The soil-atmosphere interface : a front and exit door to the unsaturated zone

Isabelle Cousin, Marine Lacoste, Agnès Grossel

First author: Isabelle COUSIN
Title : Dr.
Firstname: Isabelle
Last name: COUSIN

Institutions: Inra
Address: UR0272 Sols, 2163 avenue de la Pomme de Pin, CS40005 Ardon, F-45075 Orléans Cedex 2, France

Email: Isabelle.Cousin@inra.fr
Phone: (0033) 2 38 41 48 03

Co-authors (with their institutions) : Marine LACOSTE (Inra, UR0272 Sols, Orléans), Agnès GROSSEL (Inra, UR0272 Sols, Orléans)

Abstract title: The soil-atmosphere interface : a front and exit door to the unsaturated zone

Abstract = maximum 1500 characters
At the top of the unsaturated zone, the soil, at the interface with the atmosphere, is the location of interactions of this unsaturated zone with climate and human activities, especially agricultural practices. In contrast to the major part of the unsaturated zone, whose structure can be considered as stable at the year or decade scale, the soil structure evolves at a short time-scale - from the second to the season - under the combined influences of i) the living organisms activities (rhizosphere, mesofauna and macrofauna), ii) the action of the climate (succession of rainfall events bringing water for infiltration, and sunny periods favorable to evaporation), and iii) human activities (cropping, tillage). The dynamics of fluids exchange in soil is therefore complex, because the structure of the porous network is not stable, and because the gas and water flow direction, ascending or descending, changes at high frequency. A better understanding of the determinism of these hydric and gas exchanges requires addressing the following research questions: i) characterising and modelling the plant root dynamics in interaction and in feedback with the water and gaseous functioning of the soil, ii) as a consequence of the previous point, quantifying the contribution of the deep soil layers (or even of part of the unsaturated zone) to the water supply of the plants, iii) improving our understanding of the determinism of gas emissions from the soil towards the atmosphere, in relationships with the soil structure dynamics and the soil hydric functioning. Our presentation will present some innovative tools to address these issues.