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SSS5.6 Organo-mineral associations and microaggregates in soil: Dynamics and functions

Nanoscale chemical imaging of soil organo-mineral associations

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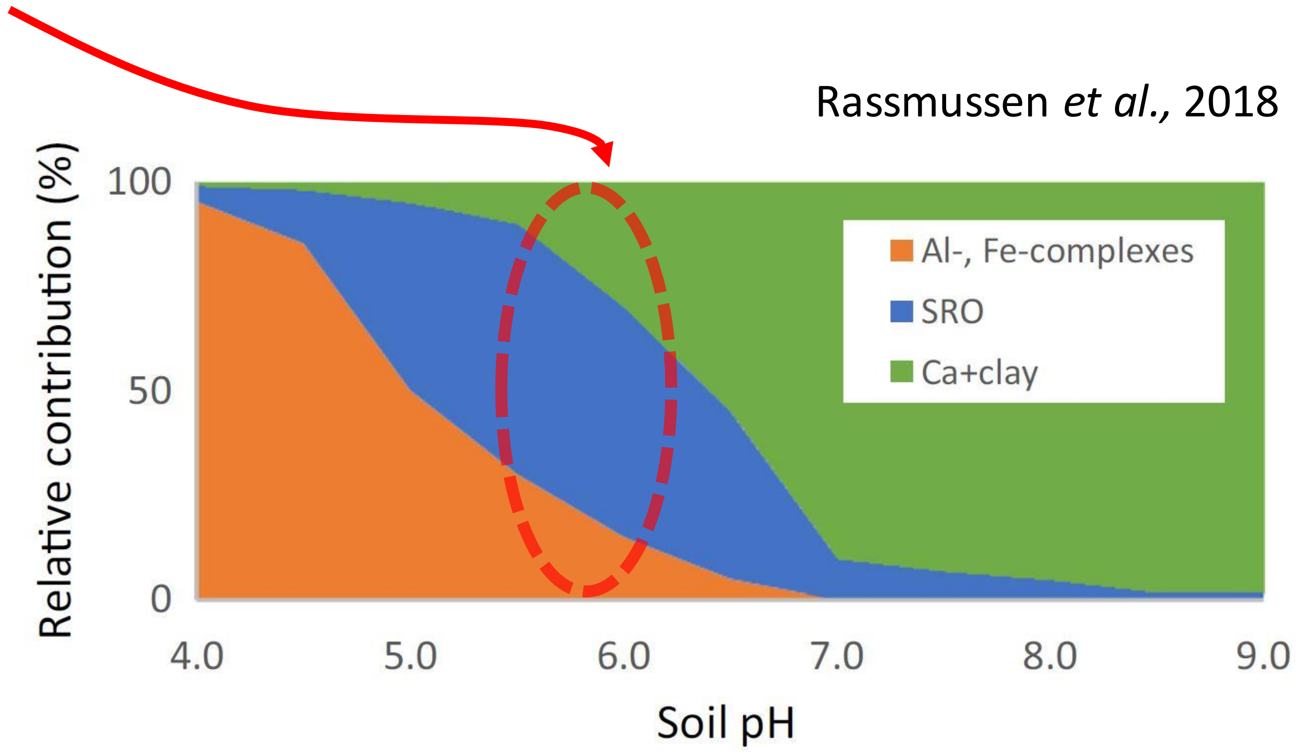
Carbon stabilization mostly drive by short range order at soil pH

At andosol pH (analysed in this study) short range order (SRO) have a major contribution to carbon storage.

