Figure DR1. Principal dendrogeomorphic process event responses resulting from landslide activity. Compression wood (A) and growth reduction (B) used to infer landslide events from growth anomalies in the tree ring record. In this study, growth-ring series had to exhibit (i) a marked growth reduction in annual ring width for at least five consecutive years such that the (ii) width of the first narrow ring was 50% or less of the width of the annual ring of the previous year. Such sharp and long reductions are not observed in the reference chronology established from 40 control trees located outside the landslide areas. The onset of compression wood is determined through the development of asymmetric growth rings, i.e. the formation of wider annual rings with smaller, reddish-yellow colored cells with thicker cell walls on the tilted side and narrow (or even discontinuous) annual rings on the opposite side.

Figure DR2. Winter precipitation (December to March) and predicted probabilities of landslide triggering for the Riou-Bourdoux catchment. Monthly values for the period 1890–2010 were obtained from the meteorological station at Barcelonnette. The incomplete series of Barcelonnette was filled using neighbouring series from Lauzet, Jausiers, Uvernet and Gap) and with data from the HISTALP database (Efthymiadis et al., 2006).

Table DR1. Geomorphic properties and material used.

Table DR2. Growth disturbances corresponding to past landslide reactivations listed by year and type. GD=growth disturbance, GR=growth reduction, CW=compression wood, EE=early earlywood, LE = late earlywood, L = latewood.

Table DR3. Parameters used for the logistic regression models of triggering (A) DJFM precipitation, (B) MAM precipitation, (C) maximum daily rainfall and (D) maximum 3-day rainfall; for each month, the p value, its significance, the intercepts (A) and slopes (B) are given. Blank cells are not statistically significant, . $p<0.1$, * $p<0.05$, ** $p<0.01$,*** $p<0.001$.

Table DR4. Confusion matrix for precipitation Logit model.

