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Spatio-temporal analysis of soil surface hydraulic properties in a semi-arid agroforestry system of the Senegalese groundnut basin

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In Senegal, the groundnut basin is the main agricultural region under a semi-arid climate, heavily cultivated in an agrarian system combining agricultural rotation and agroforestry dominated by *Faidherbia albida* trees. The soils of the groundnut basin, essentially sandy, have a low water retention capacity. In this area, water is a limiting factor, and the climate variability represents an additional constraint on an already precarious agricultural production system. It is therefore essential to improve knowledge on water saving practices and soil humidity dynamics. The management of water resources in agricultural fields requires reliable information about soil hydraulic properties, which control the partition of rainfall into infiltration and runoff, and their spatio-temporal variability.

To investigate the variability of soil hydraulic parameters we have carried out infiltration measurement in open space without tree and below tree canopies. A total of 24 infiltration measurements were carried out using an automatic single-ring infiltrometer in the nearby of each plot (4 measurements × 6 plots), and after removing the first 10 cm of uncompacted sand. The infiltration tests were carried out in June, October and December, respectively before, during and after the crop season. We used the Beerkan Estimation of Soil Transfer Parameters (BEST) method to retrieve the soil hydraulic parameters from infiltrometer data and field measurements of soil porosity, initial and saturated soil water contents and soil bulk density.

The statistical analysis of the data showed a high variability during the cultivating period, both in time and space, especially of the saturated soil hydraulic conductivity Ks. However, the Ks seems higher under tree cover, around 0.186 mm/s, for 0.167mm/s without any tree canopy influence. Despite the expected homogeneity of the investigated sandy soil, the presence of the perennials

triggered a patchy distribution of soil hydraulic conditions. These preliminary results evidenced the importance of taking into account parameters variability and landscape structure when simulating soil water dynamics in the Senegalese groundnut basin.