

## **A physically based approach for the estimation of root-zone soil moisture from surface measurements: application on the AMMA database**

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**Abstract.** In the present work, we present a new formulation for the estimation of the soil moisture in the root zone based on the measured value of soil moisture at the surface. The method sheds lights on the relationship between surface and root zone soil moisture. It derives from a simplified form of the soil water balance equation and provides a closed form of the relationship between the root zone and the surface soil moisture with a limited number of physically consistent parameters. The approach was used to interpret soil moisture dynamics at the point scale using soil moisture measurements taken from the African Monsoon Multidisciplinary Analysis (AMMA) database. These soil moisture measurements form an excellent database that well describes the soil moisture along the root-zone profile. According to this, we have used the surface soil moisture measurements at 5 cm depth to predict the soil moisture in the lower layer of the soil where the relative saturation is measured at various depths. In general, the method performed better than a traditional low pass filter with the advantage that all parameters are physically consistent.

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