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Global detection of rainfall-triggered landslide clusters

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Table S1. All identified clusters. Clusters are grouped according to year (grey and white) and location. Area is area of the convex hull.

Location		# Events	From	To	Duration [days]	Area [km²]	ID
West Coast, North America	Washington, US	44	09. Dec	15. Dec 10	7	38,699	1
	California, US	28	19. Dec	22. Dec 10	4	49,494	2
	Oregon, US	51	13. Jan	21. Jan 11	9	126,346	3
	Oregon, US	15	26. Feb	02. Mar 11	5	15,049	4
	Washington, US	35	06. Mar	20. Mar 11	15	30,224	5
	California, US	28	23. Mar	27. Mar 11	5	9,679	6
	Oregon, US	59	18. Jan	03. Feb 12	17	96,298	7
	Oregon, US	18	12. Mar	17. Mar 12	6	15,832	8
	Oregon, US	14	30. Mar	03. Apr 12	5	9,948	9
	Oregon, US	17	17. Nov	22. Nov 12	6	27,231	10
	Oregon, US	19	30. Nov	05. Dec 12	6	61,073	11
	Oregon, US	21	16. Dec	26. Dec 12	11	34,199	12
	Oregon, US	43	09. Feb	21. Feb 14	13	238,602	13
	Washington, US	28	25. Feb	08. Mar 14	12	44,817	14
	Oregon, US	37	18. Dec	25. Dec 14	8	53,173	15
	Washington, US	13	04. Jan	06. Jan 15	3	14,781	16
	Oregon, US	31	04. Feb	12. Feb 15	9	75,636	17
	Oregon, US	132	04. Dec	27. Dec 15	24	123,399	18
	Oregon, US	18	14. Jan	27. Jan 16	14	33,586	19
	California, US	20	11. Mar	15. Mar 16	5	58,030	20
	Colorado, US	11	20. Jul	20. Jul 16	1	1	21
	California, US	39	04. Jan	11. Jan 17	8	143,868	22
	California, US	21	18. Jan	24. Jan 17	7	165,451	23
	California, US	10	19. Jan	24. Jan 17	6	2,532	24
	Washington, US	15	05. Feb	09. Feb 17	5	9,641	25
	California, US	13	06. Feb	16. Feb 17	11	899	26
	California, US	15	06. Feb	17. Feb 17	12	23,707	27
	California, US	23	18. Feb	24. Feb 17	7	32,913	28
	Washington, US	11	14. Mar	20. Mar 17	7	1,029	29

Location		# Events	From	To	Duration [days]	Area [km²]	ID
Central and Eastern USA	Kentucky, US	25	02. May	03. May 10	2	20,426	30
	Ohio, US	11	08. Mar	16. Mar 11	9	9,008	31
	Ohio, US	10	25. Apr	27. Apr 11	3	3,666	32
	Ohio, US	11	03. May	03. May 11	1	5,627	33
	Minnesota, US	11	18. Jun	23. Jun 14	6	576	34
	West Virginia, US	13	02. Mar	07. Mar 15	6	6,108	35
	Kentucky, US	14	10. Apr	20. Apr 15	11	55,773	36
	West Virginia, US	12	21. Feb	27. Feb 16	7	85,675	37
South and Central America	Rio de Janeiro, Brazil	111	05. Apr	07. Apr 10	3	2,604	38
	Guatemala, Guatemala	11	26. May	30. May 10	5	2,457	39
	Distrito Federal, Venezuela	12	26. Nov	30. Nov 10	5	111	40
	Rio de Janeiro, Brazil	20	12. Jan	12. Jan 11	1	1,420	41
	Atlántico Sur, Nicaragua	14	23. Jun	23. Jun 14	1	7	42
Himalaya	West Bengal, India	15	16. Aug	20. Aug 09	5	746	43
	Jammu and Kashmir, India	13	30. Mar	08. Apr 15	10	20,066	44
	West Bengal, India	10	27. Jun	01. Jul 15	5	587	45
	Manipur, India	10	01. Aug	01. Aug 15	1	503	46
South-East Asia	Benguet, Philippines	23	03. Oct	09. Oct 09	7	2,817	47
	Misamis Oriental, Ph.	14	24. Nov	25. Nov 09	2	14,583	48
	Leyte, Philippines	10	16. Mar	20. Mar 11	5	508	49
	Jawa Barat, Indonesia	10	18. Nov	21. Nov 12	4	2,663	50

Table S2. Size of the landslides of clusters with at least 10 events for the different regions.

