

CARTOGRAFÍA GEOTÉCNICA

Exploración de variables

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SEDE MEDELLÍN

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- Tipo de variables
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Variables

Propiedad, atributo, característica, aspecto o dimensión de un objeto, hecho o fenómeno que puede variar y cuya variación es medible.

- **Ser observable:** Su información debe ser concreta y evidente en la realidad.
- **Ser cambiante:** Puede adquirir diferentes categorías y valores.
- **Ser medible:** Puede ser cuantificable.
- **Tener referencia conceptual:** Deben emanar de un previo conocimiento teórico de la realidad.

Tipo de variables

Variables independientes

Preparatorias - explicativas – cuasiestáticas - condicionantes – predictoras - intrínsecas

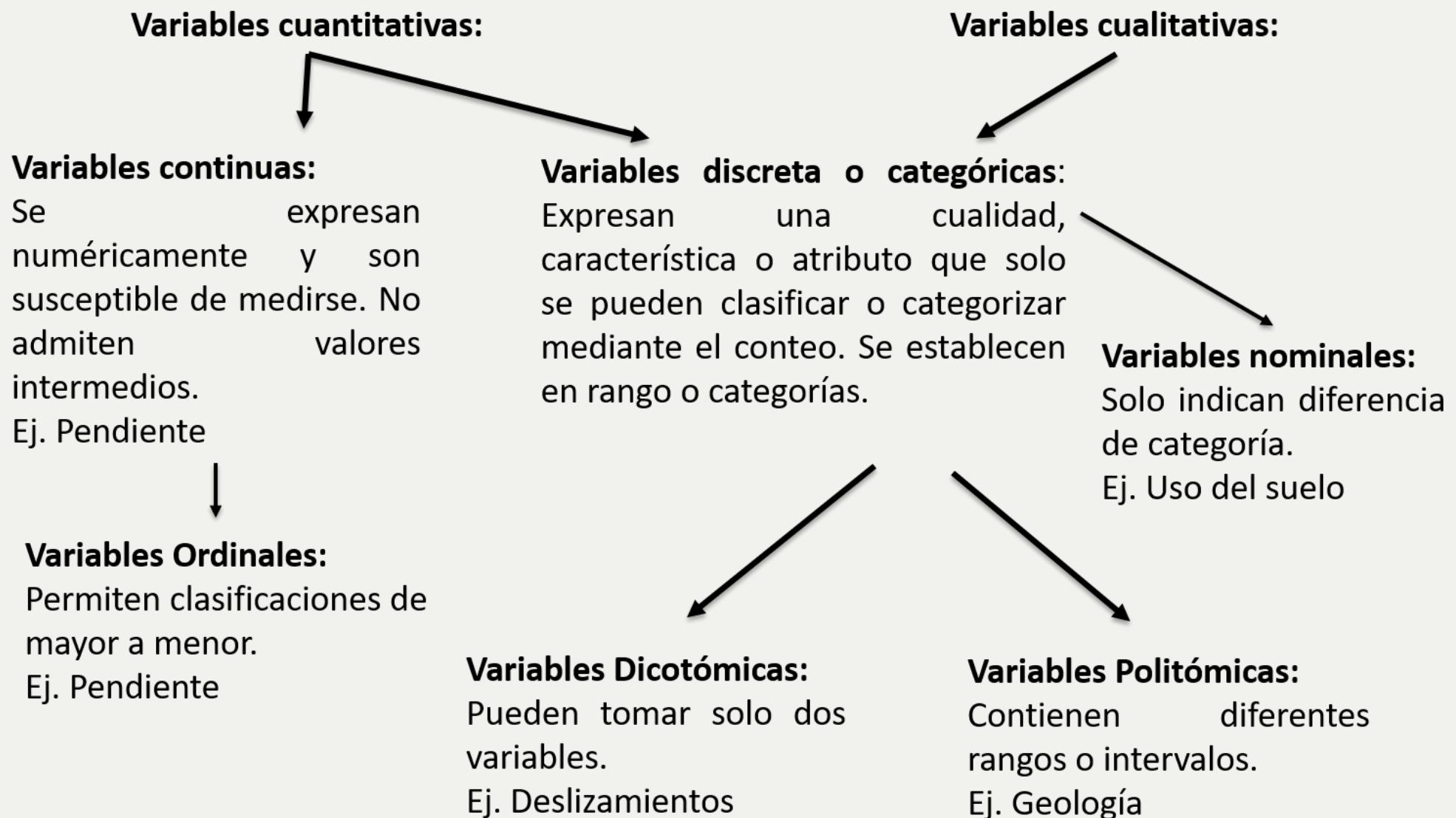
Característica o propiedad que se supone ser la causa del fenómeno estudiado, en este caso los movimientos en masa.

Ej. Geología, pendiente, aspecto, etc, etc.

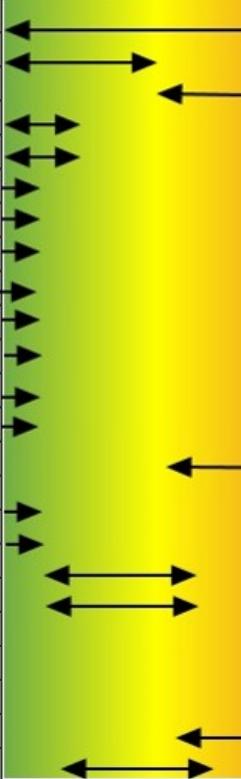
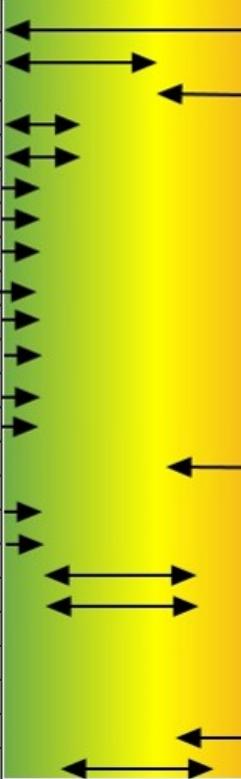
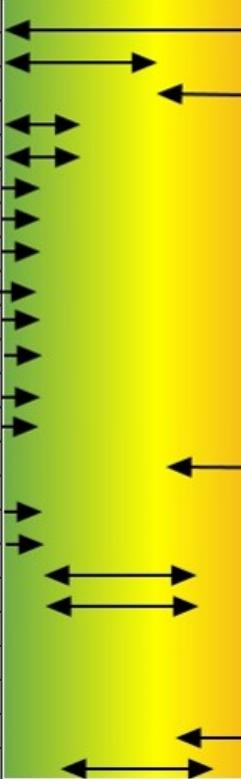
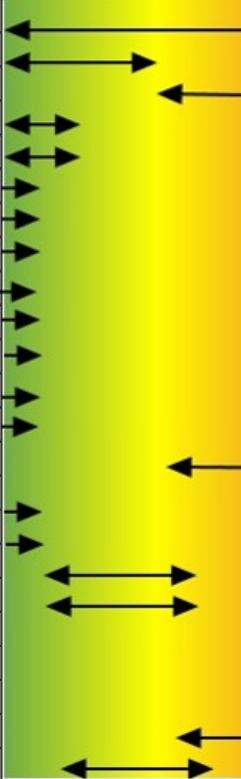
Variable dependiente

Es el factor que es observado y medido para determinar el efecto de la variable independiente. En este caso sólo existe una variable dependiente y es la ocurrencia o no ocurrencia de los movimientos en masa.

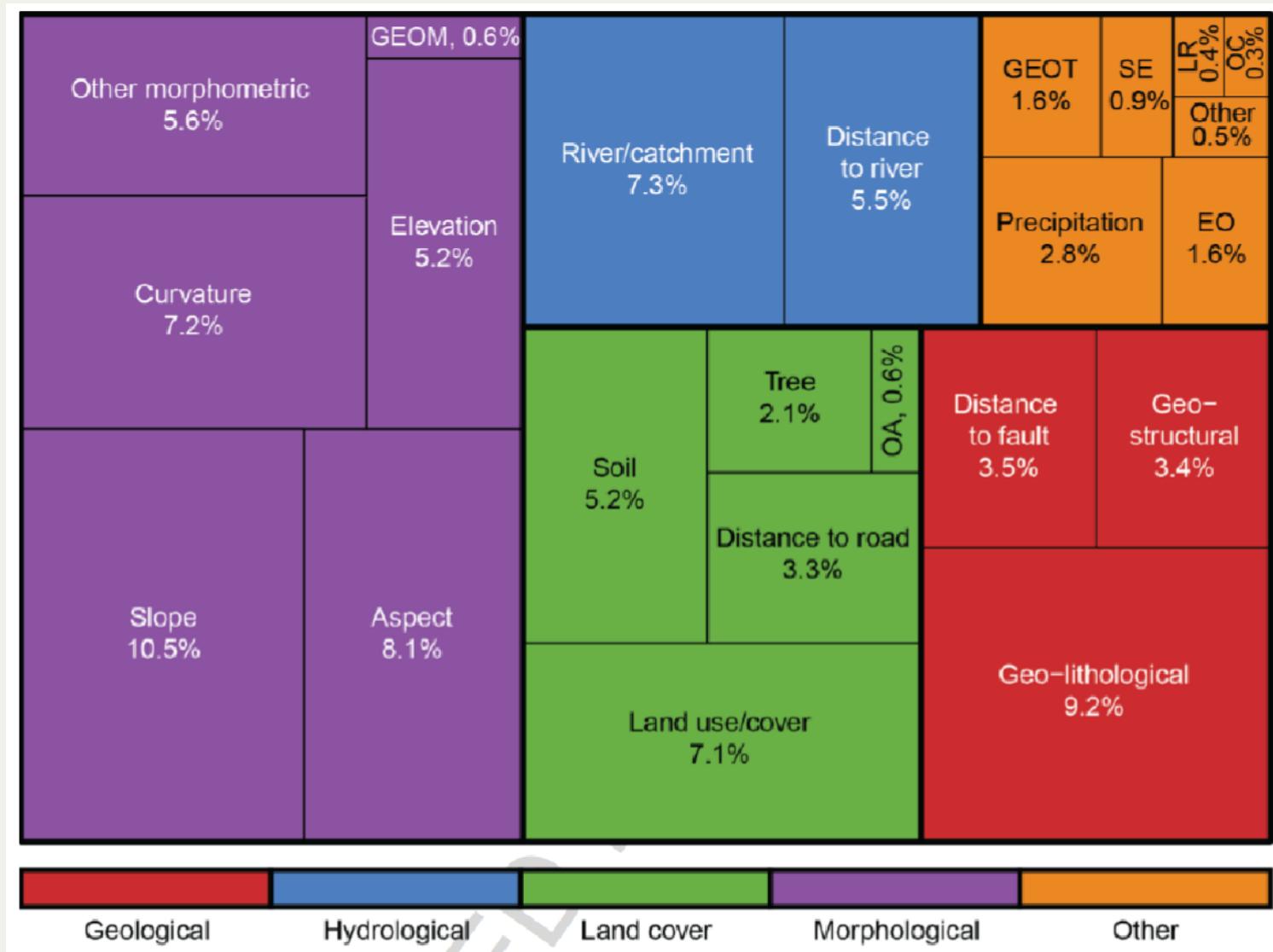
Por su naturaleza...



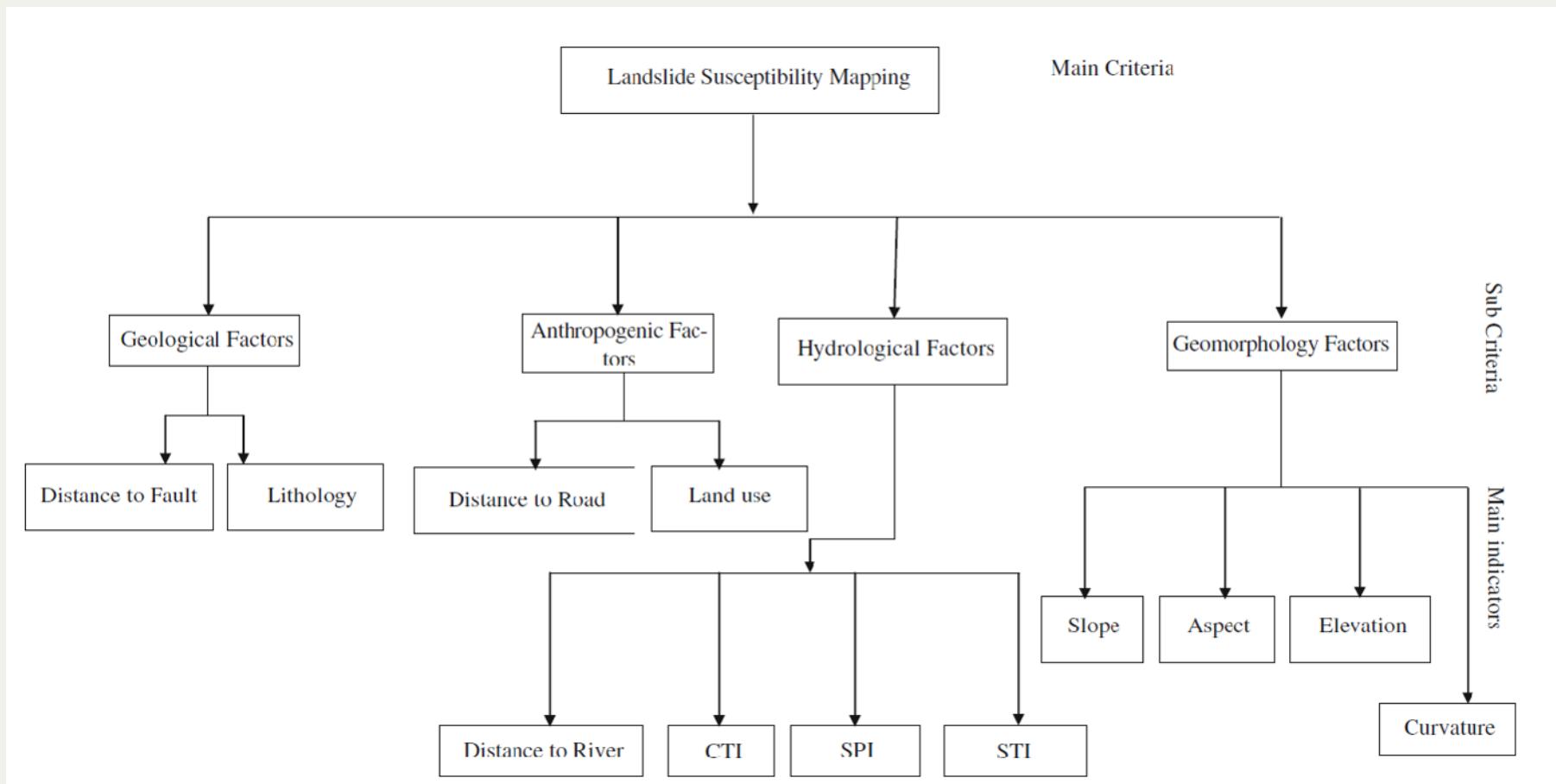
Variables Condicionantes

Main Type	Data Data layer	Update frequency 10 year....1 year... 1 day	RS	Scale		
				National	Local	Site Specific
Landslide Inventory	Landslide Inventory		H	C	C	H
	Landslide Activity		H	C	C	H
	Landslide Monitoring		M	L	M	C
Environmental factors	Digital Elevation Model		H	C	C	C
	Slope angle		H	C	C	C
	Slope aspect & exposure		H	H	M	L
	Distance from ridges		H	H	M	L
	Flow accumulation		H	M	H	H
	Lithology		M	M	H	H
	Geological Structure		M	L	M	H
	Distance to faults		M	M	H	H
	Soil types		M	M	H	C
	Soil depth		L	L	H	C
	Slope hydrology		L	L	H	C
	Geomorphology		H	H	H	M
	Distance from eroding streams		H	H	H	H
	Land use types & changes		H	H	H	H
Triggering factors	Road cuts & drainage		M	H	H	H
	Coastal cliffs		H	H	H	H
	Daily Rainfall		L	H	H	C
	Rainfall intensity/Duration		L	M	H	C
Triggering factors	Earthquakes		L	M	M	M
	Volcanic eruption		M	M	M	M

