



## **A Takagi-Sugeno fuzzy-rule based model for soil moisture retrieval from SAR under soil roughness uncertainty**

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Radar remote sensing has shown its potential for retrieving soil moisture from bare soil surfaces. Since the backscattering process is also determined by the soil roughness, the characterisation of the roughness is crucial for an accurate soil moisture retrieval. However, several field experiments have shown a large variability of the roughness parameters. Describing the roughness parameters as a possibility distribution function allows to account for their uncertainty. Recently a retrieval procedure was introduced which calculates from these uncertain roughness parameters the possibility distribution function of retrieved soil moisture, from which a soil moisture value and accuracy on the retrieval are estimated. The main disadvantage of this technique is the high computational demand, which hampers an operational application. To overcome this problem, a fuzzy modelling approach, based on a Takagi-Sugeno type of fuzzy rules, is introduced that accurately simulates the soil moisture and its accuracy, as obtained from the possibilistic algorithm. It is shown that its computation is extremely fast, allowing to invert a complete radar scene to soil moisture in a couple of minutes.