Geophysical Research Abstracts
Vol. 12, EGU2010-6218, 2010
EGU General Assembly 2010

Integrating water by plant roots over spatially distributed soil salinity

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In numerical simulation models dealing with water movement and solute transport in vadose zone, the water budget largely depends on uptake patterns by plant roots. In real field conditions, the uptake pattern largely changes in time and space. When dealing with soil and water salinity, most saline soils demonstrate spatially distributed osmotic head over the root zone. In order to quantify such processes, the major difficulty stems from lacking a sink term function that adequately accounts for the extraction term especially under variable soil water osmotic heads. The question of how plants integrate such space variable over its rooting depth remains as interesting issue for investigators. To move one step forward towards countering this concern, a well equipped experiment was conducted under heterogeneously distributed salinity over the root zone with alfalfa. The extraction rates of soil increments were calculated with the one dimensional form of Richards equation. The results indicated that the plant uptake rate under different mean soil salinities preliminary reacts to soil salinity, whereas at given water content and salinity the “evaporative demand” and “root activity” become more important to control the uptake patterns. Further analysis revealed that root activity is inconstant when imposed to variable soil salinity. It can be concluded that under heterogeneously distributed salinity, most water is taken from the less saline increment while the extraction from other root zone increments with higher salinities never stops.