

INVITED SESSION: Advanced Methods for polarimetric information extraction

**A NEW INTERPRETATION OF THE TOUZI DECOMPOSITION FOR
OPTIMUM WETLAND CHARACTERIZATION**

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ABSTRACT

Cloude-Pottier's incoherent target scattering decomposition (ICTD) [1] has been for the last decade the most used method for target scattering classification [2]. 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 ICTD, which uses a real entity, the so called Cloude α , to describe target scattering type, the Touzi ICTD characterizes uniquely the scattering type with three parameters; the symmetric scattering type magnitude α_s and phase ϕ_{α_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 5m x 5m resolution [7, 8]. In particular, the dominant scattering type phase ϕ_{α_s} permits enhanced discrimination of shrub-bog from poor-fens. These classes cannot be separated using the polarization radiometric scattering information provided by the Cloude α , the entropy H, or the multi-polarization HH, HV, and VV intensities. Target helicity generated from the ICTD looks also very promising for forest characterization. The C-band medium-forest scattering helicity was shown to be effective for detection of forest seasonal changes (leave-on/leave-off) [8]. These changes could not be detected with the multi-polarization information, as seen in the enclosed Figures 1-4. The analysis of low-entropy marsh scattering showed that the dominant-scattering-type magnitude α_{s1} and phase $\phi_{\alpha_{s1}}$, as well as the maximum polarization intensity of the dominant-scattering $m1$, are needed for a better understanding of marsh complex scattering mechanisms [8].

Even though the Touzi decomposition looks very promising, an effort is needed for the optimum integration of all the information provided by the fifteen ICTD parameters that represent the dominant, medium and low single scatterings. In this study, the ICTD helicity is used to represent the Touzi ICTD in terms of symmetric and asymmetric

scattering components. This permits the development of a new classification method that optimizes the use of the ICTD information. The new classification method is validated for wetland class characterization using Polarimetric Radarsat-2 and Convair-580 SAR data.

References:

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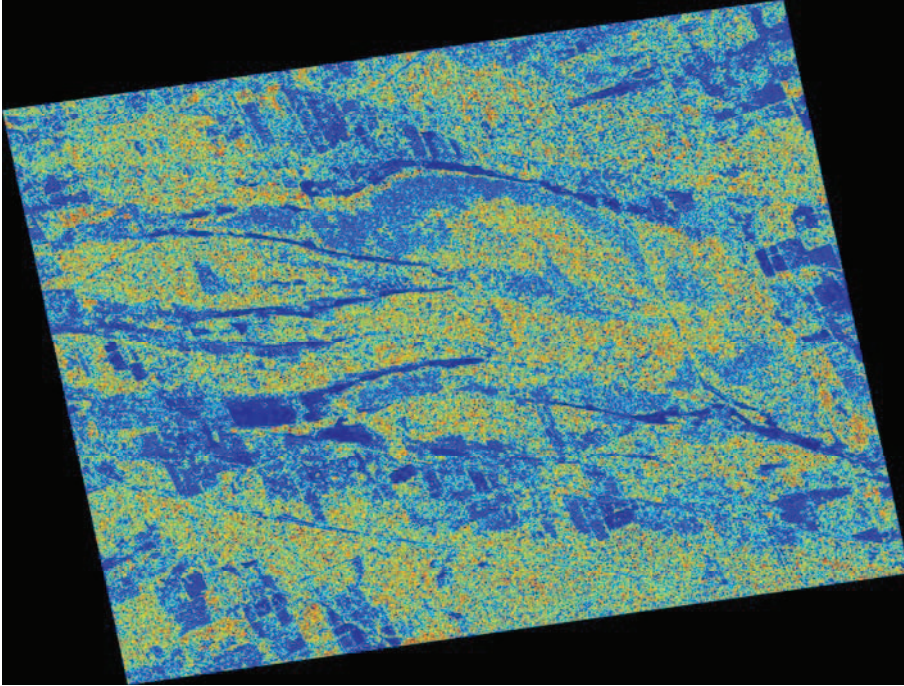


Fig.1 June target helicity for forest seasonal changes (leave-on/leave-off)

