

## S2. Supplemental material : modelization of the soil evolution on a carbonated parent material.

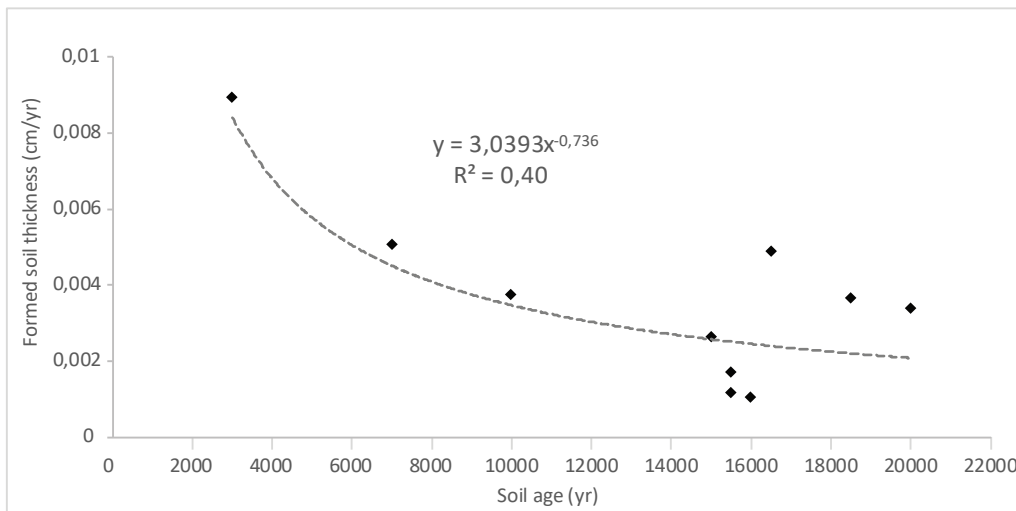
**Table S2.1.** Data of Egli & Fitze (2001) to establish a relation between the soil age and the thickness in a carbonated parent material context.

Investigation site	Egli et Fitze (2001)		Corresponding remaining non-carbonated mass (considering a parent material of 70 % of CaCO <sub>3</sub> )	Corresponding formed thickness with a BD* of 1,15
	Soil age	Carbonate mass flux		
	(yr)	(g/m <sup>2</sup> /yr)	(g/m <sup>2</sup> /yr)	(cm/yr)
Mohlin	20000	91	39	0,00339
Gubrist	18500	98	42	0,00365
Rosberg	3000	240	103	0,00894
Salez	7000	136	58	0,00507
Weissenstein	16500	131	56	0,00488
Munt	10000	101	43	0,00376
Singen	16000	28,2	12	0,00105
Liggeringen	15500	45,8	20	0,00171
Tettngang	15000	71,2	31	0,00265
Besetze	15500	31,6	14	0,00118

In carbonated context, decarbonation is the major pedogenesis process. An equation of the soil formation was established for carbonated parent material, using data (Table S2.1) of carbonate mass fluxes from Egli & Fitze (2001). The mass flux was adapted considering a parent material of 70 % of CaCO<sub>3</sub> and 30 % of aluminosilicated materials. This composition corresponds to P-XRF analysis of rocks from the Lake La Thuile catchment.

\*BD : Bulk Density

### S2a. Relation between the thickness and soil age.



The relation between the soil age and the soil thickness presents a low R<sup>2</sup> (Fig. S2a.), because of the low availability of data.

The equation of SF was integrated in time (t) to obtain the relation between the soil thickness ST [cm] and soil age [yr] :

$$SF [cm/yr] = 3,0393 \cdot x^{-0,736}$$

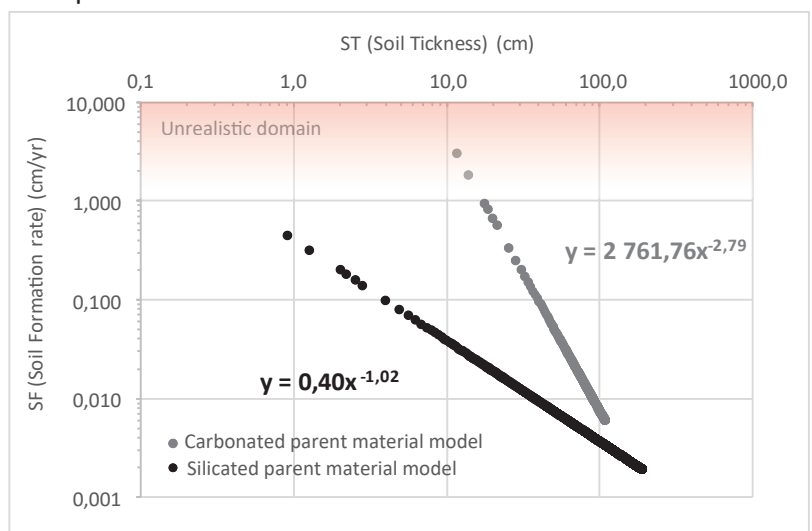
$$ST [cm] = \int_{t_1}^{t_2} SF = 3,0393 / (1 - 0,736) \cdot t^{(1-0,736)}$$

Thus, for a carbonated parent material, the equation of SF becomes (Fig. S2b.) :

$$SF [cm/yr] = 2761,76 \cdot ST^{-2,79}$$

Then, following the method described in the manuscript, it is possible to model changes in soil thickness ST and soil formation rate SF (Figure 8).

### S2b. Relation between the soil formation rate and soil thickness for both parent material.



**Supplemental material S2.** Modelization of soil evolution on a carbonated parent material of 70 % of CaCO<sub>3</sub> and 30 % of aluminosilicates, considering mass fluxes of carbonates listed in Egli & Fitze (2001).