DATA REPOSITORY: Cosmogenic nuclide sample preparation

Sample preparation

Quartz was separated from samples and ^{10}Be isolated from the quartz at the Purdue Rare Isotope Measurement (PRIME) Lab using standard methods (Kohl and Nishiizumi, 1992; Clifton and Granger, 2005; Clifton et al., 2005). Sediment was sieved to a grain size of 0.25 – 0.5 mm in order to remove any windblown detritus. Following dissolution of any carbonates with concentrated HNO_3, samples were soaked overnight in a 50% HNO_3/HCl solution in order to remove any metals. Samples were then magnetically separated, typically leaving only quartz and feldspar, with minor amounts of accessory minerals (e.g. zircon, rutile). Samples were then split into ~75 gram fractions and subjected to at least three 10 hour leaches in a warm, continuously agitated 5% HF/HNO_3 solution. This treatment dissolves most of the feldspar grains, as well as etches the outside of the quartz grains in order to remove any potential contamination by meteoric ^{10}Be (Clifton and Granger, 2005). After rinsing and drying, heavy minerals were removed gravimetrically using lithium heteropolytungstate. Samples were then treated with a 1% HF/HNO_3 solution overnight in an ultrasonic bath. The resulting clean quartz was spiked with ~300 μg of ^{9}Be in a weak HNO_3 carrier solution and dissolved in a 5:1 solution of concentrated HF and HNO_3. After the quartz was completely dissolved, the resulting sample solution was evapoconcentrated, transferred to a platinum crucible, and dried. Fluorides were removed by fuming with concentrated H_2SO_4. The resulting sulfate cake was dissolved in concentrated HCl, transferred to a Teflon beaker, and dried. This chloride-form sample cake was dissolved in oxalic acid and Be isolated by standard ion chromatography methods according to von Blanckenburg et al. (1996) and Clifton et al. (2005). Beryllium hydroxide was then precipitated at pH ~9 using NH_4OH in the presence of EDTA, centrifuged and rinsed three times, loaded into quartz crucibles, dried, and then oxidized to BeO at 1100˚C for one hour. The BeO was then crushed, mixed with niobium powder, and loaded into stainless steel holders for analysis by accelerator mass spectrometry (AMS). AMS measurements of $^{10}Be/^{9}Be$ were made at PRIME Lab against standards prepared by K. Nishiizumi.

