

Backscattering and vegetation water content response of paddy crop at C-band using RISAT-1 satellite data

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The study about the temporal behaviour of vegetation water content (VWC) is essential for monitoring the growth of a crop to improve agricultural production. In agriculture, VWC could possibly provide information that can be used to infer water stress for irrigation decisions, vegetation health conditions, aid in yield estimation and assessment of drought conditions (Penuelas et al., 1993). The VWC is an important parameter for soil moisture retrieval in microwave remote sensing (Srivastava et al., 2014). In the present study, the backscattering and VWC response of paddy crop has been investigated using medium resolution (MRS) radar imaging satellite-1 (RISAT-1) synthetic aperture radar (SAR) data in Varanasi, India. The VWC of paddy crop was measured at its five different growth stages started from 15 July 2013 to 23 October 2013 from the transplanting to maturity stage during Kharif season. The whole life of paddy crop was divided into three different major growth stages like vegetative stage, reproductive stage and ripening stage. During vegetative stage, the backscattering coefficients were found increasing behaviour until the leaves became large and dense due to major contribution of stems and the interaction between the stems and water underneath the paddy crop. During reproductive stage, the backscattering coefficients were found to increase slowly due to random scattering by vertical leaves. The increase in the size of leaves cause to cover most of the spaces between plants resulted to quench the contributions from the stems and the water underneath. At the maturity stage, the backscattering showed its decreasing behaviour. The VWC of paddy crop was found increasing up to vegetative to reproductive stages (28 September 2013) and then started decreasing during the ripening (maturity) stage. Similar behaviour was obtained between backscattering coefficients and VWC that showed an increasing trend from vegetative to reproductive stage and then lowering down at ripening stage at HH- and HV- polarizations. It is concluded that HH- polarized backscattering coefficients using RISAT-1 data are more sensitive in comparison to HV- polarized backscattering coefficients. The C-band, RISAT-1 backscattering coefficients may be useful for the retrieval of VWC of paddy crop to monitor its growth stages.

Keywords: SAR, C-band, dual polarimetric, RISAT-1, VWC, paddy

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