Modeling the key role of microorganisms in organic storage of soil and plant nutrition

M. PANSU[1], H. IBRAHIM[2], J.J DREVON[1], F. GÉRARD[1], AND D. BLAVET[1]

[1] Univ Montpellier, UMR Eco&Sols, France

[2] Univ El Manar Tunis, Faculty of sciences, Tunisia

A new equation system for C and N cycle

Initially proposed from a comparative prediction of ^{14}C flows in tropical fields [1], mathematically linked to climate data, biological properties of plant residues, soil moisture and soil texture [2, 3], the MOMOS model was validated [4], and then extended to prediction of ^{15}N flows in 6 contrasted tropical ecosystems [5]. It was then tested on a cereal/legume intercropping in a non-fertilized Mediterranean soil, to model the C and N flows between plant organs and microorganisms from the measurement of few state variables [6,7].

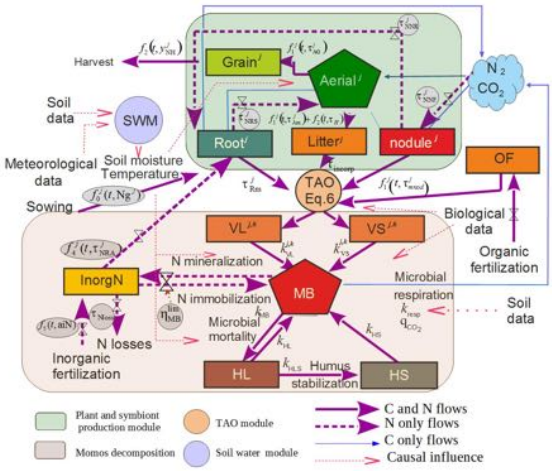

Figure 1- The MOMOS model (Microorganisms and Organic Matters of Soils): coupling decomposition and vegetal production in link with climate, biological data (TAO, transformation of Added Organic matters) and soil texture. MB is microbial biomass, $VL^{j,k}$ and $VS^{j,k}$ are labile and stable fractions of each organ *k* of plant *j* or organic fertilzer OF. HL and HS are labile and stable humus respectively, inorgN is inorganic N continuously exchanged with MB and roots of plants.

Result and discussion

All transfer parameters were adjusted in an unique set of solutions indicating that MOMOS was not over-parameterized. The new method enables essential estimations on plant growth and soil nutrition, sometimes very difficult to measure, such as microbial and root respirations, humus storage, N losses and N exchanges between decomposers, plant roots and symbionts, all essential in agro-ecology and global change predictions.

[1] Pansu et al.(2004) Glob Biogeochem Cycle **18**, GB4022. [2] Bottner et al. (2006) Soil Biol. Biochem. **38**, 2162-2177. [3] Pansu et al., (2007) Europ. J. Soil Sci. **58**, 775 - 785. [4] Pansu et al. (2010). Glob. Biogeochem. Cycles **24**, GB1008. [5] Pansu et al. (2014). Biogeosci. **11**, 915-927. [6] Ibrahim et al. (2016) Plant & Soil **398**, 381-397. [7] Pansu et al. (2018) Soil Biol. Biochem. **125,** 185-196.