °C for + 100m altitude	Correction with height difference bewteen weather station and event location with lapse rate of -0.65 °C for + 100m altitude	Correction with height difference bewteen weather station and event location with lapse rate of -0.65 °C for + 100m altitude	Correction with height difference bewteen weather station and event location with lapse rate of -0.65 °C for + 100m altitude	Correction with height difference bewteen weather station and event location with lapse rate of -0.65 °C for + 100m altitude	Correction with height difference bewteen weather station and event location with lapse rate of -0.65 °C for + 100m altitude	Correction with height difference bewteen weather station and event location with lapse rate of -0.65 °C for + 100m altitude	-	-	-	-
MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss
116	117	118	119	120	121	122	123	124	125	126	127	128	129

M_Wind_avg_5d	M_Win_avg_10d	M_Wind_max	M_Wind_max_5d	M_Wind_max_10d	M_Wind_dir	M_Win_dir_5d	M_Win_dir_10d	M_Snow	M_Fresh_snow	M_Fresh_snow_5d	M_Fresh_snow_10d	M_Accronym_Stn_Weath	M_Alt_Stn_Weath	M_Diff_Alt_Stn_Weath_Event	M_Dist_Stn_Weath
Average wind speed the 5 last days from event	Average wind speed the last 10 days from event	Maximum wind speed the event day	Maximum wind speed the 5 last days from event	Maximum wind speed the last 10 days from event	Average wind direction the event day	Average wind direction the last 5 days from event	Average wind direction the last 10 days from event	Snow cover height the event day	Fresh snow cover height the event day	Fresh snow cover height the 5 last days from event	Fresh snow cover height the 5 last days from event	Accronym of the used weather station	Altitude of the used weather station	Altitude difference between the weather station and the even location	Distance between the weather station and the even location
[km/h]	[km/h]	[km/h]	[km/h]	[km/h]	[°]	[°]	[°]	[cm]	[cm]	[cm]	[cm]	-	[m] a.s.l.	[m]	[km]
9	10	32	38	46	47	48	63.9	0	0	0	0	ZER	1638	-261	36
-	-	-	-	-	0° = North, 90° = East, 180° = South, 270° = West	0° = North, 90° = East, 180° = South, 270° = West	0° = North, 90° = East, 180° = South, 270° = West	-	-	-	-	-	-	-	-
MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss	MeteoSwiss
130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145

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Geology   Number of attributes: 11

Category	Geology										
Attribute	G_watershed	G_Geol	G_Tecto_f	G_Geol_f	G_Tec1_f	G_Tec2_f	G_Tec3_f	G_Acquifer	G_Hydrogeology	G_Productivity	G_Geology
Description	Watershed on the event			Geology	Tectonic 1	Tectonic 2	Tectonic 3	Aquifer	Hydrogeology	Productivity of the event field	General geology
Unit	-	-	-	-	-	-	-	-	-	-	-
Exemple	RHONE	er	pi	Gneiss et micaschistes (y compris migmatites et phyllites; princ. metasediments)	Nappes de socle cristallin penniques moyennes	Nappe du Mont-Fort	-	Aquifer reservoirs in coherent rocks	Sparsely productive aquifer reservoirs in non-karstified, cracked and porous coherent rocks	Variable productivity	Sericite gneiss
Comment	-	-	-	-	-	-	-	-	-	-	-
Source	Swisstopo	Swisstopo	Swisstopo	Swisstopo	Swisstopo	Swisstopo	Swisstopo	Swisstopo	Swisstopo	Swisstopo	Swisstopo
	146	147	148	149	150	151	152	153	154	155	156

