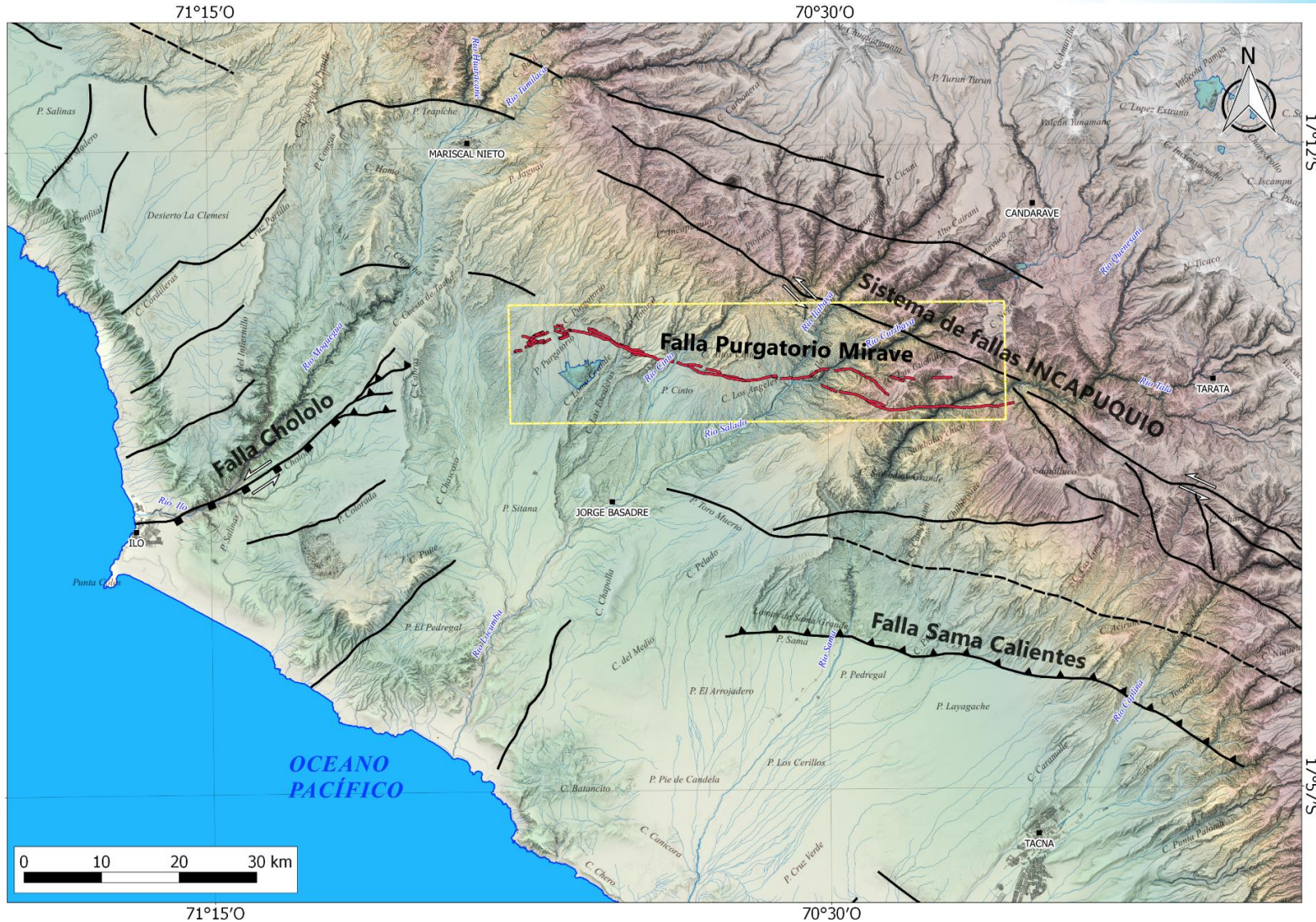


# Tectónica activa y datación por morfometría de la falla Purgatorio-Mirave

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Dirección de Geología Ambiental y Riesgo Geológico

Carlos Benavente, Fabrizio Delgado, Briant Garcia, Lorena Rosell y Anderson Palomino

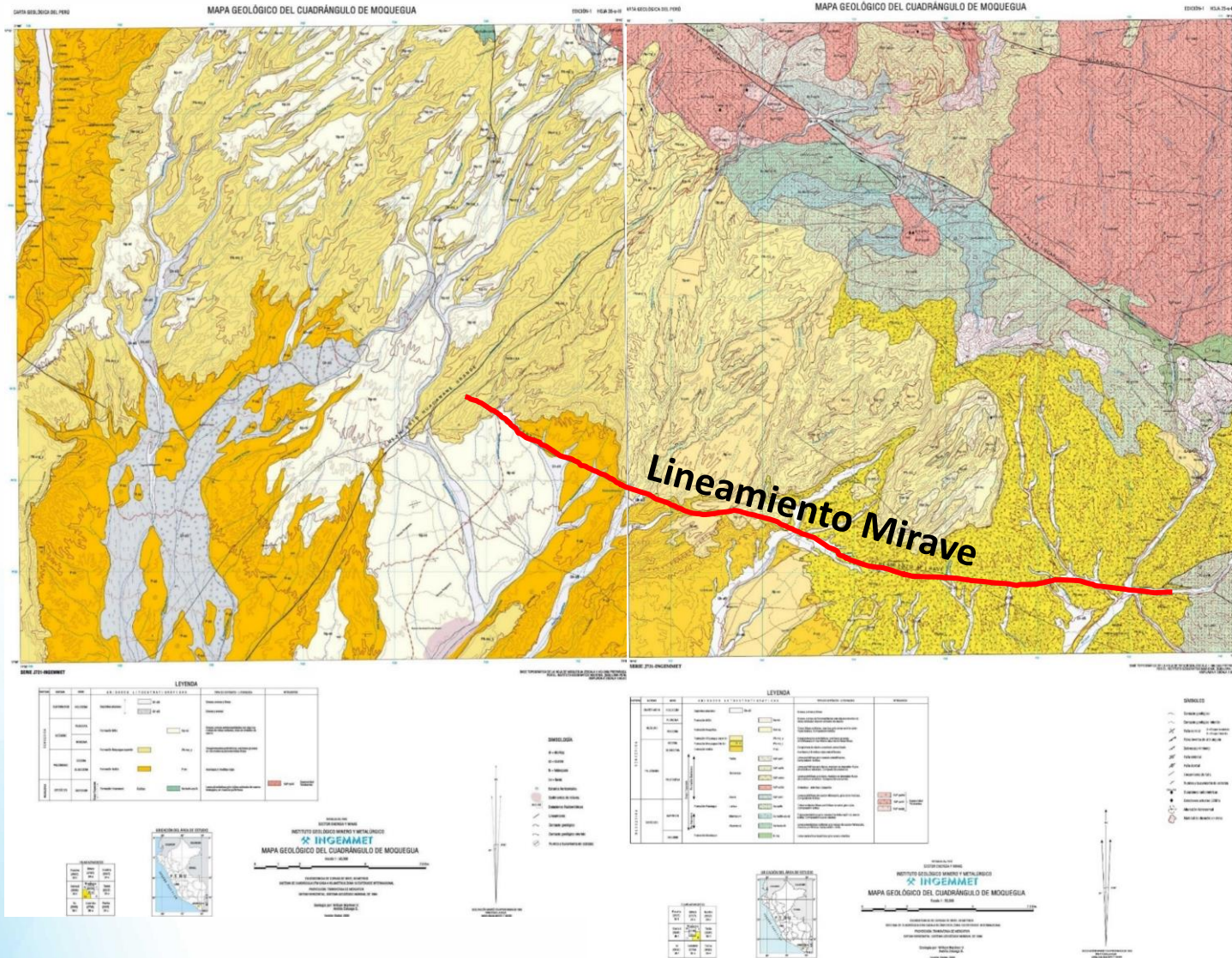


17°12'5"

17°57'5"

Modificado de Audin et al. (2006)

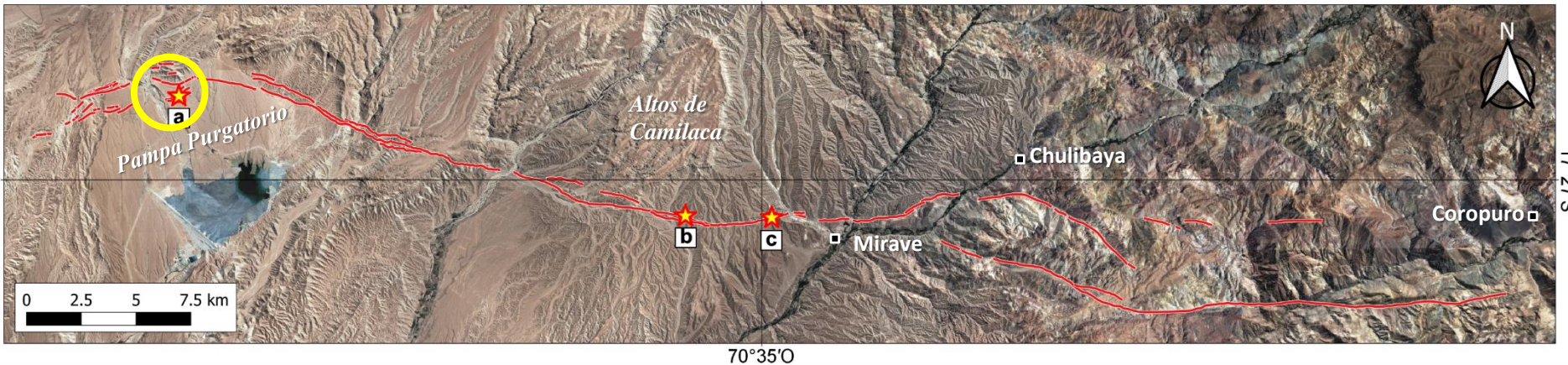
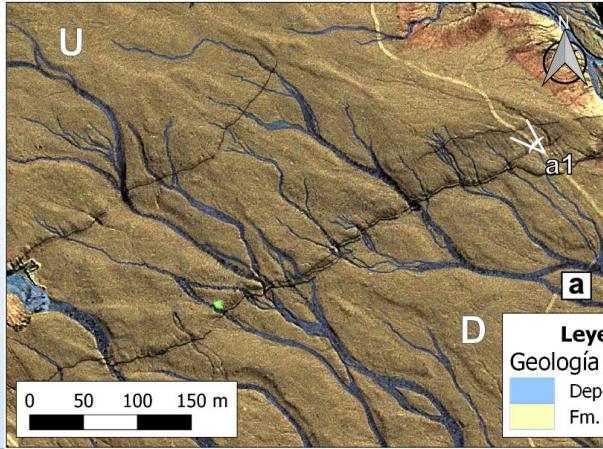