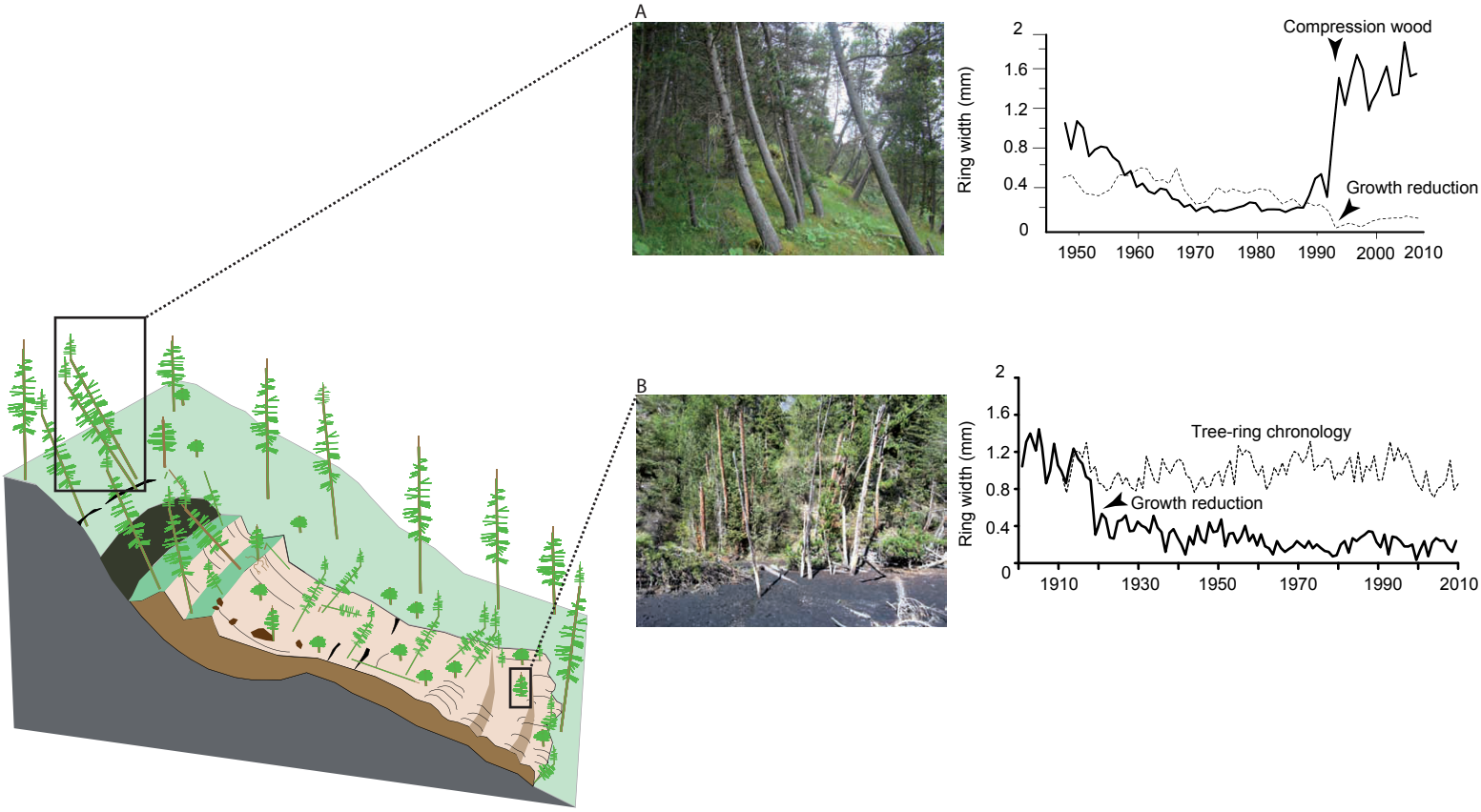
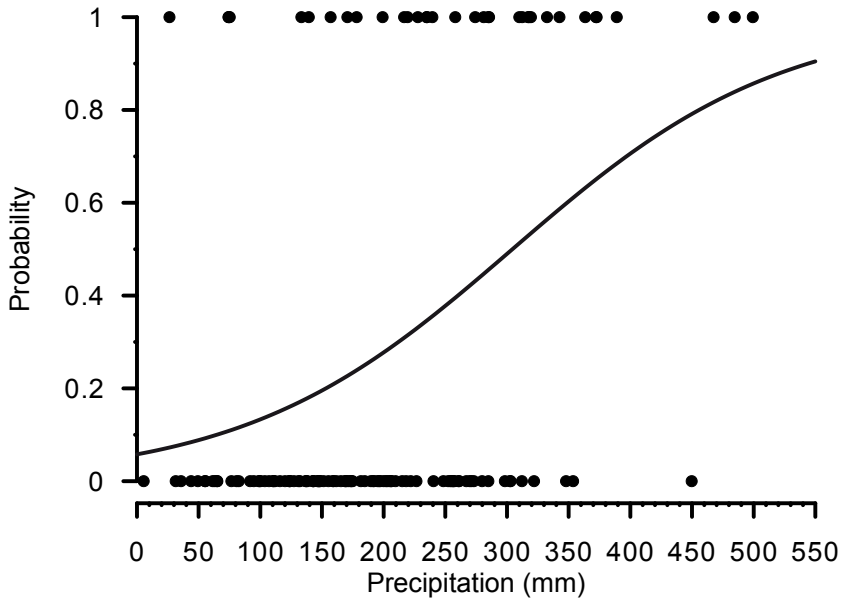

A
Compression wood
Growth reduction
Ring width (mm)
2
1.6
1.2
0.8
0.4
0
1950
1960
1970
1980
1990
2000
2010
B
Tree-ring chronology
Growth reduction
Ring width (mm)
2
1.6
1.2
0.8
0.4
0
1910
1930
1950
1970
1990
2010

Figure DR1



p = 0.000204 (***)

