Supplement of

Modelling the effect of catena position and hydrology on soil chemical weathering

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**Table S1**: Profile SC4. Description of the horizons.

| Depth (cm) | Horiz. | Description |
|------------|--------|-------------|
| 0-18       | A      | Colour 7.5YR 4/3; Brown; Sandy clay; structure granular, size very fine to fine; soft; few pores, very fine, irregular; few roots, very fine, distributed throughout the horizon; boundary abrupt and smooth. |
|            |        | Colour 10YR 5/8; Yellowish Brown; Sandy clay; structure granular, size very fine to fine; soft; few pores, very fine, irregular; few roots, very fine to coarse, distributed throughout the horizon; boundary gradual to wavy; 2% igneous rocks fragments partly weathered, discoidal and subangular, size gravel; mottles of krotovina 2-3 cm diameter; preferential routes of infiltration. |
| 18-44      | B      | Colour 10YR 6/6; Brownish Yellow; unweathered parent material with oxidation of manganese, some yellow-grey mottles, abundant dark Mn mottles. |

*a* Munsell reading was taken on moist soil.

**Table S2**: Profile SC5. Description of the horizons.

| Depth (cm) | Horiz. | Description |
|------------|--------|-------------|
| 0-18       | A      | Colour 7.5YR 3/4; Dark Brown; Sandy loam; structure subangular, size very fine to coarse; soft; few pores, very fine, irregular; common roots, very fine to very coarse, distributed throughout the horizon; boundary abrupt and wavy; 2% igneous rocks fragments, subprismoidal and angular, fine-medium gravel. |
|            |        | Colour 5YR 4/6; Yellowish Red; Sandy loam; structure granular, size medium to coarse; soil loose; no pores; common roots, very fine to very coarse, distributed throughout the horizon; boundary abrupt and wavy; horizon very weathered, no igneous rocks fragments. |
| 18-60      | B      | Colour 10YR 5/6; Yellowish Brown; unweathered parent material; mottles of manganese; very few roots, very fine to very coarse, between peds. |

*a* Munsell reading was taken on moist soil.

**Table S3**: Profile SC6. Description of the horizons.

| Depth (cm) | Horiz. | Description |
|------------|--------|-------------|
| 0-55       | A      | Colour 7.5YR 2,5/2; Very Dark Brown; Sandy loam; structure granular, size medium to coarse; soft; moderately few pores, very fine to medium, irregular; common roots, very fine to very coarse, distributed throughout the horizon; boundary diffuse and smooth; 5-10% igneous rocks fragments, discoidal and angular, gravel to cobbles. |
| 55-95      | B      | Colour 7.5YR 4/3; Brown; loamy sand; structure granular, size medium to very coarse; slightly hard; moderately few pores, very fine to medium, irregular; moderately few roots, very fine to very coarse, distributed throughout the horizon; 20-25% igneous rocks fragments, subdiscoidal and angular, gravel to boulders. |

*a* Munsell reading was taken on moist soil.

**Table S4**: Profile SC7. Description of the horizons.

| Depth (cm) | Horiz. | Description |
|------------|--------|-------------|
| 0-45       | A      | Colour 7.5YR 2,5/2; Very Dark Brown; loamy sand; structure subangular, size fine to medium; soft; moderately few pores, very fine to medium, irregular; common roots, very fine to very coarse, distributed throughout the horizon, boundary diffuse and smooth; 5-10% igneous rocks fragments, discoidal and very angular, gravel. |
| 45-97      | B      | Colour 7.5YR 4/3; Brown; loamy sand; structure granular, size medium to very coarse; soft; moderately few pores, very fine to medium, irregular; moderately few roots, very fine to coarse, distributed throughout the horizon; boundary gradual and wavy; 15-20% igneous rocks fragments, discoidal and very angular, gravel to stones; two large stones, spherical and subangular, the first (30x25 cm) between 45-60 cm depth, the second (40x22 cm) between 60-83 cm depth. |
| 97-160     | C      | Colour 2.5Y 5/3; Light Olive Brown; sand; soil loose; no pores; very few roots, medium, between peds; very weathered horizon, igneous rocks fragments laminated; mottles black and orange. |