Region	Small	Medium	Large	Very large	Unknown
West Coast, North America	26%	29%	1%	-	43%
Central and Eastern USA	62%	38%	-	-	-
South and Central America	4%	88%	5%	3%	
Himalaya	6%	88%	6%	-	-
South-East Asia	4%	88%	9%	-	-

Table S3. Apparent trigger of the landslides of clusters with at least 10 events for the different regions.

Region	Downpour	Rain	Continuous rain	Snow melt	Flooding	Tropcial cycloon	Construction	Unknown
West Coast, North America	27%	19%	3%	2%	1%	-	-	47%
Central and Eastern USA	64%	15%	9%	3%	-	-	1%	6%
South and Central America	85%	-	8%	-	-	7%	-	-
Himalaya	40%	4%	48%	-	2%	-	-	6%
South-East Asia	16%	19%	-	-	-	65%	-	-

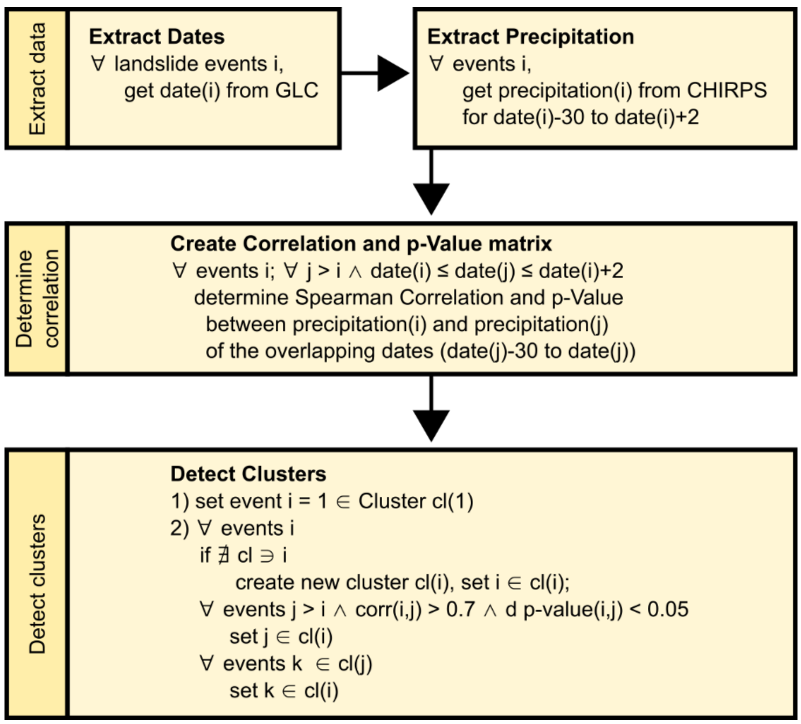

Figure S1. Flowchart of the algorithm to detect clusters within the global landslide catalog (GLC). Symbols included:

∀ - for all; ∧ - logical conjunction; ∈ - element of; ∄ - there does not exist; ∋ - contains.

