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► **To cite this version:**

S. Valet, Mikael Motelica-Heino, H. Ozier-Lafontaine. Soil layer condensation peak as a response to soil water properties under Sudanese climatic conditions. EGU General Assembly, European Geosciences Union (EGU). DEU., Apr 2012, Vienne, Austria. 1 p. insu-00839569

HAL Id: insu-00839569

<https://hal-insu.archives-ouvertes.fr/insu-00839569>

Submitted on 5 Jun 2020

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Soil layer condensation peak as a response to soil water properties under Sudanese climatic conditions

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The soil apparent density is strongly dependent on their physico-chemical properties. It can be negatively impacted by human activities such as soil work or animal pasture or natural salinity influenced by irrigation. In contrast it can be improved for different depths by agricultural practices. A « condensation peak » defined as an increase in the apparent density was found for the heterogeneous soils of Niger for several profiles of 5 soil classes and for a very shallow depth (10 cm maximum) with a very variable extreme depth (from 35 to 150 cm) associated with extreme density values (from 1.45 to 2). The depth of this peak, for soils neither saline nor vertic, varies inversely with the proportion of soil fine elements (silts+clays). However it corresponds to an average value of useful water (AWC) of 100mm (CV=24.4%). In sodic and alkaline soils this peak can be observed at shallow depths (from 53 to 61cm with a CV from 15 to 40%), thus for much lower AWC values (from 74 to 87cm with a CV from 26 to 47%). It can be found either below or above an impermeable horizon of a maximal density of 2. This peak is likely to be associated with a multi-annual alternance of humectation-dessication at this depth. Its occurrence is based on an interplay of intrinsic physical and hydric soil properties but also on extrinsic parameters such as the pluviometry, the location at the scale of the watershed and the micromodelling.