*a* Munsell reading was taken on moist soil.
Tables S5: Profile SC8. Description of the horizons.

| Depth (cm) | Horiz. | Description |
|------------|--------|-------------|
| 0-14       | A      | Colour 7.5YR 3/1; Very Dark Gray; loamy sand; structure subangular, size fine to medium; slightly hard; few pores, very fine to very coarse, irregular; common roots, very fine to very coarse, distributed throughout the horizon; boundary clear and wavy; 15% igneous rocks fragments, discoidal and very angular, coarse gravel. |
| 14-47      | B      | Colour 10YR 5/6; Yellowish Brown; Sandy loam; structure subangular; size medium to coarse; slightly hard; few pores, very fine to very coarse, irregular; common roots, very fine to very coarse, distributed throughout the horizon; boundary abrupt and irregular; 2-5% igneous rocks fragments, discoidal and very angular, medium gravel. |
| 47-240     | C      | Colour 7.5YR 5/8; Strong Brown; sand; moderately hard; few pores, very fine to very coarse, irregular; common roots, very fine to very coarse, distributed throughout the horizon; slightly weathered igneous rocks fragments, coarse to very coarse, manganese coating between the fragments. |

a Munsell reading was taken on moist soil.

Table S6: Profile SC9. Description of the horizons.

| Depth (cm) | Horiz. | Description |
|------------|--------|-------------|
| 0-19       | A      | Colour 7.5YR 2.5/3; Very Dark Brown; Sandy loam; structure subangular, size medium to coarse; slightly hard; few pores, very fine, irregular; common roots, very fine to coarse, distributed throughout the horizon, boundary abrupt and wavy; 2-5% igneous rocks fragments, discoidal and very angular, size gravel to cobbles. |
| 19-57      | B      | Colour 7.5YR 4/6; Strong Brown; loamy sand; structure subangular; size very fine to fine; soft; few pores, very fine, irregular; common roots, very fine to coarse, distributed throughout the horizon; boundary abrupt and irregular; 2-5% igneous rocks fragments, discoidal and very angular, fine gravel. |
| 57-137     | C      | Colour 7.5YR 6/8; Reddish Yellow; sand; structure massive; size medium; slightly hard; few pores, very fine, irregular; common roots, very fine to coarse, distributed throughout the horizon; very weathered igneous rocks fragments (parent material). |

a Munsell reading was taken on moist soil.

Table S7: Profile SC10. Description of the horizons.

| Depth (cm) | Horiz. | Description |
|------------|--------|-------------|
| 0-12.5     | A      | Colour 7.5YR 3/4; Dark Brown; loamy sand; structure subangular, size medium to coarse; soft; few pores, very fine, irregular; common roots, very fine to fine, distributed throughout the horizon; boundary very abrupt and wavy; 0-2% igneous rocks fragments, discoidal and very angular, gravel. |
| 12.5-51    | B      | Colour 7.5YR 7/8; Reddish Yellow; Sandy clay; structure massive, size medium to coarse; moderately hard; few pores, very fine, irregular; few roots, very fine to coarse, distributed throughout the horizon. |
| 51-73      | C1     | Colour 7.5YR 5/6; Strong Brown; sand; structure massive; unit soil loose; few pores, very fine, irregular; few roots, very fine to coarse, distributed throughout the horizon; boundary gradual and smooth; 0-2% igneous rocks fragments, discoidal and very angular, gravel, clay accumulation surfaces above fragments, accumulation of roots in water channels. |
| 73-100     | C2      | Colour 7.5YR 6/8; Reddish Yellow; sand; structure massive; unit soil loose; few pores, very fine, irregular; few roots, very fine to coarse, distributed throughout the horizon; 0-2% igneous rocks fragments, discoidal and very angular, parental material; clay accumulation surfaces above fragments, preference routes roots accumulation presence of water canals. |

a Munsell reading was taken on moist soil.
Table S8: Physical and Chemical characteristics of soil profiles (SC4-SC10).