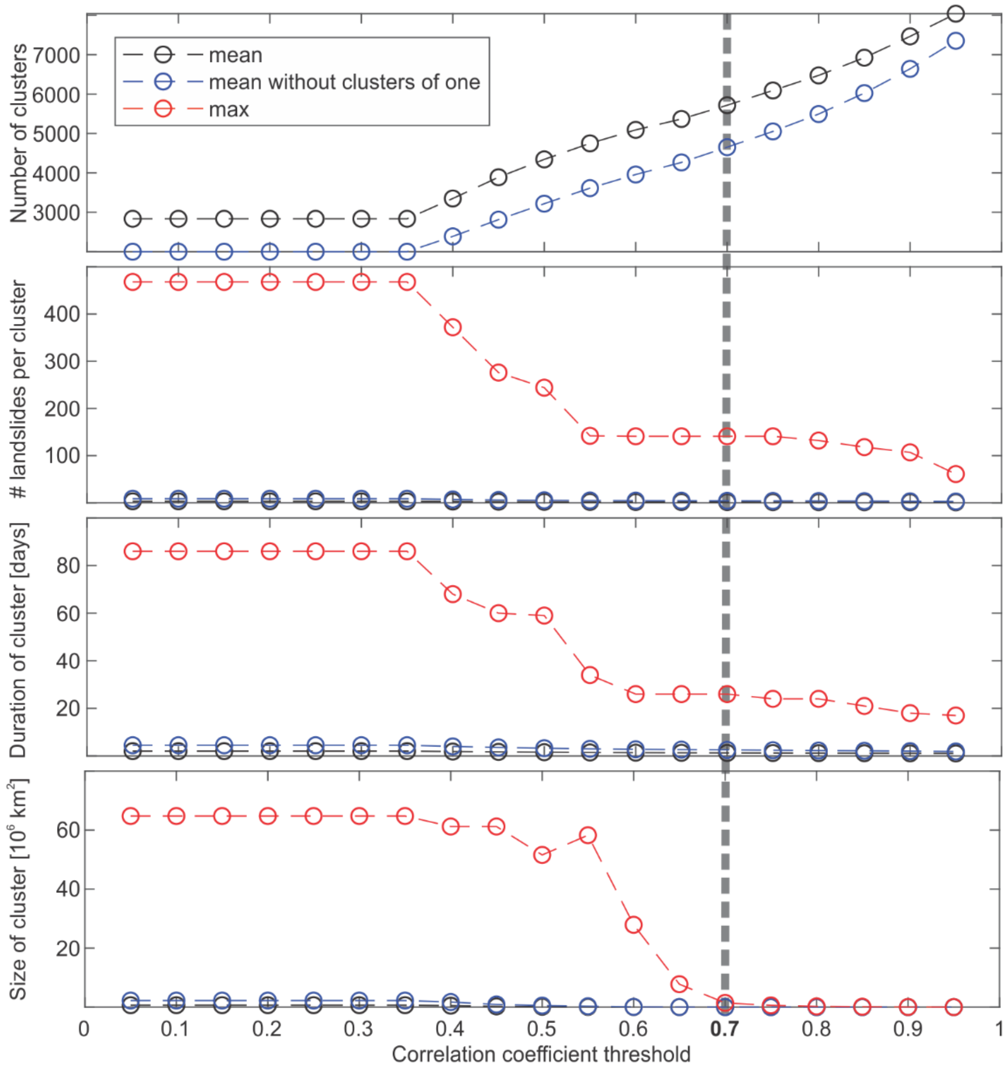

Figure S2. Impact of the chosen threshold for the spearman correlation coefficient on total number of clusters in the global landslide catalog, on the average number of landslides per cluster, on the average duration of landslide clusters, and on the average area of landslide clusters. Correlation was determined for the 30 days prior to the second event. In this study a threshold of 0.7 was chosen as from this point onwards maximums size of, duration of and landslides per cluster, becomes stable compared to the original values.