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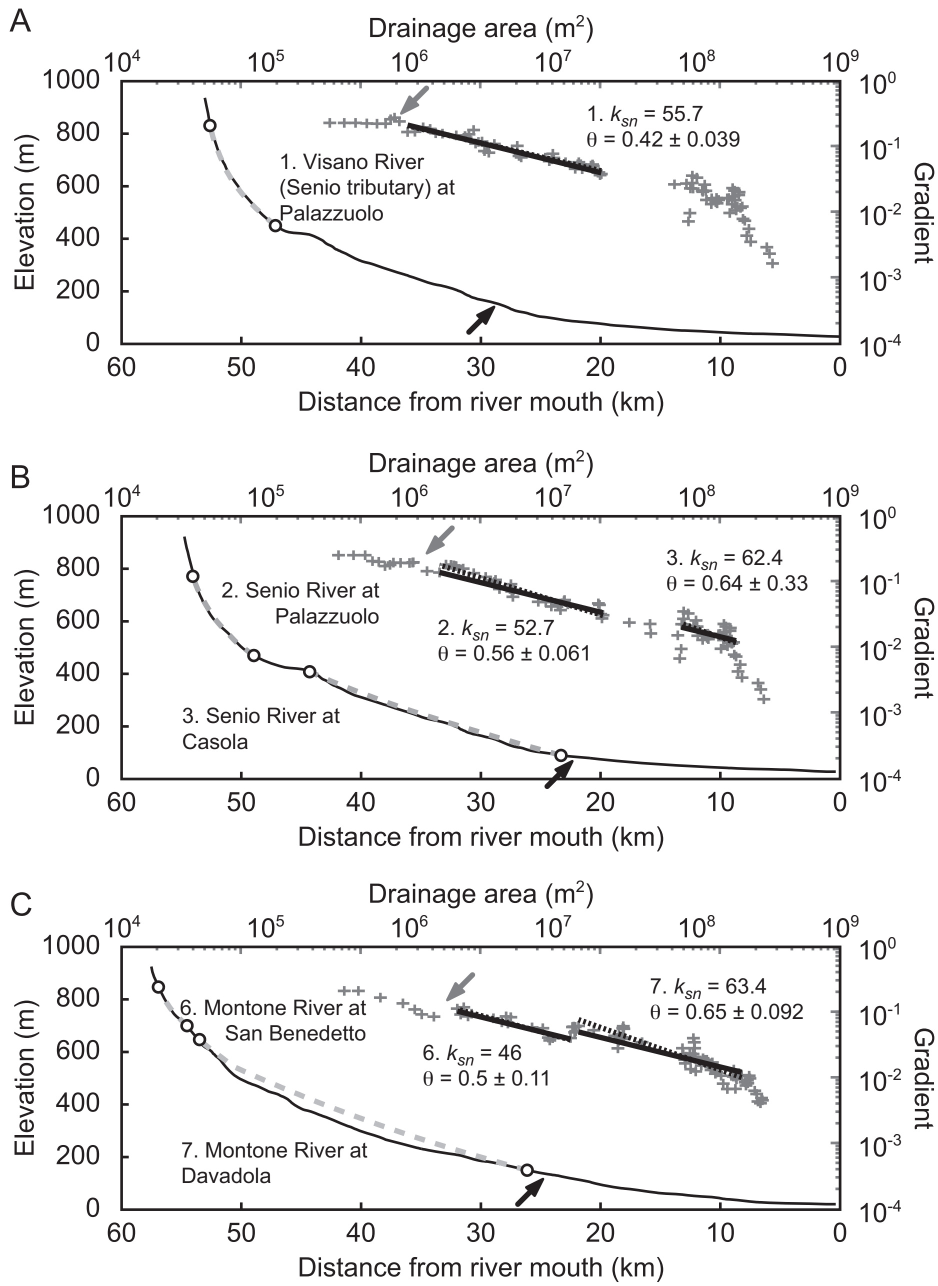
Figure DR1. Channel profiles and slope-area data for streams in the Romagna Apennines. See Figure 2 for description of symbols.

Figure DR2. Channel profiles and slope-area data for streams in the Peloritani Mountains. See Figure 2 for description of symbols.

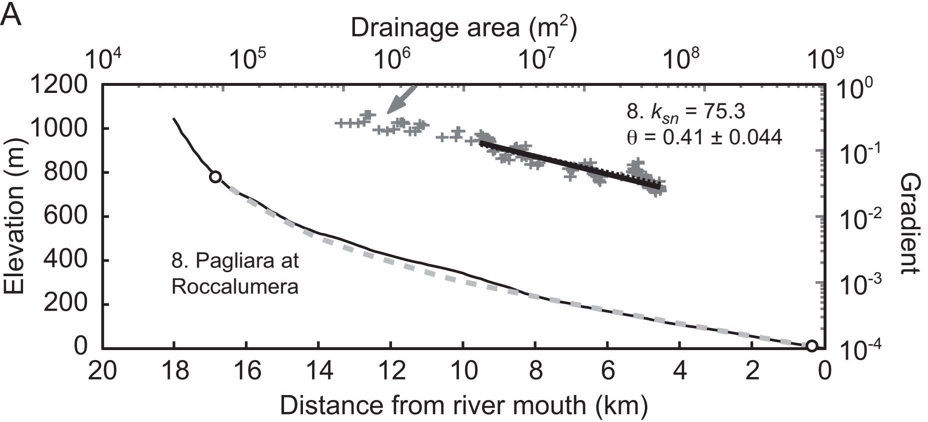
Figure DR3. Channel profiles and slope-area data for streams in the Aspromonte Massif. See Figure 2 for description of symbols.