Fuente: van Westen et al. (2008)

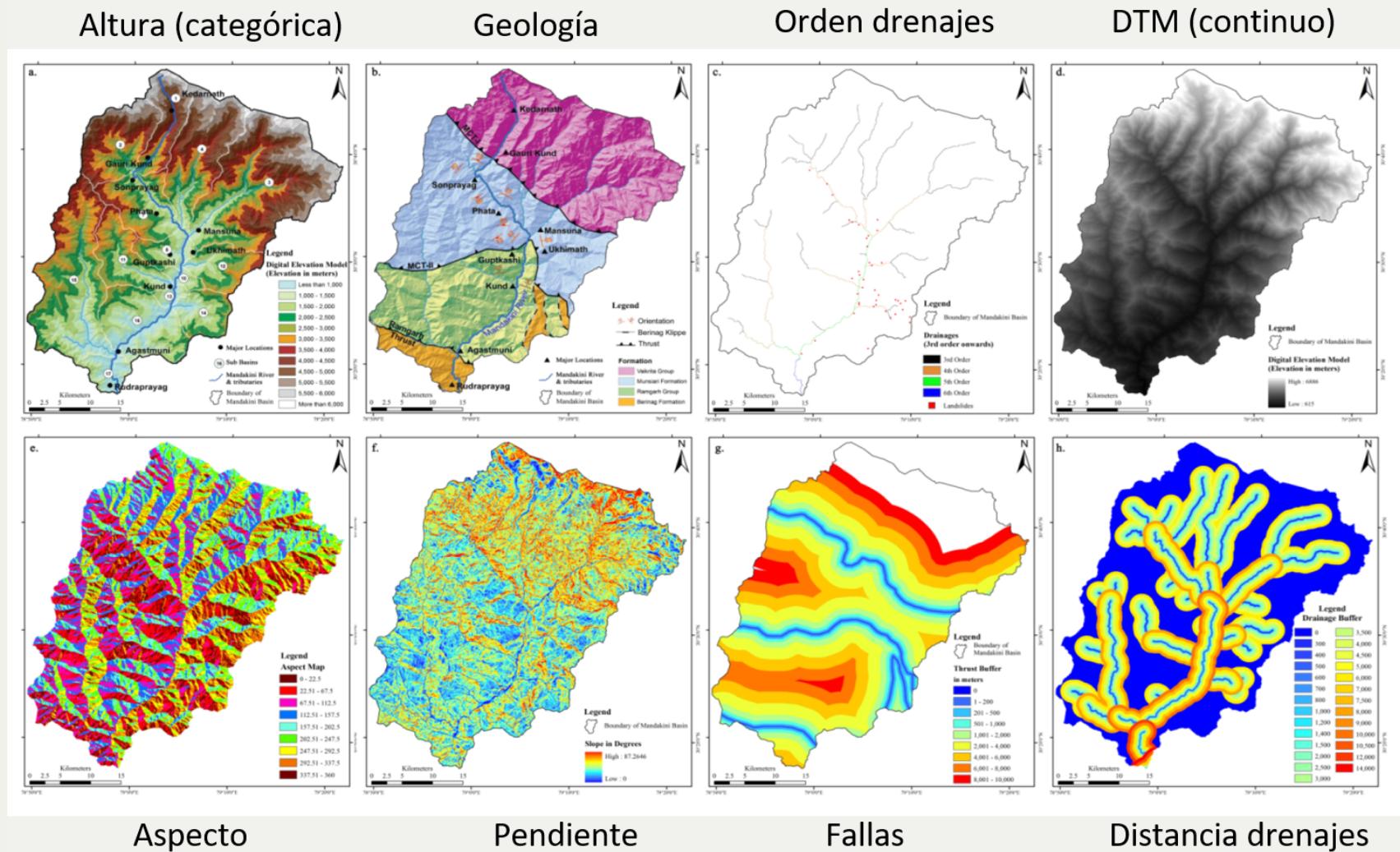


Fuente: Reichenbach et al. (2018)



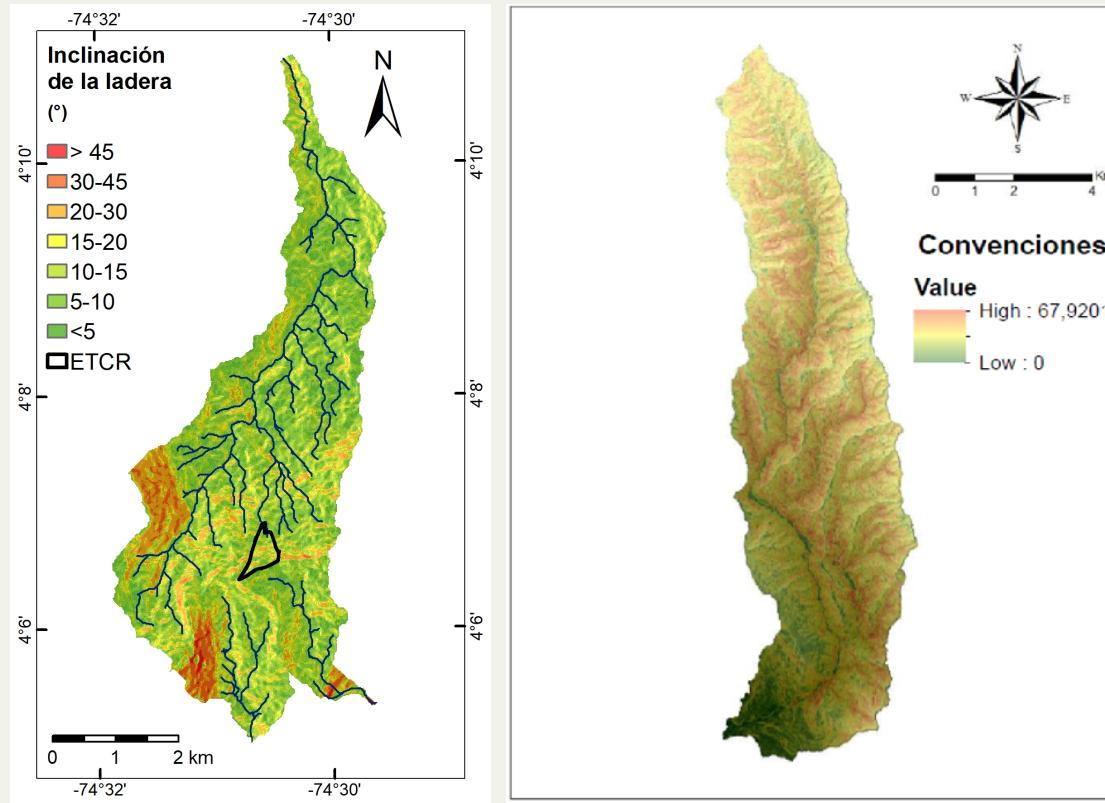
Fuente: Pourghasemi et al. (2010)

Ejemplos de variables



Fuente: Shukla et al. (2016) – Río Mandakini (India)

Variables continuas y categóricas



Fuente: Shukla et al. (2016) – Río Mandakini (India)

Formaciones superficiales

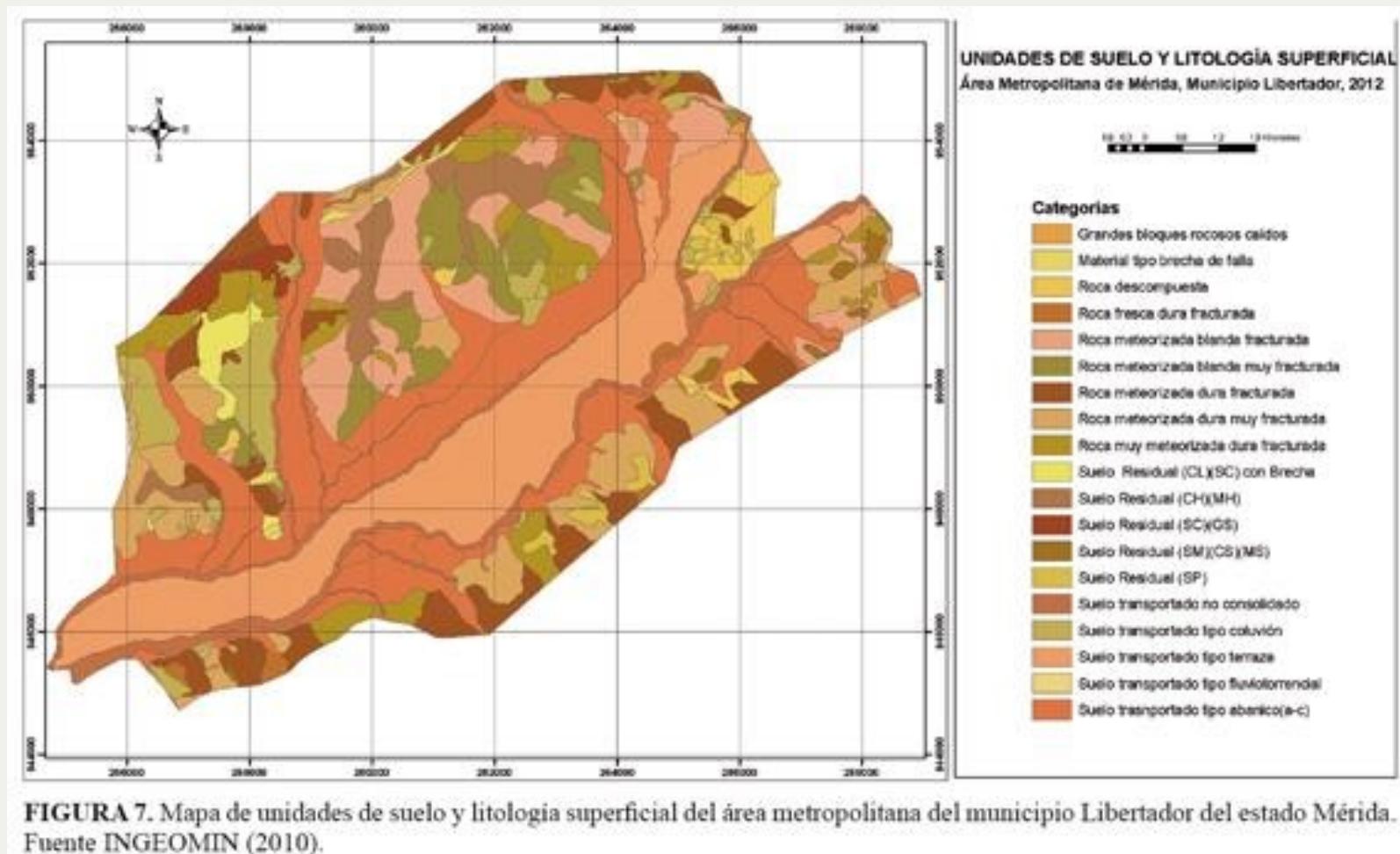
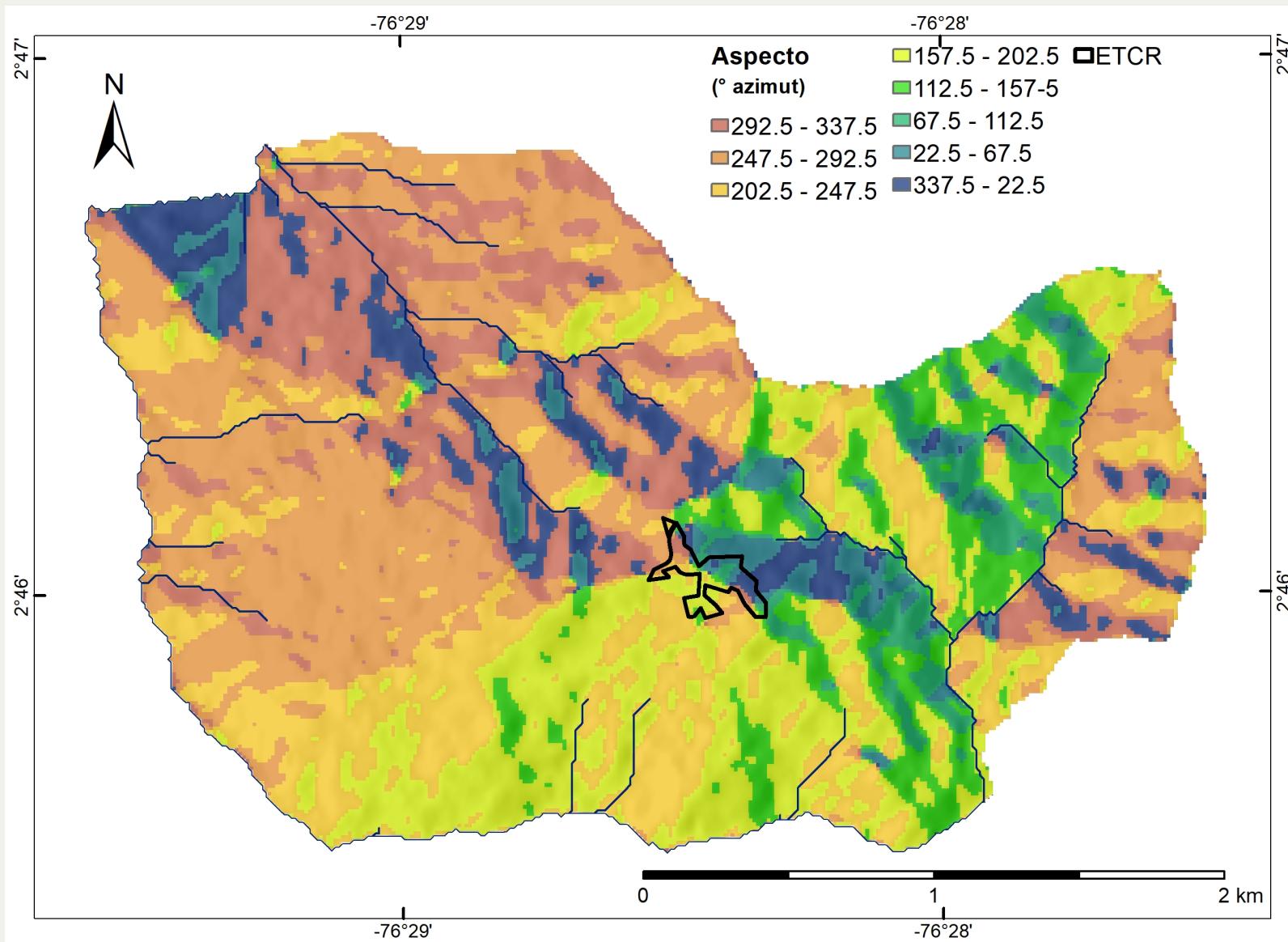
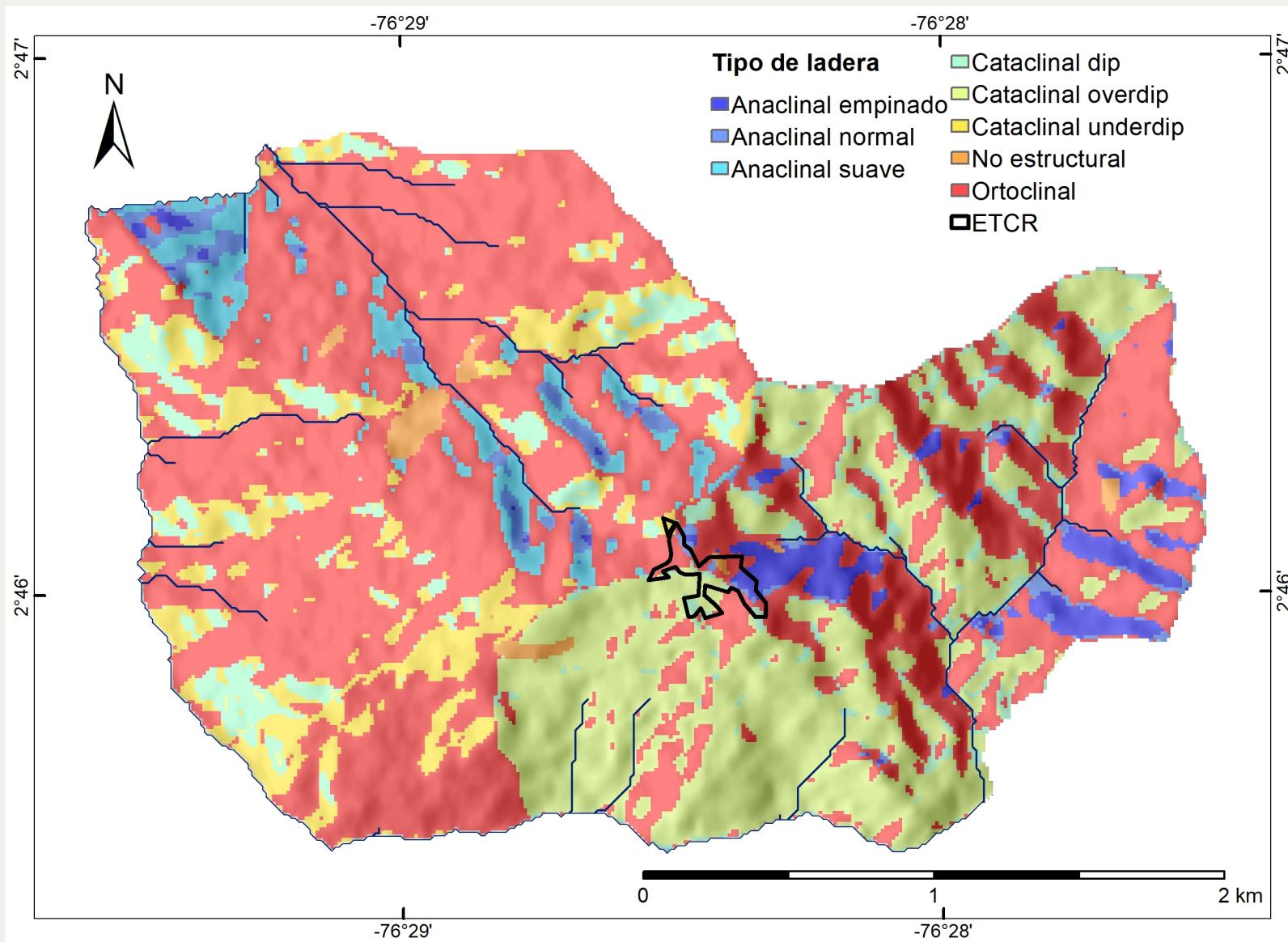