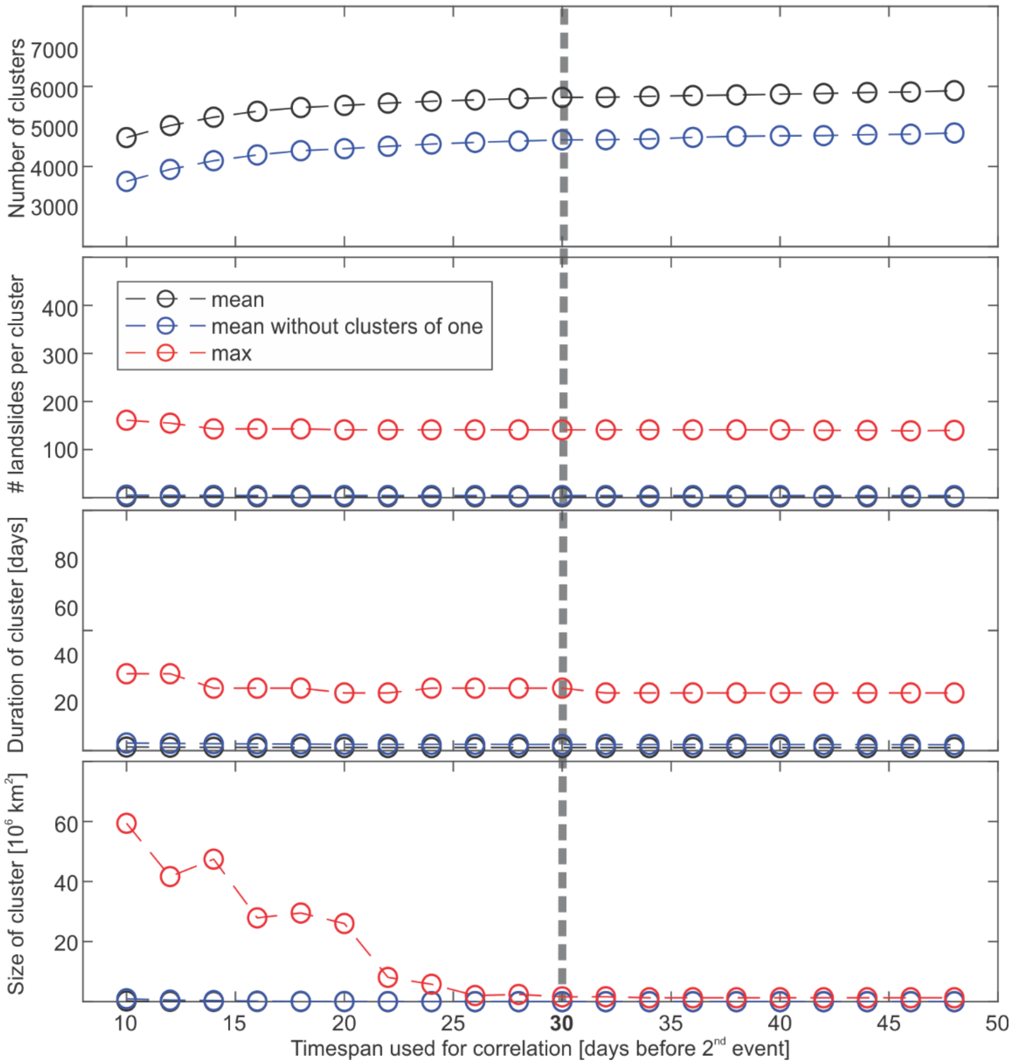

Figure S3. Impact of the chosen threshold for the timespan for which the spearman correlation coefficient is determined on the total number of clusters in the global landslide catalog, on the average number of landslides per cluster, on the average duration of landslide clusters, and on the average area of landslide clusters. The correlation coefficient threshold was set to 0.7 for this analysis. In this study a threshold of 30 days was chosen, as from this point onwards number of clusters, maximums size of, duration of and landslides per cluster, becomes stable.

