

CARTOGRAFÍA GEOTÉCNICA

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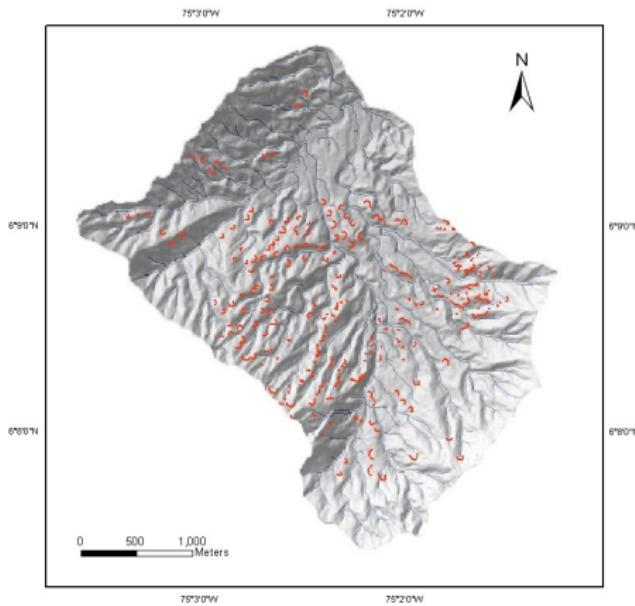
Version:August 22, 2020



Inventario de MenM

Colección de las características de los deslizamientos en una cierta área y tiempo, preferiblemente en formato digital con información espacial relacionada con la localización (puntos o polígonos) combinada con información de atributos. Estos atributos deben idealmente contener información sobre:

- el tipo de deslizamiento,
- actividad actual,
- tamaño y/o volumen,
- fecha de ocurrencia o edad relativa,
- causas.



Por qué son importantes?

- Los inventarios de deslizamientos son la base para evaluar la susceptibilidad, amenaza y riesgo por deslizamientos.
- Son esenciales para los modelos de susceptibilidad que predicen los deslizamientos basados en las condiciones pasadas: Necesitamos saber dónde ocurren y cuántos.
- Esas condiciones son utilizadas para predecir los deslizamientos futuros: Necesitamos saber los factores causantes.
- Estas condiciones difieren para diferentes tipos de movimientos: Necesitamos saber qué pasó.
- La información temporal es esencial para estimar la frecuencia de los deslizamientos: Necesitamos saber cuándo pasaron.
- Los inventarios de deslizamientos son usados para validar los resultados de la zonificación.

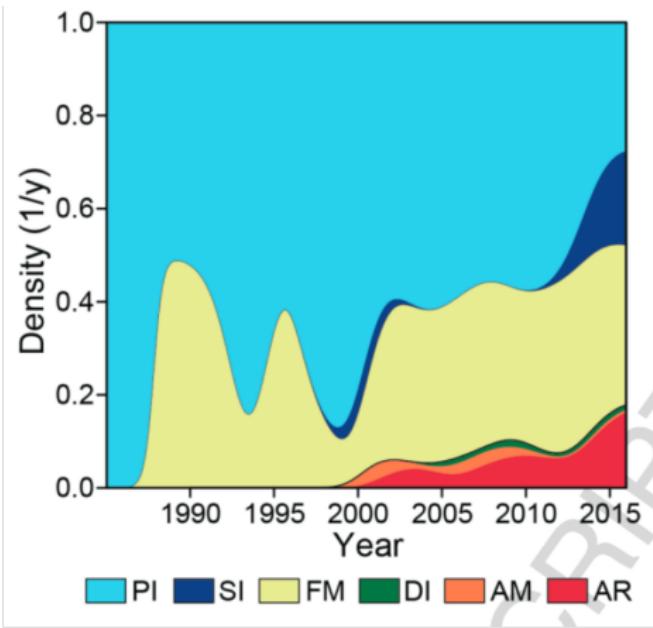
Fuente: van Westen en ACP-EU Natural Disaster Risk Program

Técnicas de levantamiento

- Análisis de archivos información histórica (Reichenbach et al., 1988; Salvati et al., 2003).
- Fotointerpretación de fotografías aéreas (Guzzetti & Cardinali, 1989, 1990; Galli et al., 2008; Santagelo et al., 2010, 2013).
- Análisis visual de imágenes LIDAR (Ardizzone et al., 2007; van den Eeckhaut et al., 2007; Haneberg et al., 2009; Guzzetti et al., 2012; Razak et al., 2011, 2013).
- Procesamiento de imágenes LIDAR (Martha et al., 2010; Lu et al., 2011, van der Eeckhaut et al., 2012).
- Procesamiento de imágenes de satélite (Mondini & Chang, 2014; Yang & Chen, 2010; Rosin & Hervas, 2005).
- Levantamiento de campo.

Fuente: van Westen en Landslide types and causes; Santagelo et al. (2015)

Técnicas de levantamiento



Legend: PI, visual interpretation of aerial photographs; SI, visual interpretation of satellite images; FM, field mapping; DI, visual interpretation of DEM derivatives; AM, automatic or semi-automatic mapping using remote sensing imagery; AR, analysis of archive and historical sources.

Fuente: Reichenbach et al. (2018)

Técnicas de levantamiento

Group	Technique	Description	Scale		
			N	L	S
Image interpretation	Stereo aerial photographs	Analog format or digital image interpretation with single or multi-temporal data set	M	M	M
	High Resolution satellite images	With monoscopic or stereoscopic images, and single or multi-temporal data set	H	H	H
	LiDAR shaded relief maps	Single or multi-temporal data set from bare earth model.	H	H	H
(Semi) automated classification based on spectral characteristics	Aerial photographs	Image ratioing, thresholding	M	M	M
	Medium resolution multi spectral images	Single data images, with pixel based image classification or image segmentation	H	H	H
		Multiple date images, with pixel based image classification or image segmentation	M	M	M
(Semi) automated classification based on altitude characteristics	InSAR	Terrestrial Radar Interferometry	M	M	M
		Permanent scatterers for pointwise displacement data	L	L	L
	LiDAR	Overlaying of LiDAR DEMs from different periods	L	L	L
Field investigation methods	Photogrammetry	Overlaying of DEMs from airphotos or high resolution satellite images for different periods	L	L	L
	Field mapping	Conventional method	H	H	H
		Using Mobile GIS and GPS for attribute data collection	H	H	H
Archive studies	Interviews	Using questionnaires, workshops etc.	H	H	H
	Newspaper archives	Historic study of newspaper, books and other archives	M	M	M
	Road maintenance organizations	Relate maintenance information along roads caused by landslides	H	H	H
	Fire brigade/police	Extracting landslide occurrence from logbooks on accidents	H	H	H

(N=National, L=Local and S=Site specific.

