Geophysical Research Abstracts
Vol. 19, EGU2017-12297, 2017
EGU General Assembly 2017

Role of litter decomposition sensitivity to water content in non-additive litter mixture effect: theoretical demonstration and validation with a peatland litter experiment

Sébastien Gogo (1,2,3), Fabien Leroy (1,2,3), Renata Zoccatelli (1,4), Léonard Bernard-Jannin (1,2,3), Fatima Laggoun-Défarge (1,2,3)

(1) Université d'Orléans, Institut des Sciences de la Terre d'orléans, France (sebastien.gogo@univ-orleans.fr), (2) CNRS, ISTO, UMR 7327, 45071 Orléans, France, (3) BRGM, ISTO, UMR 7327, BP 36009, 45060 Orléans, France, (4) CETRAHE, Cellule d'Expertise et de transfert en TRAçages appliqués à l'Hydrogéologie et à l'Environnement

In this work, we showed theoretically that differences in litter water content, evaporation rate and reaction rate sensitivity to water content can give account of non-additive litter mixture effect. More specifically two litters with the same dependence to litter water content and contrasted water content, and 2 litters with contrasted decomposition sensitivity to litter water content can exert synergistic mixture effect on decomposition when the 2 litters interact. In these situations, water can flow from the wettest to the driest litter, changing the whole reaction rate without changing the whole litter water content. The reaction rate increase of the litter receiving the water was relatively more important than the reaction rate decrease of the litter supplying the water. These theoretical considerations were validated with experimental data. Sphagnum rubellum and Molinia caerulea decompose faster in measured mixture than expected from the rates obtained in monoculture incubation. Sphagnum rubellum litter can contain more water, which evaporates at a slower rate than Molinia caerulea. It is thus proposed that water flowed from Sphagnum rubellum litter to the Molinia caerulea litter, with a substantial increase of the decomposition of the latter. The physical and biochemical litter characteristics towards water explains a fraction of the synergistic effect of mixing the 2 litters, which suggests that other factors intervene in this effect, such as the carbon substrate.