A modified first-order vegetation model for soil moisture retrieval in wheat fields using Sentinel-1 data

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ABSTRACT

Soil moisture is an important factor affecting crop growth. In our work, the aim of this paper is to retrieve volumetric soil moisture in wheat fields using Sentinel-1 synthetic aperture radar (SAR) data. In order to eliminate the effect of wheat cover, we used a first-order vegetation model and improved the model. Then the support vector regression technique was used to retrieve soil moisture and validate the performance using experimental data. Three experimental campaigns were conducted in the Hebi, Northeastern Henan in different periods of wheat growth in 2019, with simultaneous satellite overpass. Compared with the water cloud model, the retrieved soil moisture given by the modified first-order vegetation model agreed better with field measurements, the R^2 and root mean square error value of this modified first-order vegetation model was (0.847, 0.015), (0.901, 0.016) and (0.936, 0.014) for the three experiments respectively. The results show that the modified first-order vegetation model based on the Sentinel-1 SAR data satisfied the requirement of soil moisture retrieval in the study region.

Keywords: Soil moisture; Sentinel-1 data; First-order vegetation model; Support vector regression

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