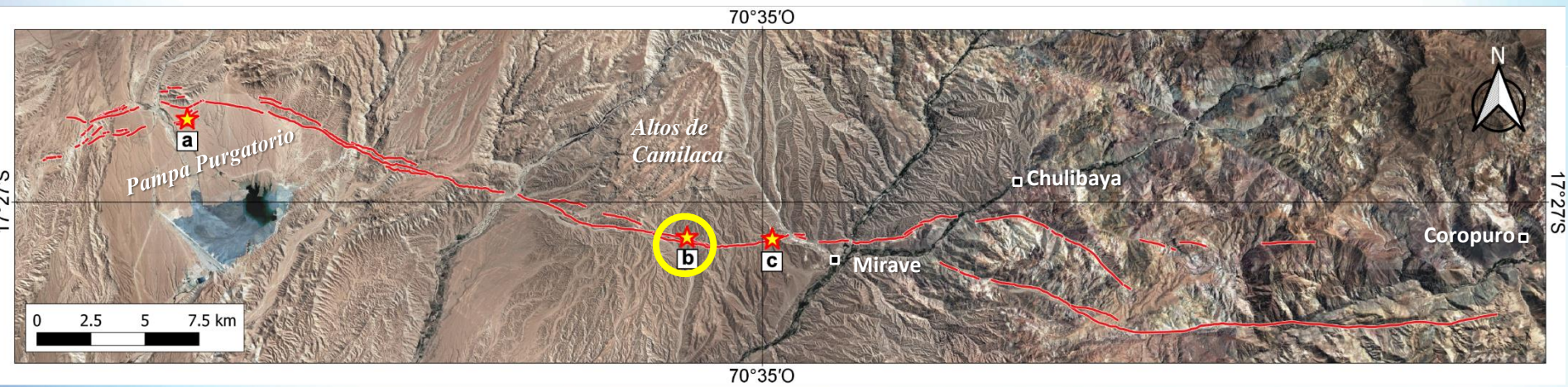
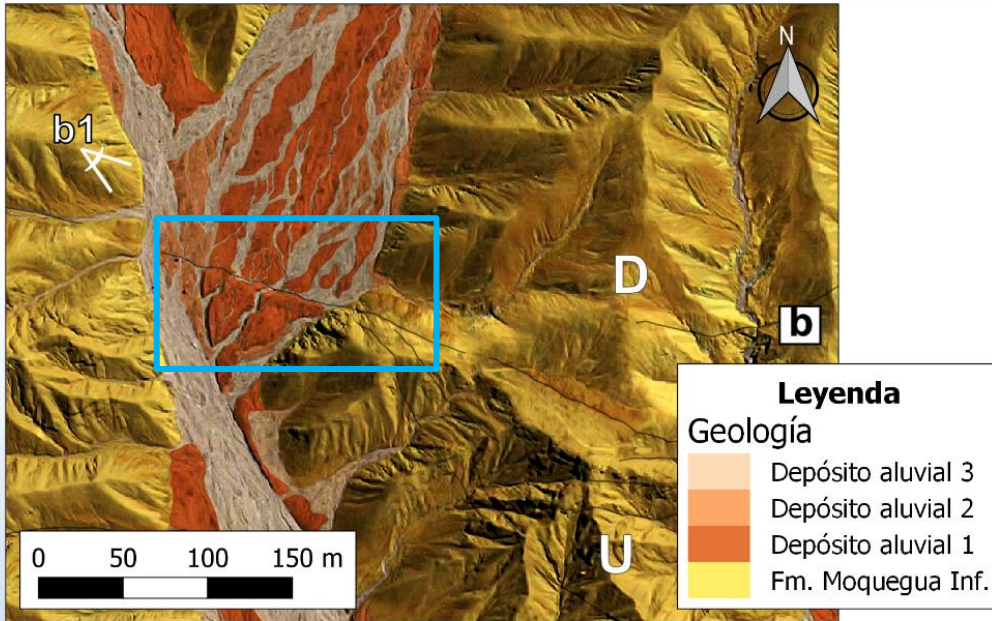


S

N



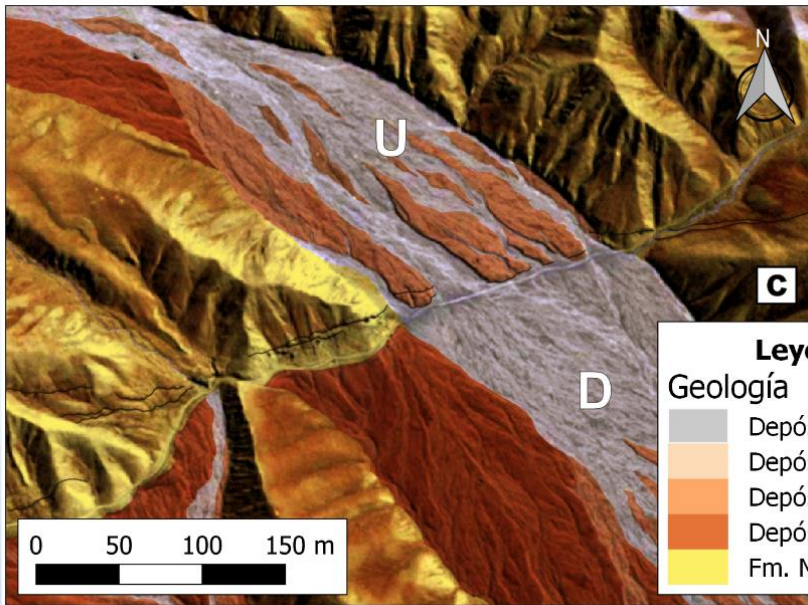






N

S



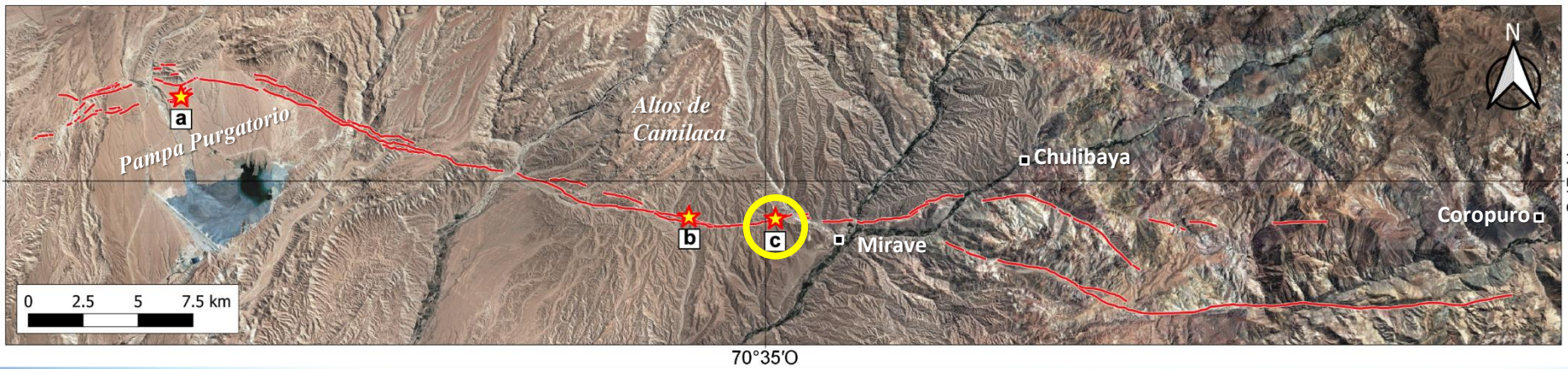
**Legenda**

**Geología**

- Depósito aluvial 4
- Depósito aluvial 3
- Depósito aluvial 2
- Depósito aluvial 1
- Fm. Moquegua Inf.