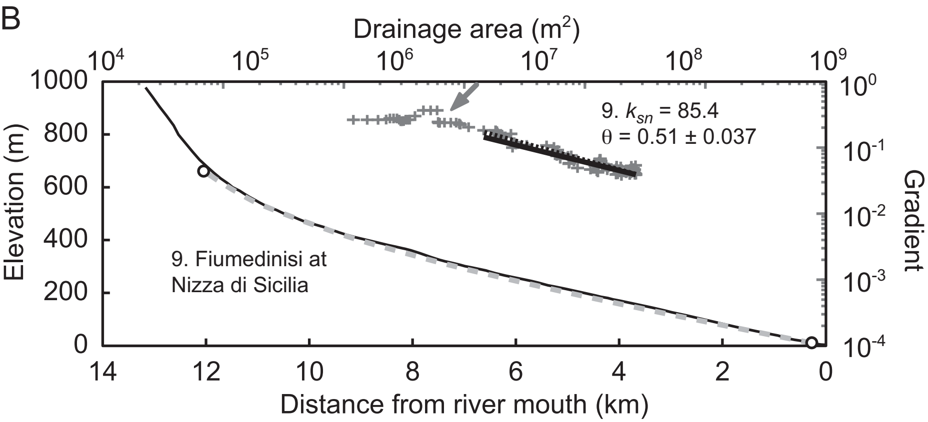
Figure DR4. Comparison of k_{sn} values calculated using a range of θ_{ref} (from 0.2 to 0.7) to rock uplift rates in the Romagna Apennines (filled diamonds) and Peloriatni/Aspromonte (open diamonds). Regressions assume a linear relationship between k_{sn} and rock uplift rate.