FIGURA 7. Mapa de unidades de suelo y litología superficial del área metropolitana del municipio Libertador del estado Mérida.
Fuente INGEOMIN (2010).

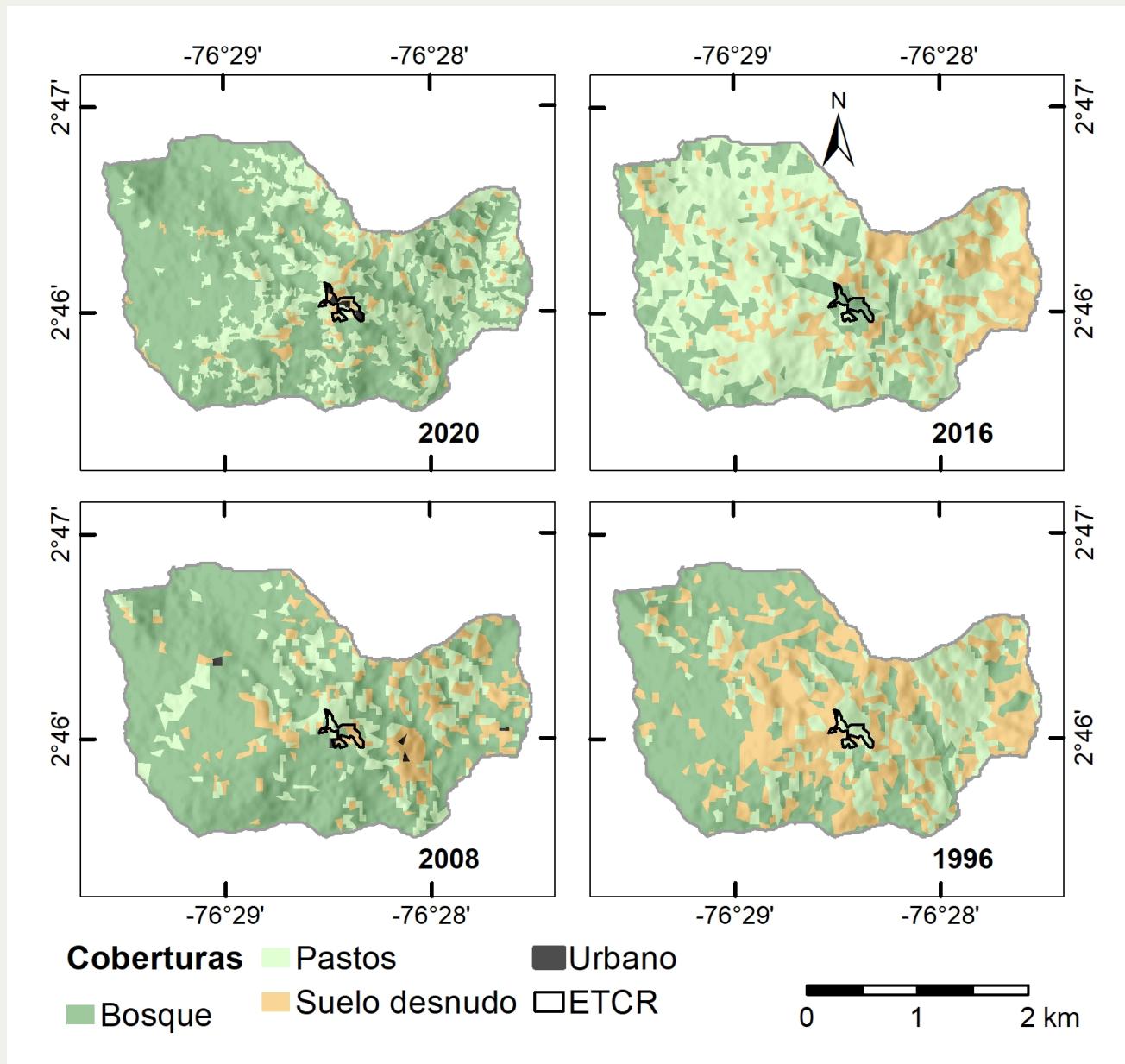
Aspecto



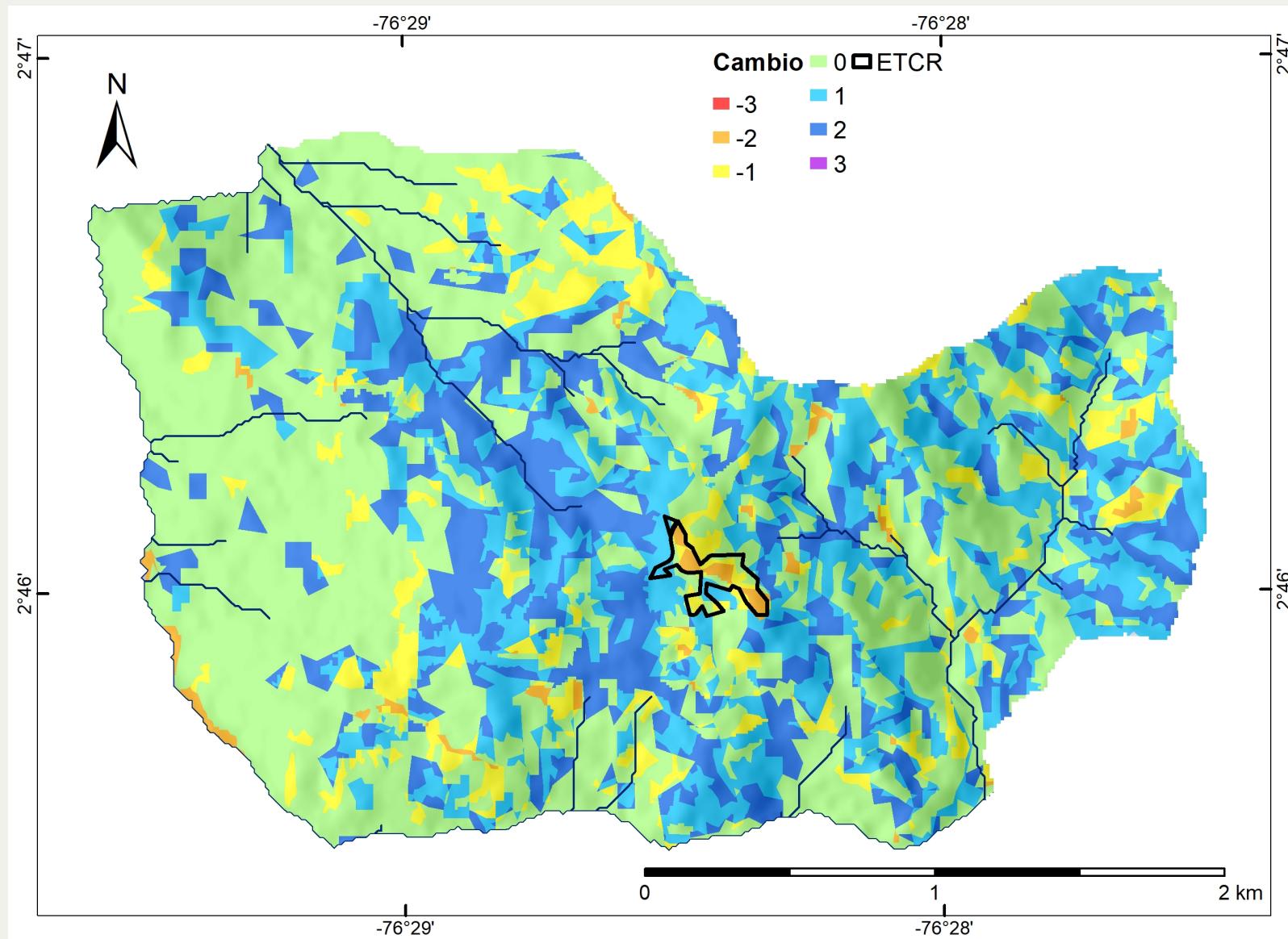
Análisis Cinemático



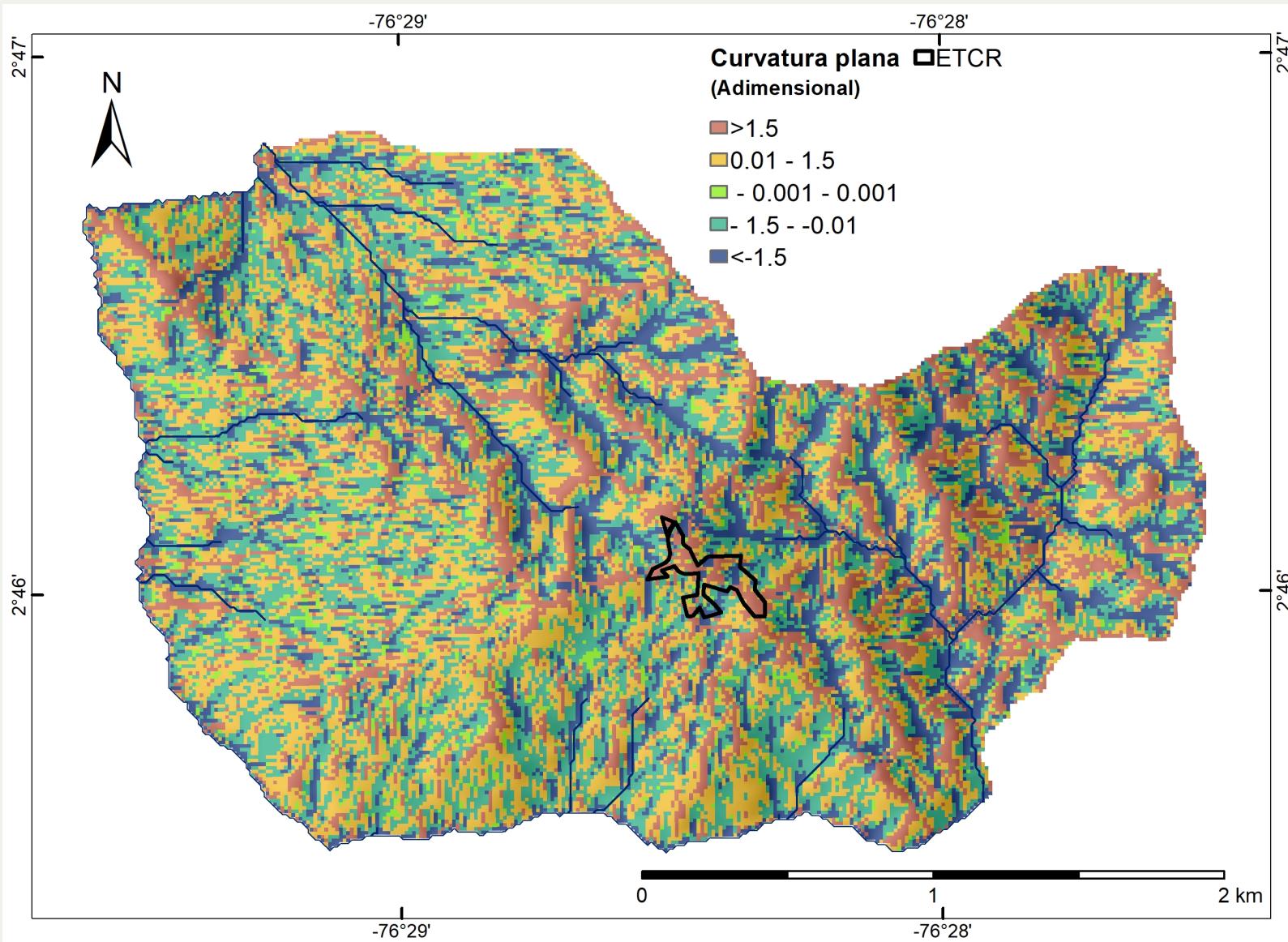
Coberturas



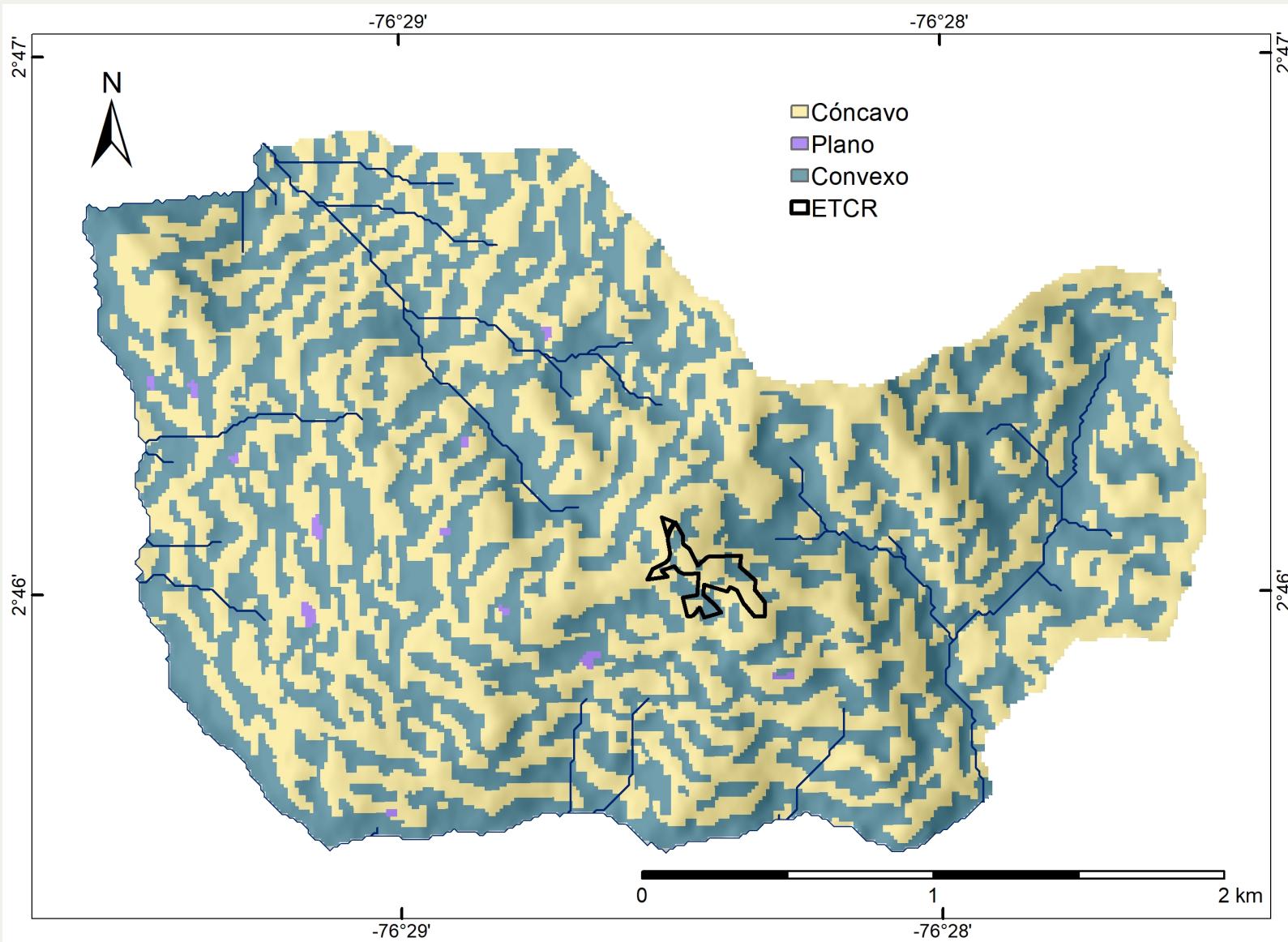