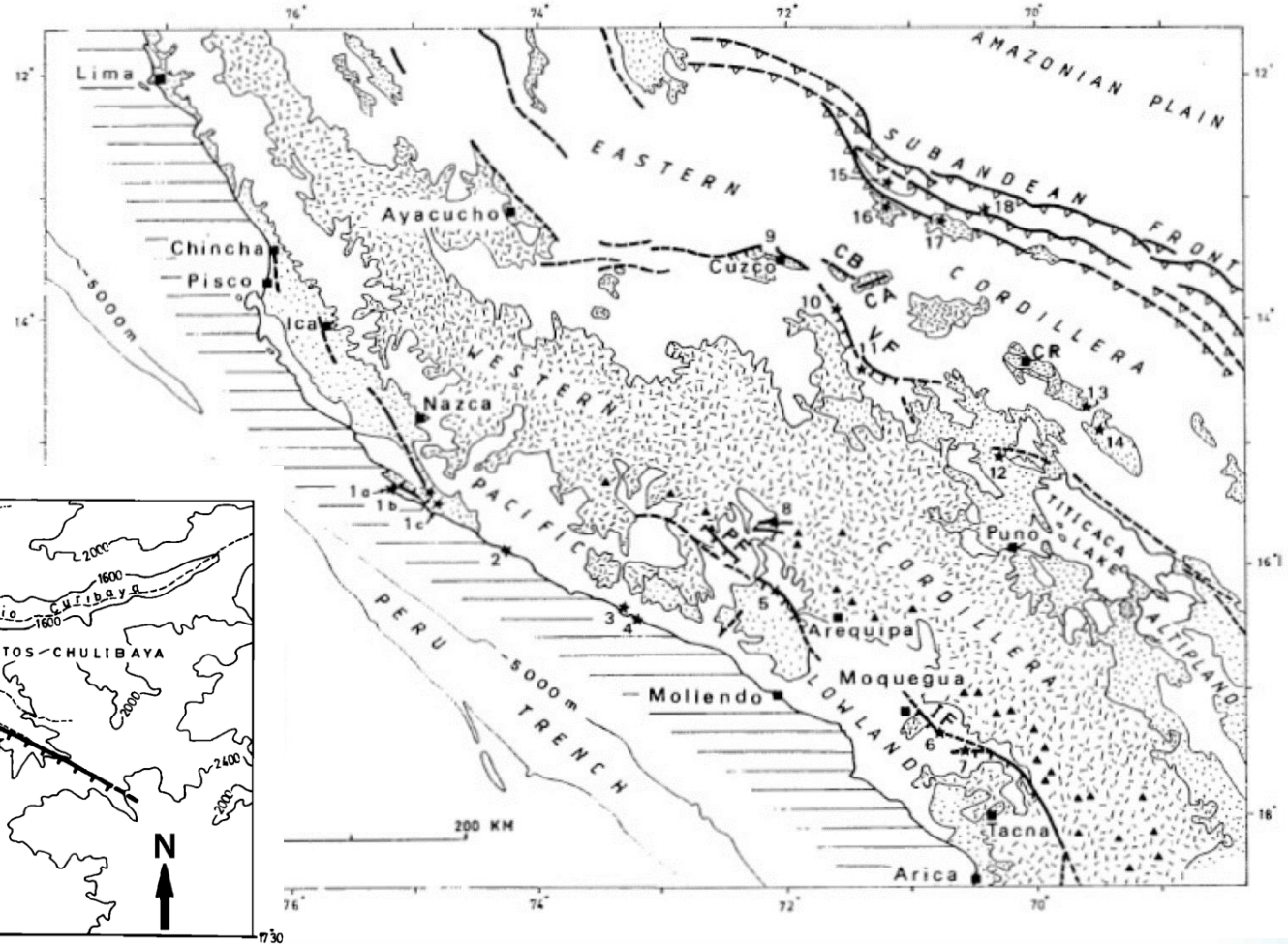


70°35'O





A que tipo de falla esta asociada esta deformación?



Tomado de Sebrier et al. (1985)



