INVITED SESSION: *Innovative Methods SAR Polarimetry and Applications to the Remote Sensing of Wet and Arid Regions*

WETLAND CHARACTERIZATION USING POLARIMETRIC L AND C-BAND ALOS AND RADARSAT 2

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ABSTRACT

Canada has 25 % of the world's wetlands and wetland management has become a critical issue in order to avoid or mitigate further loss of wetland area or function. Mapping wetlands and monitoring their change, in a systematic and repeatable manner, are important in order to manage and protect significant wetland areas in Canada and to avoid or mitigate further loss of wetland areas. The unique polarimetric [1] and all-weather capabilities of RADARSAT-2 should play a key role to support continuous, long-term quantification of wetlands extent and type and associated dynamics, and will make a unique contribution to the sustainable development approach being developed by the federal government and the provinces for protecting wetlands and maintaining their functions in the long term.

This paper reports on the use of polarimetric target scattering decomposition for wetland characterization. Cloude-Pottier's incoherent target scattering decomposition [2] has been for the last decade the most used method for target scattering classification. Recently, the Touzi decomposition is introduced [3, 4] for the incoherent decomposition of target scattering in terms of unique and roll invariant parameters. In contrast to the Cloude-Pottier decomposition, which uses a real entity, the so called Cloude α, to describe target scattering type, the Touzi decomposition characterizes uniquely the scattering type with three parameters; the symmetric scattering type magnitude α_s and phase $\phi_{\alpha s}$ introduced in [3] and the target helicity [5, 6]. The Touzi decomposition has been shown to be very promising for wetland characterization using polarimetric Convair-580 C-band SAR data with a 4-look 5mx5m resolution [7, 8]. In particular, the scattering type phase $\phi_{\alpha s}$ permits enhanced discrimination of shrub-bog from poor-fens. Theses classes cannot be separated using optic sensors. They cannot also discriminated using the polarization radiometric scattering information provided by the Cloude α, the entropy H, or the multi-polarization

HH, HV, and VV intensities. $\phi_{\alpha s}$ permits also the discrimination between conifer-dominated-treed bogs from upland deciduous forest, under leafy conditions.

The objective of this study is to validate the results above using the C-band polarimetric RADARDAT2 of coarser 9mx9m resolution. L-band polarimetric ALOS of deeper penetration should permit better separation of wetland forests (treed bogs and fens) from upland forests. The investigation has been conducted using polarimetric Satellite and ground field data collected over various RAMSAR wetland sites in Canada; Mer Bleue (East of Ottawa), Lac St Pierre (near Montreal), Williams Lake (British Columbia) and Wapusk (near Churchill). The wetland sites should permit an effective assessment of the potential of polarimetric L and C band SAR for characterization of various wetland classes; shrub and treed- bog, poor and rich fens, swamps, and marshes.

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