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A model of C and N cycling where the plant-soil synchrony functions as a symphony

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Introduction & Objectives

➤ Integration of priming effect (PE) in agroecosystem models could qualitatively change predictions of global change effects on C storage and plant production.

➤ Some models were built to simulate PE. However, PE has never been inserted in plant-soil model to analyze its consequences on ecosystem properties.

➤ Our objective was to explore the consequences of PE integration in plant-soil model on:

- C storage
- Nutrient cycle
- Plant-soil interaction

Approach

- Integration of plant in the model of Fontaine and Barot (2005)
- Mathematical analysis of the model at equilibrium followed by numerical simulations

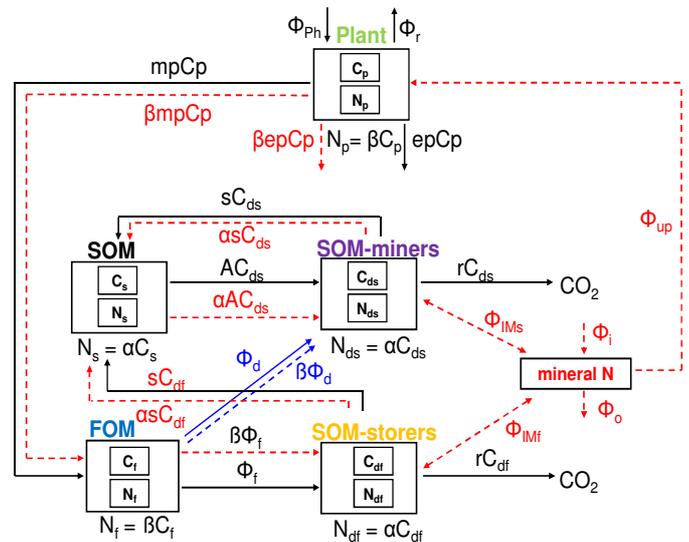
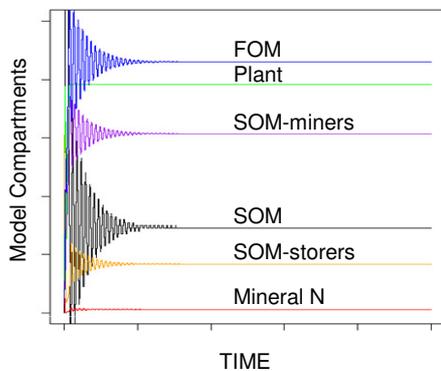


Figure : Modified model of Fontaine and Barot (2005)

Results

Model equilibrium for closed ecosystem

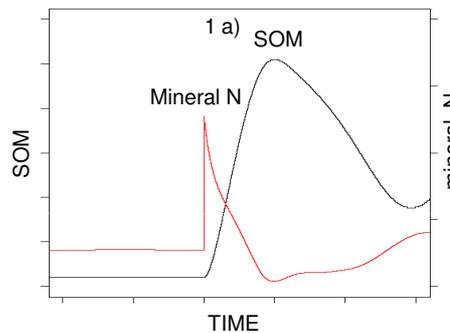


➤ Plant-microbial coexistence (persistence of all compartments)

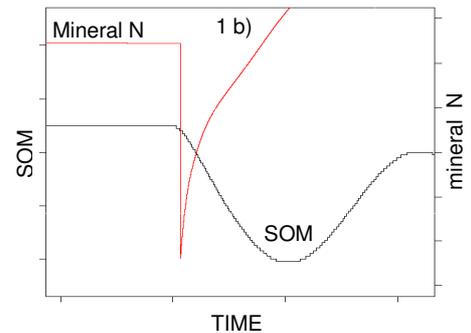
Bank mechanism : Accumulation or loss of SOM depends on ecosystem nutrient balance.

Ecosystem response to:

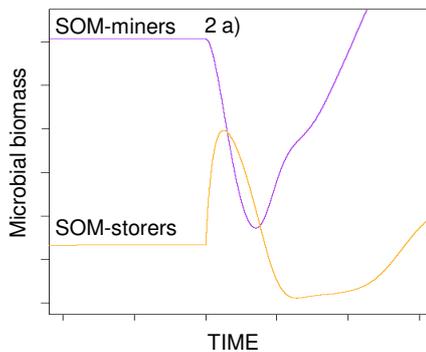
a) N input



b) N output

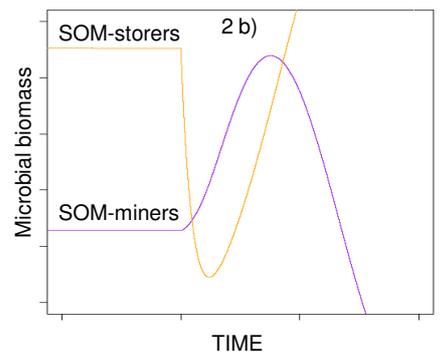


2 a)



➤ N input → SOM accumulation

2 b)



➤ N output → SOM loss

Conclusion

➤ In permanent vegetation cover, synchrony between plant nutrient demand and soil N offer which leads to :

- Optimize plant production (maximum exploitation of PAR)
- Minimize nutrient loss by leaching
- SOM building (C and N storage)

Perspectives

➤ Development of new agricultural practices based on the bank mechanism