(H= highly applicable, M= moderately applicable, and L= Less applicable)

Inventario histórico

<http://www.emdat.be/>

The screenshot shows the homepage of the EM-DAT website. At the top, there is a navigation bar with links for Home, About, Database, Activities, FAQs, Publications, and Login. Below the navigation bar, there is a banner featuring a volcano and a search bar. On the left side, there is a "What's New" section with a thumbnail image of surgical instruments and a link to a publication about barriers to surgical care in Nepal. On the right side, there is a "Disasters Of The Week" section for the week of June 26 - July 02, listing several natural disasters. There is also a "Technological disasters" section for the same week. At the bottom, there is a "Welcome to the EM-DAT website" section with a brief history of the database and its main objective. To the right of this, there is a purple box titled "Options to consult the EM-DAT database" containing a message from the team and a link to "Consult the database...".

www.emdat.be

EM-DAT
The International Disaster Database
Centre for Research on the Epidemiology of Disasters - CRED

Home About Database Activities FAQs Publications Login

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What's New

[Barriers to surgical care in Nepa](#)

[In BMC Health Services Research](#)

[Click here to read the publication...](#)

EM-DAT: Disasters Of The Week

Week 26-2017: June 26 - July 02

Natural disasters:

- 2017-0237 Wildfires; United States
- 2017-0238 Severe storm; Gradiacac, Bosnia-Herzegovina
- 2017-0241 Heat wave; Soha, Bulgaria
- 2017-0242 Flash floods; Balochistan, Pakistan

Technological disasters:

- 2017-0229 Cable car accident; nera Islamabad, Pakistan
- 2017-0239 Shipwreck with migrants; Libya
- 2017-0240 Collision between a truck and a bus; Tartastan region, Russia
- 2017-0248 Gold mine collapse; Prestea-Nutsa, Ghana

Week 25-2017: June 19 - June 25

Welcome to the EM-DAT website

In 1988, the Centre for Research on the Epidemiology of Disasters (CRED) launched the Emergency Events Database (EM-DAT). EM-DAT was created with the initial support of the World Health Organisation (WHO) and the Belgian Government.

The main objective of the database is to serve the purposes of humanitarian action at national and international levels. The initiative aims to rationalise decision making for disaster preparedness, as well as provide an objective base for vulnerability assessment and priority setting.

EM-DAT contains essential core data on the occurrence and effects of over 22,000 mass disasters in the world from 1900 to the present day. The database is compiled from various sources, including UN agencies, non-governmental organisations, insurance companies, research institutes and press agencies.

Options to consult the EM-DAT database

The EM-DAT team has implemented a new system to access to the validated data. This system is in a testing phase, therefore we apologize for any inconvenience. Any feedback from the EM-DAT users are welcomed to contact@emdat.be.

[Consult the database...](#)

Inventario histórico

<http://desinventar.net>

The screenshot shows the homepage of the DesInventar Sendai website. The header features the UNDRR logo and the text "DesInventar Sendai". Below the header is a navigation bar with links for HOME, ABOUT, ANALYSIS, ADMINISTRATION, DOWNLOAD, and CONTACT. To the left, there's a sidebar with links to "What is DesInventar?", "What is DesInventar Sendai?", "Basic methodology", "Disaster Hazards classification", "Definition of effects", "About loss data sources", "How to migrate to Sendai mode", and "Recent publications". A diagram titled "Sendai Framework | 2018 Agenda for Sustainable Development Multi-Hazards Data Integrated Monitoring & Reporting Overall Structure of SFM" illustrates the system architecture. The main content area has a large world map showing disaster loss data. Text on the page includes "Welcome to DesInventar Sendai !!!", "Disaster loss data for Sustainable Development Goals and Sendai Framework Monitoring System", "Available datasets worldwide", and "Detailed disaster loss data for more than 89 countries are available →". On the right side, there's a section for downloading software, a server icon, and a note about the open-source nature of the software. At the bottom, there are links for Documentation, Disaster type definitions, Datasets for the GVR 2015, Other DesInventar Servers, and a footer with social media icons.

Inventario histórico

<https://data.nasa.gov/dataset/Global-Landslide-Catalog-Export/dd9e-wu2v>

Es seguro | https://data.nasa.gov/dataset/Global-Landslide-Catalog-Export/dd9e-wu2v/data



NASA's Open Data Portal

Data Catalog About Developer Resources Suggest a Dataset

Global Landslide Catalog Export

The Global Landslide Catalog (GLC) was developed with the goal of identifying rainfall-triggered landslide events around the world, regardless of size, impacts or location. The GLC considers all types of mass movements →

id	date	time	country	nearest_places	hazard_type	landslide_type	trigger	storm_name
1	01/02/2007		United Kingdom	Whitehaven, Cumbria	landslide	Landslide	Rain	
2	01/03/2007		Peru	Alto Mesapa, in the Pasco province	landslide	Complex	Rain	
3	01/05/2007		Brazil	Nova Friburgo, Rio de Janeiro	landslide	Landslide	Rain	
4	01/05/2007		Brazil	Sumidouro, Rio de Janeiro	landslide	Landslide	Rain	
5	01/06/2007		Brazil	Jundiaí, São Paulo	landslide	Landslide	Rain	
6	01/05/2007		Pakistan	Halar Bridge, Koti	landslide	Landslide	Rain	
7	01/08/2007		Brunei	Bandar Seri Begawan	landslide	Landslide	Rain	
8	01/08/2007		Indonesia	Sungai Banak, Sumatra	landslide	Complex	Rain	
9	01/11/2007		Philippines	Inipuan in Barangay Manit, Nabunturan, Compostela	landslide	Landslide	Unknown	
10	01/13/2007		Sri Lanka	Nuwara Eliya, Sri Lanka	landslide	Landslide	Rain	
11	01/13/2007		United Kingdom	Merstham Tunnel, between Redhill and Coulsdon	landslide	Landslide	Dowpour	
12	01/14/2007		Iran	Macandaran, Northern Iran	landslide	Complex	Rain	
13	01/11/2007	evening	Indonesia	Sangghe island	landslide	Mudslide	Dowpour	
14	01/17/2007		Philippines	Surigao Sur, Agusan del Sur	landslide	Landslide	Rain	
15	01/18/2007		Philippines	Barangay Dalican in Bontoc, Mt. Province	landslide	Landslide	Rain	
16	01/19/2007		China	Wuning County, East China's Jiangxi Province	landslide	Landslide	Rain	
17	01/31/2007		Indonesia	Donggala, Central Sulawesi	landslide	Landslide	Rain	
18	02/02/2007		Peru	Inca Run trail, between Machu Picchu and Cusco	landslide	Landslide	Rain	
19	02/04/2007		Canada	Sea-to-sky Hwy between Vancouver and B.C.	landslide	Complex	Rain	
20	02/06/2007		Indonesia	Panjanggeng regency, Banten province, Cadassan	landslide	Landslide	Rain	
21	02/07/2007		United Kingdom	Devon	landslide	Landslide	Unknown	
22	02/11/2007		Brunei	Kampung Sg Alar	landslide	Landslide	Rain	
23	02/11/2007		Fiji	Rawaqaq, Mavua, Vunarewa, Toga, Tawatawadi, Vu	landslide	Landslide	Rain	
24	02/11/2007		United States	Napa County, CA - @ Hwy 128	landslide	Landslide	Rain	
25	02/13/2007		United Kingdom	Newquay, Cornwall	landslide	Landslide	Rain	
26	02/14/2007		United Kingdom	Merstham Tunnel, Surrey	landslide	Landslide	Rain	
27	02/15/2007		United States	Piper Road, Stevenson, WA	landslide	Landslide	Rain	
28	02/19/2007		Indonesia	Senarang district, Central Java	landslide	Landslide	Rain	
29	02/25/2007		Pakistan	a village near Rawalakot, Kashmir	landslide	Landslide	Rain	
30	02/27/2007		United States	San Francisco, CA	landslide	Complex	Rain	