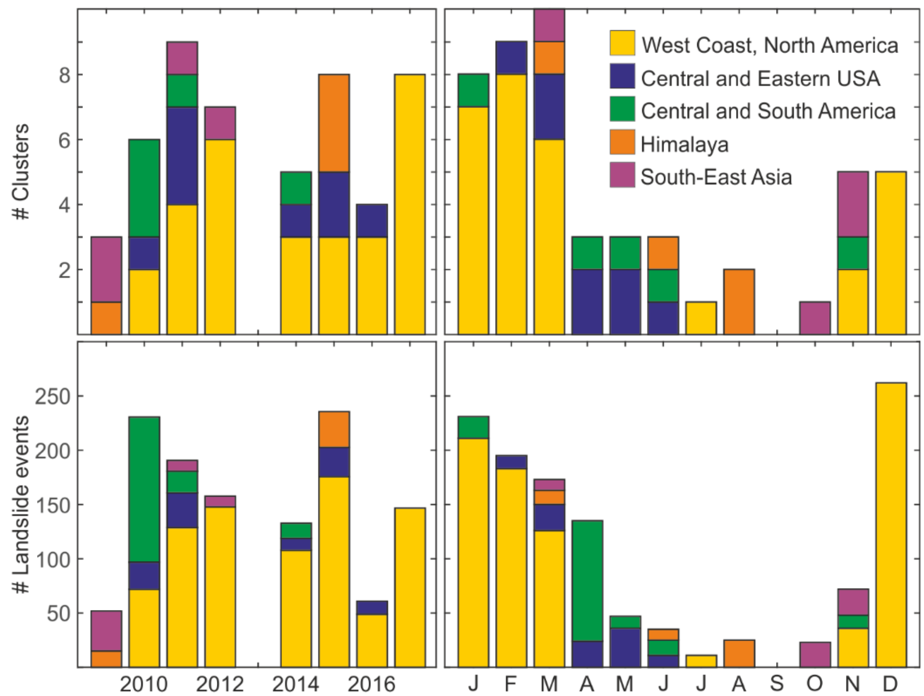

Figure S4. Recorded landslide clusters throughout the years and seasons for all of the 5 distinct regions.