Cyr, Granger, Olivetti, and Molin (L96) - Figure DR1

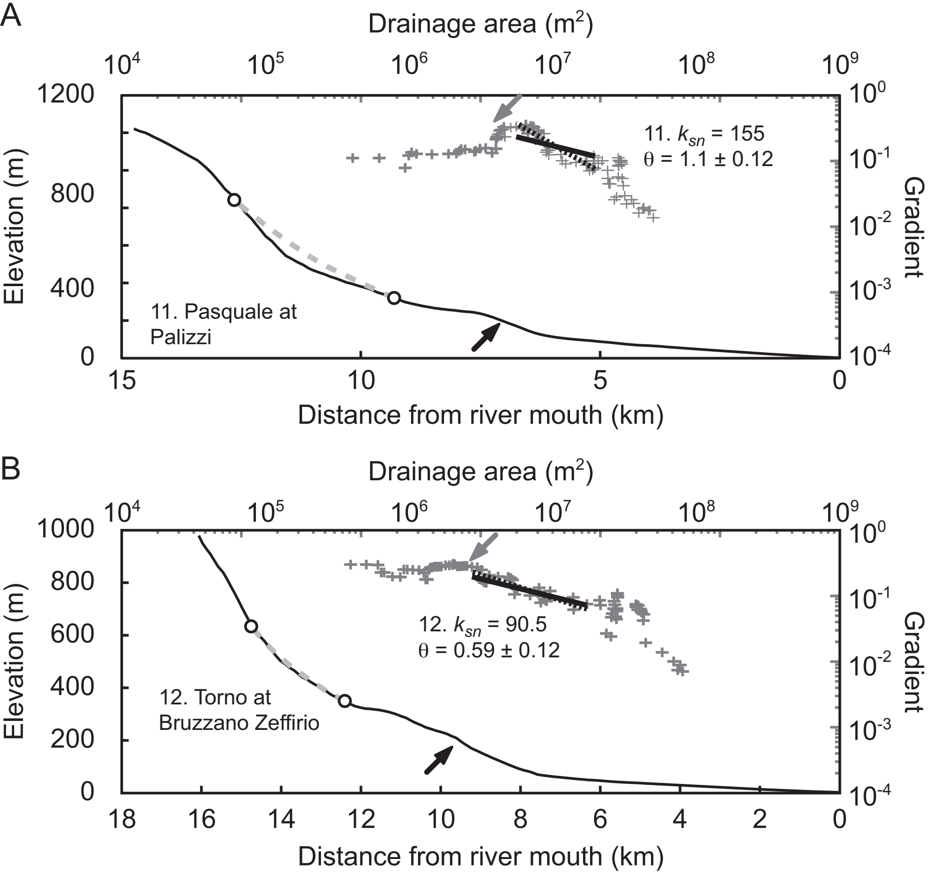


Cyr, Granger, Olivetti, and Molin (L96) - Figure DR2