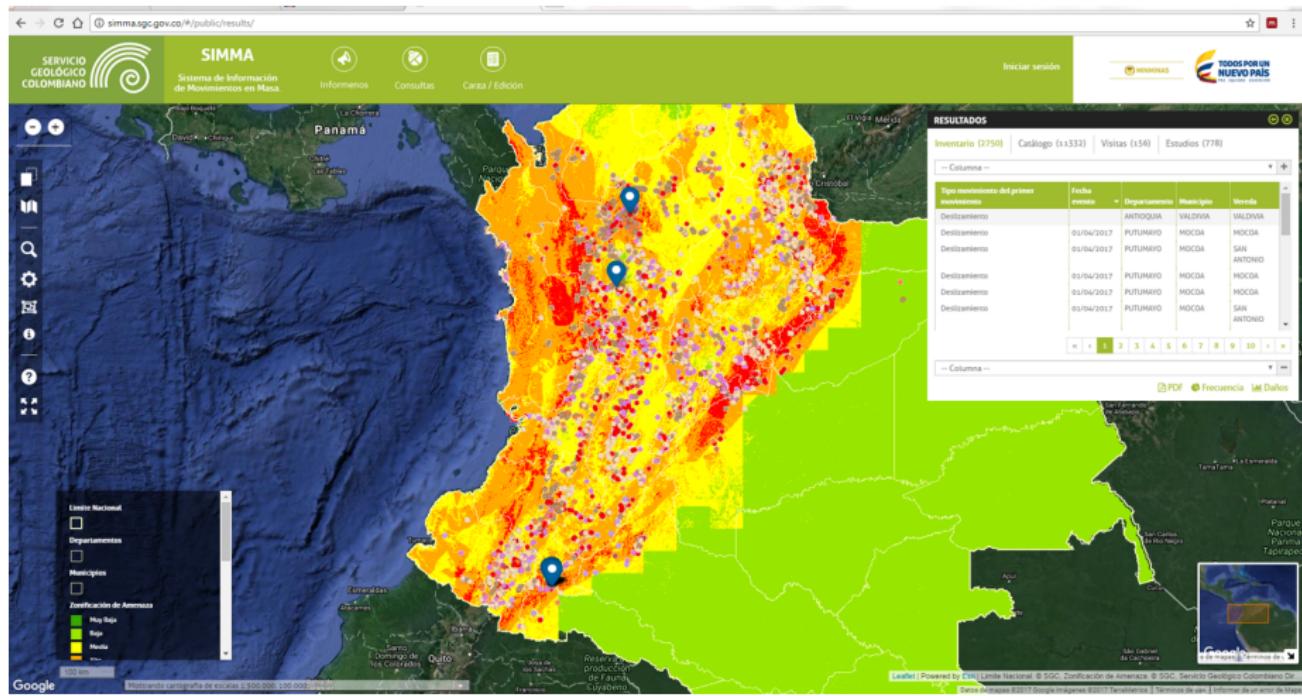
Inventario histórico

<https://desinventar.org>

Colombia - Inventario de Desastres Antioquia - DAPRD																								
Fila	Descripción	Fecha	Tipo de evento	Nombre Geografía	Lat	Lng	Fuentes	Observaciones de efectos	Muertos	Desaparecidos	Heridos	Dañados	Afectados	Vacuados	Refugiados	Viviendas	Callejones	Distancia	Centros	Centros	Daños	Valor	Perdidas	Costo
1	8 1903-12-14 Sismo		Sureste/Urrao/URRAO	LAT. 6.4 N Y LONG. 76.4 W.			ACOSTA ET AL.	INTENSIDAD III. (D16Author : C.P., D16Date : 13/03/01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2	7 1903-12-15 Sismo		Sureste/Urrao/URRAO	LAT. 6.4 N Y LONG. 76.4 W.			ACOSTA ET AL.	INTENSIDAD III. (D16Author : C.P., D16Date : 13/03/01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
3	5 1903-12-18 Sismo		Sureste/Urrao/URRAO	LAT. 6.4 N Y LONG 76.4 W.			ACOSTA ET AL.	INTENSIDAD III. (D16Author : C.P., D16Date :)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	9 1903-12-28 Sismo		Sureste/Urrao/URRAO	LAT. 6.4 N Y LONG 76.4 W.			ACOSTA ET AL.	INTENSIDAD III (D16Author : C.P., D16Date :)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5	19 1921-01-12 Deslizamiento		Hogadaira medio/Puerto Berrio/PUERTO BERRIÓ				EL COLOMBIANO.	(D16Author : C.P., D16Date :)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
6	10 1921-08-30 Sismo		Hogadaira medio/Puerto Berrio/PUERTO BERRIÓ				DNPAD-OSSO.	(D16Author : C.P., D16Date : 11/01/01)	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7	16 1921-10-10 Vendaval		Hogadaira medio/Puerto Berrio/PUERTO BERRIÓ				EL COLOMBIANO.	(D16Author : C.P., D16Date :)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8	18 1921-10-18 Deslizamiento	Noreste/Cisneros/CISNEROS	Km 52 y 50	Sector del Nus carretera Km 52 y 50			El Colombiano.	Conformidades del año 1932 "Km 17 7545 28" (D16Author : C.P., D16Date : 10/12/00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
9	17 1921-10-19 Deslizamiento	Hogadaira medio/Maceo/SAN JOSÉ DEL NUS	Km 76 y Caracao Km 58				El Colombiano.	6028 46 y 7501 21 (D16Author : C.P., D16Date : 10/12/00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
10	12 1921-10-21 Deslizamiento	Hogadaira medio/Carcasi/CARACOLÍ	Via Caracoli - Cisneros				El Colombiano.	6024 01 y 7445 20 (D16Author : C.P., D16Date : 10/12/00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