Cambios de coberturas



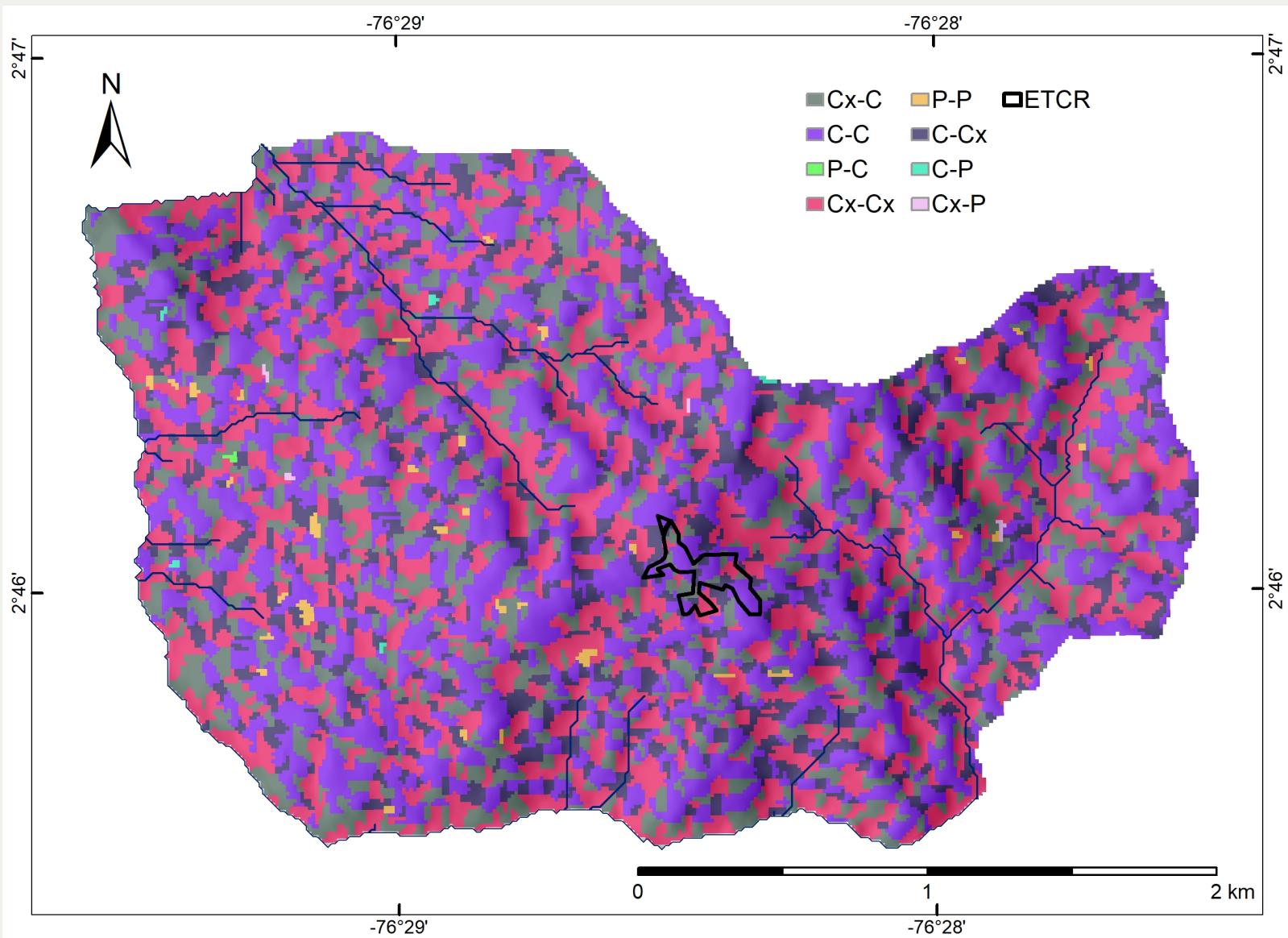
Curvatura plana



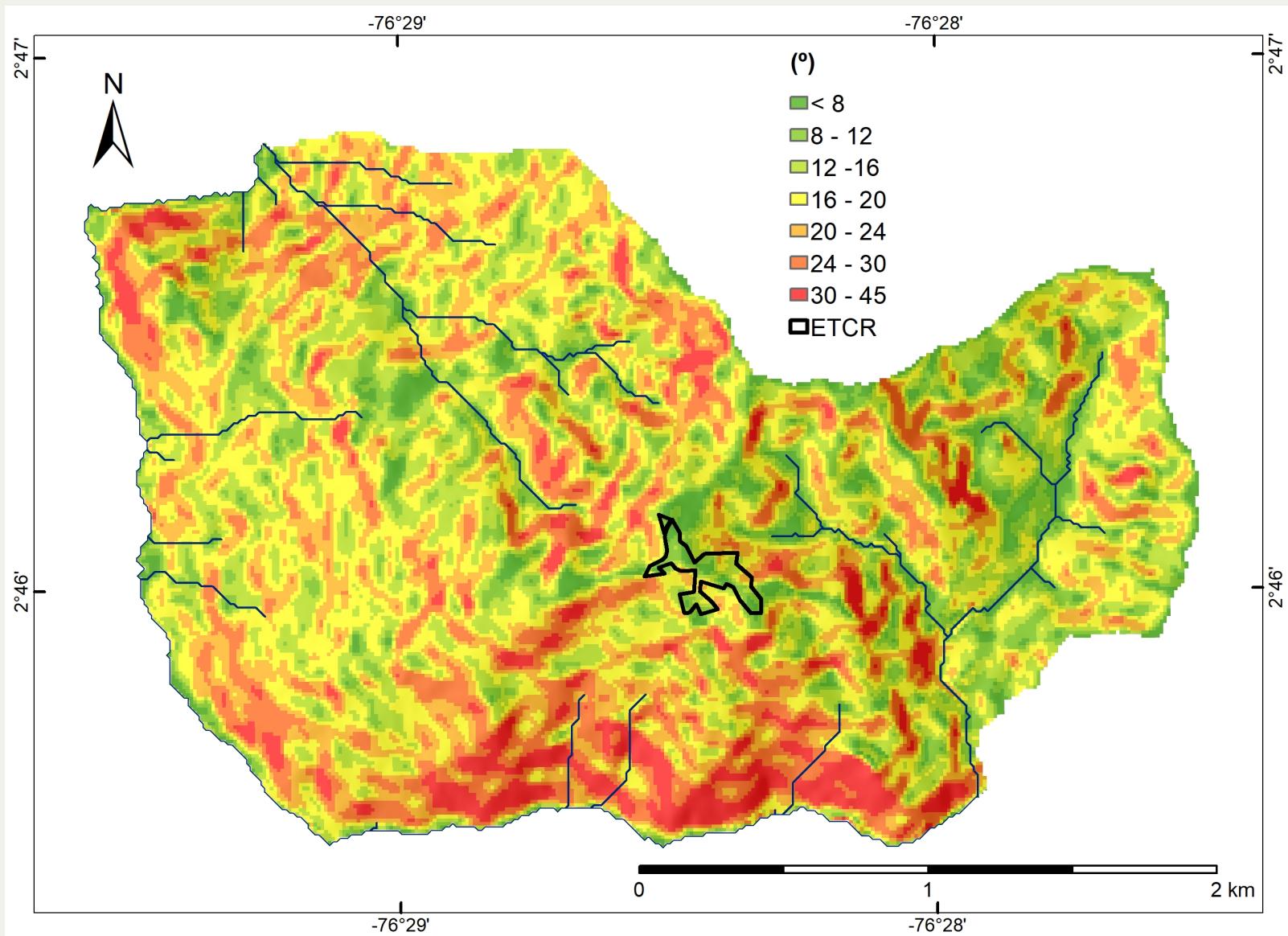
Curvatura perfil



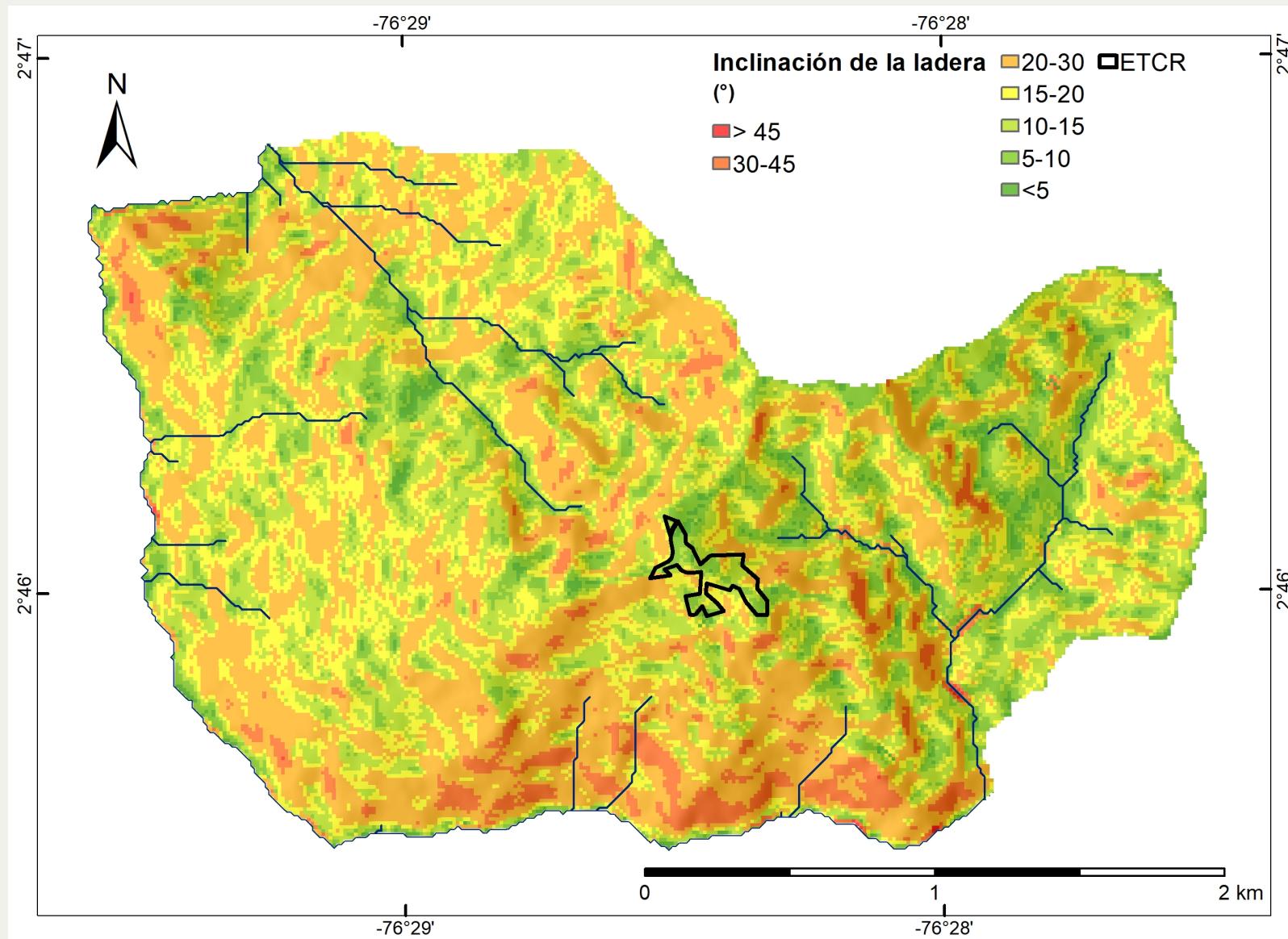
Curvatura total



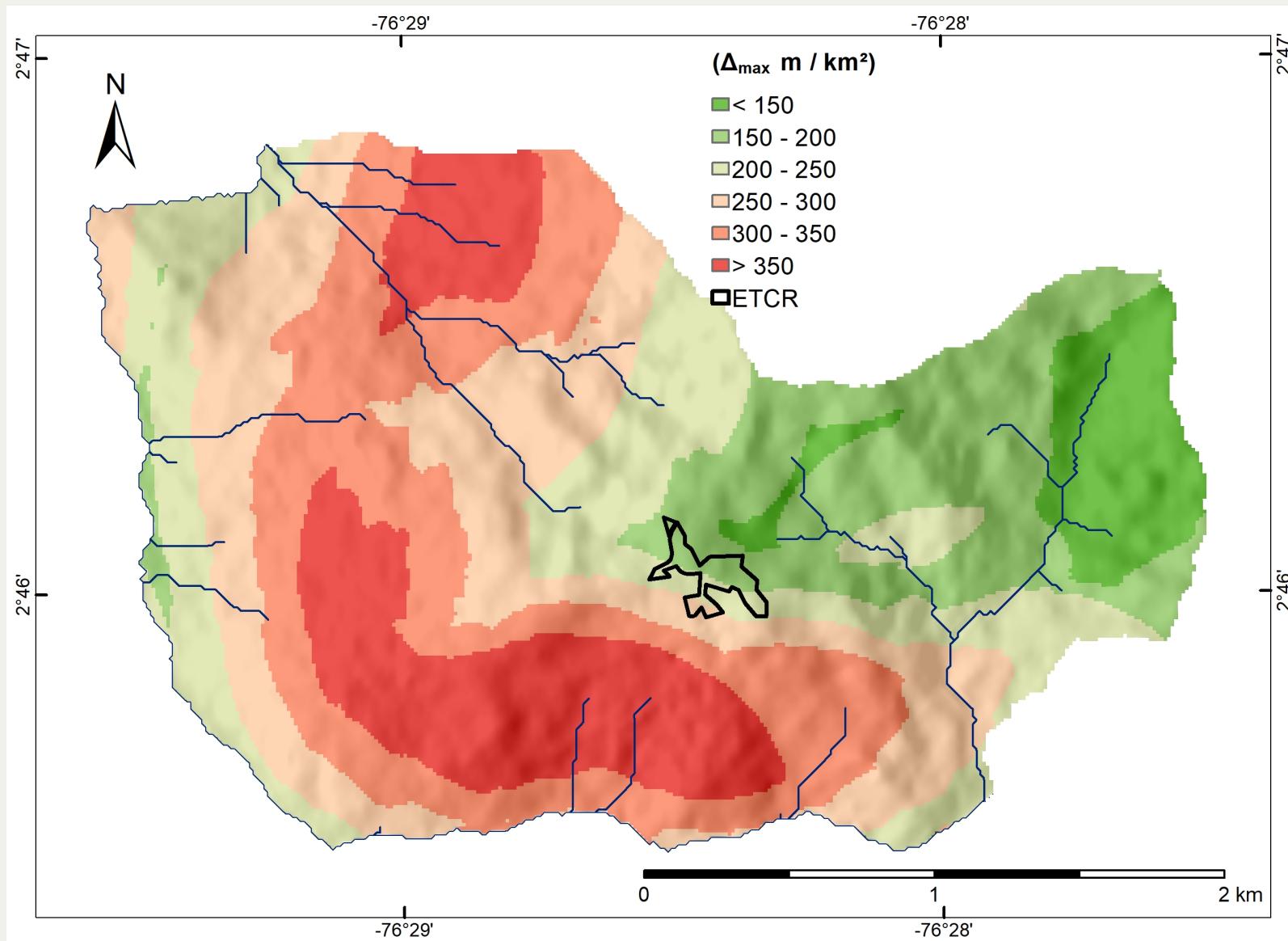
Pendiente



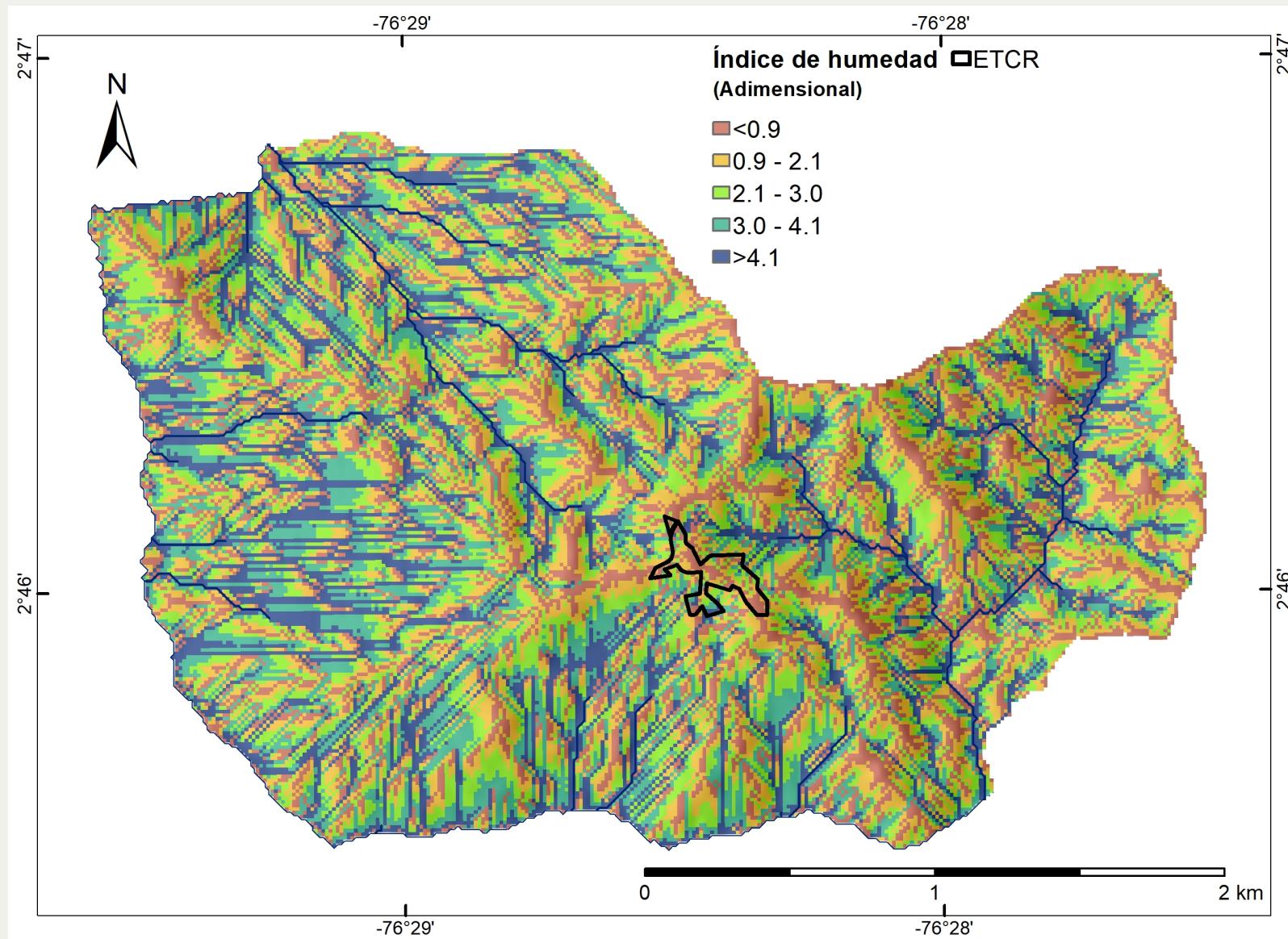
Inclinación de la ladera



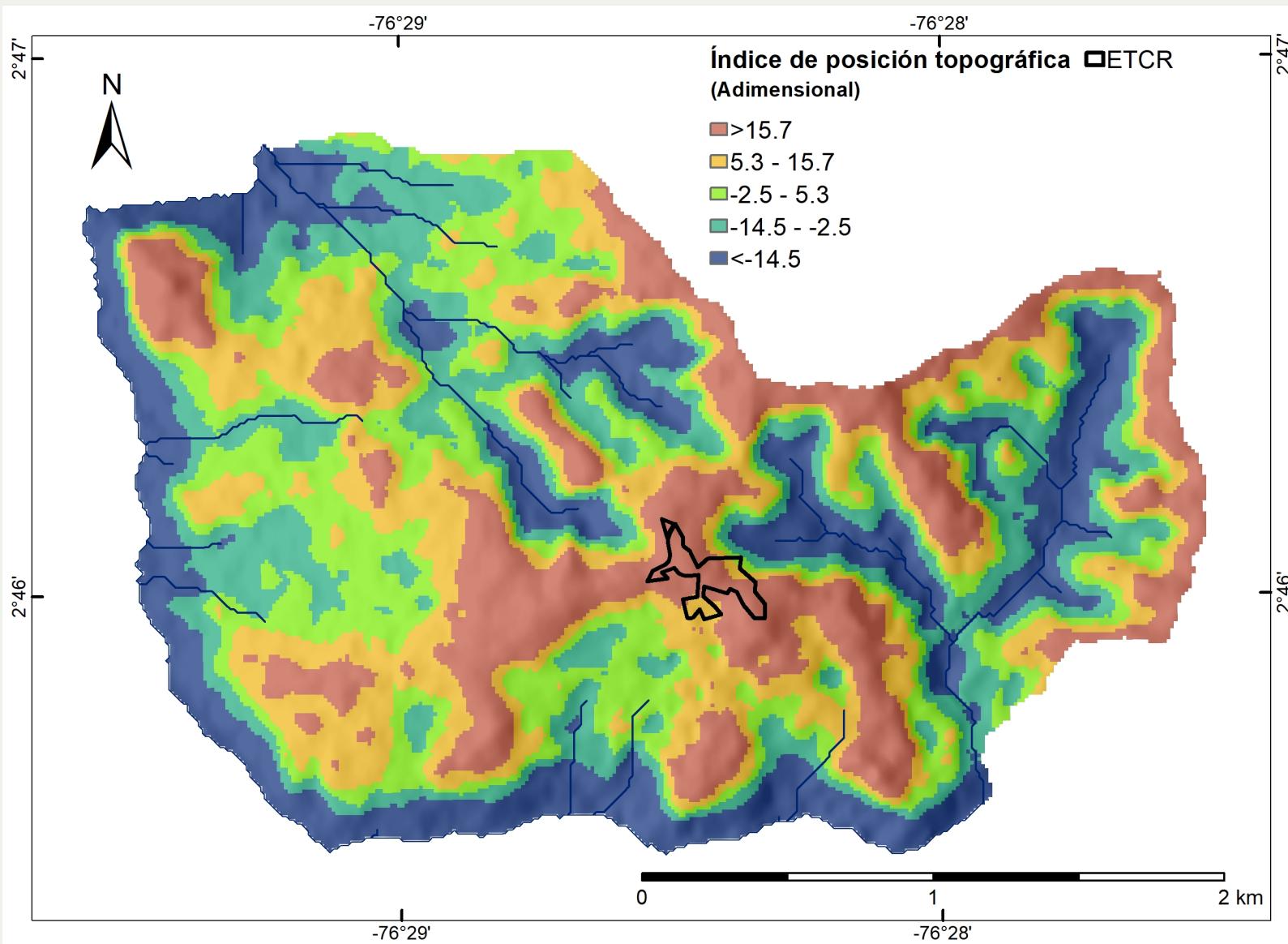