Source   Number of attributes: 16

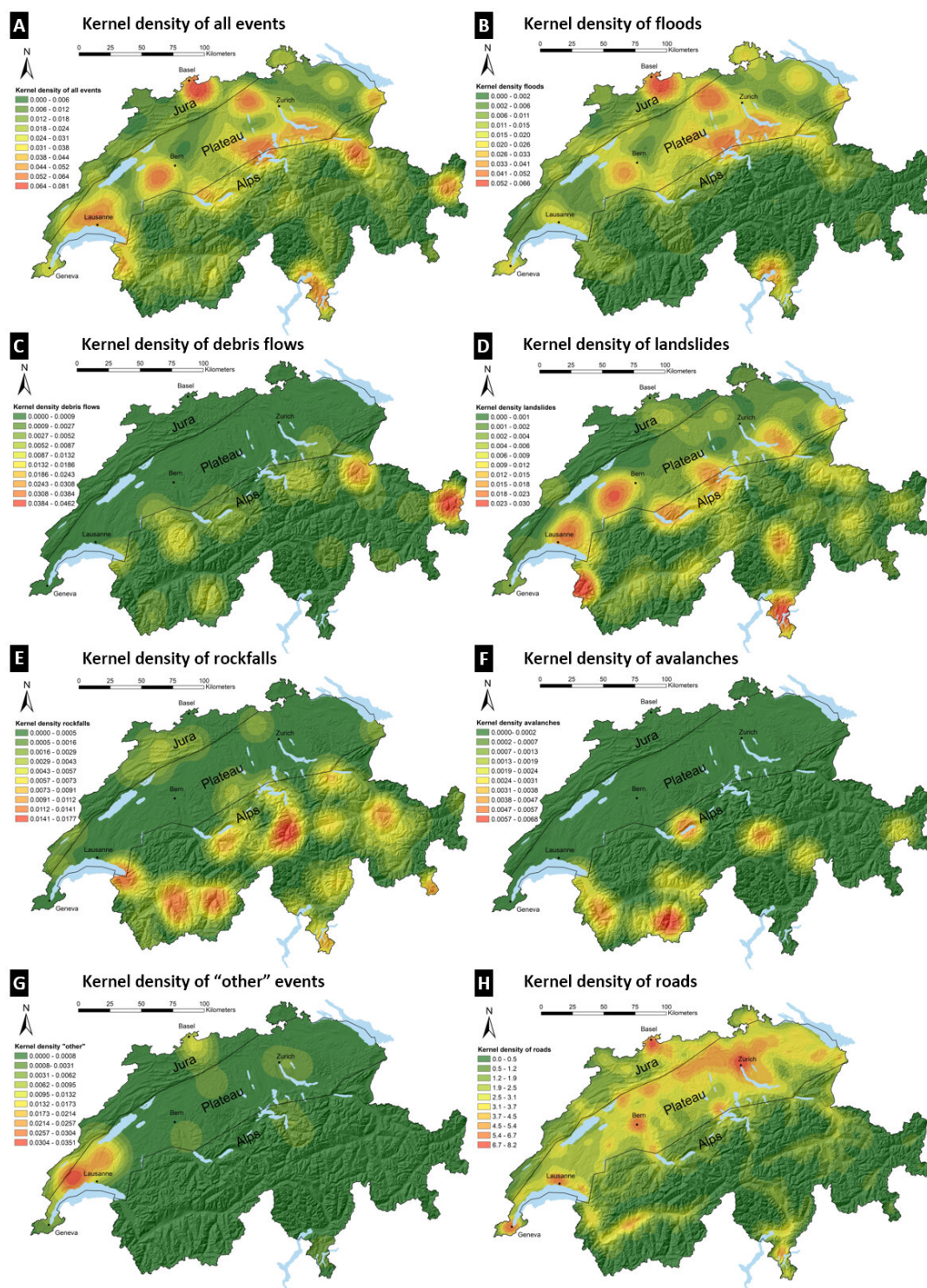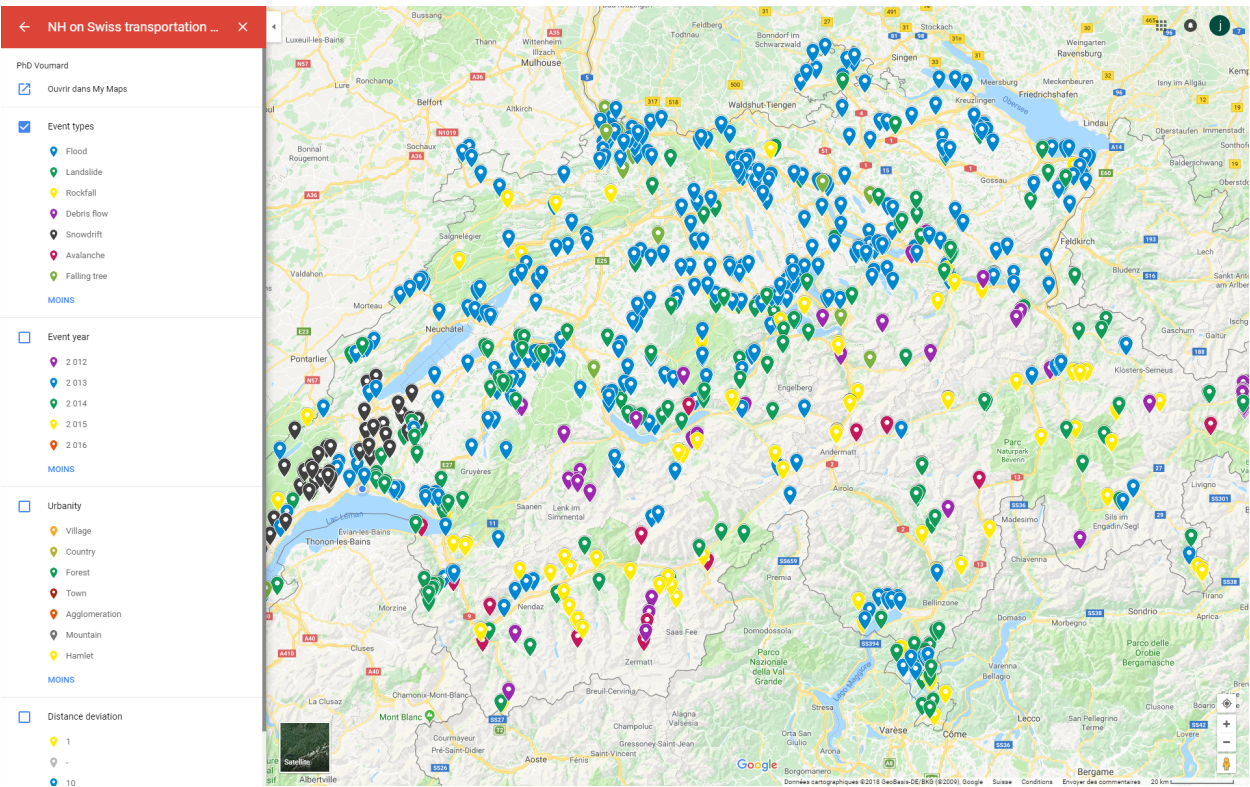| Category	Source															
Attribute	Source1	Source2	Source3	Source4	Source5	Source6	Source7	Source8	Source9	Source10	Source11	Source12	Source13	Source14	Source15	Source16
Description	Source 1 for the event	Source 2 for the event	Source 3 for the event	Source 4 for the event	Source 5 for the event	Source 6 for the event	Source 7 for the event	Source 8 for the event	Source 9 for the event	Source 10 for the event	Source 11 for the event	Source 12 for the event	Source 13 for the event	Source 14 for the event	Source 15 for the event	Source 16 for the event
Unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Exemple	https://www.rts.ch/info/suisse/6749453-le-chablais-et-le-bas-valais-restent-en-etat-d-alerte-face-aux-pluies.html	http://www.24heures.ch/vaud-regions/riviera-chablais/A-Monthey-les-secours-sont-prets-a-evacuer-les-riverains-de-la-Vieze/story/22490259	http://www.24heures.ch/suisse/geneve-subit-grande-crue-arve-1935/story/10943703	http://www.24heures.ch/vaud-regions/monthey-reveille-soulagee-evacuation-300-personnes/story/19307318	http://www.lenouvelliste.ch/articles/valais/canton/inondation-a-st-gingolph-temoignages-du-president-et-de-restaurateurs-378561	https://www.letemps.ch/Page/Uuid/b0e525de-f0c0-11e4-8a43-4ad205b10b56/Les_eaux_en_furie_dans_toute_la_Suisse	http://www.arcinfo.ch/articles/regions/neuchatel-et-littoral/inondations-a-cornaux-et-a-lignieres-378552	http://www.romandie.com/news/Le-Chablais-fortement-touche-par-les-inondations/589780.rom	http://www.rts.ch/info/suisse/6749453-inondations-et-rivieres-en-crue-apres-les-fortes-pluies-.html	http://www.24heures.ch/suisse/suisse-romande/certaines-routes-valaisannes-fermees-cause-deluge/story/27182180	https://www.rfj.ch/rfj/Actualite/Region/20150801-La-Roche-Saint-Jean-a-deux-doigts-de-l-inondation.html	http://www.20min.ch/ro/news/romandie/story/25748211	-	-	-	-
Comment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Source	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts	Google Alerts
	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172