S

N

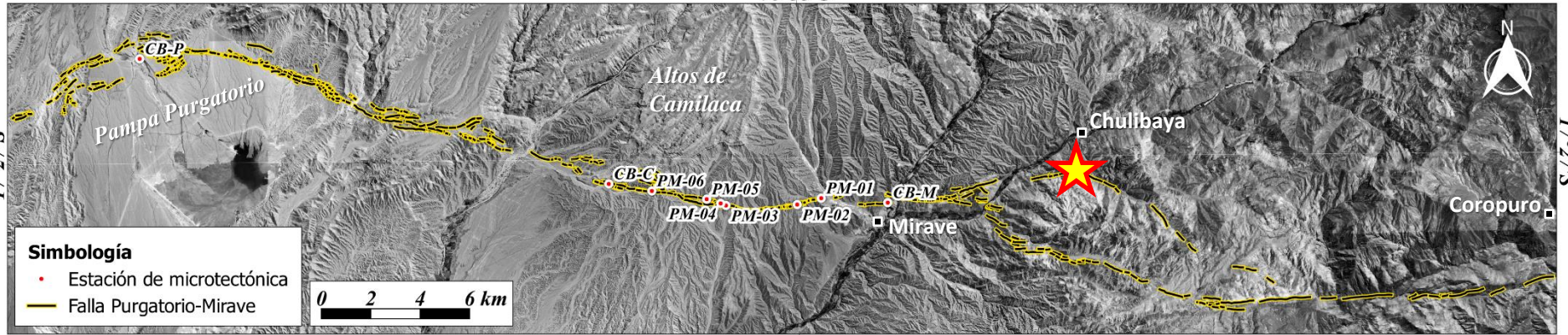


S

N

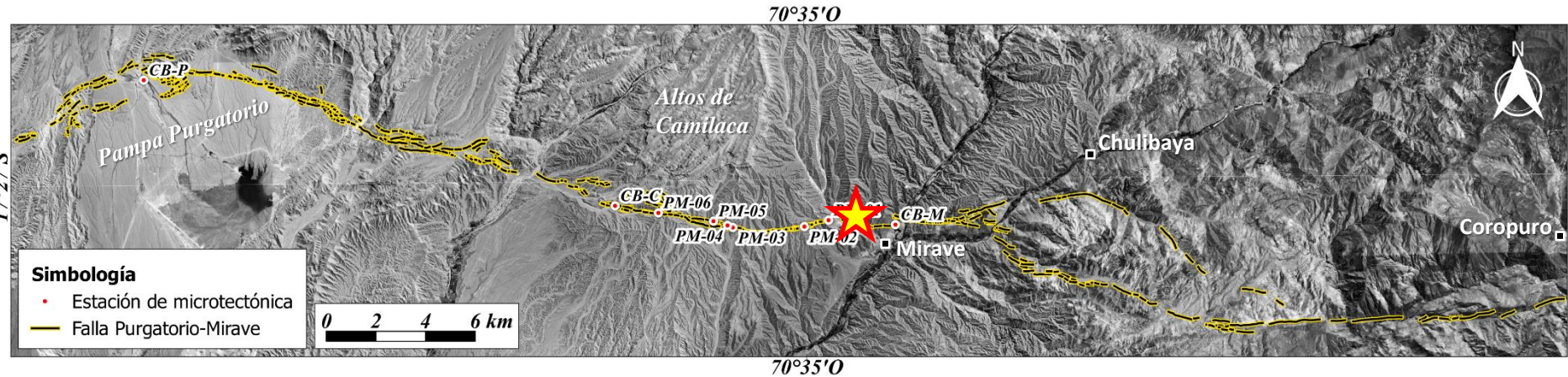


70°35'O



70°35'O





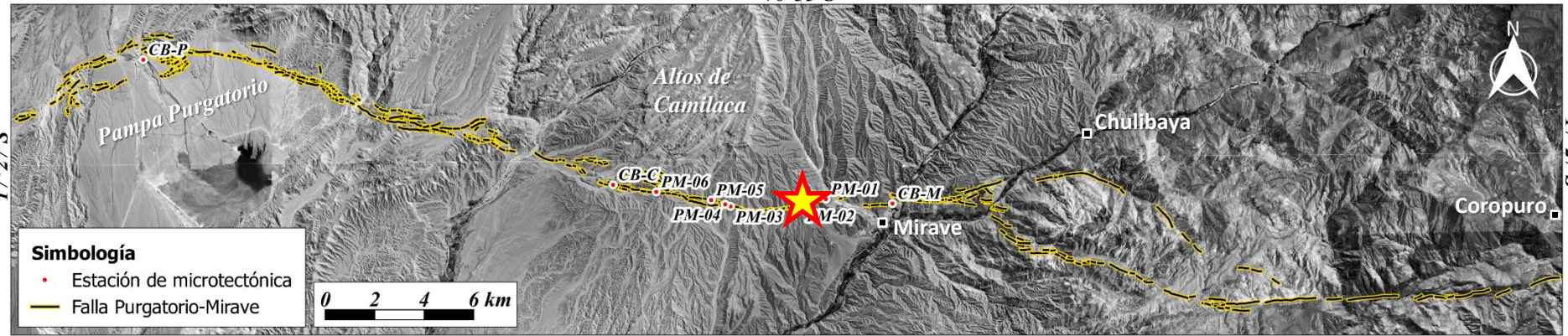


N

S



70°35'O

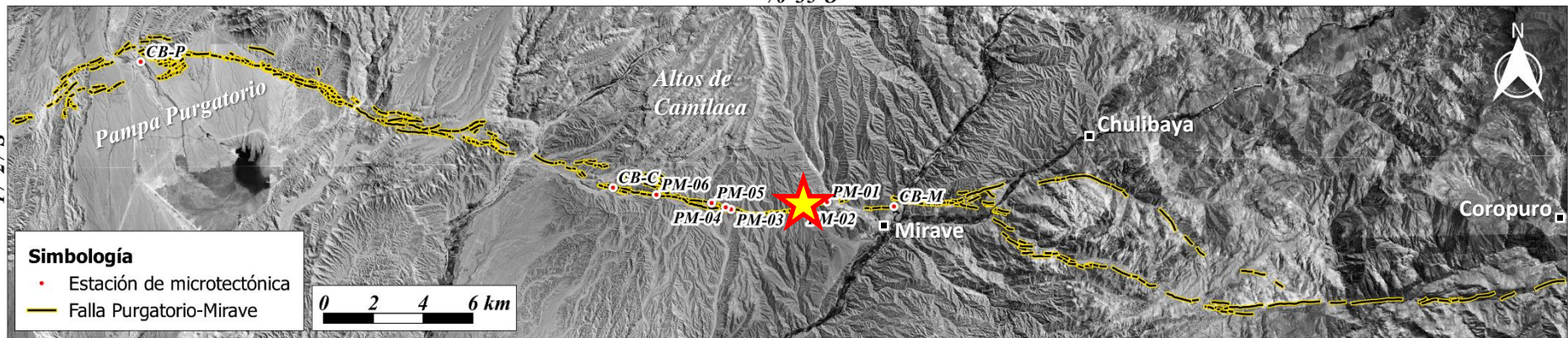


70°35'O



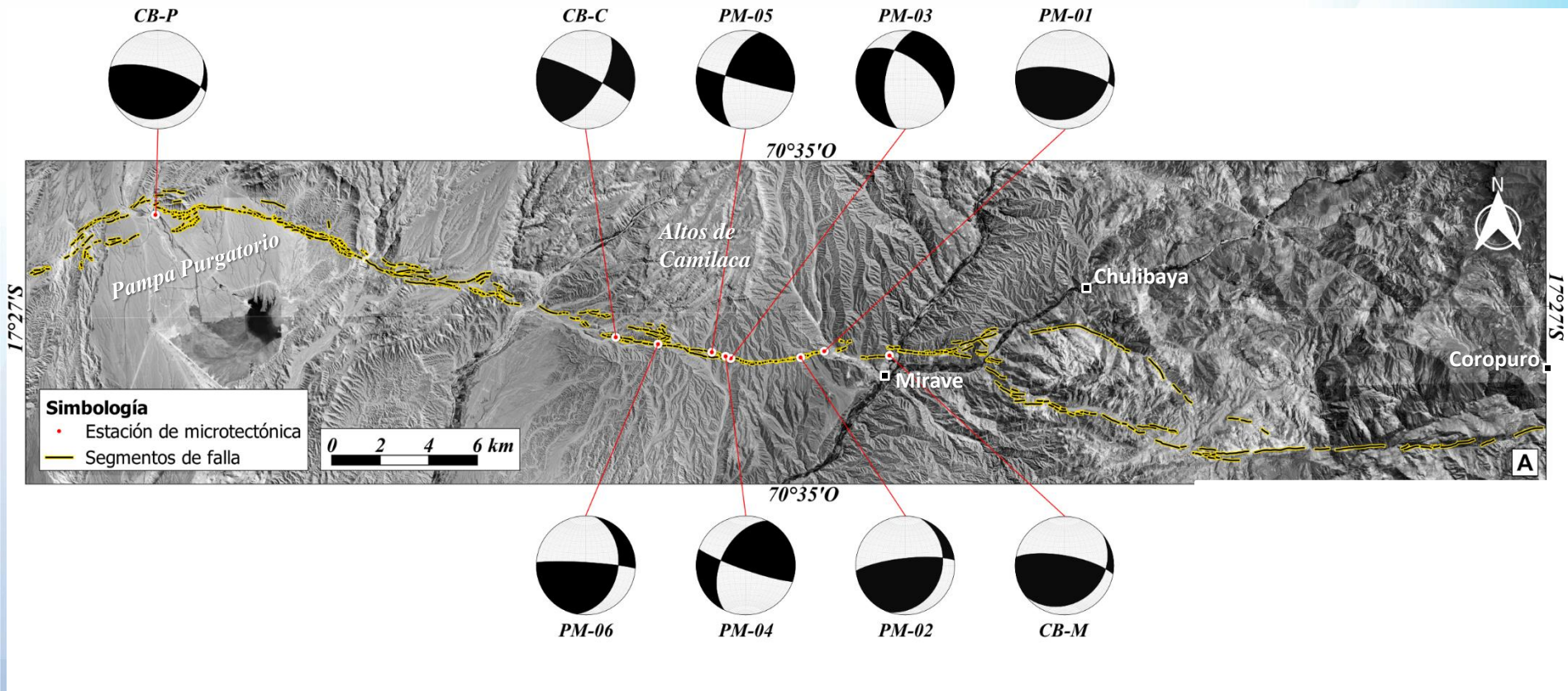


70°35'O



70°35'O

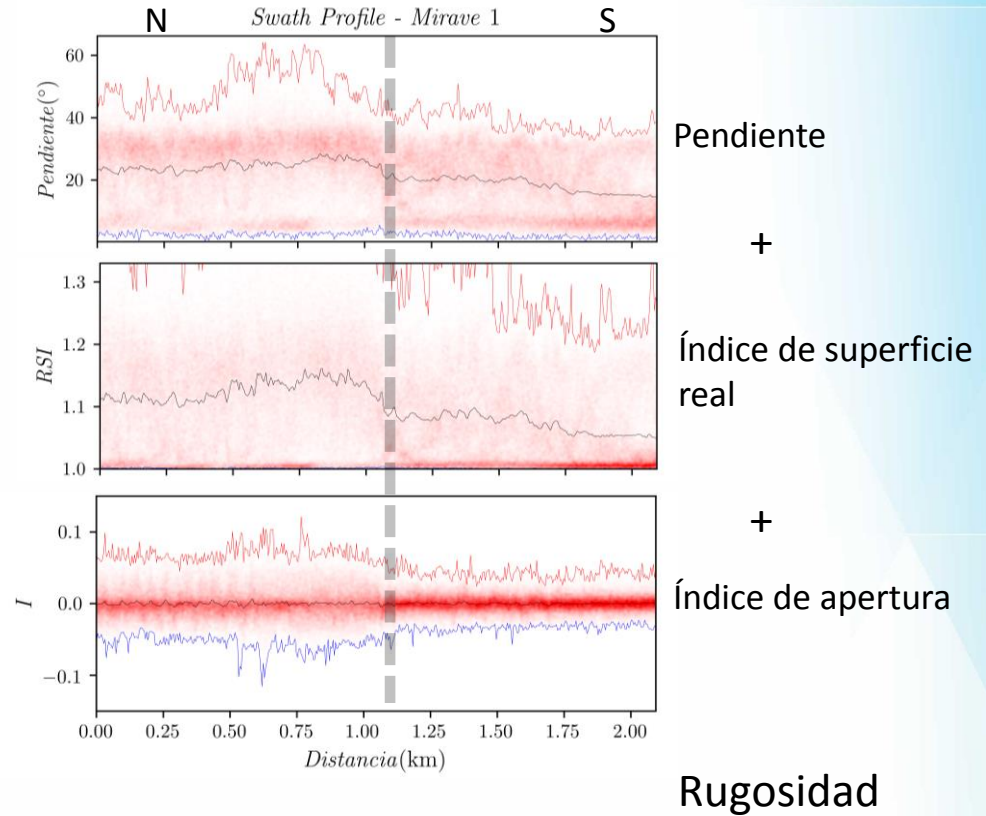
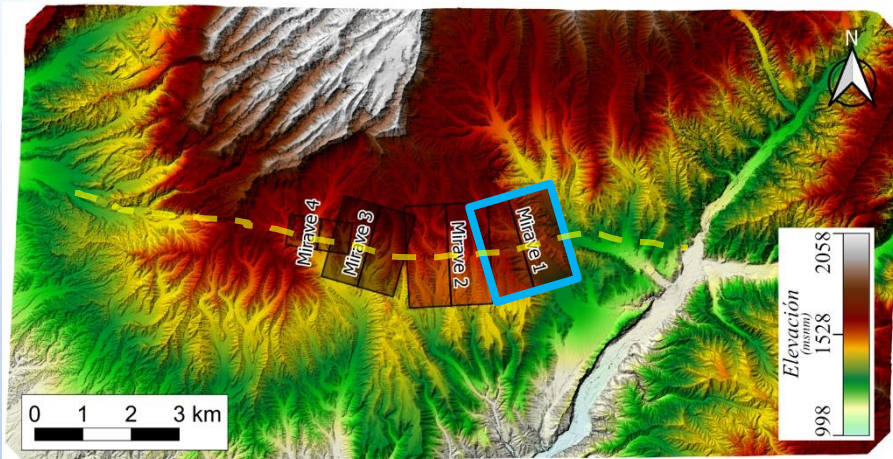




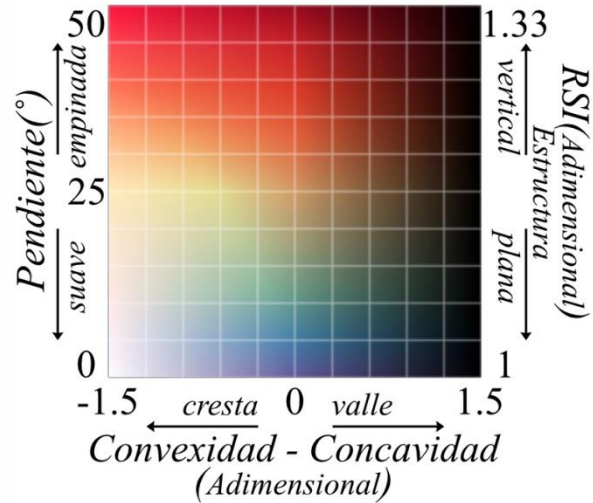
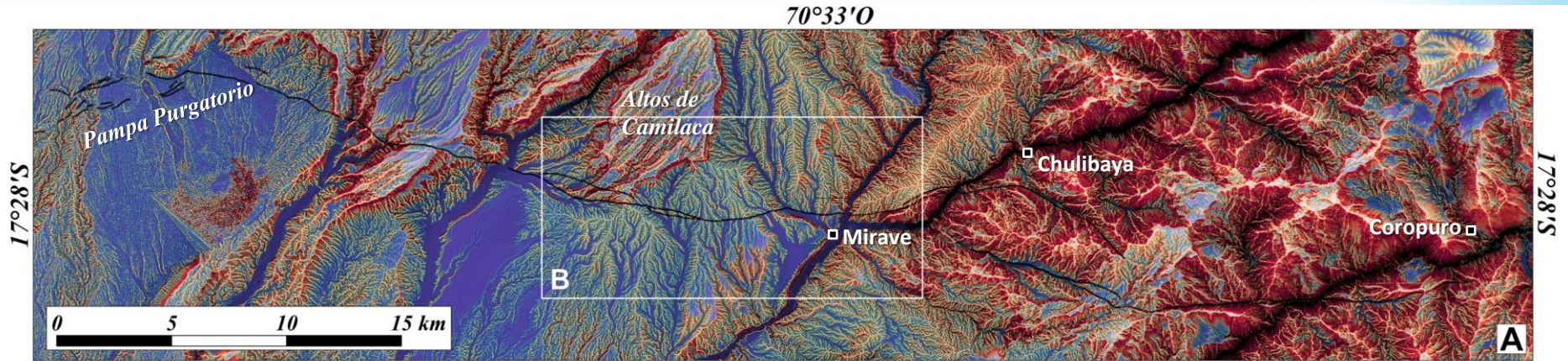
Que impacto tiene en el relieve?