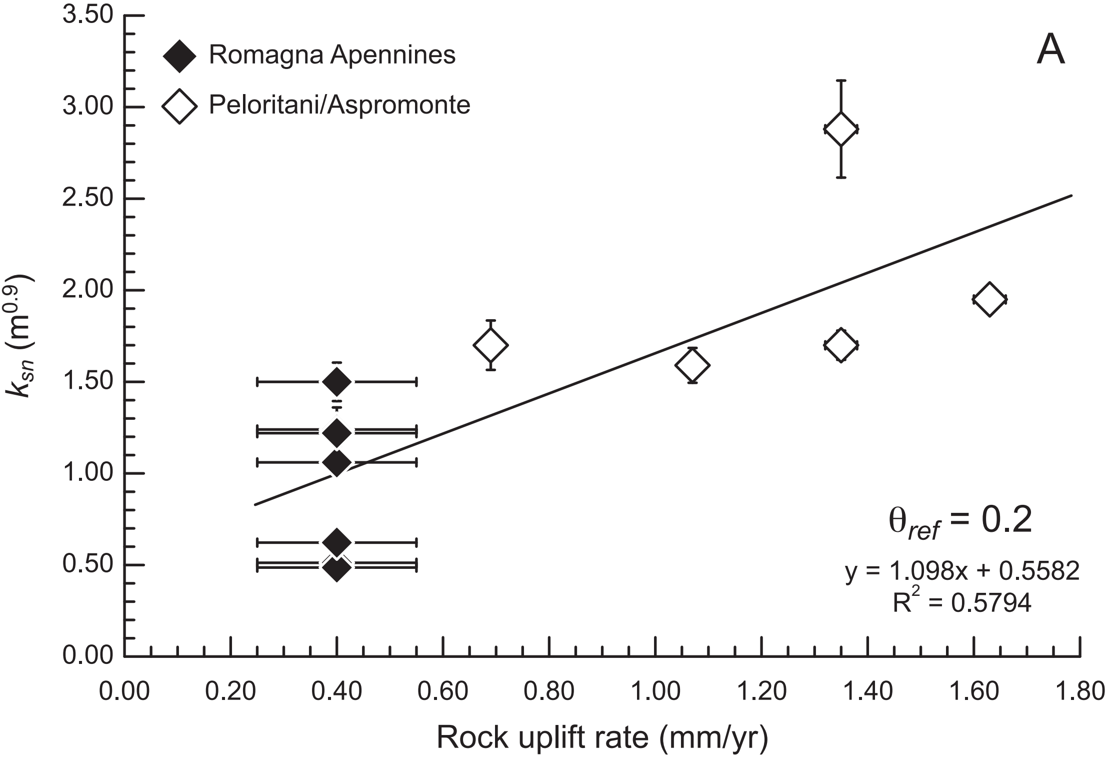


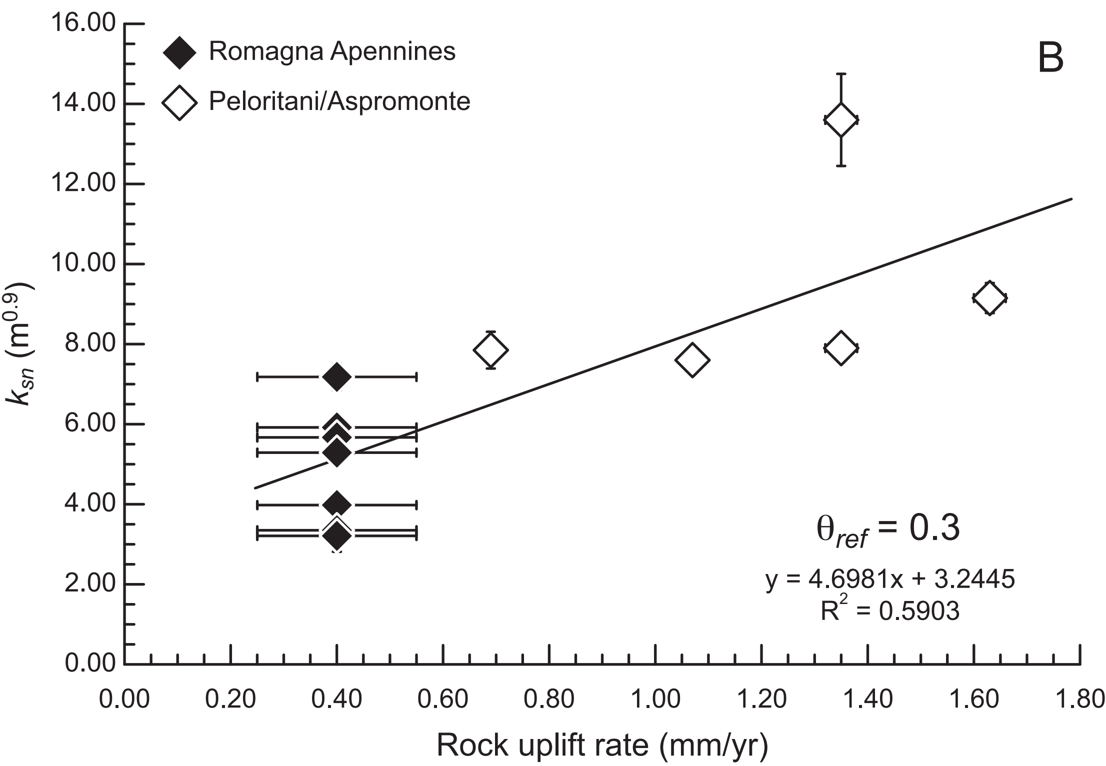


Cyr, Granger, Olivetti, and Molin (L96) - Figure DR3

