Short-term and long-term erosion rates in Chile

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2 big questions in hydrology/geomorphology

How much do extreme hydrological events contribute to long-term erosion?

Kirchner et al., 2001
2 big questions

In which extent does long term erosion depend on climate?

3 articulos contradictarios en Nature en 2003

Stolar et al 06
Short term Erosion rates in the Andes
Chilean Data: DGA database 66 stations 4-45 years

Strong climatic gradient

Pepin et al, 2010
Short term erosion rates in Chile

Pepin et al, 2010 => slope and vegetation threshold
Cosmogenic Nuclides (10Be, 21Ne, etc....)

Lal, 1991 ; Brown et al., 1995 ; Granger et al., 1996
Method

\[ \langle \text{Erosion rate} \rangle \propto \frac{1}{\langle 10\text{Be} \rangle} \]

Total erosion
Integration over several 1ka $\Rightarrow$ long term
∼ 50 data
Short versus long term erosion rates in Chile

Figure 1
=> Increased contribution of extreme events toward aridity.
Conclusion

1. Climate effect: modulated by slope and vegetation thresholds => erosion max for temperate climate

2. Extreme events: increased contribution toward aridity => underestimation of long term erosion rate in arid climate using short-term measurements.