11	11 1921-10-27 Deslizamiento	Noreste/Cisneros/CISNEROS	Sector del Nus (Km 34 y 116).				El Colombiano.	6032 26 y 7505 25 (D16Author : C.P., D16Date : 10/12/00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
12	14 1921-10-28 Tempestad	Hogadaira medio/Puerto Berrio/PUERTO BERRIÓ					EL COLOMBIANO.	(D16Author : C.P., D16Date :)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
13	15 1921-11-21 Deslizamiento	Noreste/Yolombó/YOLOMBO	EL LIMONK KH 116 VSA PERREA.				EL COLOMBIANO.	(D16Author : C.P., D16Date : 27/01/2001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
14	13 1921-11-25 Deslizamiento	Sureste/Andes/ANGELOPOLIS					El Colombiano.	(D16Author : C.P., D16Date : 08/04/01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
15	26 1922-01-21 Tempestad	Norte/Valdivia/VALDIVIA					EL COLOMBIANO.	(D16Author : C.P., D16Date :)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
16	22 1922-05-18 Deslizamiento	Noreste/Cisneros/CISNEROS	Sector del Nus (Km 110 del ferrocarril de				El Colombiano.	(D16Author : C.P., D16Date : 10/11/00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Inventario histórico

<http://simma.sgc.gov.co>



Inventario histórico

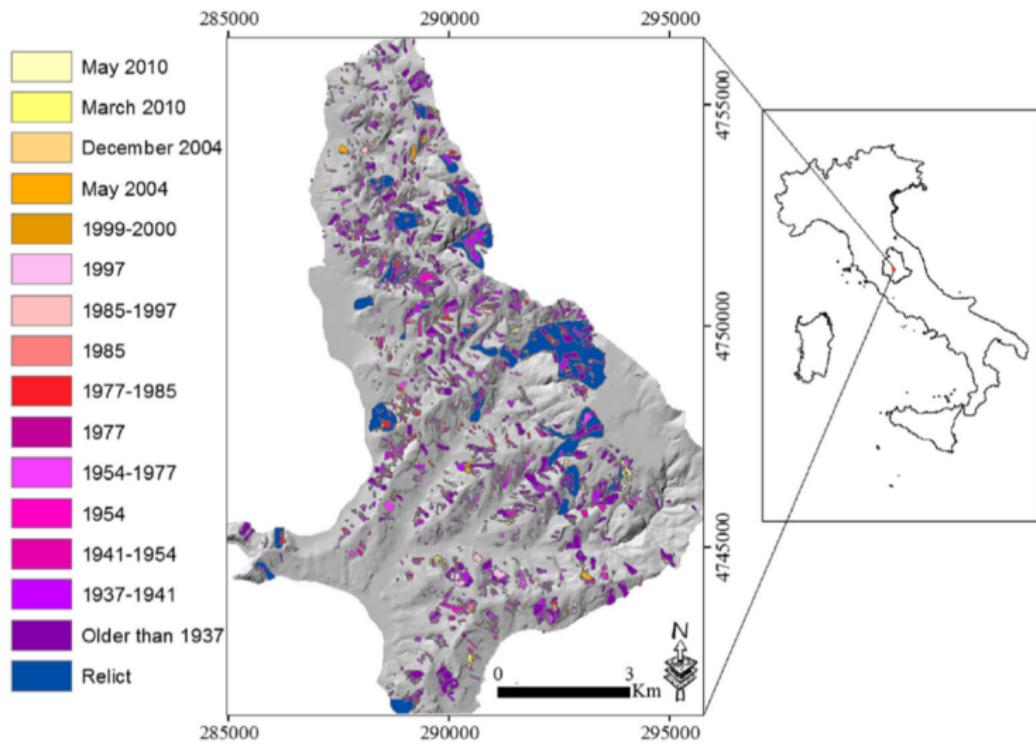
Inventario de deslizamientos multi-temporal: son comúnmente utilizados en modelos de susceptibilidad y amenaza. Entre mas largo el periodo que cubre, mayor significancia temporal del inventario.

Inventario de un solo periodo: corresponden a inventarios de deslizamientos de un cierto periodo de tiempo a partir de fotos aéreas o imágenes de satélite. No son validos para calibrar un modelo de susceptibilidad.

Inventario de deslizamientos de un evento: inventarios de deslizamientos que ocurren como resultado de un evento detonante particular (lluvia, sismo). Son adecuados para análisis de susceptibilidad basados. Su elaboración puede ser mas sencilla, especialmente con imágenes de alta resolución espacial y temporal fácilmente obtenibles en la actualidad.

Fuente: Lee (2014) SLdR

Inventario multitemporal



Fuente: Samia et al. (2016)

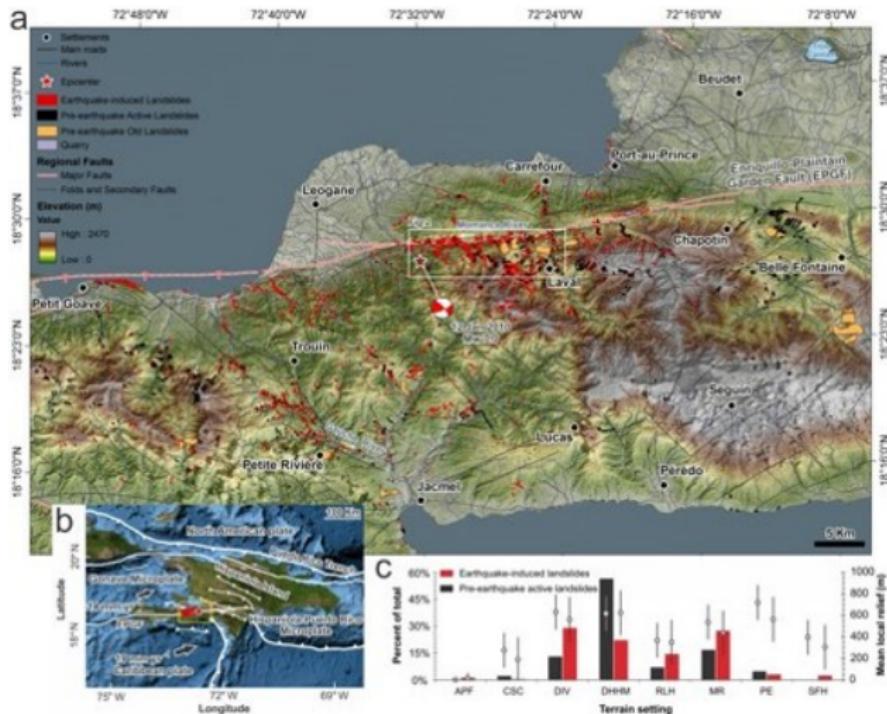
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Inventario