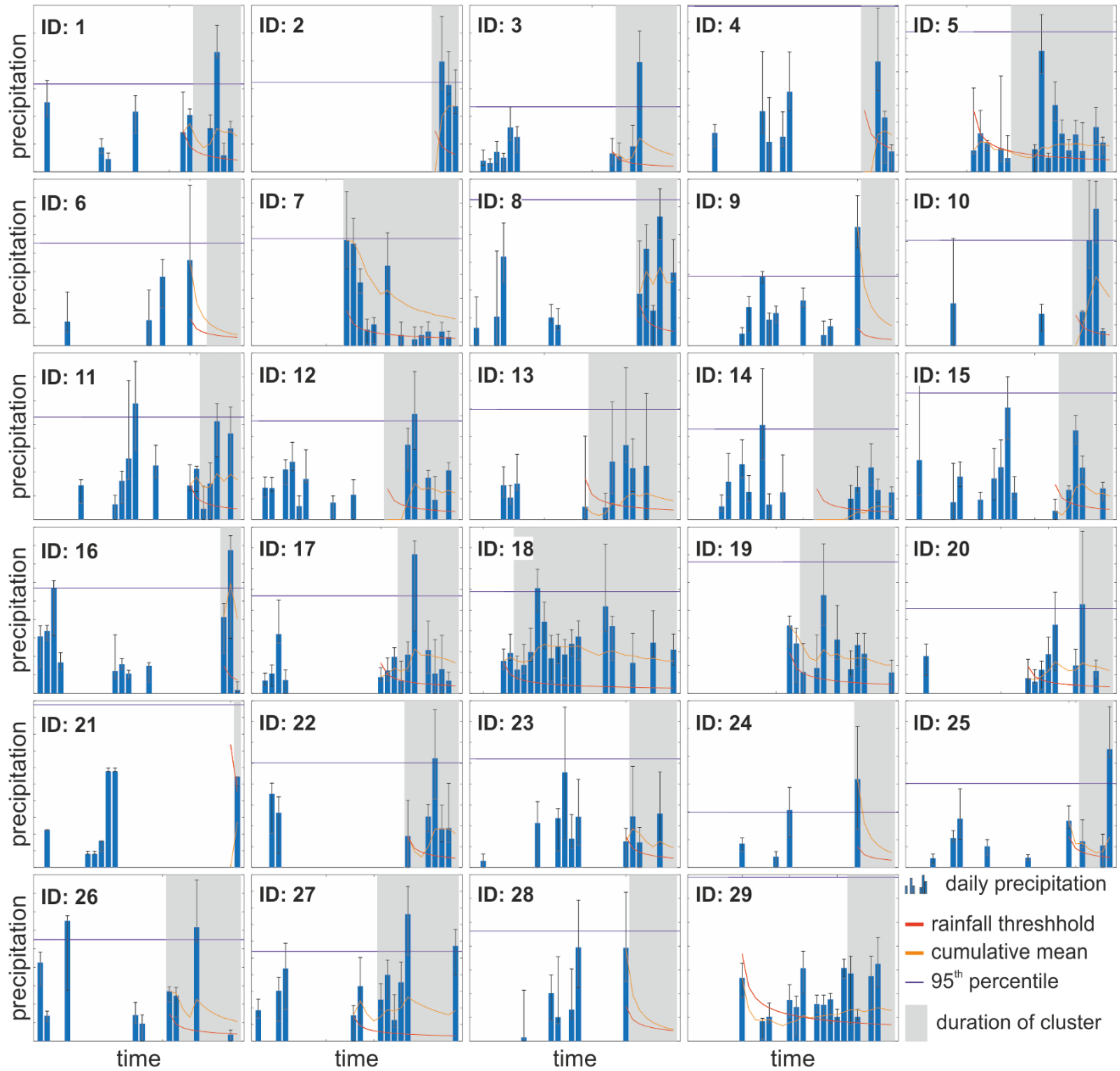

Figure S5. Median Rainfall (error bars show inner quartile range) in the 30 days preceding the last landslide event of the clusters located in the West Coast of North America. The blue line indicates the 95th percentile of rainfall (excluding rain-free days). Given in red is the global rainfall threshold (ID from Guzzetti et al. 2008) and in orange the cumulative mean for the rainfall event preceding the cluster.

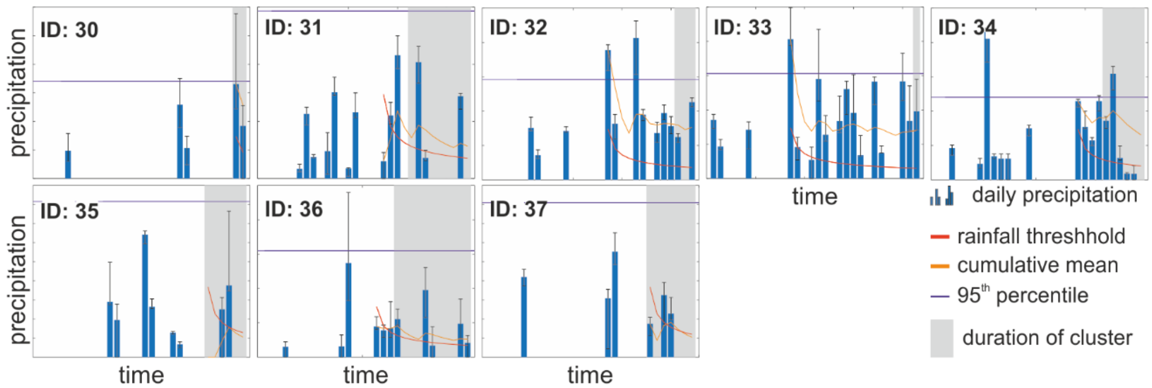

Figure S6. Rainfall in the 30 days preceding the last landslide event of the clusters located in Central and Eastern USA. The blue line indicates the 95th percentile of rainfall (excluding rain-free days). Given in red is the global rainfall threshold (ID from Guzzetti et al. 2008) and in orange the cumulative mean for the rainfall event preceding the cluster.