Relieve relativo



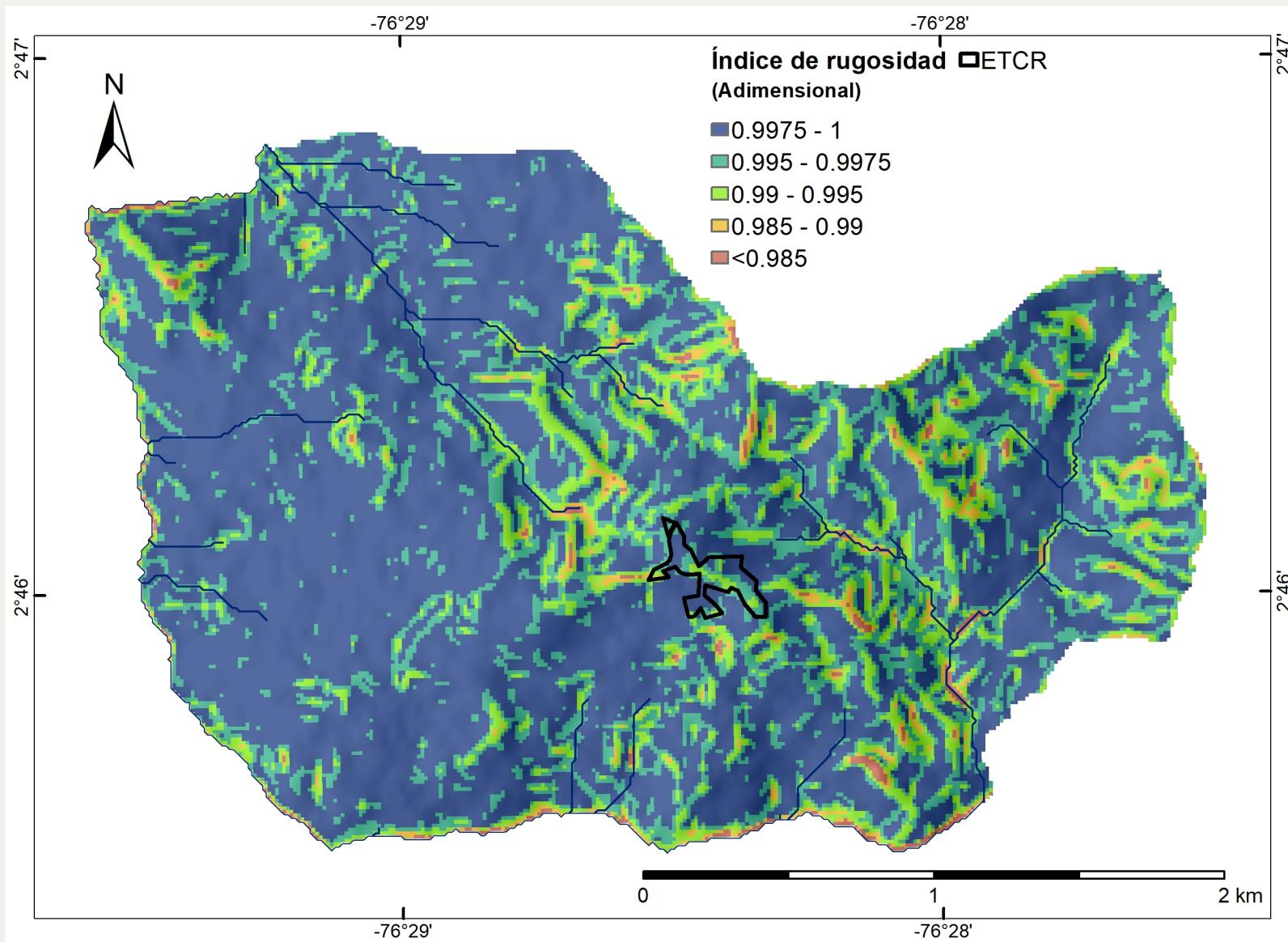
Índice de humedad topográfica



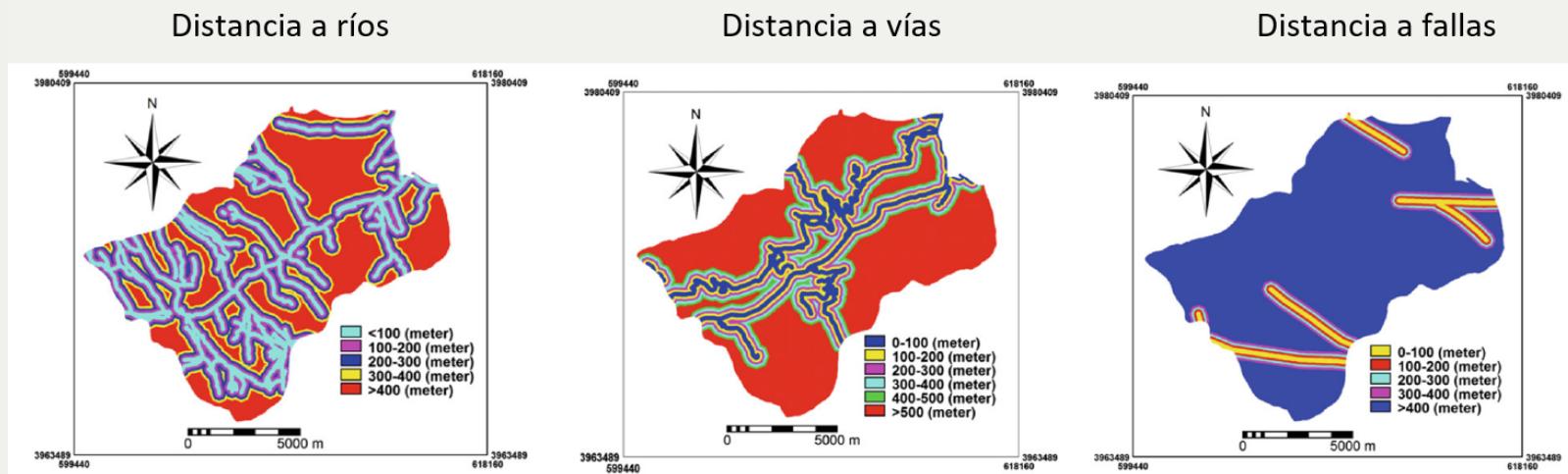
Índice de posición topográfica



Indice de rugosidad



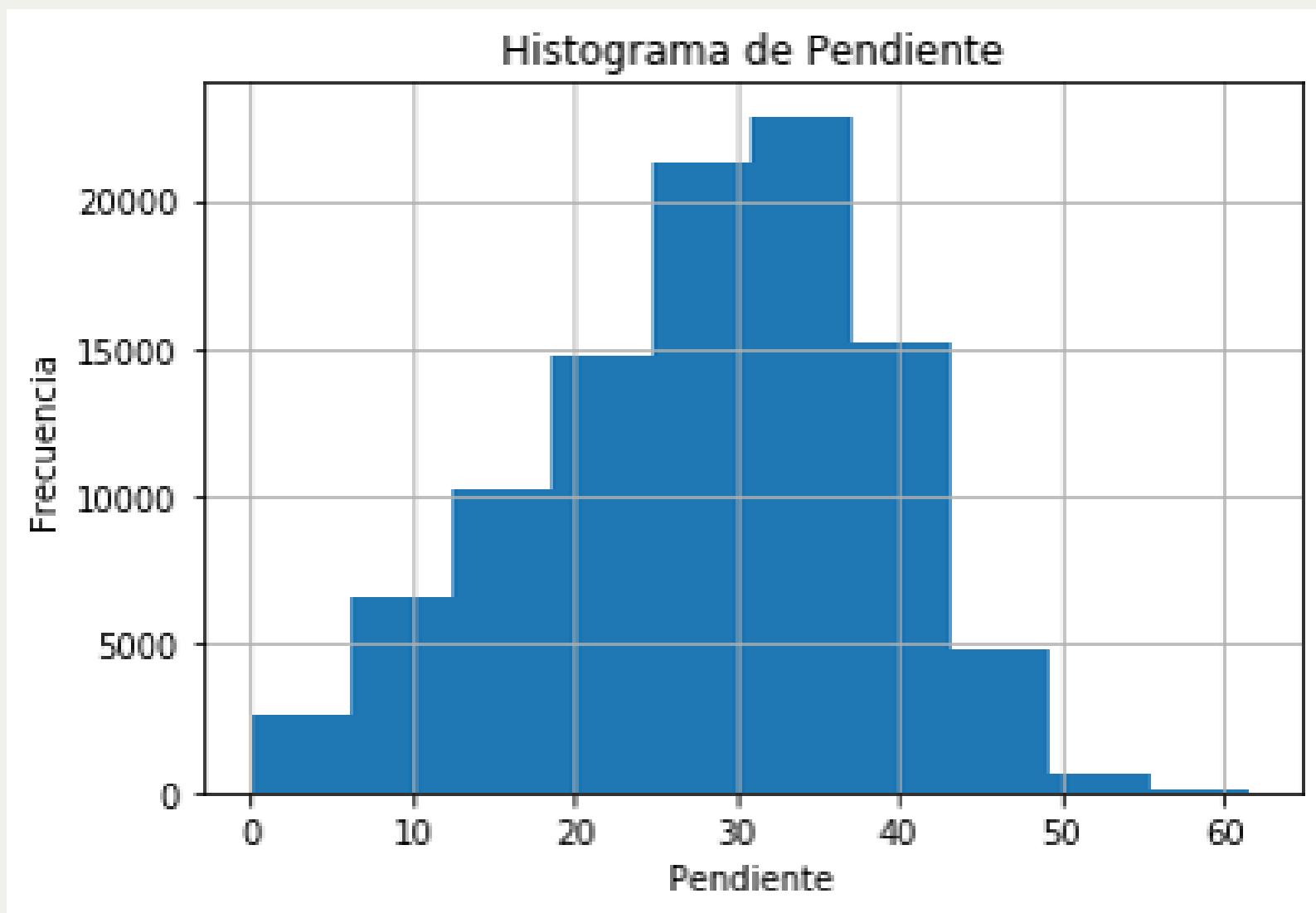
Variables tipo buffer



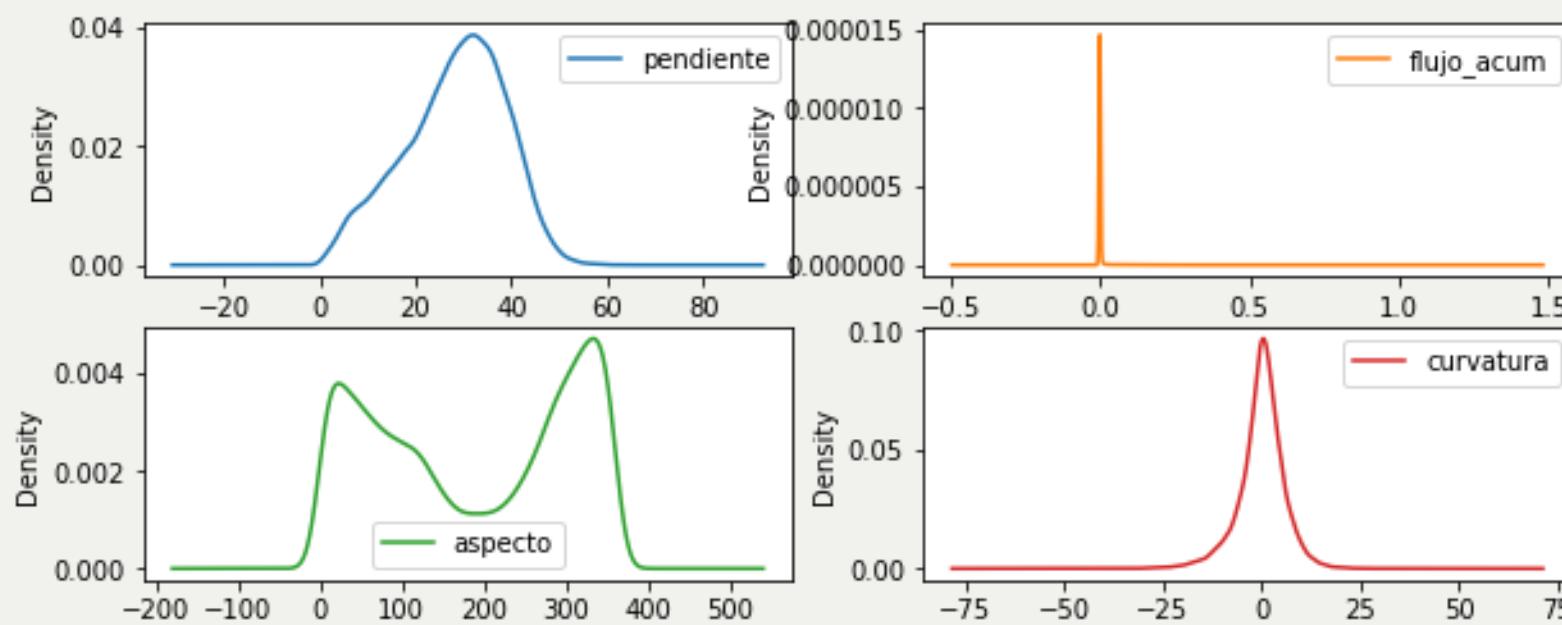
Fuente: Pourghasemi et al. (2010) en la cuenca del Haraz (Iran)