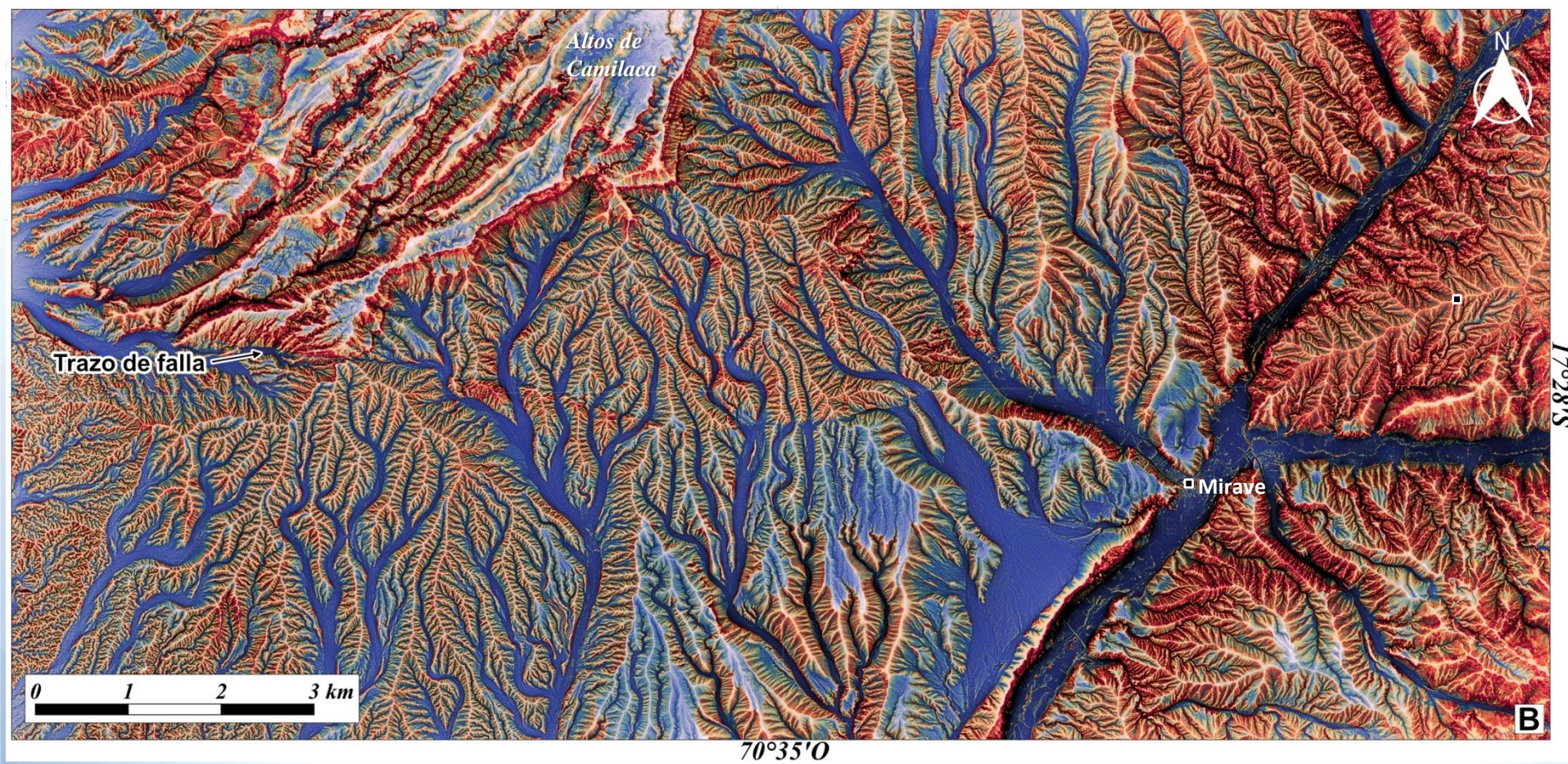
## Deformación producto de la actividad de la falla.