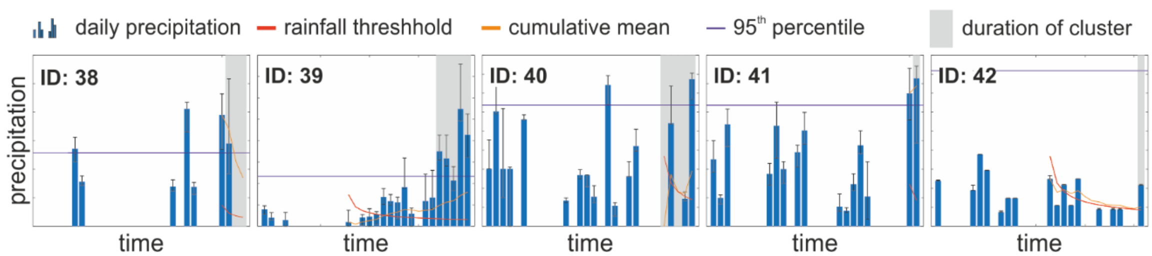

Figure S7. Rainfall in the 30 days preceding the last landslide event of the clusters located in Central and South America. The blue line indicates the 95th percentile of rainfall (excluding rain-free days). Given in red is the global rainfall threshold (ID from Guzzetti et al. 2008) and in orange the cumulative mean for the rainfall event preceding the cluster.

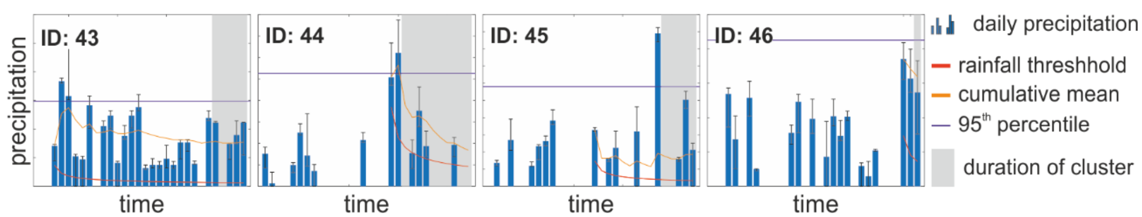

Figure S8. Rainfall in the 30 days preceding the last landslide event of the clusters located in the Himalaya Region. . The blue line indicates the 95th percentile of rainfall (excluding rain-free days). Given in red is the global rainfall threshold (ID from Guzzetti et al. 2008) and in orange the cumulative mean for the rainfall event preceding the cluster.

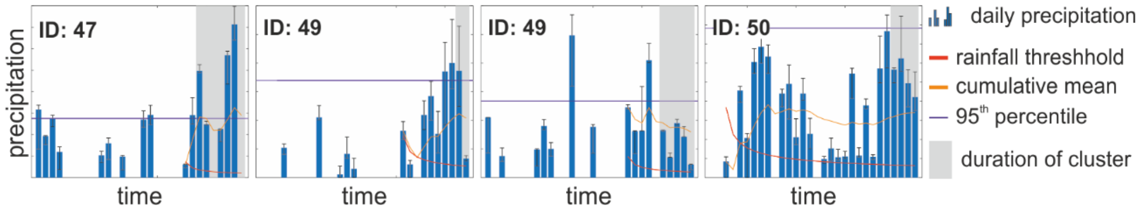

Figure S9. Rainfall in the 30 days preceding the last landslide event of the clusters located in the Philippines. The blue line indicates the 95th percentile of rainfall (excluding rain-free days). Given in red is the global rainfall threshold (ID from Guzzetti et al. 2008) and in orange the cumulative mean for the rainfall event preceding the cluster.