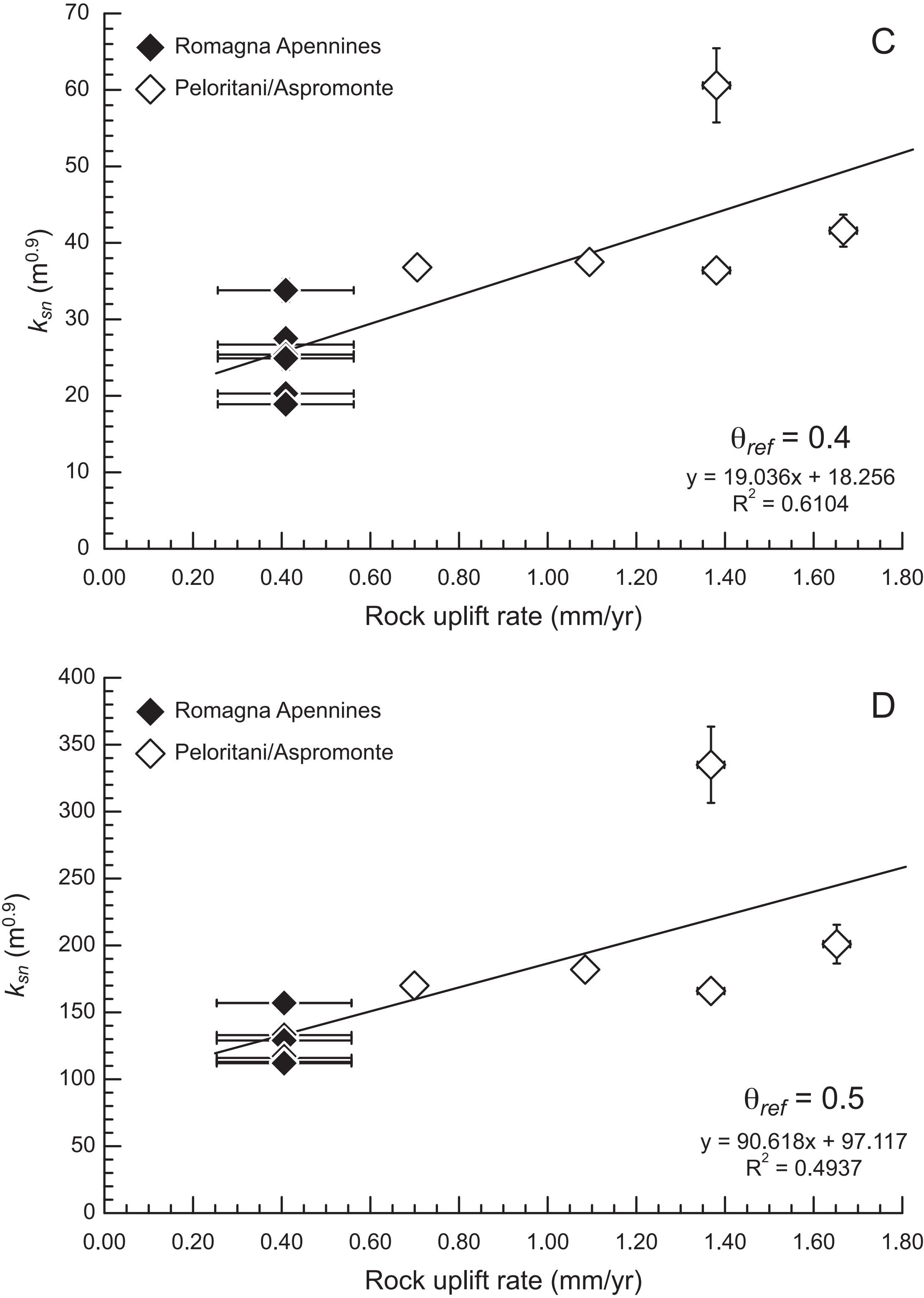


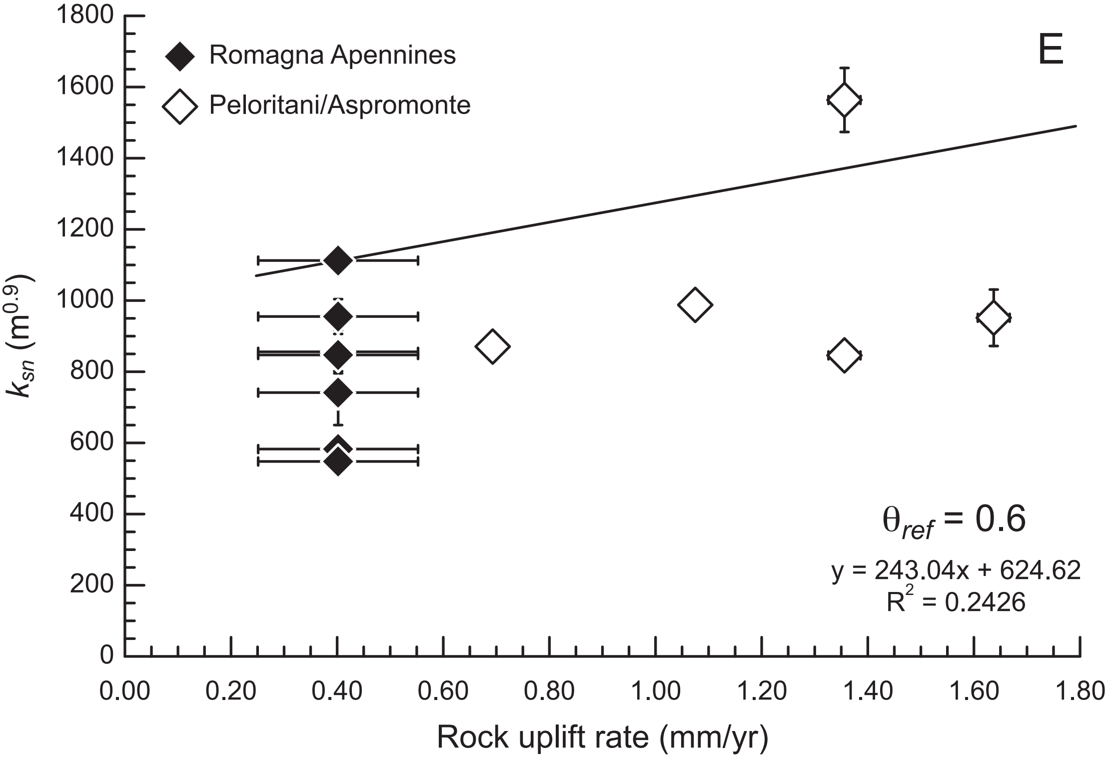
Cyr, Granger, Olivetti, and Molin (L96) -Figure DR4