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Figure S2: Kernel density maps. Search radius for events: 20 km. Search radius for road network: 10 km. The results were classified using 10 classes with the Jenks natural breaks method. A: All events; B: Floods; C: Debris flows; D: Landslides; E: Rockfalls; F: Avalanches; G: "Other"; H: Roads. Hillshade and map ground sources: Swisstopo.

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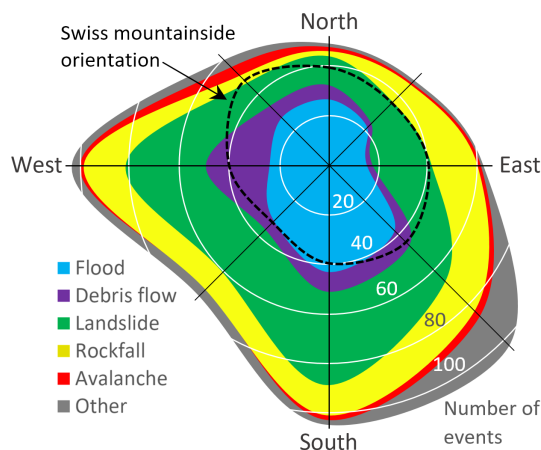
Figure S3: Slope orientation distribution of natural hazard events on the Swiss transportation network from
2012 to 2016. The relative distribution of Swiss mountainside orientation is shown by the black dashed line.

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Figure S4: Database on Google Maps. Available at (last accessed: 25 January 2018):
https://www.google.ch/maps/@46.7199391,7.1246016,8z/data=!4m2!6m1!1s1qtu6LEYum-
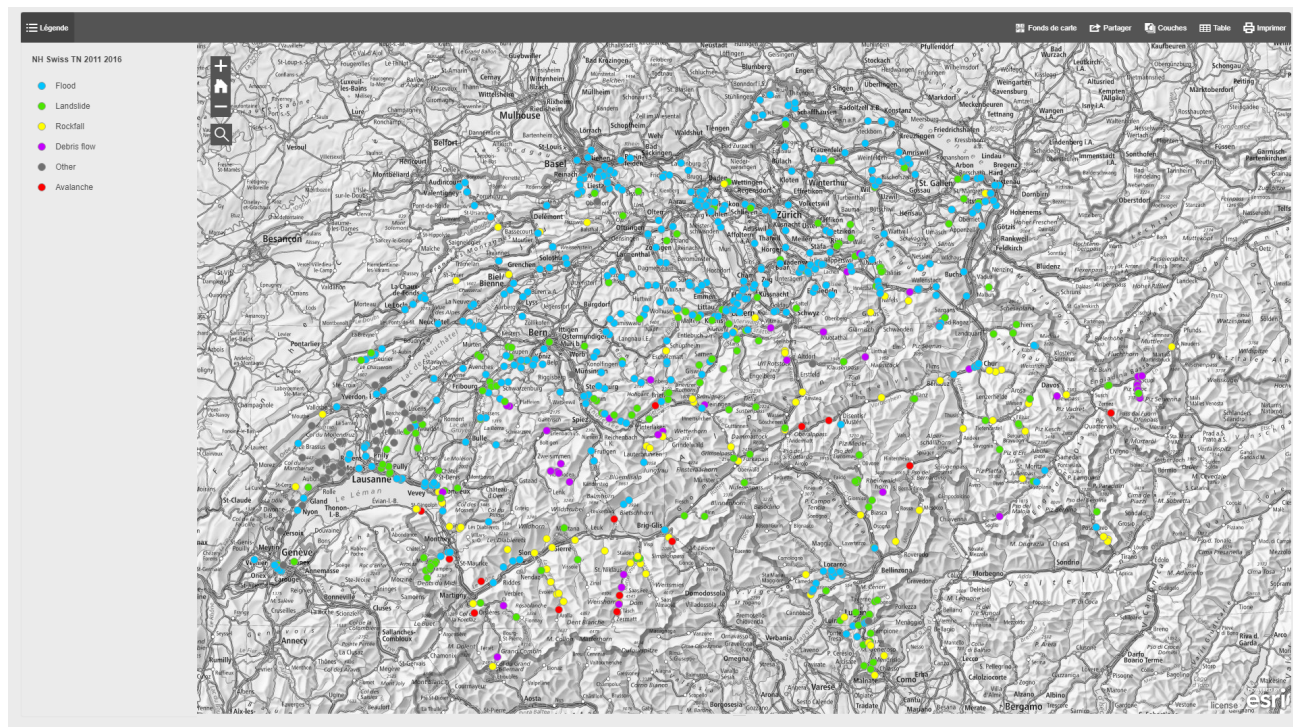7ghpPg9WWzWwgPHYA?hl=fr, last access: 25 January 2018.

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Figure S5: Database on ArcGIS online. Available at (last accessed: 25 January 2018):
http://unil.maps.arcgis.com/apps/MapTools/index.html?webmap=34ee3eb719a647889abd34175969d781, last
access: 25 January 2018.

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