Análisis Exploratorio de Variables

Univariado

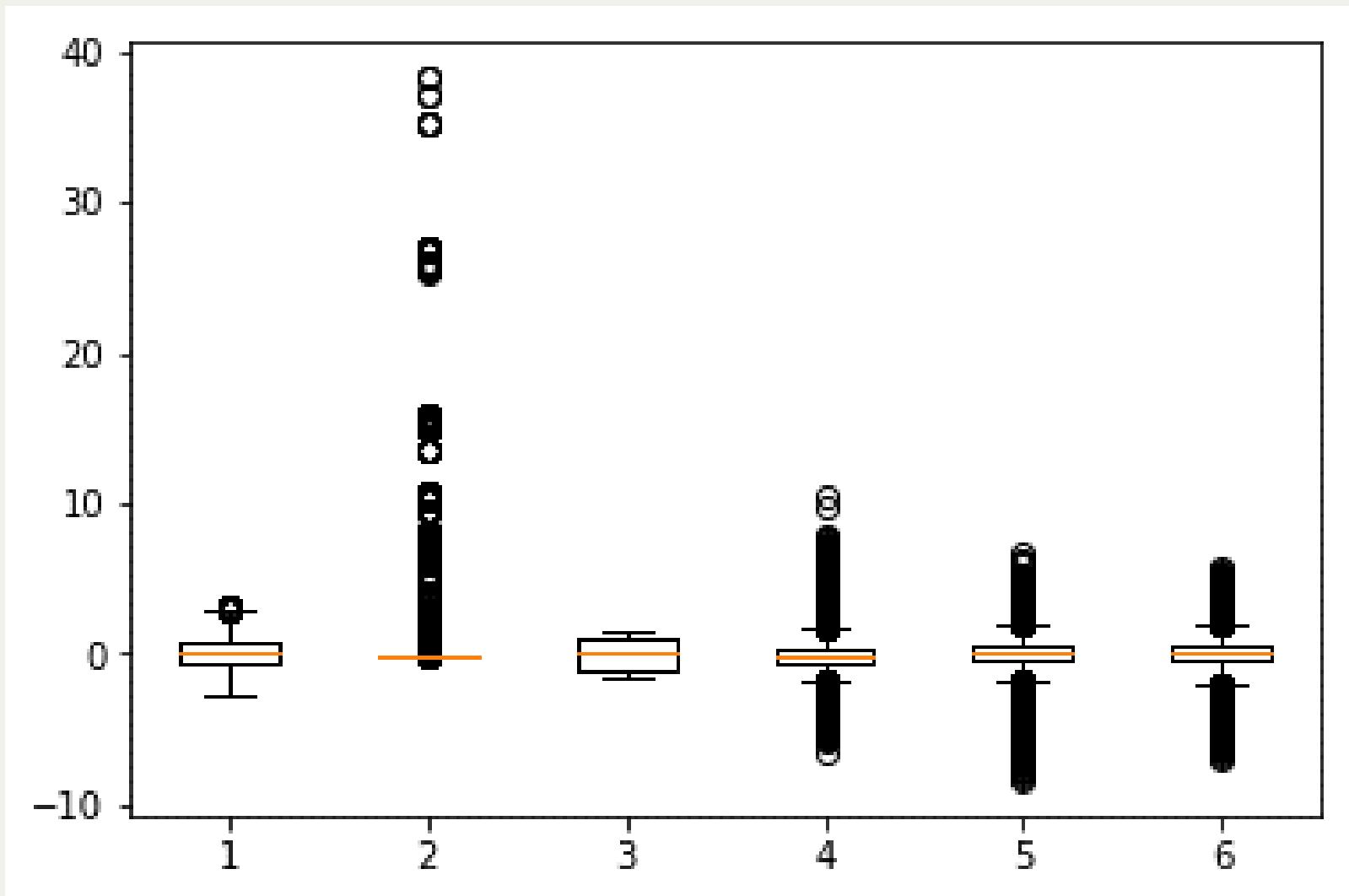


Univariado



Univariado

7 . 1

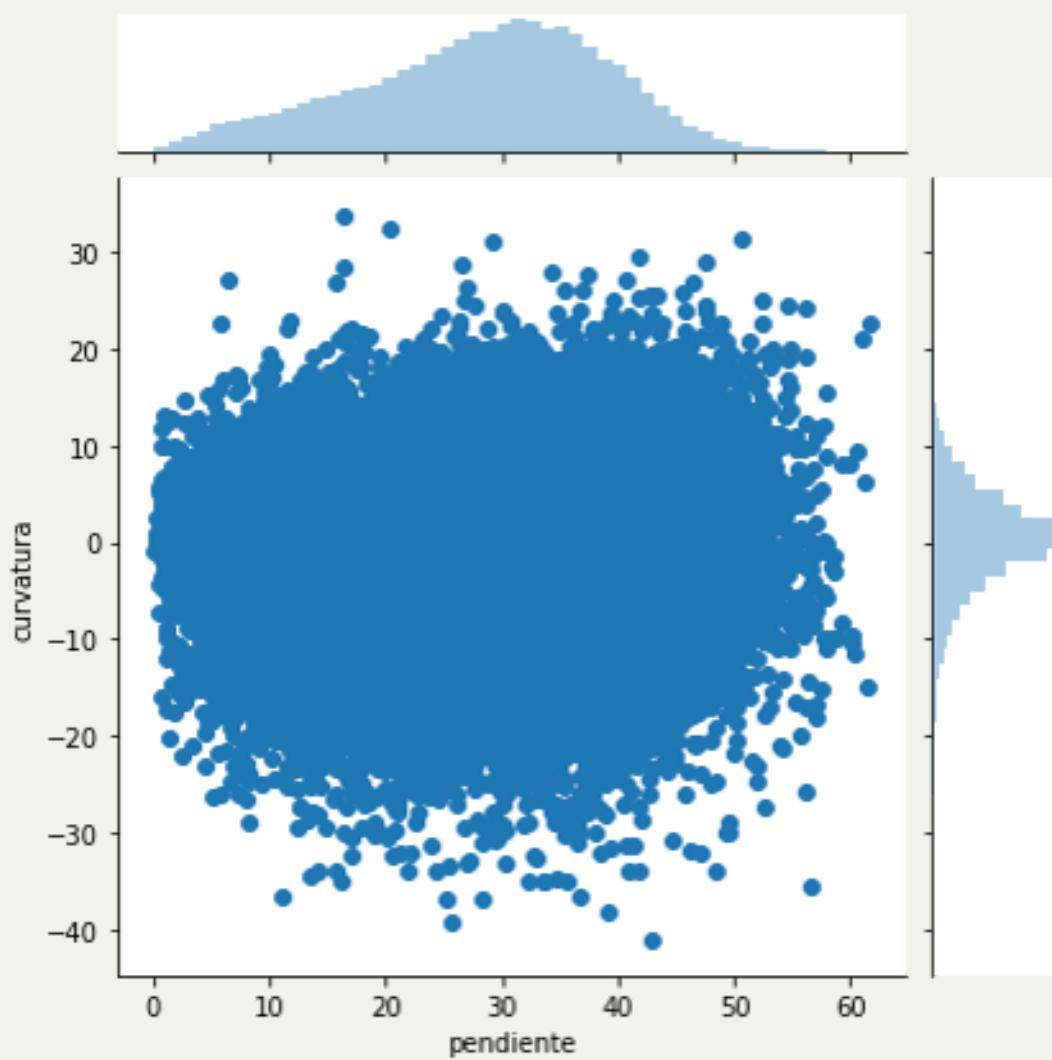


7 . 2

Bivariado

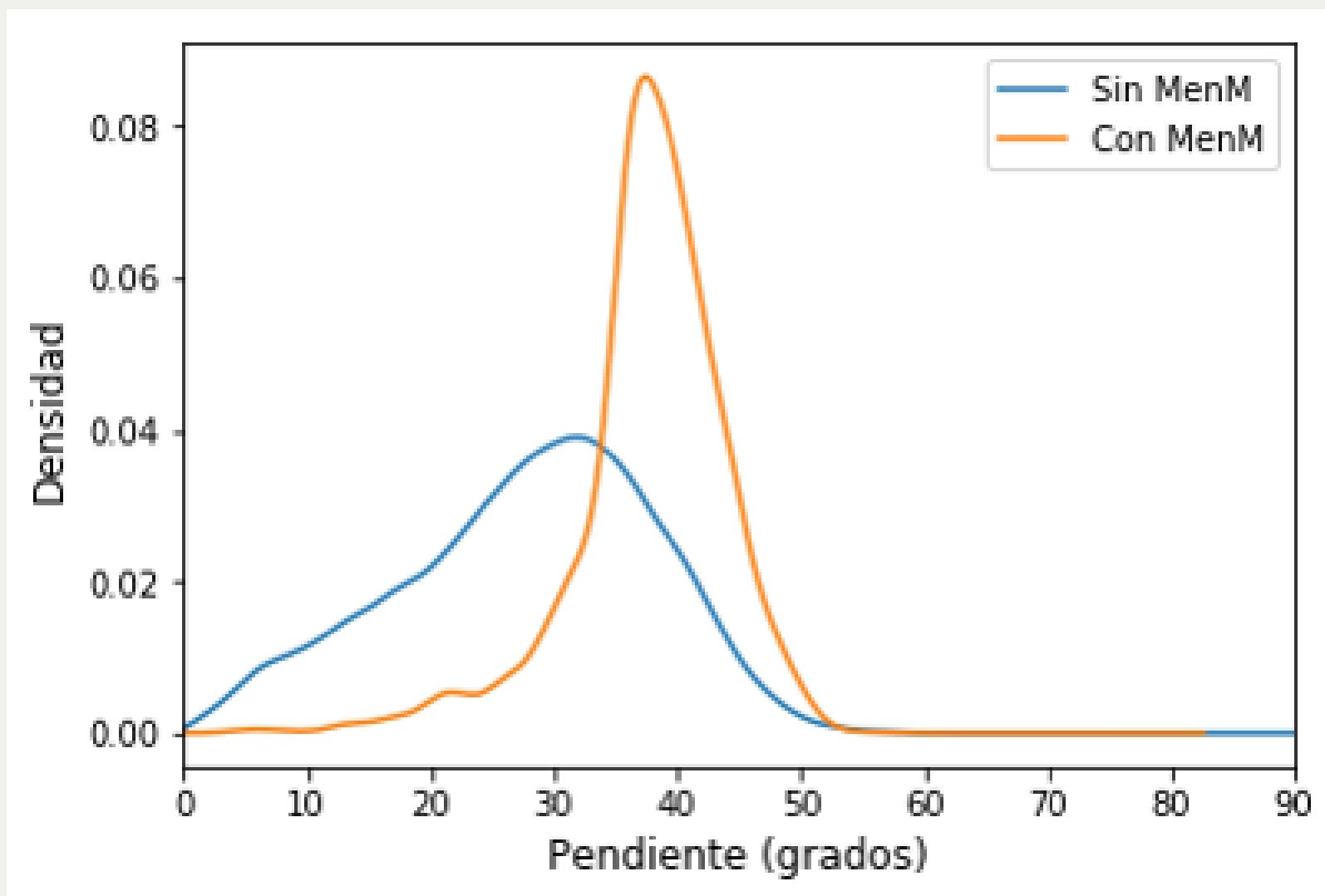


Bivariado

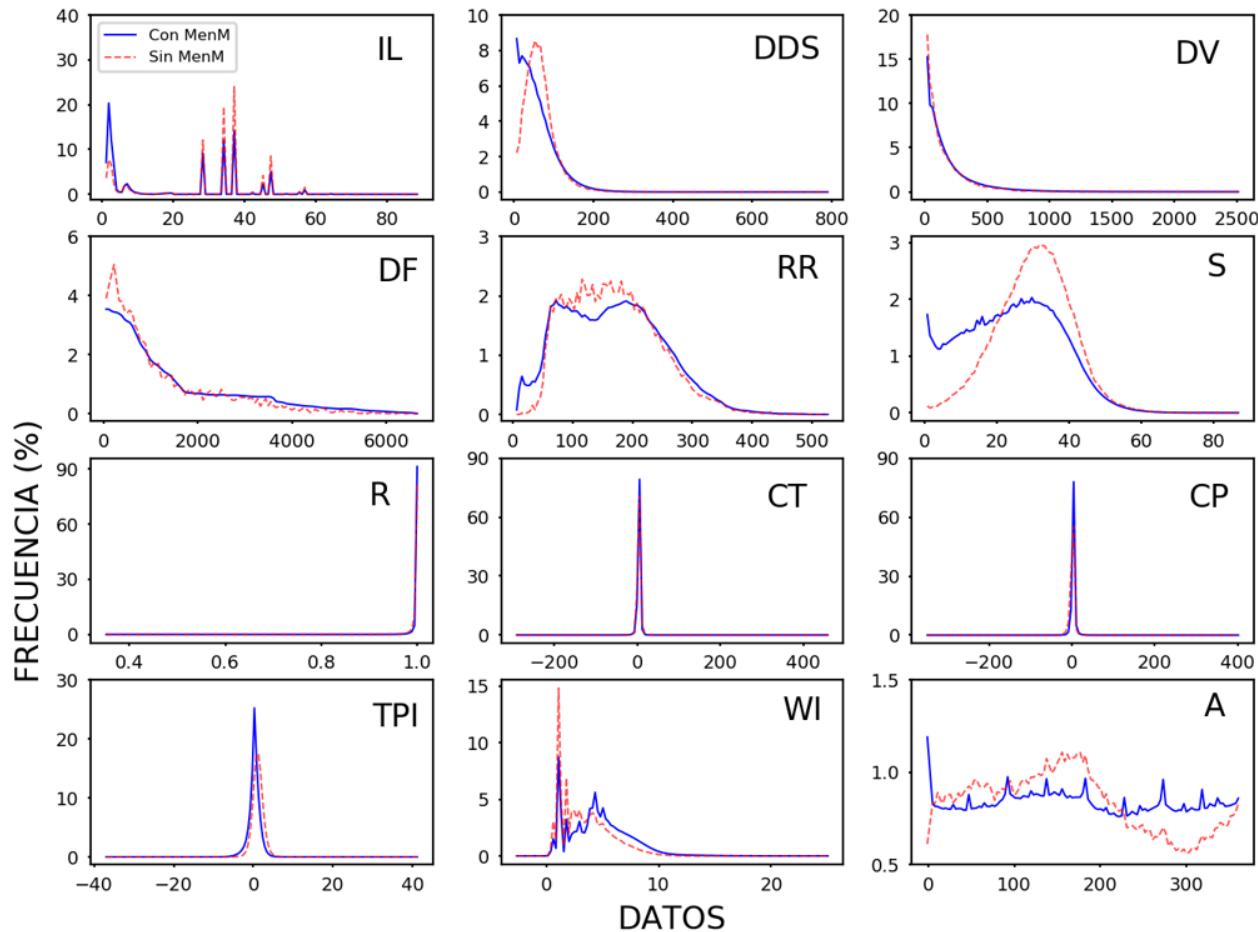


Selección de Variables