Version: August 22, 2020

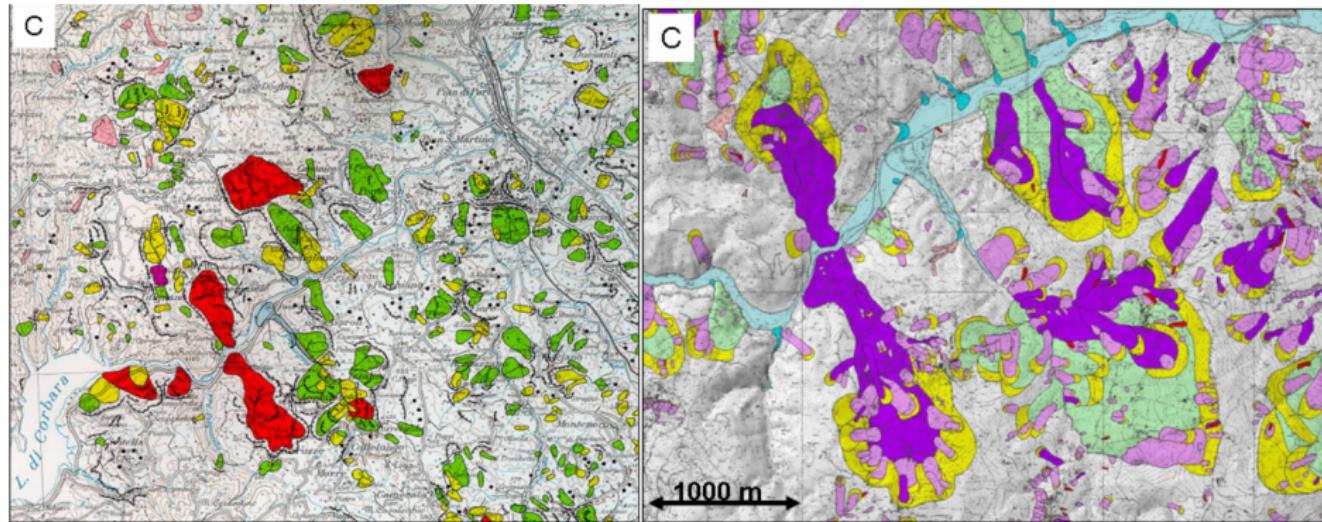
13 / 33

Inventario evento



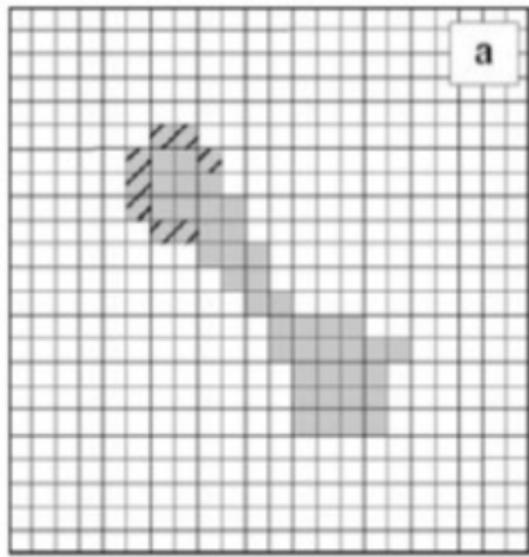
Fuente: van Westen en Landslide types and causes

Escala de análisis



Fuente: Guzzetti (2005)