| Profile | Profile Photo | Horizon | Depth cm | pH_{w,1} | CaCO₃ % | OC % | Exchangeable cations (cmol_+(kg⁻¹)) | CEC (cmol_+(kg⁻¹)) | Sand % | Silt % | Clay % |
|---------|---------------|---------|----------|-----------|----------|------|-----------------------------------|------------------|--------|--------|--------|
| SC4     |               | A       | 0-18     | 5.7       | 0        | 1.3  | Ca  | Mg  | Na  | K  | B  | 18-44 |
|         |               | B       | 18-64    | 5.9       | 0        | 0.28 | 0.9 | 1.1 | 0.38 | 0.24 | 8.7 | 73.2  |
|         |               | C       | 44-110   | 6.1       | 0        | 0.1  | 5.8 | 1.9 | 0.37 | 0.12 | 8.3 | 77.1  |
| SC5     |               | A       | 0-18     | 6.0       | 0        | 0.05 | 8.7 | 1.6 | 0.4  | 0.2  | 10.9 | 75.7  |
|         |               | B       | 18-60    | 6.2       | 0        | 0.23 | 21.0| 2.4 | 0.4  | 0.15 | 14.0 | 85.7  |
|         |               | C       | 60-100   | 5.9       | 0        | 0.12 | 10  | 3   | 0.5  | 0.15 | 13.6 | 86.4  |
| SC6     |               | A       | 0-55     | 6.6       | 0.1     | 0.7  | 10.5| 2.6 | 0.5  | 0.2  | 13.7 | 69.5  |
|         |               | B       | 55-95    | 7.4       | 0.05    | 0.2  | 9.2 | 3.7 | 0.7  | 0.1  | 11.7 | 74.9  |
| SC7     |               | A       | 0-45     | 6.3       | 0        | 0.9  | 9.2 | 2.3 | 0.9  | 0.2  | 12.7 | 73.5  |
|         |               | B       | 45-97    | 6.7       | 0        | 0.3  | 8   | 2.6 | 0.8  | 0.1  | 11.7 | 73.9  |
|         |               | C       | 97-160   | 7.0       | 0        | 0.1  | 12.4| 5.1 | 0.6  | 0.1  | 18.3 | 74.8  |
| SC8     |               | A       | 0-14     | 6.21      | 0        | 1.6  | 12.3| 0.98| 0.7  | 0.35 | 14.4 | 75.7  |
|         |               | B       | 14-47    | 6.4       | 0        | 0.3  | 20.4| 3.4 | 0.7  | 0.2  | 24.7 | 56.5  |
|         |               | C       | 47-240   | 6.1       | 0        | 0.2  | 20.4| 5.6 | 0.8  | 0.2  | 27   | 52.4  |
| SC9     |               | A       | 0-19     | 5.8       | 0        | 1.5  | 10.3| 2.4 | 0.7  | 0.5  | 15.7 | 71.7  |
|         |               | B       | 19-57    | 6.3       | 0        | 0.3  | 9.1 | 2.1 | 0.7  | 0.2  | 12.2 | 76.1  |
|         |               | C       | 57-137   | 6.7       | 0        | 0.1  | 8.2 | 3.9 | 0.7  | 0.2  | 11   | 81.1  |
| SC10    |               | A       | 0-12.5   | 6.8       | 0        | 2.75 | 14.4| 1.6 | 0.6  | 0.5  | 6.3  | 68.5  |
|         |               | B       | 12.5-51  | 6.2       | 0        | 0.24 | 9.5 | 1.3 | 0.3  | 0.3  | 11.8 | 84.2  |
|         |               | C1      | 51-73    | 6.6       | 0        | 0.18 | 9.2 | 1.8 | 0.7  | 0.2  | 11.9 | 86.3  |
|         |               | C2      | 75-100   | 6.7       | 0        | 0.1  | 8.13| 2.7 | 0.6  | 0.2  | 11.6 | 89.5  |
Figure S1: X-ray patterns of the powdered rock samples. C-V: Chlorite-Vermiculite intergrade; F: Feldspar (Orthoclase, Plagioclase); K: Kaolinite; M: Mica; Q: Quartz.