Boncio et al.(2017) => deformación HW > deformación FW

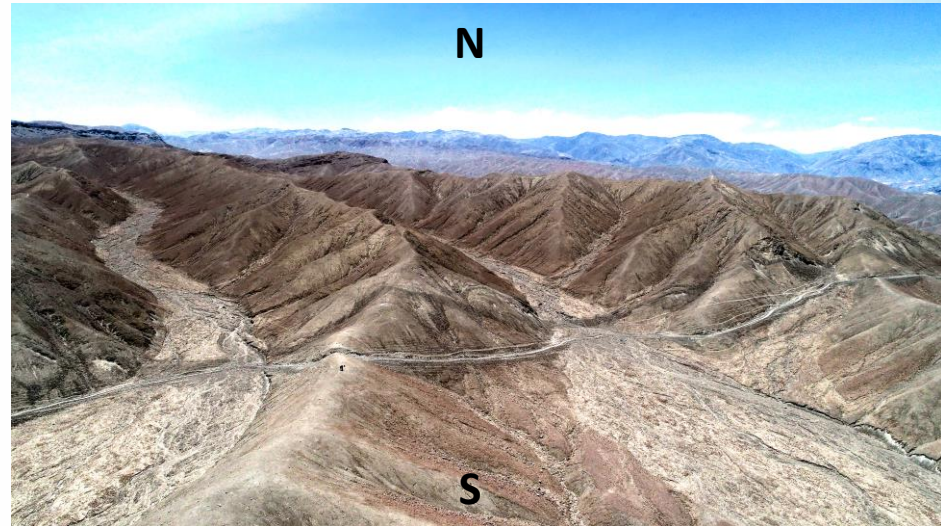


S

N



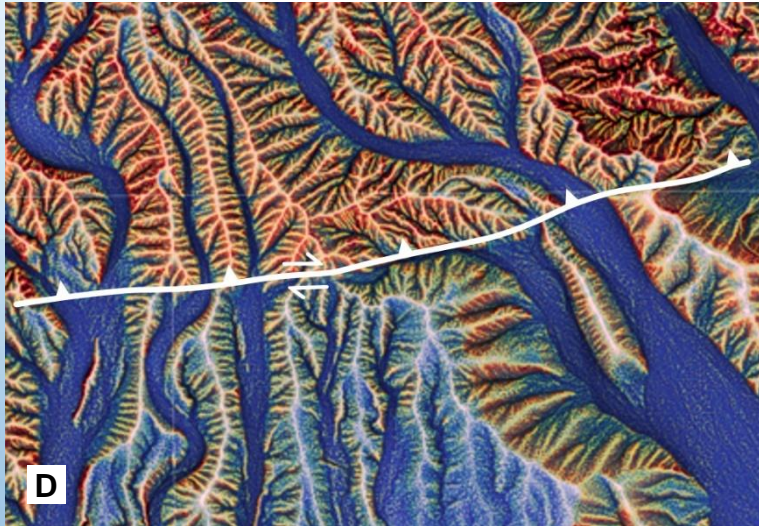
N



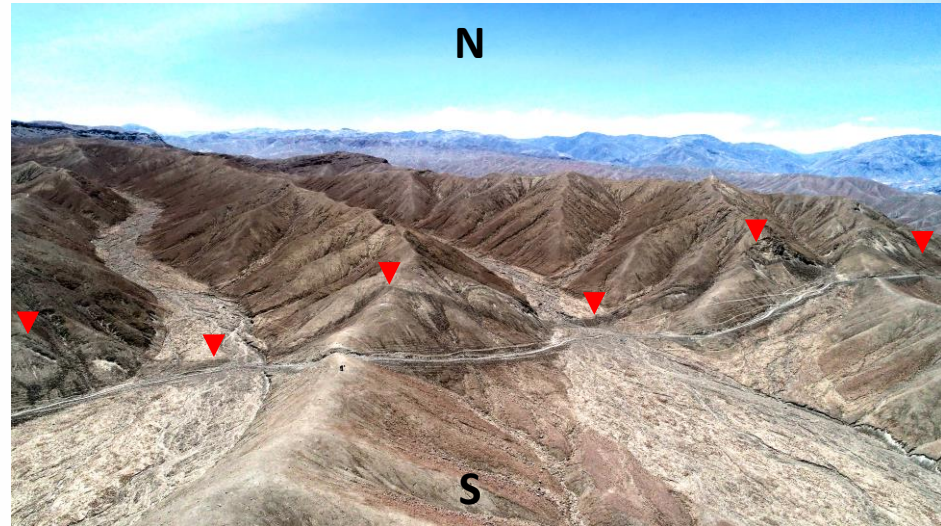


S

N



N

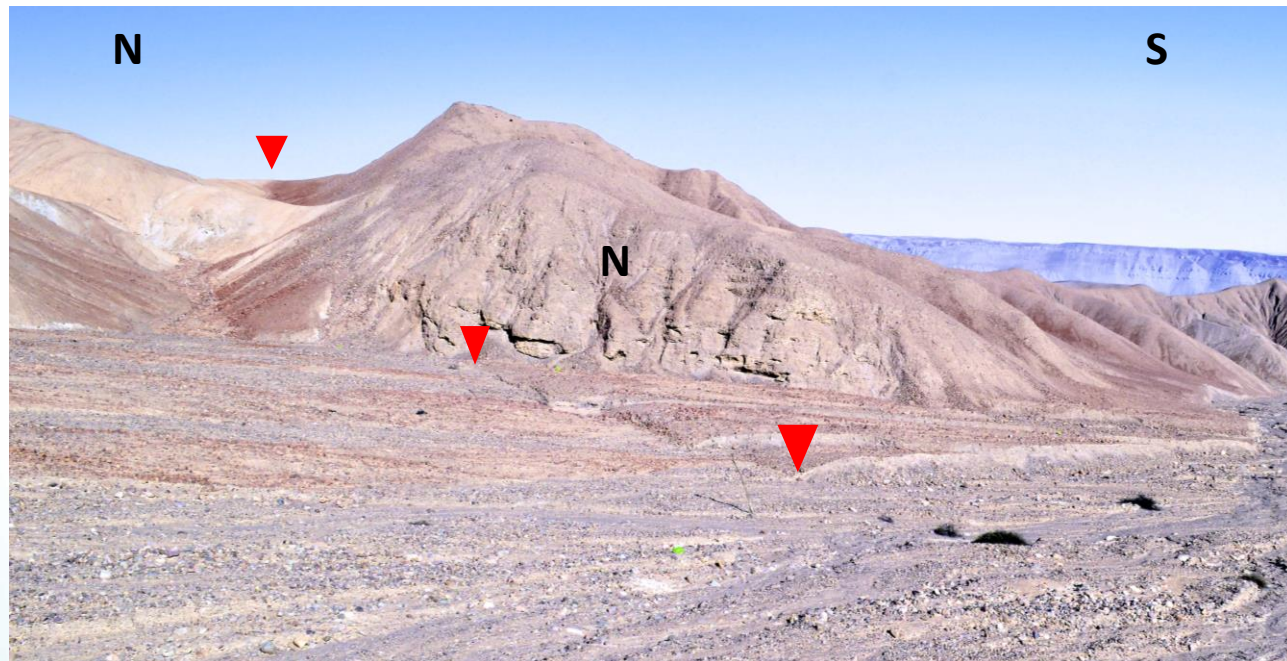
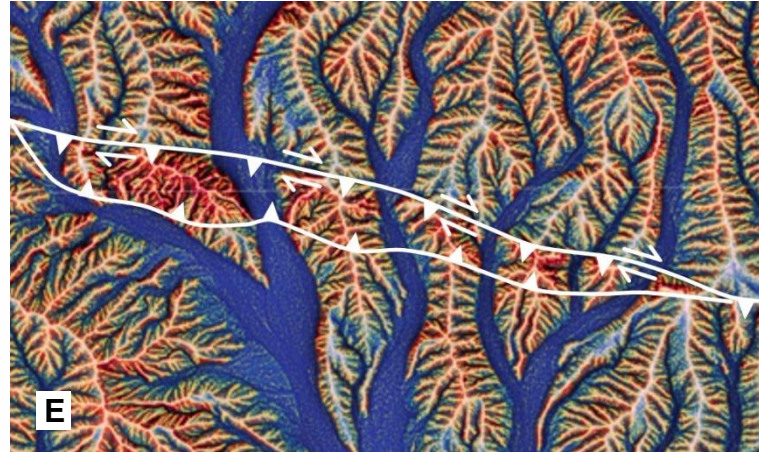
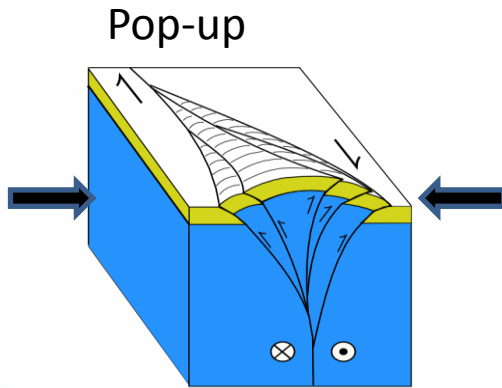


S





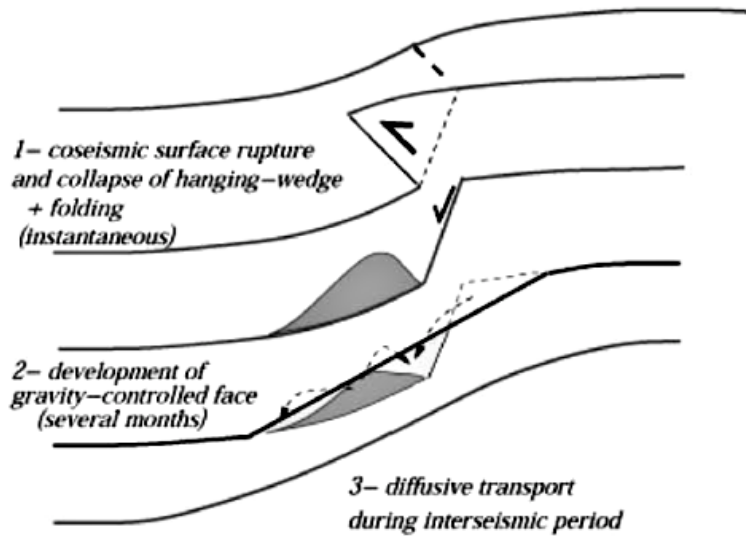




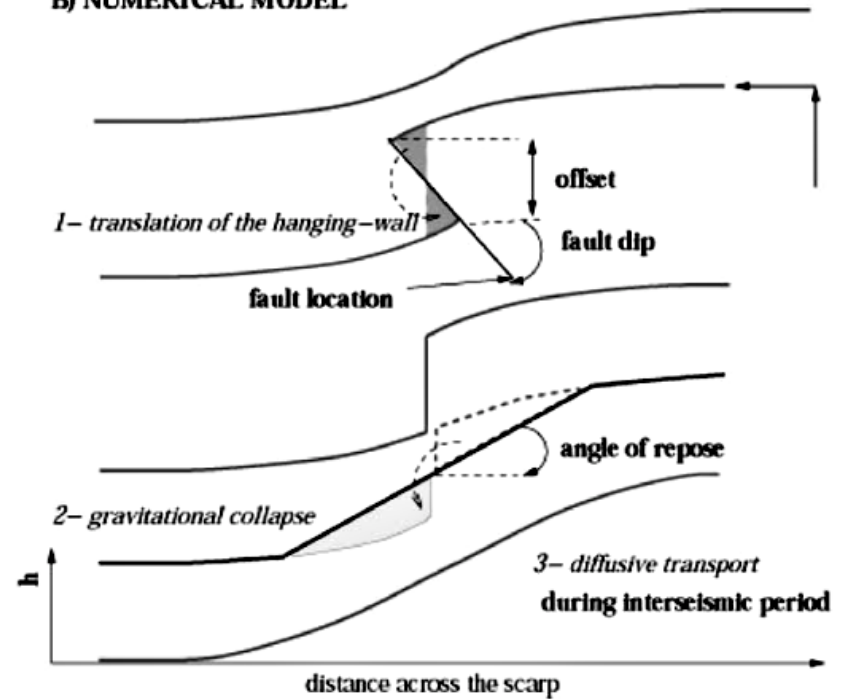


# Datación por morfometría

**A) NATURAL CASE**



**B) NUMERICAL MODEL**



Ecuación de continuidad para flujo de sedimentos (Culling, 1960)

$$q = kS$$

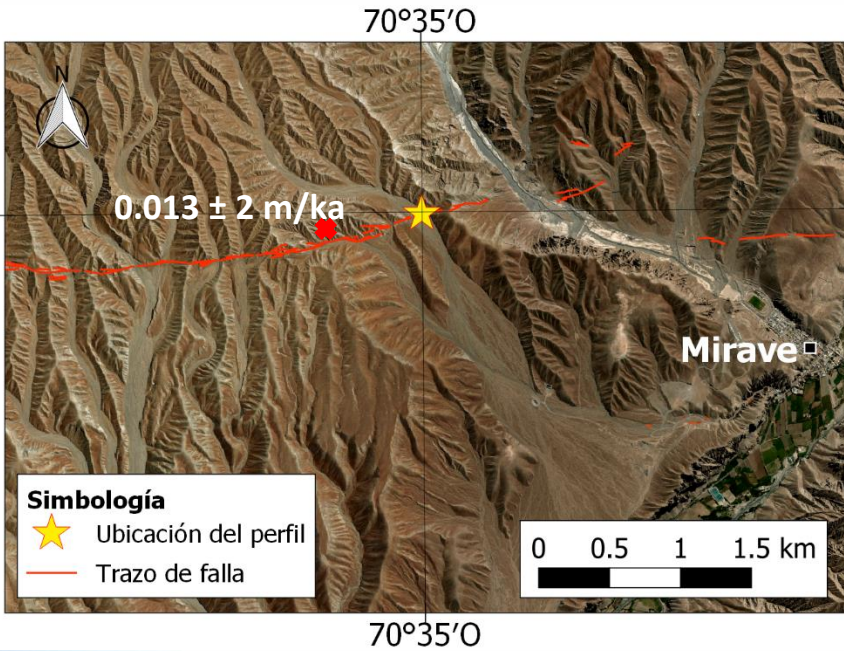
$q$  : flujo de sedimentos ( $m^2/ka$ )  
 $k$  : coeficiente de difusión ( $m^2/ka$ )  
 $S$  : pendiente local

Modelo de erosión por difusión del escarpe

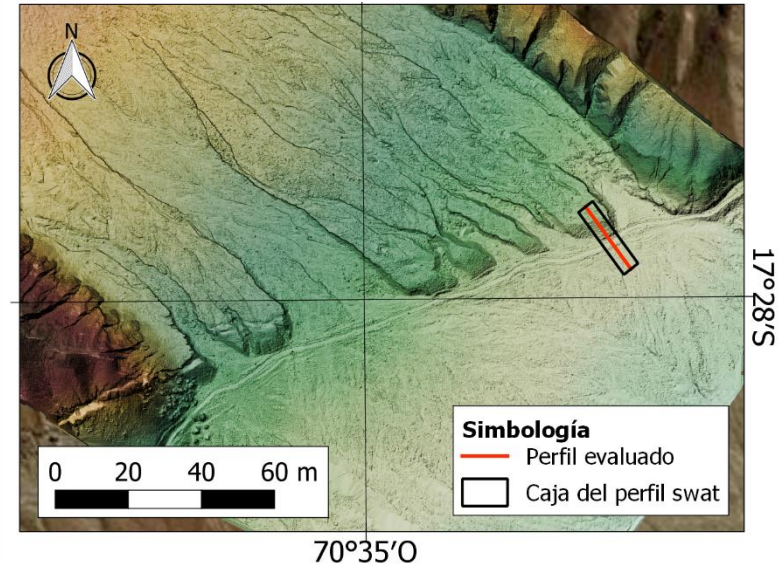
$$\frac{\partial h}{\partial t} = k \frac{\partial^2 h}{\partial x^2}$$