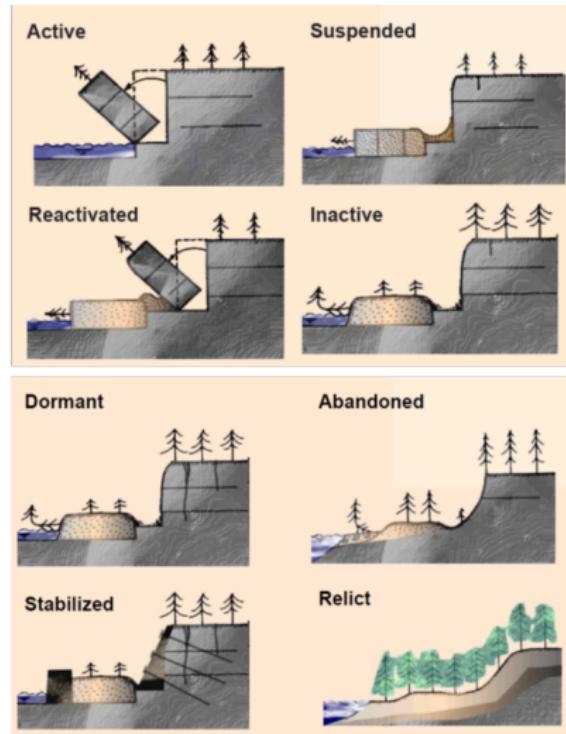
Cartografía



- Landslide area
- Main scarp upper edge
- Selected factor cell

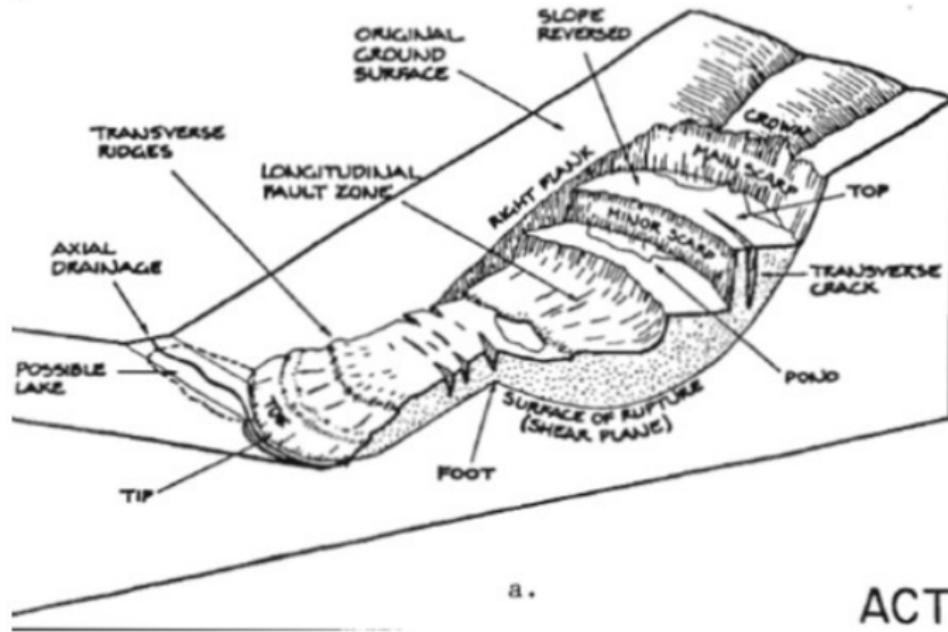
Fuente: Hussin et al., (2016); Clereci et al. (2006)

Actividad



Fuente: tomado de Cruden & Varnes (1996)

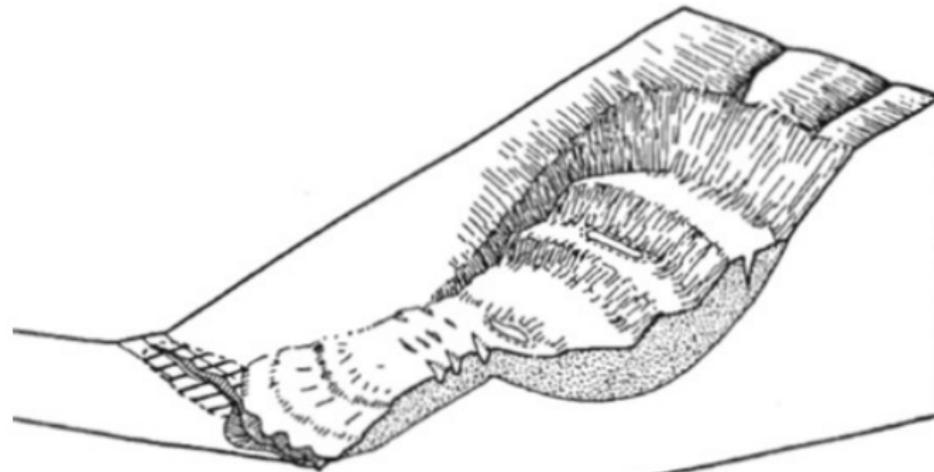
Activos



ACTIVE

Fuente: McCalpin (1984)

Inactivo joven

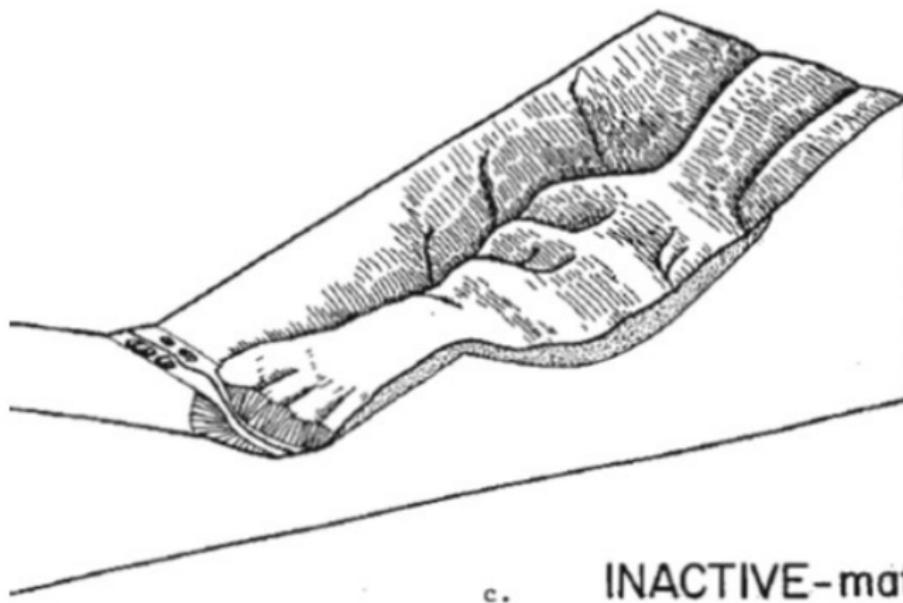


b.

INACTIVE-young

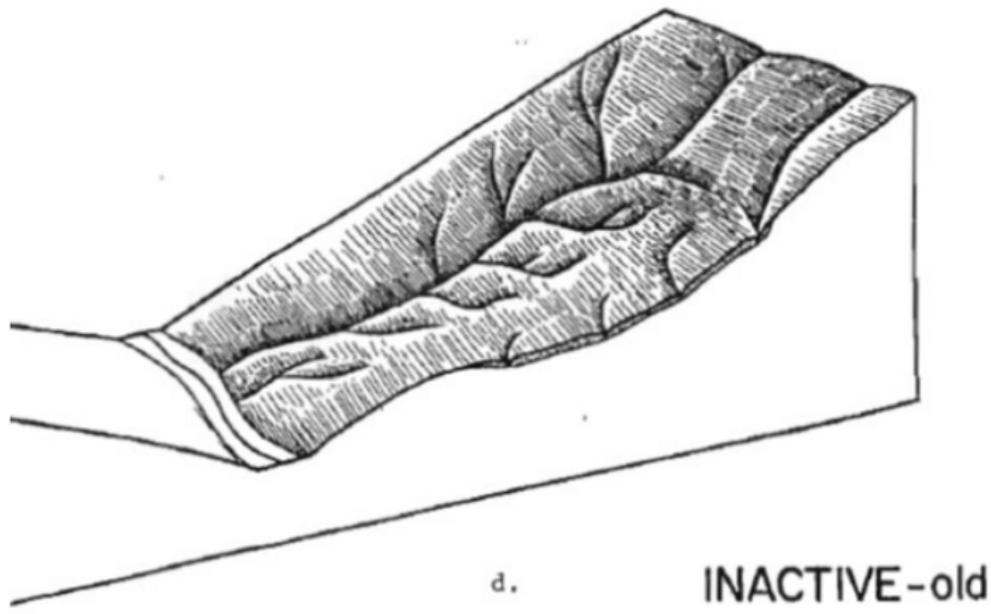
Fuente: McCalpin (1984)

