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Anatja Samouëlian, Isabelle Cousin, Guy Richard, Ary Bruand

ESTABLISHEMENT OF CRACK INDEXES BY ELECTRICAL APPARENT RESISTIVITY DATA

A. Samouelian (1,2), I. Cousin (1), G. Richard (3), A. Bruand (4)

(1) INRA, Unite de Science du Sol, BP 20619, 45166 Ardon France, (2) Universität Heidelberg, Institut für Umweltphysik INF 229, 69120 Heidelberg Germany, (3) INRA, Unite d'Agronomie, rue Fernand Christ, 02007 Laon France, (4) ISTO, Universite d'Orleans, Geoscience BP 6759, 45067 Orleans Cedex 2 France.

Soil cracks, whose formation are associated to natural climate phenomena, play an important role in water and gas transfer. Detecting cracks by non-destructive geophysical methods permits a 3D temporal monitoring of the cracking patterns. Electrical resistivity is indeed well adapted to recognize the electrical resistant signature of crack filled by air during a dessiccation period.

The experimentation was conducted on a soil block (x = 0.26 m, y = 0.30 m, z = 0.40 m), wherethe cracking pattern resulted of natural dessiccation phenomena during 18 days. We proposed to use a square array device in two orientation 0° and 90°. Indeed in heterogeneous medium, like cracking soil, electrical measurement is sensitivte to electrode configuration. The inter-electrode spacing was 0.03 m . The interpretation of the apparent resistivity measurement led to develop two anisotropic indexes AAI and α_{max}.

At the final stage the α_{max} distribution was in good aggrement with the soil cracking surface analysis. Three major cracks spreaded out at depth with the same orientation. The AAI index was also correlated with the position of the cracks. Positive AAI values were related with cracks preferentially oriented at 90°, and negative values was related to crack preferentially oriented at 0°. The temporal monitoring showed that for the three major crack, the alphamax index did not change with time, whereas the AAI index exhibited variations during the monitoring time.

By way of numerical simulation, the sensitivity of these two indexes to parameters describingthe cracks geometry was tested. The α_{max} index was correlated with the

crack orientation in the Oxy plan; the AAI index was also sensitive to the width, the depth, and the pitch of the crack. The peak of AAI value observed at the 6th day was related to a variation of the pitch of the crack. These two indexes provided useful and not redundant information for the cracking pattern interpretation.