Cyr, Granger, Olivetti, and Molin (L96) -Figure DR4




E
Romagna Apennines
Peloritani/Aspromonte
θ_{ref} = 0.6
y = 243.04x + 624.62
R^2 = 0.2426
k_{sn} ($m^{0.9}$)
Rock uplift rate (mm/yr)
0
200
400
600
800
1000
1200
1400
1600
1800
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80

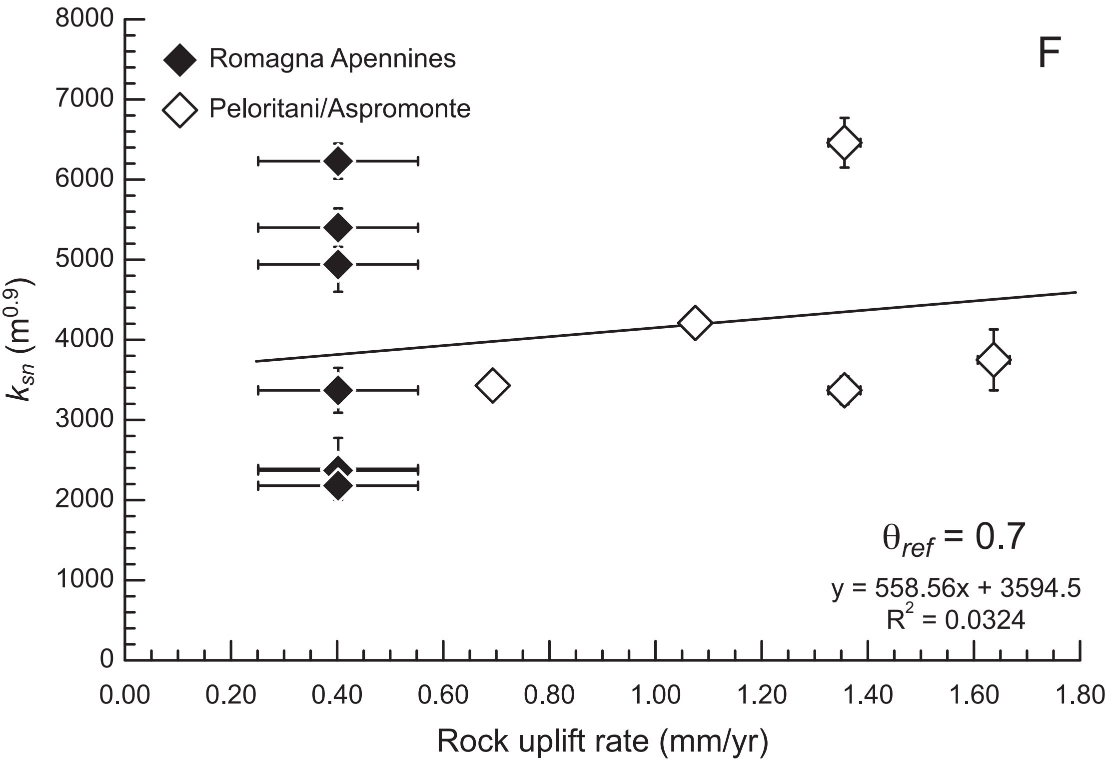

F
Romagna Apennines
Peloritani/Aspromonte
θ_{ref} = 0.7
y = 558.56x + 3594.5
R^2 = 0.0324
k_{sn} ($m^{0.9}$)
Rock uplift rate (mm/yr)
0
1000
2000
3000
4000
5000
6000
7000
8000
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80