Prob. $= e^{(0.009164*X-2.78984)} / (1+e^{(0.009164*X-2.78984)})$

Figure DR2

SUPPLEMENTARY TABLE DR1. GEOMORPHOLOGICAL PROPERTIES AND DATA AVAILABILITY OF THE INVESTIGATED LANDSLIDES

Landslide characteristics	**Fraissinets (1)**	**Berger (2)**	**Replat (3)**	**Clémence (4)**	**La Pare (5)**	**Pra Bellon (6)**	**Aiguettes (7)**
Location	44°25'18'' N., 6°37'7'' E	44°25'25'' N., 6°37'46'' E	44°25'25.2'' N., 6°37'56'' E	44°25'29.6'' N., 6°37'43.2'' E	44°25'31.7'' N., 6°37'4.5'' E	44°25'01'' N., 6°37'42'' E	44°25'31'' N., 6°37'27'' E
Geomorphology							
Elevation landslide area (m a.s.l.)	1500-1750	1700-1780	1780-1810	1630-770	1540-1750	1470-1750	1740-1980
Exposition	West	West	West	West	East	West	East
Landslide classification	rotational landslide	rotational landslide	rotational landslide	rotational landslide	rotational landslide	rotational landslide	rotational landslide
Rock	Callovo-Oxfordian black marls	Callovo-Oxfordian black marls	Callovo-Oxfordian black marls	Callovo-Oxfordian black marls	morainic colluvium	Callovo-Oxfordian black marls	morainic colluvium
Surface (ha)	9	2	3	3.7	9	32	16
Slope (degree)	18	15	9	17	19	20	20
Data availability							
Time period	1897-2010	1877-2010	1910-2010	1890-2010	1890-2010	1848-2010	1890-2010
No. of sampled trees	27	30	16	30	30	403	223
No. of GD	36	23	11	49	48	534	295
No. of landslides events	5	4	2	7	7	22	14
25% of all trees present since	1899	1908	1912	1900	1899	1897	1903
50% of all trees present since	1922	1931	1917	1910	1920	1915	1920
Age structure of the stand (year and STD)	86.6 (STD : 17)	90.2 (STD : 23,5)	90.6 (STD : 9)	96.2 (STD : 15.2)	90.7 (STD : 14)	91 (STD : 28)	91 (STD : 16)
Data source	this study	this study	this study	this study	this study	Lopez Saez et al., 2012c	Lopez Saez et al., 2012b

Note: STD = standard deviation, ha = hectare, GD = growth disturbance

SUPPLEMENTARY TABLE DR2. DENDROGEOMORPHOLOGICAL PROPERTIES

Years of reactivations	GD (n)	GR (n)	CW (n)	% EE (n CW)	% LE (n CW)	% L (n CW)
2007	5	4	1	100 (1)	0	0
2005	30	30	0	0	0	0
2004	59	51	8	100 (8)	0	0
2003	10	5	5	80 (4)	20 (1)	0
2002	23	22	1	0	100 (1)	0
2001	81	62	19	84 (16)	16 (3)	0
1998	106	98	8	100 (8)	0	0
1997	30	21	9	56(5)	22 (2)	22 (2)
1996	49	34	15	80 (12)	0	20 (3)
1995	19	4	15	60 (9)	27 (4)	13 (2)
1993	14	8	6	100 (6)	0	0
1990	32	23	9	67 (6)	11 (1)	22 (2)
1986	13	6	7	85 (6)	0	15 (1)
1982	15	10	5	100 (5)	0	0
1979	79	48	31	58 (18)	25 (8)	17 (5)
1977	74	44	30	63 (19)	20 (6)	17 (5)
1971	31	12	19	67 (13)	11 (2)	22 (4)
1963	8	2	6	100 (6)	0	0
1961	61	46	15	73 (11)	20 (3)	7 (1)
1960	10	5	5	60 (3)	40 (2)	0
1951	7	4	3	100 (3)	0	0
1947	15	10	5	100 (5)	0	0
1941	14	12	2	50 (1)	50 (1)	0
1940	9	8	1	100 (1)	0	0
1936	71	29	42	85 (36)	10 (4)	5 (2)
1934	18	6	12	80 (10)	0	20 (2)
1921	9	7	2	50 (1)	50 (1)	0
1919	6	6	0	0	0	0
1917	15	10	5	100 (5)	0	0
1916	29	23	6	100 (6)	0	0
1915	21	8	13	92 (12)	8 (1)	0
1912	8	1	7	85 (6)	15 (1)	0
1911	5	1	4	50 (2)	0	50 (2)
1904	10	0	10	100 (10)	0	0
1898	10	2	8	80 (6)	20 (2)	0
Total	**996**	**662**	**334**	**77,8 (260)**	**12,9 (43)**	**9,3 (31)**

Note GD = Growth disturbance, GR = Growth reduction, CW = Compression wood, EE = Early earlywood, LE = Late earlywood, L = Latewood