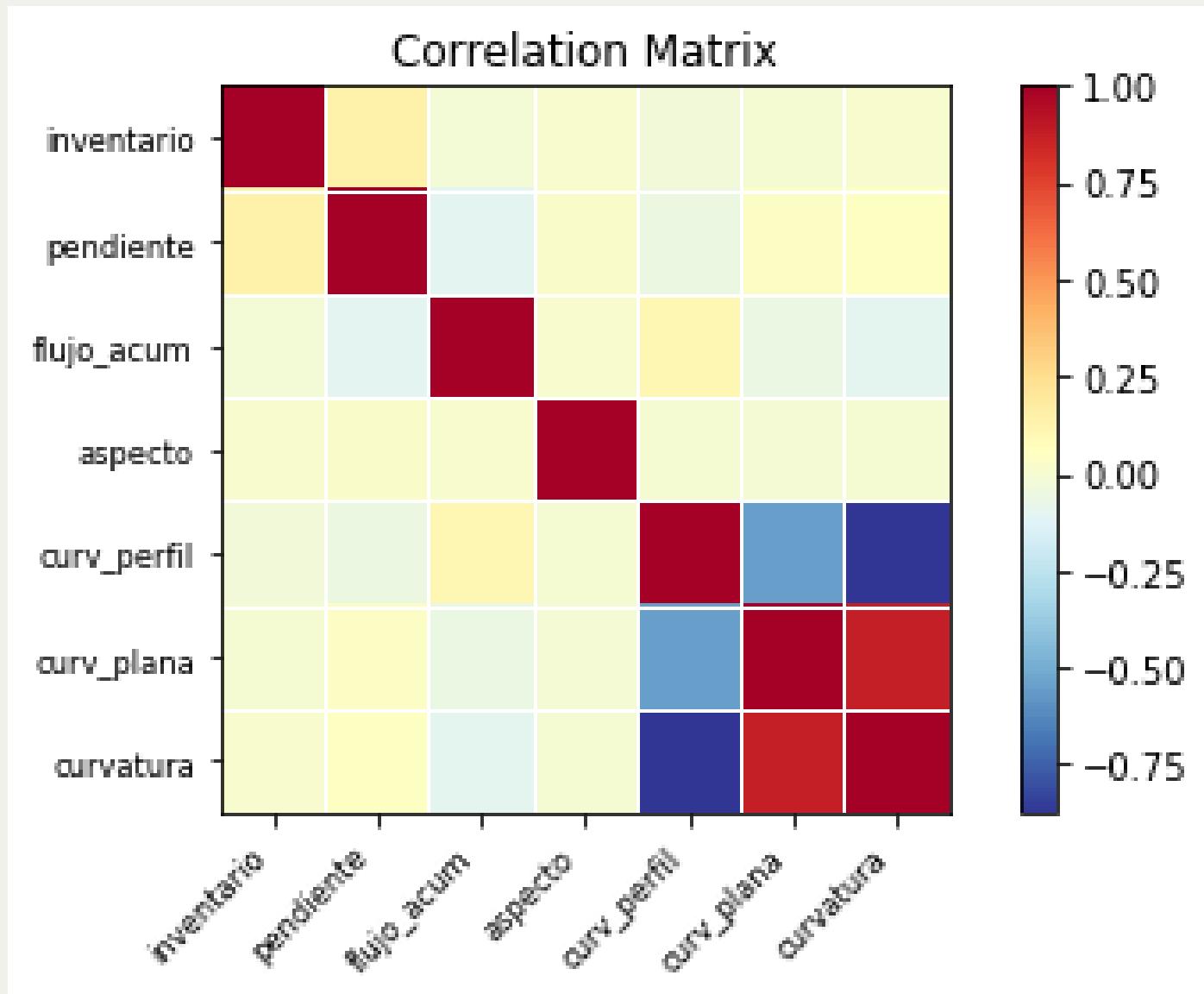
Capacidad de separación



Capacidad de separación

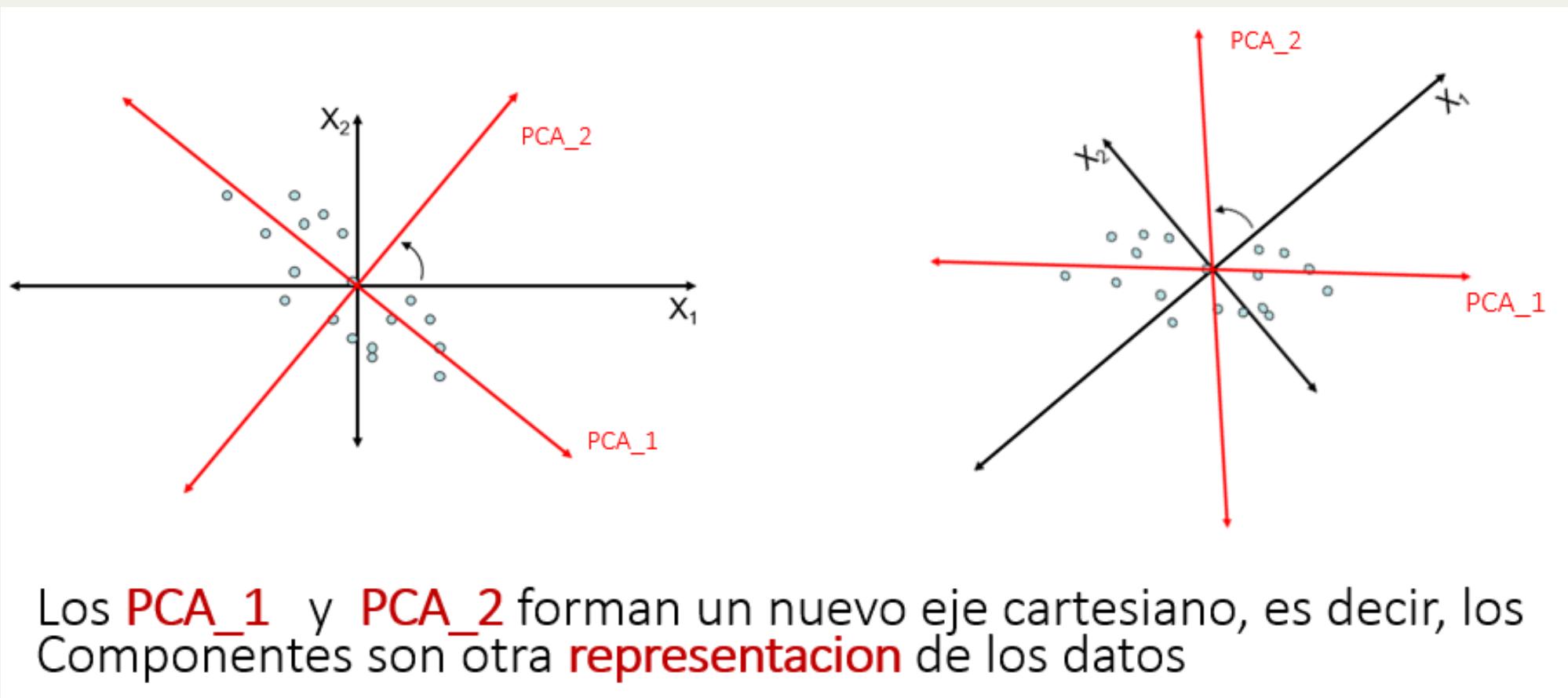


Matriz de correlación

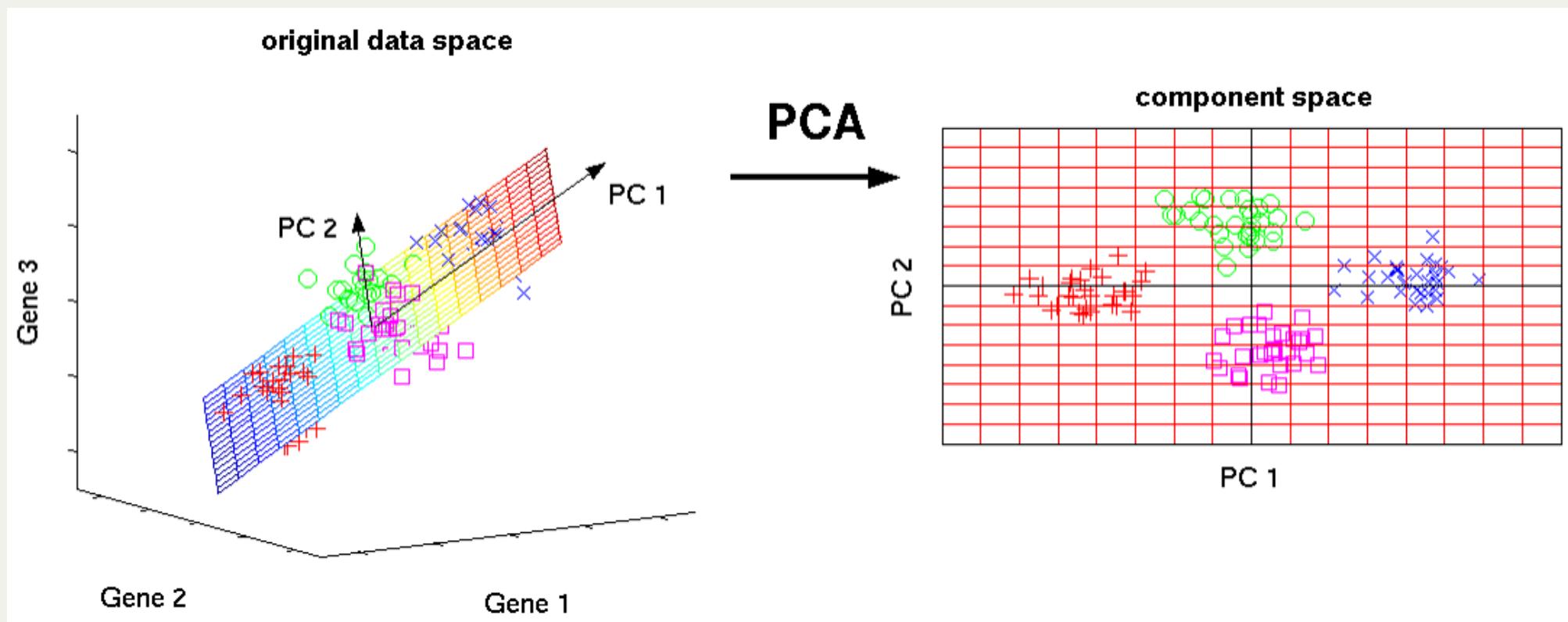


Análisis de Componentes principales

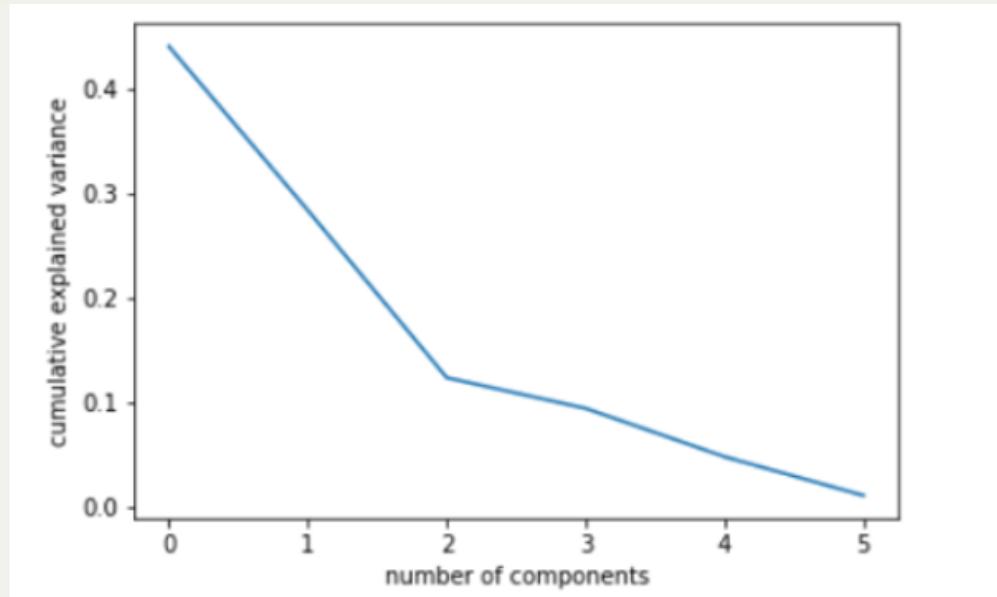