$h$  : elevación  
 $t$  : tiempo  
 $x$  : localización





**DEM LIDAR de 0.02 m/px de resolución**



Tasa de erosión ~0.013m/ka (Benavente et al., 2017)

$$k = \frac{E}{S} * l$$

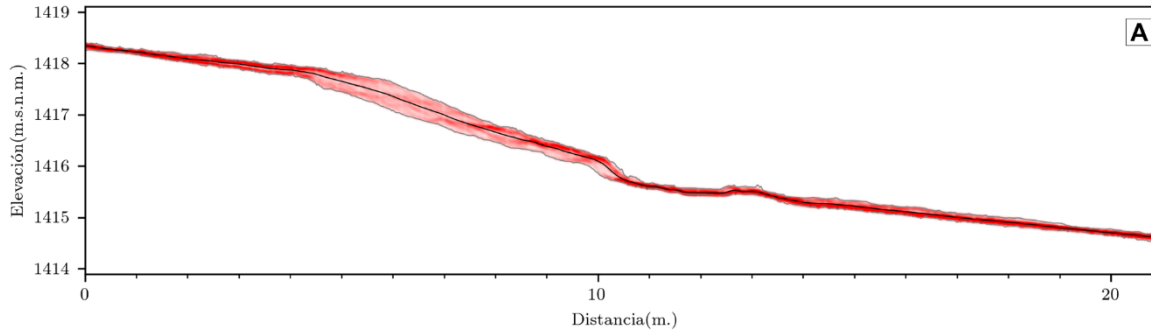
$$k = \frac{0.013}{0.58} \times 4.5$$

$$k = 0.1 \frac{m^2}{ka}$$

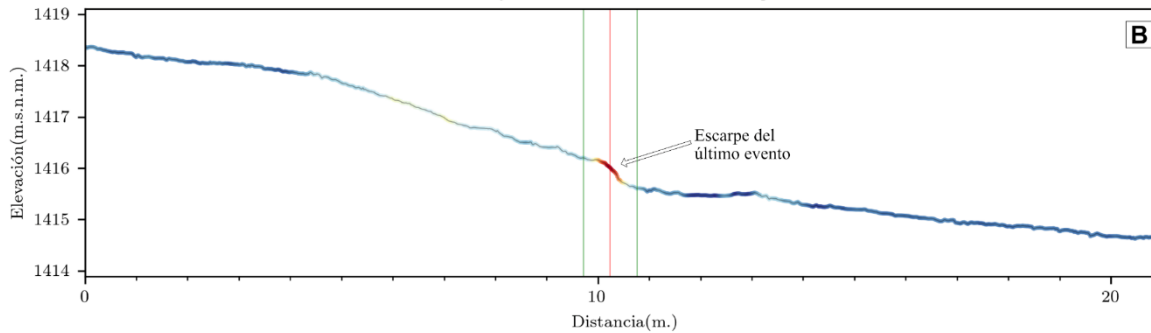
Fernandez y Dietrich (1997)



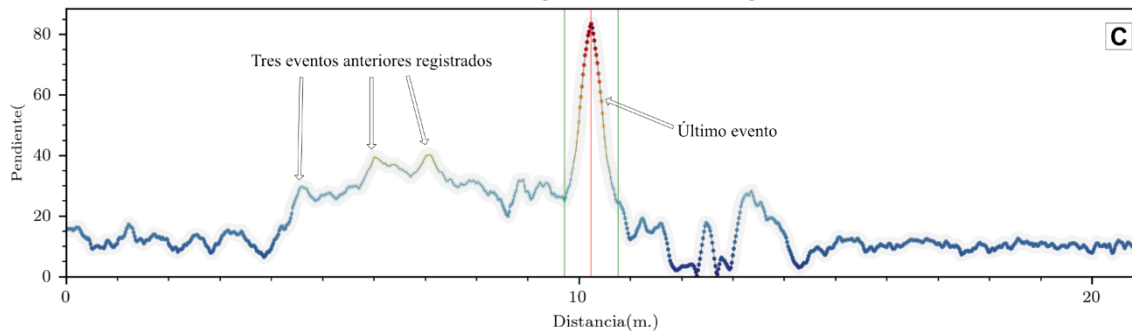
Estimación del perfil del escarpe, parámetros de la caja: celda=0.02m. ancho de la caja=3m.



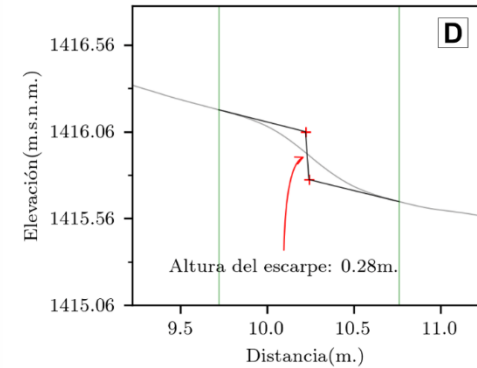
Perfil de elevación media del escarpe



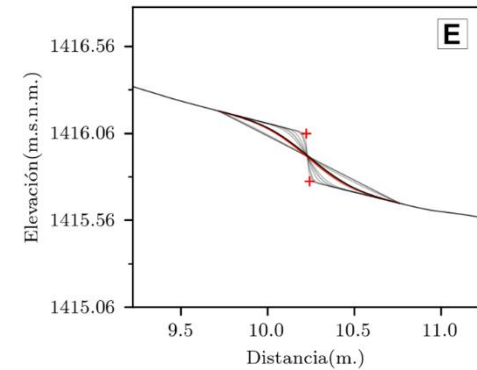
Análisis de pendientes sobre el escarpe



Estimación de la altura del escarpe



Difusión en: dx=0.02 k=0.1. Resultado: 177.20 +/- 17a



## Cálculo de la tasa de desplazamiento

$$Sr = \frac{280}{177.20}$$

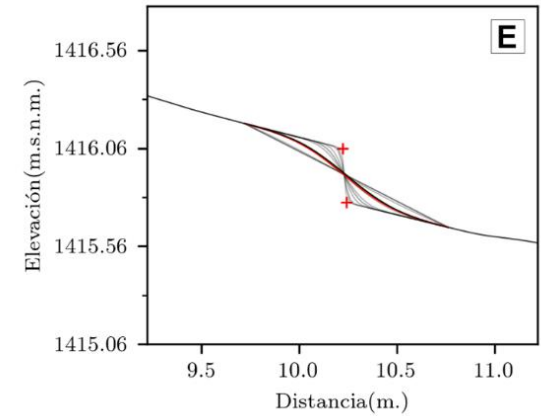
$$Sr = 1.58 \frac{mm}{año}$$



## Conclusiones

- La falla Purgatorio-Mirave es una falla activa

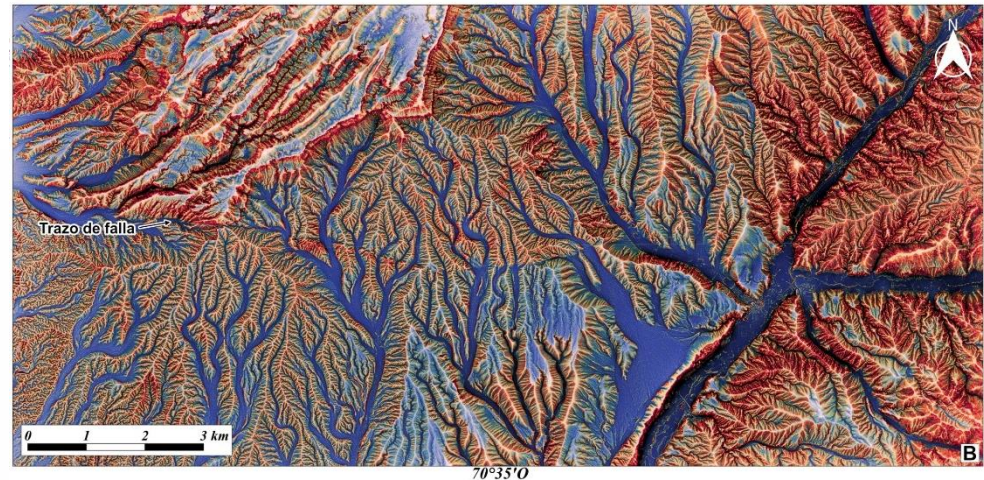
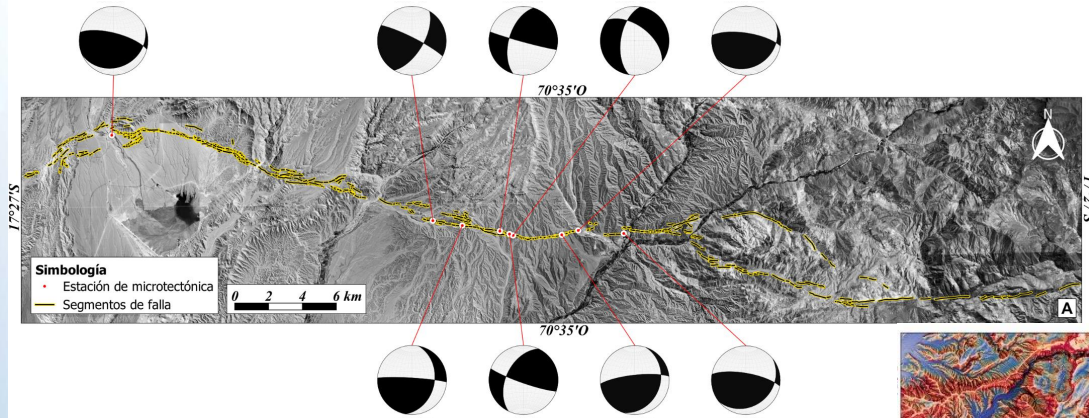
Difusión en:  $dx=0.02$   $k=0.1$ . Resultado:  $177.20 \pm 17a$