SUPPLEMENTARY TABLE DR3A. PARAMETERS USED FOR THE LOGISTIC REGRESSION MODELS OF TRIGGERING (DJFM PRECIPITATIONS)

Month	*p* value	Significance	A	B
June (n-1)	0.072871	.	0.009051	-1.388868
July (n-1)	0.983		0.0001346	-0.7946275
August (n-1)	0.9564		0.0003133	-0.8059274
September (n-1)	0.9095		-0.0004553	-0.7572598
October (n-1)	0.24933		0.003493	-1.094258
November (n-1)	0.171864		0.00395	-1.107231
December (n-1)	***0.000729***	*********	***0.016402***	***-1.798535***
January (n)	0.0275	*	0.010465	-1.350093
February (n)	0.0312	*	0.011234	-1.299532
March (n)	0.51691		0.003077	-0.960039
April (n)	0.5630		-0.002872	-0.632424
May (n)	0.07383		-0.001697	-0.682599
June (n)	0.389		-0.004517	-0.507247
July (n)	0.9547		0.0003728	-0.8052012
August (n)	0.7794		-0.001627	-0.699424
September (n)	0.0232	*	-0.0106	-0.11968
December (n-1) + January (n) + February (n) + March (n)	***0.000204***	*********	***0.009164***	***-2.78984***

SUPPLEMENTARY TABLE DR3B. PARAMETERS USED FOR THE LOGISTIC REGRESSION MODELS OF TRIGGERING (MAM TEMPERATURES)

Month	*p* value	Significance	A	B
December (n-1)	0.129		0.02185	-0.99776
January (n)	0.102		0.02114	-0.98379
February (n)	0.037	*	0.02665	-0.98512
March (n)	0.0261	*	0.03421	-1.07258
April (n)	0.232		0.0228	-1.03799
May (n)	0.0021	**	0.05415	-1.15671
June (n)	0.00175	**	0.05933	-1.20763
July (n)	0.101		0.02542	-0.98965
August (n)	0.237		0.01859	-1.02173
September (n)	0.943		-0.00109	-1.02353
Mar (n) + Apr (n) + May (n)	***0.00242***	********	***0.0729***	***-1.13405***

SUPPLEMENTARY TABLE DR3C. PARAMETERS USED FOR THE LOGISTIC REGRESSION MODELS OF TRIGGERING (Maximum daily rainfall)

Month	*p* value	Significance	A	B
December (n-1)	0.269		-0.002436	-0.09776
January (n)	0.0536	*	0.0295	-1.31434
February (n)	0.0316	*	0.01302	-0.91515
March (n)	0.118		-0.005115	-0.623916
April (n)	0.0388	*	0.01604	-1.00157
May (n)	0.15		0.00146	-0.72181
June (n)	0.623		-0.02706	-0.26002
July (n)	0.0159	*	0.02579	-1.2225
August (n)	0.461		-0.01972	-0.39041
September (n)	0.864		-0.02533	-0.08621
October (n)	0.2666		-0.006465	-0.537529
November (n)	0.0335	*	0.01345	-1.04464

SUPPLEMENTARY TABLE DR3D. PARAMETERS USED FOR THE LOGISTIC REGRESSION MODELS OF TRIGGERING (Maximum 3-day rainfall)

Month	*p* value	Significance	A	B
December (n-1)	0.104		-0.581125	-0.006743
January (n)	0.0135	*	-0.941411	0.007132
February (n)	0.0673	*	-0.998741	-1.01149
March (n)	0.0352	*	-0.732737	-.0000703
April (n)	0.0986	*	-1.03823	-1.01097
May (n)	0.126		-0.714583	-0.001326
June (n)	0.253		-0.48625	-0.01126
July (n)	0.0554	*	-1.08475	0.001643
August (n)	0.134		-0.618302	0.005551
September (n)	0.170		-0.497894	-0.008181
October (n)	0.0455	*	-0.7375656	-0.0003204
November (n)	0.0871	*	-1.026043	0.0012913

SUPPLEMENTARY TABLE DR4. CONFUSION MATRIX FOR PRECIPITATION LOGIT MODEL

		Predicted landslide reactivation (logit model)		
		N	Y	total
Reconstructed landslide reactivation (tree-rings)	N	79	7	86
	Y	21	14	35
	Total	**100**	**21**	**121**