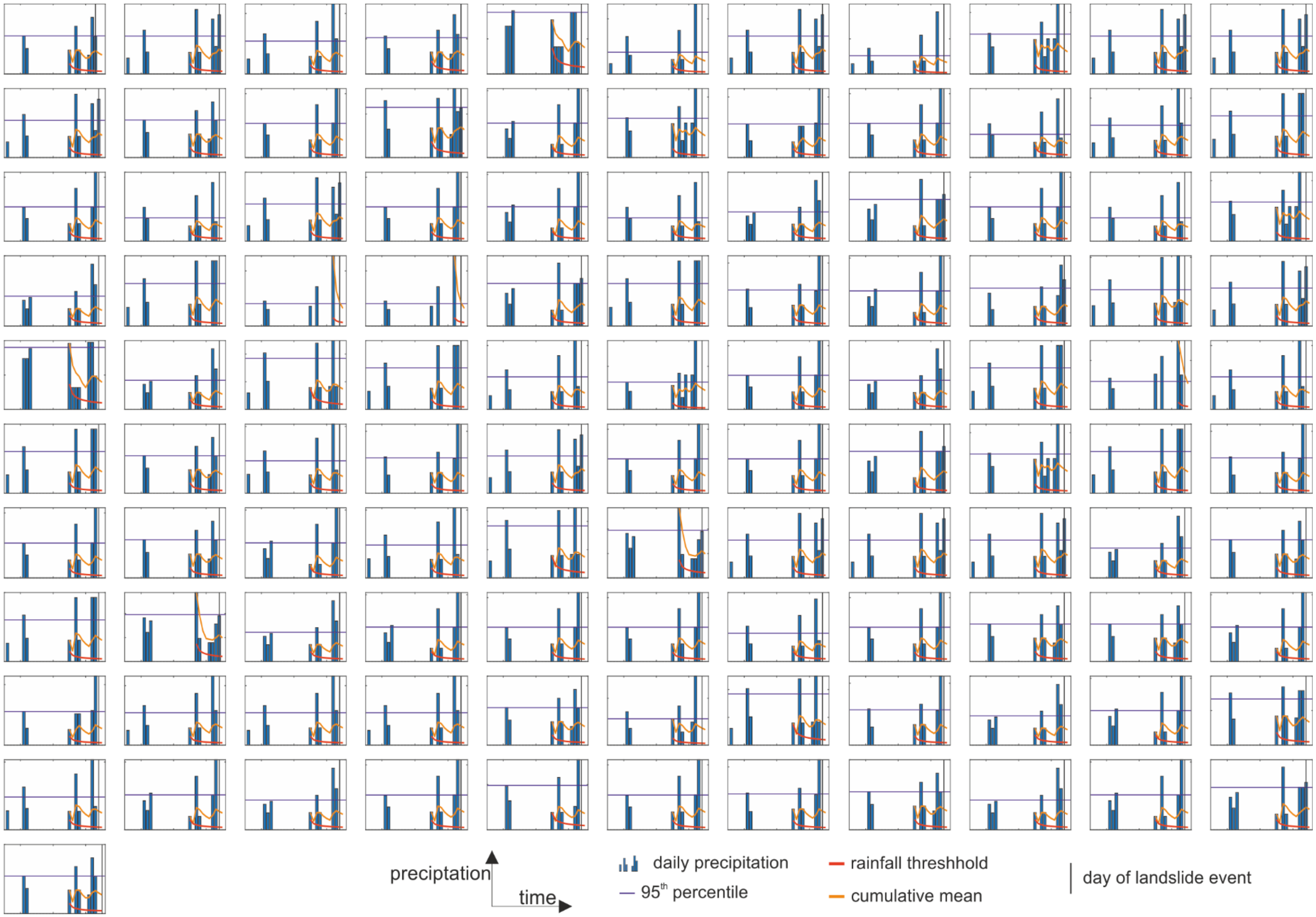

Figure S10. Rainfall at the location of all events associated with the cluster in Rio de Janeiro with the most events per day. Shown is daily precipitation of the 30 days preceding the last event of the cluster.

Figure S11. Rainfall at the location of all events associated with the longest Cluster (Oregon, USA). Shown is daily precipitation of the 30 days preceding the last event.