Use of RADARSAT-2 images to develop a scaling method of soil moisture over an agricultural area

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Soil moisture is a significant parameter that drives the hydrological cycle at different temporal and spatial scales. It can be a preventive factor in agriculture production (small scale), and/or a crucial element for understanding climate changes (large scale). The traditional methods for measuring soil moisture are the ground measurements. These are expensive point measurements and they do no represent the high spatial variability of soil moisture. However, microwave remote sensing data (passive and active) can provide areal soil moisture data. Radarsat-2, an actual spaceborne synthetic aperture radar (SAR) system operates at different spatial resolutions varying from 6 meters (at fine mode) to 50 meters (Scansar mode). Although the concept of the scaling effect on remote sensing data and on the retrieved results is well understood, its accounting into inverse algorithms of soil moisture remains an issue in remote sensing. Indeed, ground soil moisture measurements are often used as true data to check inversion results obtained from SAR data acquired at a spatial resolution of several meters. Thus, there is a great interest to investigate the scaling effect of soil moisture using Radarsat-2 images acquired at different spatial resolutions. The main objective of this study is to describe and evaluate the spatial variability of the surface soil moisture at small scales using Radarsat-2 images acquired over an agricultural area. For this reason, an upscaling method will developed to understand the transferability of ground measurements to satellite aerial estimations. Statistical analysis will be applied to up scale the soil moisture from ground measurements to the resolution of radar images and also from different radar images acquired at different spatial resolutions. The maximum spatial resolution which verifies this up scaling methods will be determined. To conduct this study, in addition to four RADARSAT-2 images acquired at different modes, during the summer of 2008, over

agriculture fields located in Saskatoon (Saskatchewan, Canada), the available data is ground measurements of soil moisture, surface roughness and vegetation characteristics.