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Influence of the Soil Moisture on RADARSAT-2 Polarimetric SAR Images used for mapping surficial deposits in peatland ecosystems in Northern Ontario and for mapping *Lowveld* savannah ecosystems in Kruger National Park (South Africa)

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The paper presents a study on the assessment of the influence of soil moisture on RADARSAT-2 C-band polarimetric parameters in two case studies. The first one is part of a research program on mapping surficial materials and land covers in peatland ecosystems of northern Ontario using RADARSAT-2 WFQ01, 12, and 20 descending polarimetric SAR images. In the second case study, RADARSAT-2 FQ15 ascending polarimetric SAR images were used for mapping *Lowveld* savannah ecosystems in Kruger National Park. In both cases, linear and circular polarized backscatters, polarimetric discriminators and polarimetric decomposition parameters were computed. The research shows that a number of linear and circular polarizations (C-HH, C-HV, C-RR, and C-LL), Freeman-Durden and van Zyl decomposition parameters (particularly the double-bounce component), and polarimetric discriminators, such as $P_{r \max}$, $P_{r \min}$, S_{\max} , S_{\min} are sensitive to soil moisture. In the first case study, a Random Forests classifier (RF) was applied to the following input features: DEM, slope, six LANDSAT-7 ETM+ optical bands, intensity images in the four polarizations (HH, HV, VH, VV) and various polarimetric parameters extracted from the RADARSAT-2 images. The image combination with the best classification was found using both wet and dry images with LANDSAT-7 ETM+ optical bands, the four RADARSAT-2 intensity images, the slope and DEM data. Our study helps understand how soil moisture affects C-band polarimetric scattering mechanisms in the Northern Ontario peatland ecosystem and in the South Africa *Lowveld* savannah. The study was funded by the *Canadian Space Agency Class Grant and Contribution Program*, by a NSERC Discovery Grant (Brigitte Leblon), by a EU-Canada TRANSFOR-M scholarship (M. Kong), and by a NSERC&ACUNS scholarship (J. Byatt). The *Canadian Space Agency* provided the RADARSAT-2 data

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