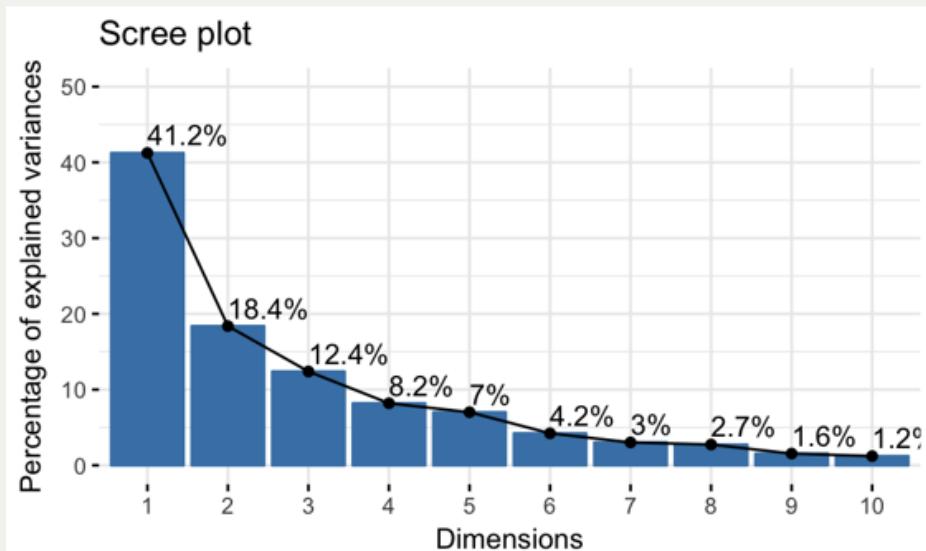
PCA



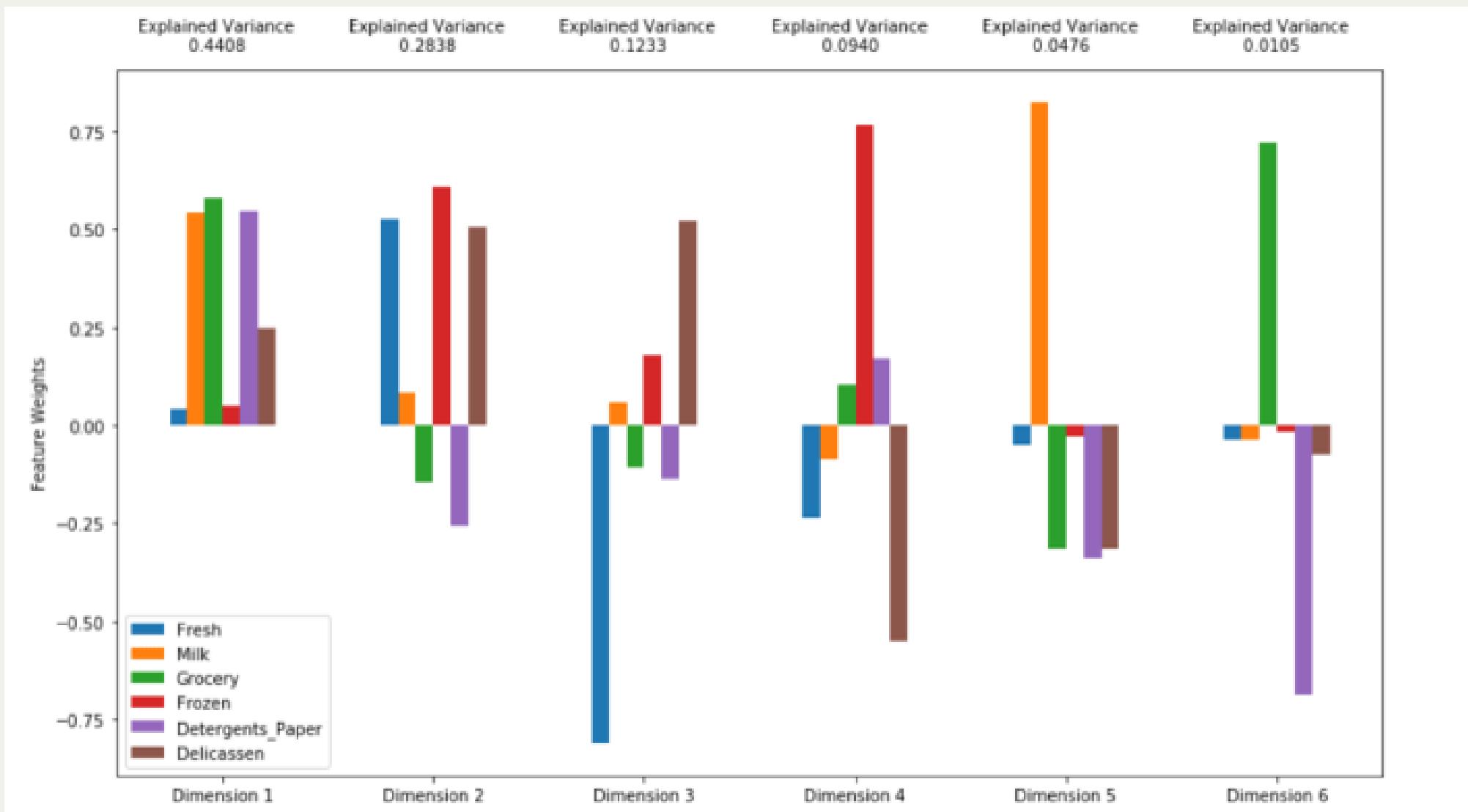
PCA



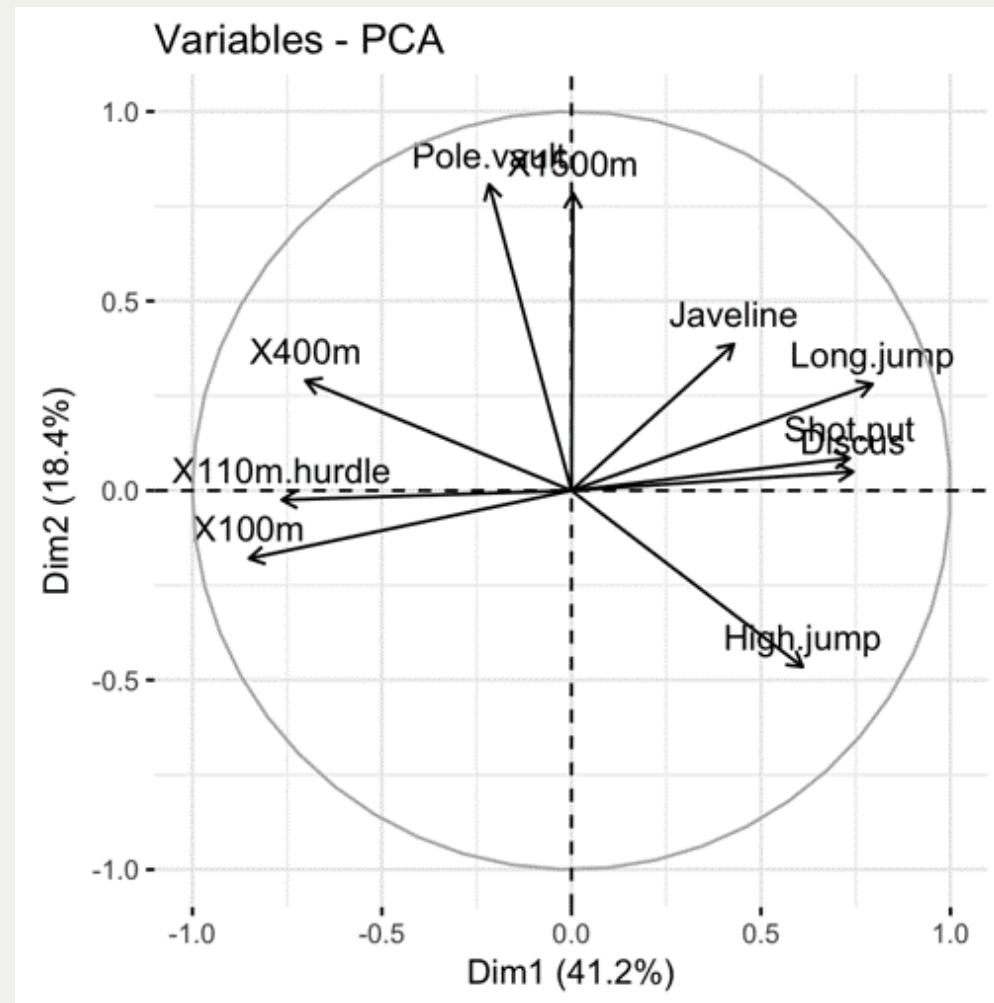
Varianza de cada componente



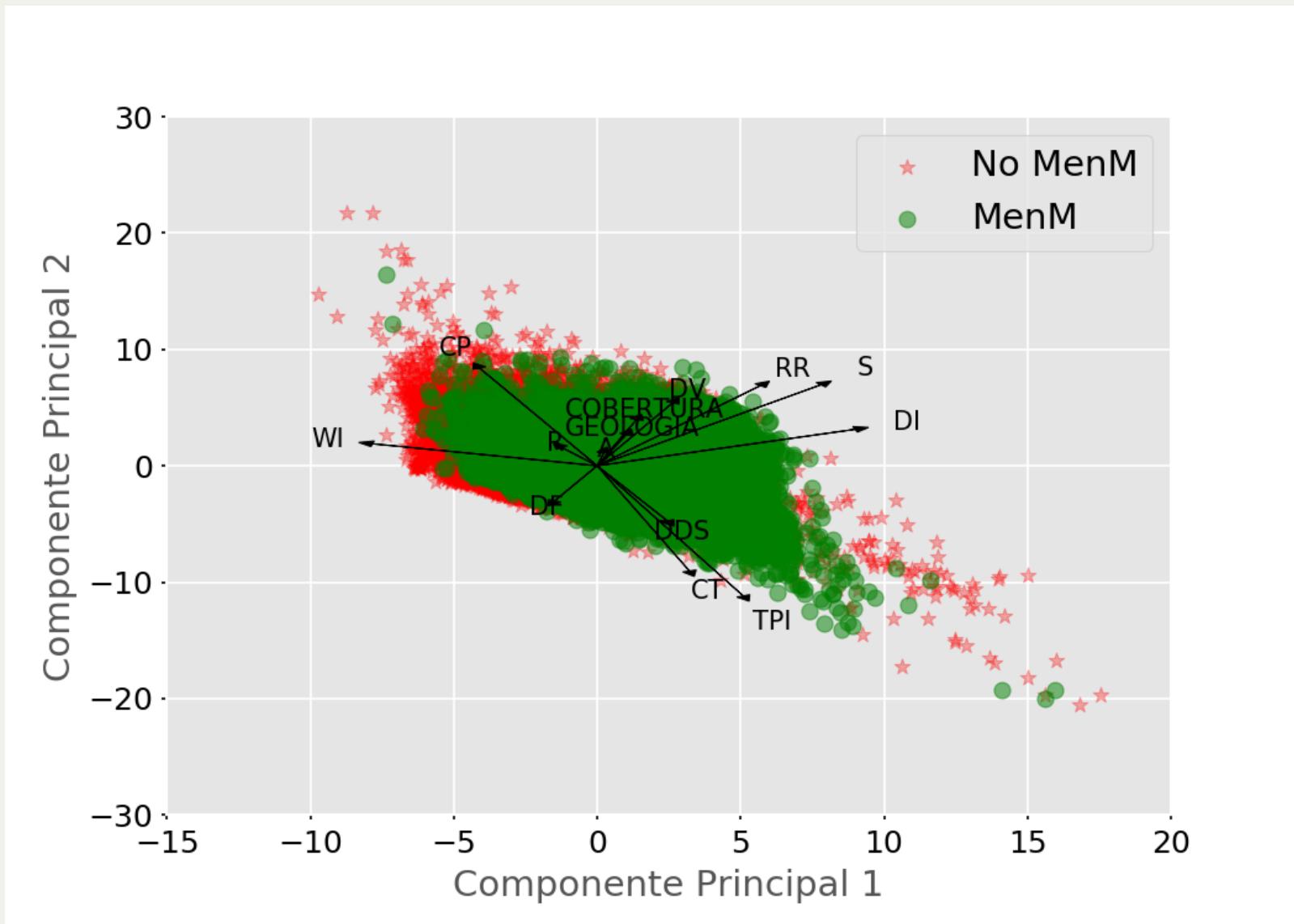
Apporte de cada variable



Apporte de cada variable



Apporte de cada variable



Apporte de cada variable