Inactivo maduro



Fuente: McCalpin (1984)

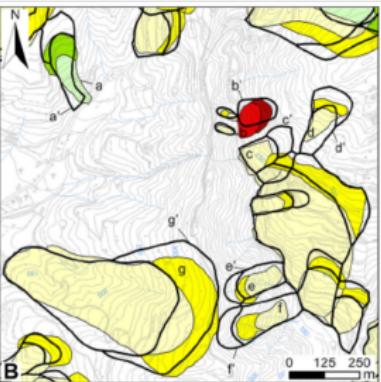
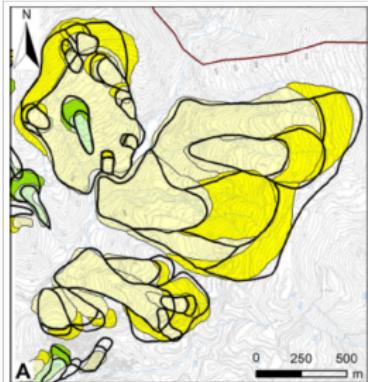
Inactivo antiguo



Fuente: McCalpin (1984)

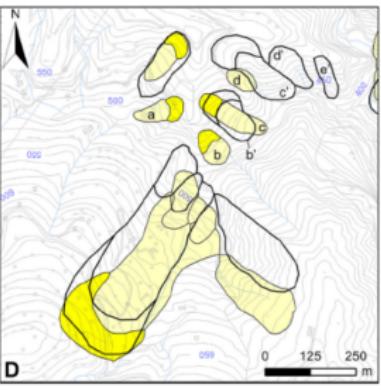
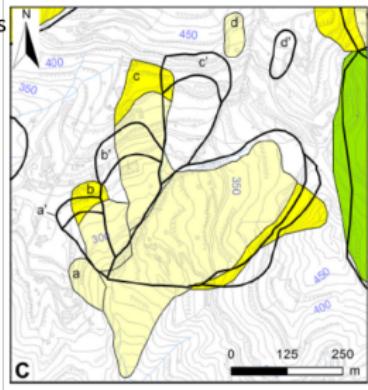
Errores

Aceptable



Tamaños equivocados

La ubicación es no aceptable



Localización y tamaño no aceptable

Subregistro

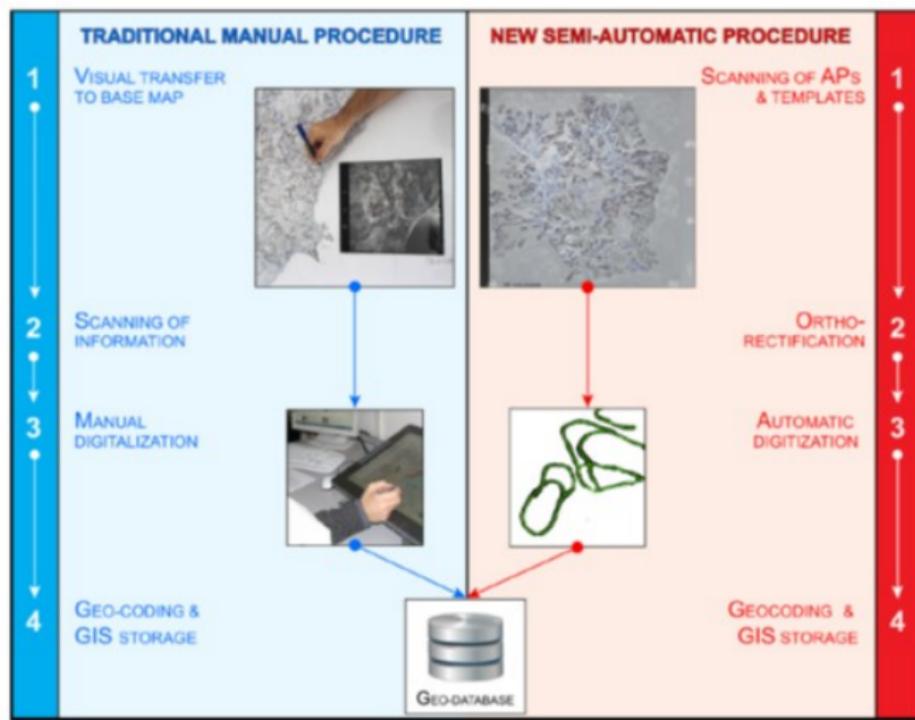
Los inventarios de deslizamientos tienden a ser sesgados por la relación entre magnitud-frecuencia en los deslizamientos asociada a:

- Se desconoce la longitud del periodo de observación.
- Se desconoce el papel de eventos detonantes de alta intensidad tales como sismos.
- La geometría de los pequeños deslizamientos tiende a ser eliminada por procesos erosivos y la vegetación.



Fuente: Fuente: Korup (2005)

Errores



Fuente: Santagelo et al. (2015)