TABLE DR1. SEA LEVEL-HIGH LATITUDE PRODUCTION RATE CONSTANTS FOR CALCULATION OF COSMOGENIC NUCLIDE EROSION RATES

Physical Constants	
^{10}Be radioactive mean life, τ	1.96 ± 0.10 Myr
Rock density, ρ	2.6 g/cm^3
SLHL production rates	
P_n	4.350 at/g (quartz)/yr
$P_{\mu 1}$	0.084 at/g (quartz)/yr
$P_{\mu 2}$	0.018 at/g (quartz)/yr
$P_{\mu 3}$	0.022 at/g (quartz)/yr
Attenuation Lengths	
Λ_n	160.0 g/cm^2
L_1	738.6 g/cm^2
L_2	2688.0 g/cm^2
L_3	4360.0 g/cm^2

TABLE DR2. NORMALIZED CHANNEL STEEPNESS INDICES CALCULATED FOR A RANGE OF REFERENCE CONCAVITIES

River (river at location)*	Rock uplift rate (mm/yr)	Reference Concavity (θ_{ref}) 0.2	0.3	0.4	0.45	0.5	0.6	0.7
Romagna Apennines								
1. Visano at Palazzuolo	0.40 ± 0.15	1.220 ± 0.07	5.920 ± 0.245	26.7 ± 0.5	55.7 ± 0.5	116.0 ± 2.5	518.0 ± 18.0	2370 ± 145
2. Senio at Palazzuolo	0.40 ± 0.15	1.240 ± 0.12	5.670 ± 0.390	25.4 ± 1.0	52.7 ± 1.4	112.0 ± 2.0	487.0 ± 9.0	2180 ± 100
3. Senio at Casola	0.40 ± 0.15	0.622 ± 0.03	3.980 ± 0.185	24.9 ± 1.1	62.4 ± 1.3	157.0 ± 5.0	989.0 ± 31.0	6230 ± 220
4. Lamone at Biforco	0.40 ± 0.15	1.500 ± 0.11	7.180 ± 0.335	33.8 ± 1.5	58.9 ± 0.7	157.0 ± 5.0	753.0 ± 40.5	3370 ± 280
5. Lamone at San Eufemia	0.40 ± 0.15	0.486 ± 0.06	3.21 ± 0.395	18.9 ± 0.9	63.7 ± 1.5	113.0 ± 8.5	761.0 ± 54.0	4940 ± 340
6. Montone at San Benedetto	0.40 ± 0.15	1.060 ± 0.04	5.29 ± 0.320	25.4 ± 2.0	46.0 ± 1.0	129.0 ± 12.5	659.0 ± 81.0	2390 ± 385
7. Montone at Davadola	0.40 ± 0.15	0.512 ± 0.04	3.35 ± 0.270	20.3 ± 1.25	63.4 ± 2.0	133.0 ± 8.0	849.0 ± 43.5	5400 ± 240
Peloritani/Aspromonte								
8. Pagliara at Roccalumera	1.07 ± 0.02	1.590 ± 0.095	7.600 ± 0.300	37.5 ± 1.0	75.3 ± 1.0	182.0 ± 2.0	878.0 ± 12.0	4210 ± 120
9. Fiumedinisi at Nizza di Sicilia	1.63 ± 0.03	1.950 ± 0.065	9.150 ± 0.375	41.6 ± 2.1	85.4 ± 0.5	201.0 ± 14.5	846.0 ± 70.5	3750 ± 380
10. San Elia at Pentedatillo	1.35 ± 0.03	1.700 ± 0.08	7.900 ± 0.230	36.4 ± 0.5	81.8 ± 0.8	166.0 ± 3.0	752.0 ± 26.0	3370 ± 175
11. San Pasquale at Palizzi	1.35 ± 0.03	2.880 ± 0.27	13.60 ± 1.15	60.6 ± 4.85	155.0 ± 5.4	335.0 ± 28.5	1390.0 ± 80.0	6460 ± 310
12. Torno at Burzzano Zeffirio	0.69 ± 0.02	1.700 ± 0.14	7.85 ± 0.46	36.8 ± 1.45	90.5 ± 11.5	170.0 ± 5.0	774.0 ± 14.5	3430 ± 65

*Location is name of town nearest to where sample was collected, according to the Millennial edition of the Atlante stradale d'Italia, published by the Touring Club Italiano