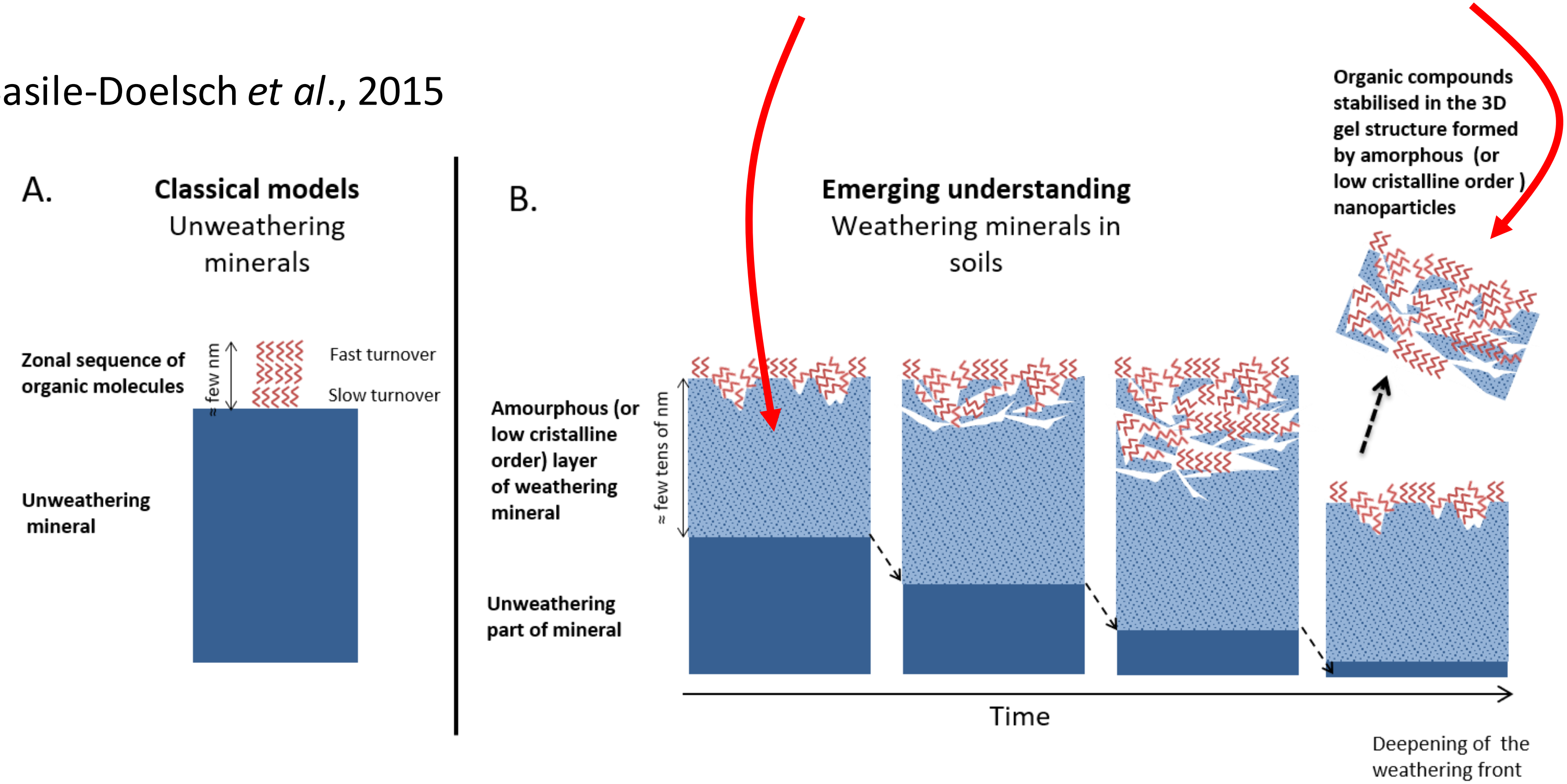
Rassmussen *et al.,* 2018



SRO formation by mineral weathering

Mineral weathering forms SRO on the surface of minerals or/and in the soil solution.

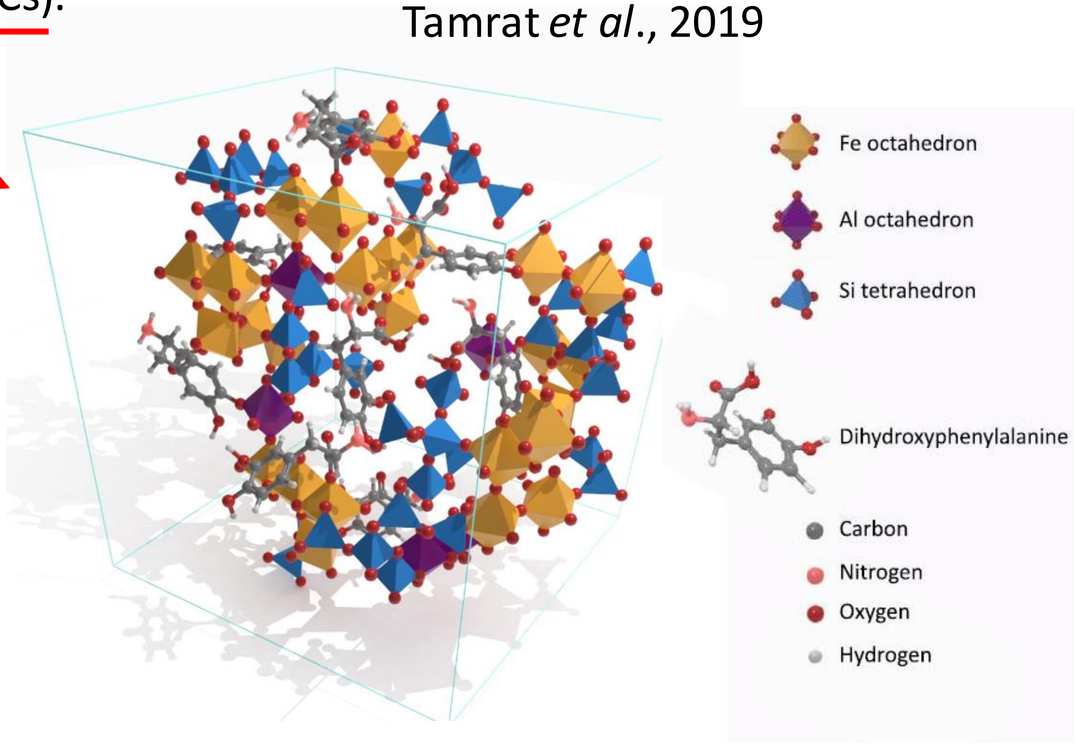
Basile-Doelsch *et al.*, 2015



nanoCLICs model : a coprecipitation of C, Si, Al and Fe down to the nanoscale

By mimicking the mineral weathering in interaction with a small organic molecule, coprecipitates are produced in the form of : Nanosized Coprecipitates of inorganic oLIgomers with organiCs (nanoCLICs).