## Conclusiones

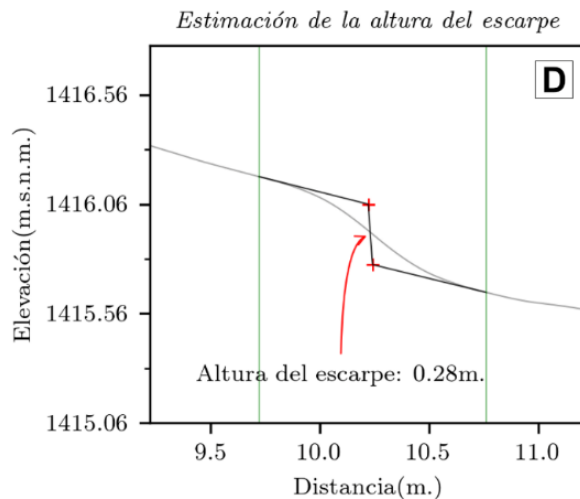
- La falla Purgatorio-Mirave es una falla transpresiva que impacta en el relieve.





## Conclusiones

- Los métodos morfométricos y morfotectónicos contribuyen con información importante para estos estudios, ya que es posible fechar y estimar las magnitudes máximas con que una falla se puede reactivar, en el caso de la falla Purgatorio-Mirave de hasta 7Mw.

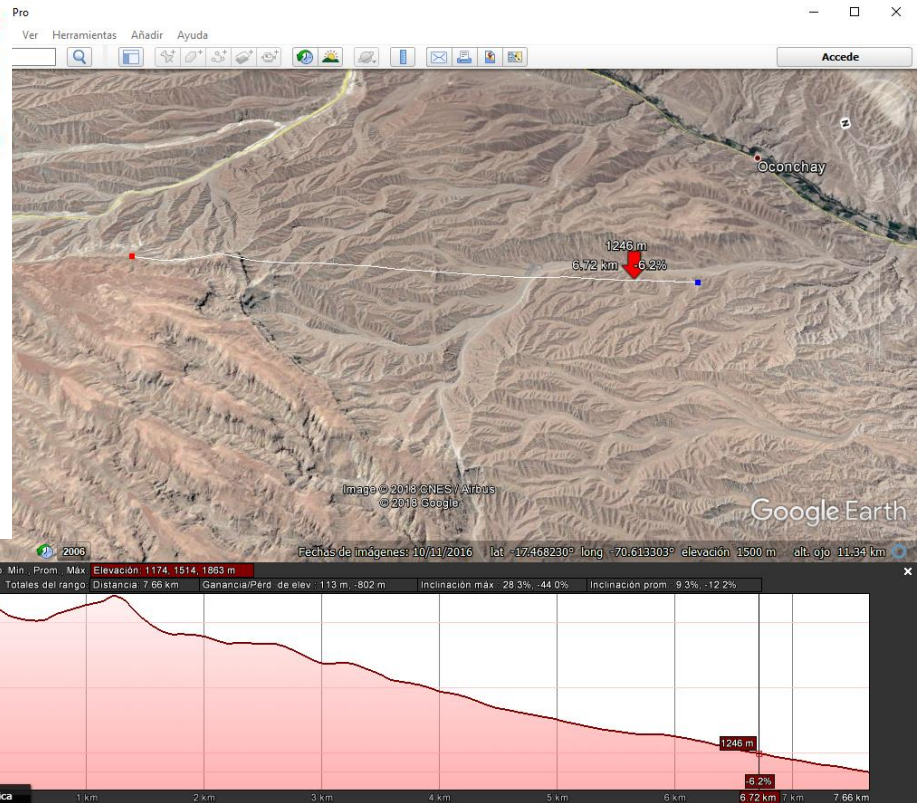
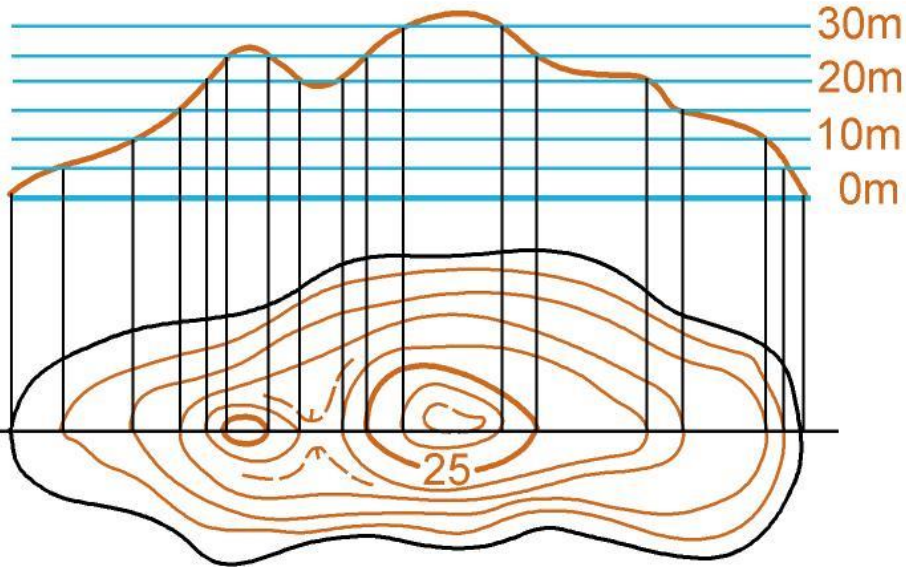




**GRACIAS**

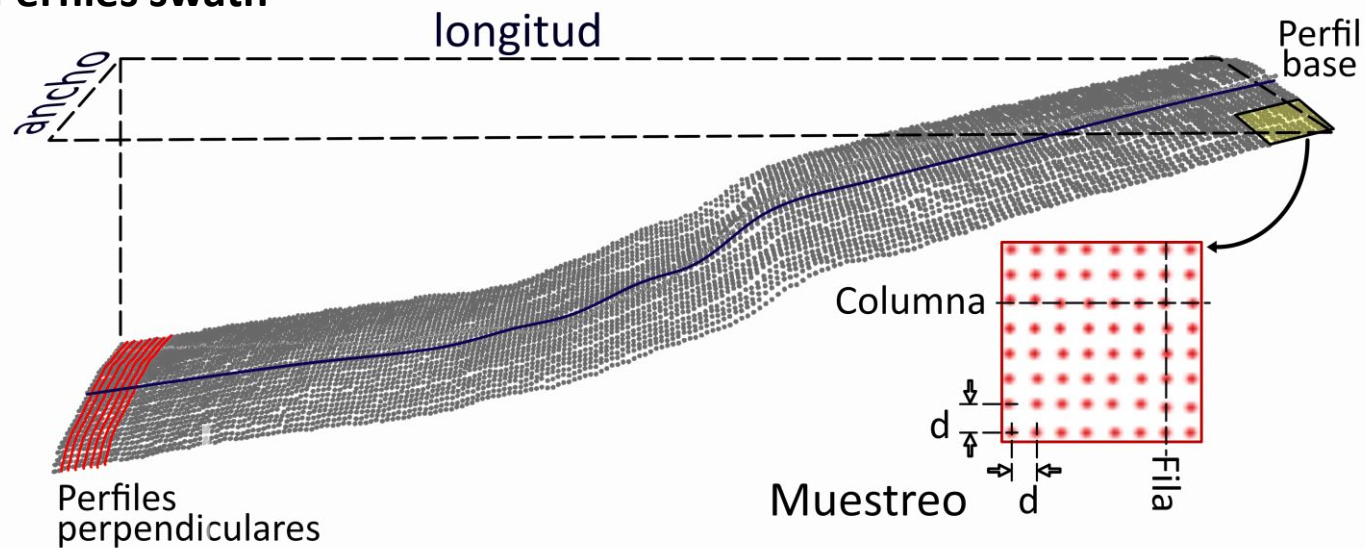


# Perfiles topográficos

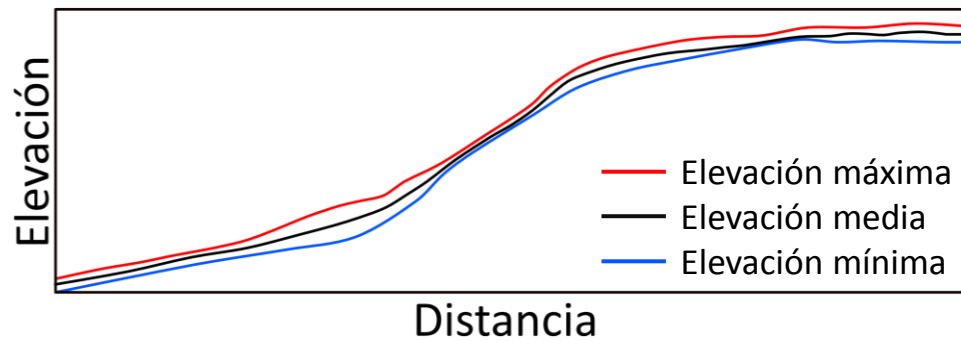




## Perfiles swath



## Perfil swath





$$M = 5,0 + 1,22 \log_{10}(LRS)$$

Wells y Coppersmith (1994)