Ejemplos

DEM



Ejemplos

DEM



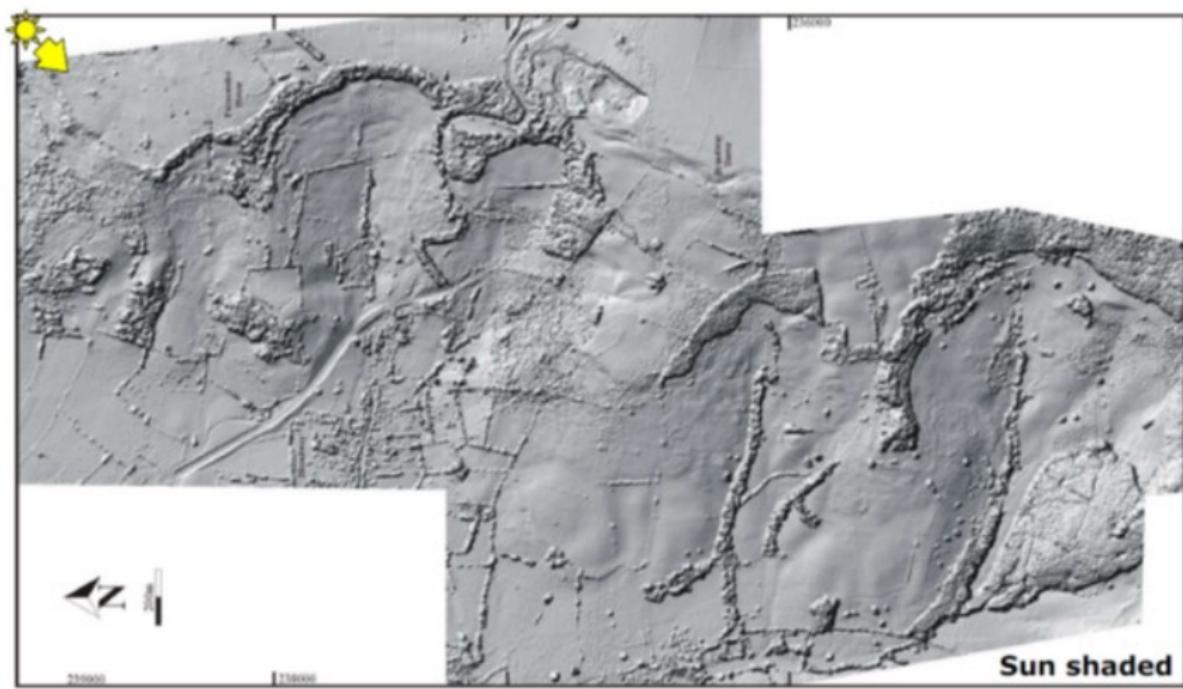
Ejemplos

LIDAR



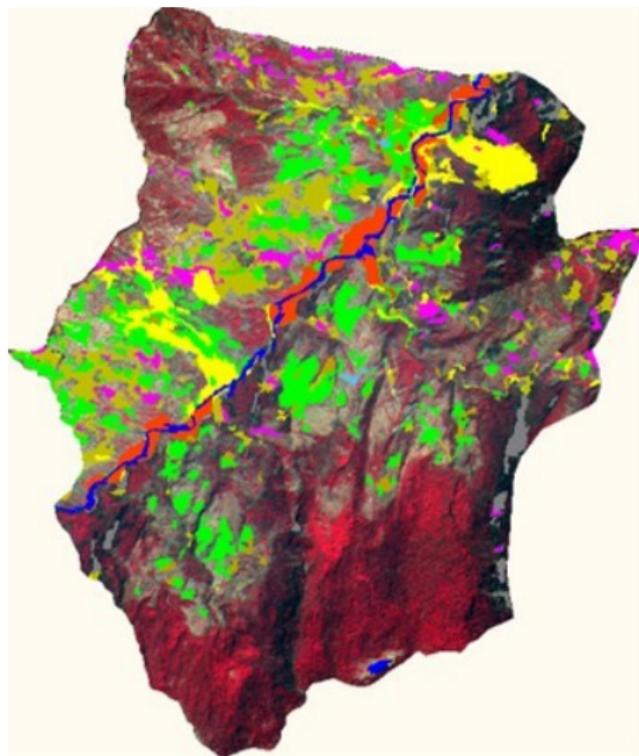
Ejemplos

LIDAR

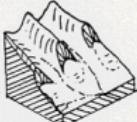


Ejemplos

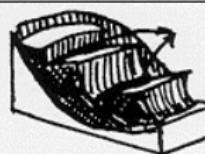
NDVI



Características en fotos

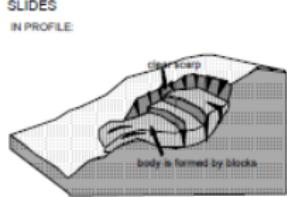
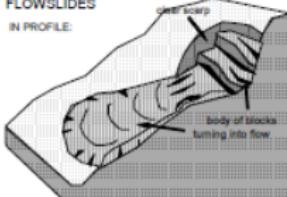
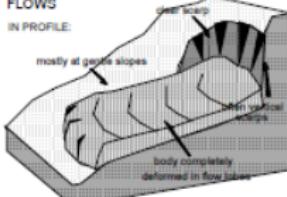
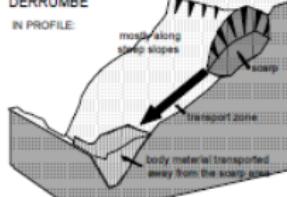
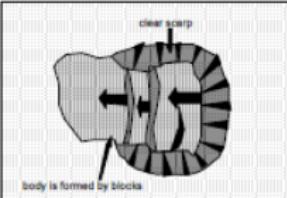
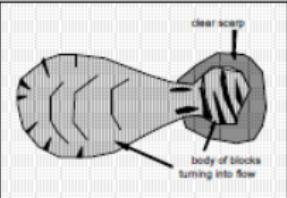
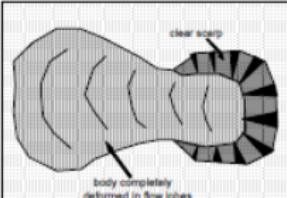
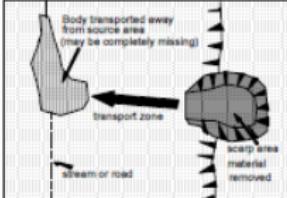
Morphological Characteristics	Block diagram	Plant View/ Profile
1. Concave-convex slopes		
2. Semicircular niches		
3. Step-like morphology		
4. Back tilting of slope faces		
5. Hummocky relief		
6. Cracks formation		
7. Steeping of the slopes		

Características en fotos

Drainage Characteristics		Sketch
13. Disarranged drainage	Drainage lines broken	
14. Anomaly in drainage pattern		
15. Zones of stagnated water	Ponds formation	
16. Seepage zones or well appearance	Darker tones leading to drainage line	
17. Excessively drained masses (especially dried out landslide bodies)	Light phototones	

Características en fotos

LANDSLIDE TYPES INTERPRETED FROM AIRPHOTOS

SLIDES IN PROFILE:	FLOWSLIDES IN PROFILE:	FLows IN PROFILE:	DERRUMBE IN PROFILE:
			
IN PLAN:	IN PLAN:	IN PLAN:	IN PLAN:
			

- Landslide blocks recognizable.
- No disintegration of blocks in flow lobes
- Blocks may be back-tilted
- Intermediate scarps/ cracks possible.

- Landslide blocks in the upper part visible.
- Blocks are deformed into flowlobe downslope
- The flowlobe generally is larger than the blocks
- Body is still present within scarp area

- No landslide blocks are visible.
- Mass movement took place as a flow.
- Occurs generally at gentle slopes
- Flow lobe may extend far beyond scarp area

- Rapid movement of material away from the scarp area.
- Landslide body is found lower on the slope or may be removed.
- Occurs on steeper slopes

GEOHAZARDS

Semillero de Investigación



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Sede Medellín
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