Tamrat *et al.*, 2019

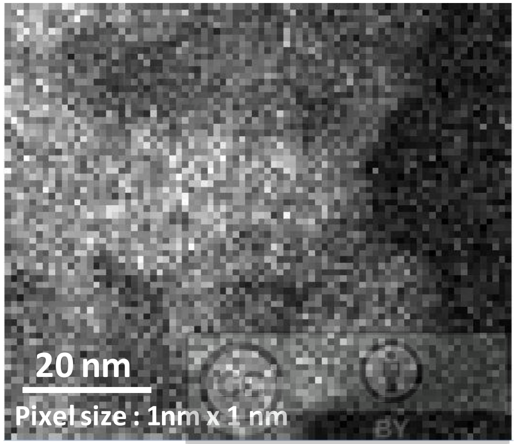


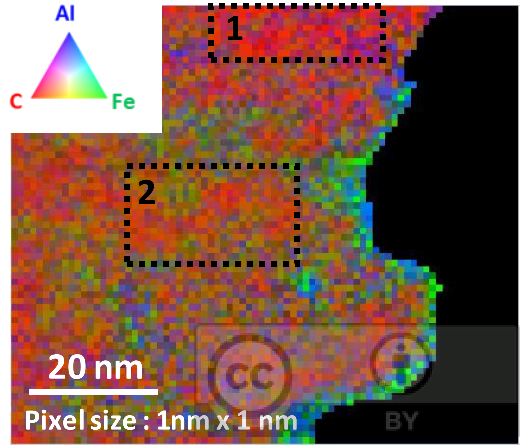
1/ Are coprecipitates observable at the nanoscale using Transmission Electron Microscope coupled with Electron Energy Loss Spectroscopy (TEM-EELS) ?

2/ Do this coprecipitates exist in a natural soil ?

TEM-EELS analysis reached a single quantification per nanometer

On synthetic coprecipitates from basalt weathering: Cam *et al., in prep*

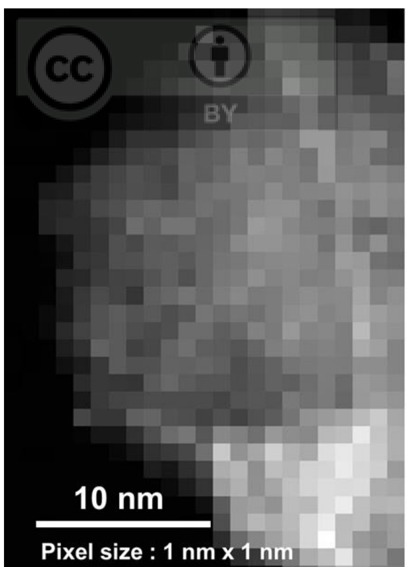


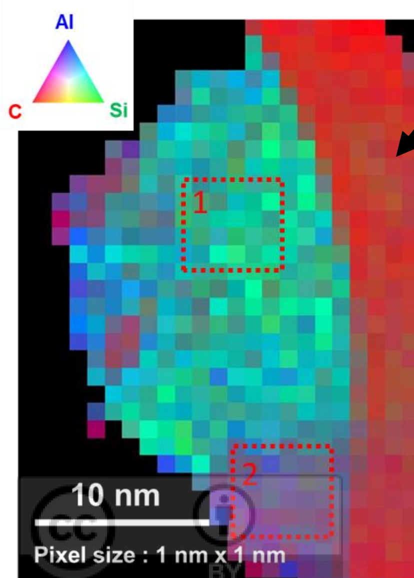


Atomic semi-quantification %

	Zone 1	Zone 2
C	63	50
Fe	17	33
Al	13	9
Si	7	8

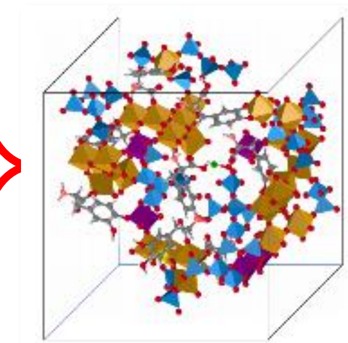
On a natural andosol from la Martinique island (10-20 cm):





Atomic semi-quantification %

	Zone 1	Zone 2
C	11	48
Fe	10	4
Al	33	29
Si	46	19



No pure C area, similar to nanoCLICs model

Conclusion

1/ TEM-EELS reached a quantification per nanometer, thus it is an appropriated tools to observe C location and colocalization with other element at nanoscale.

2/ Carbon in the syntheses was always colocated with O, Al, Si and Fe. As well, in an andosol, C was colocated with O, Al, Si and little Fe.
The nanoCLICs model is therefore the most suitable according to these nanometric observations.