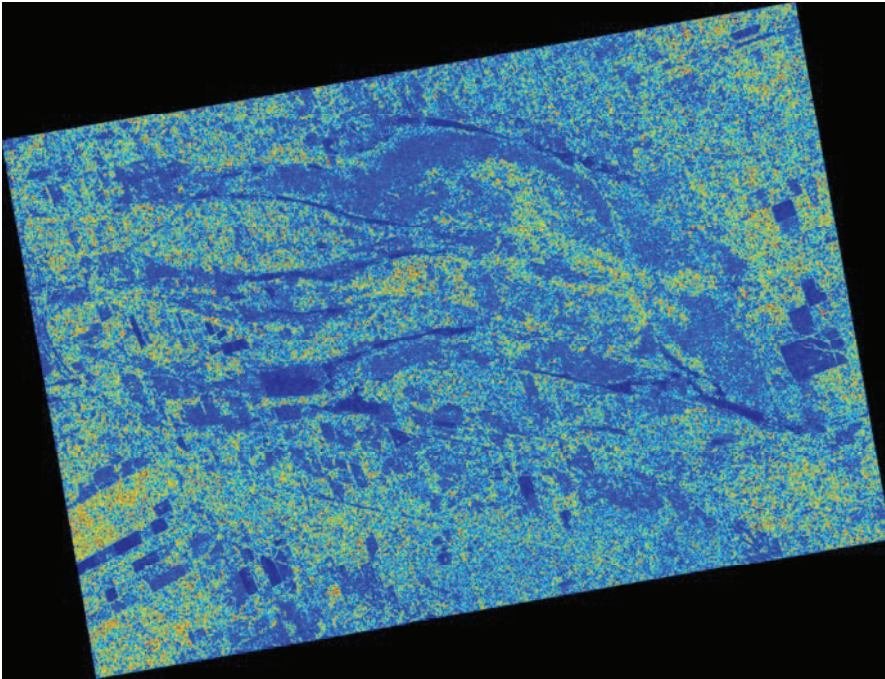


Fig.2 June target helicity for forest seasonal changes (leave-on/leave-off)

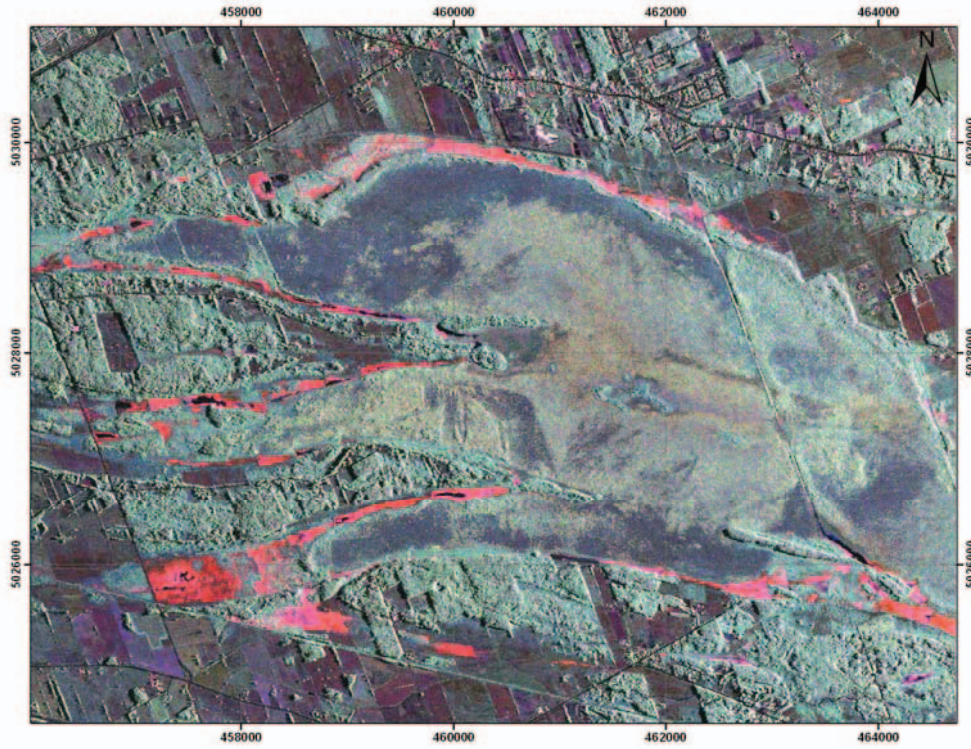


Fig.3 June Multi-polarization HH-HV-VV image

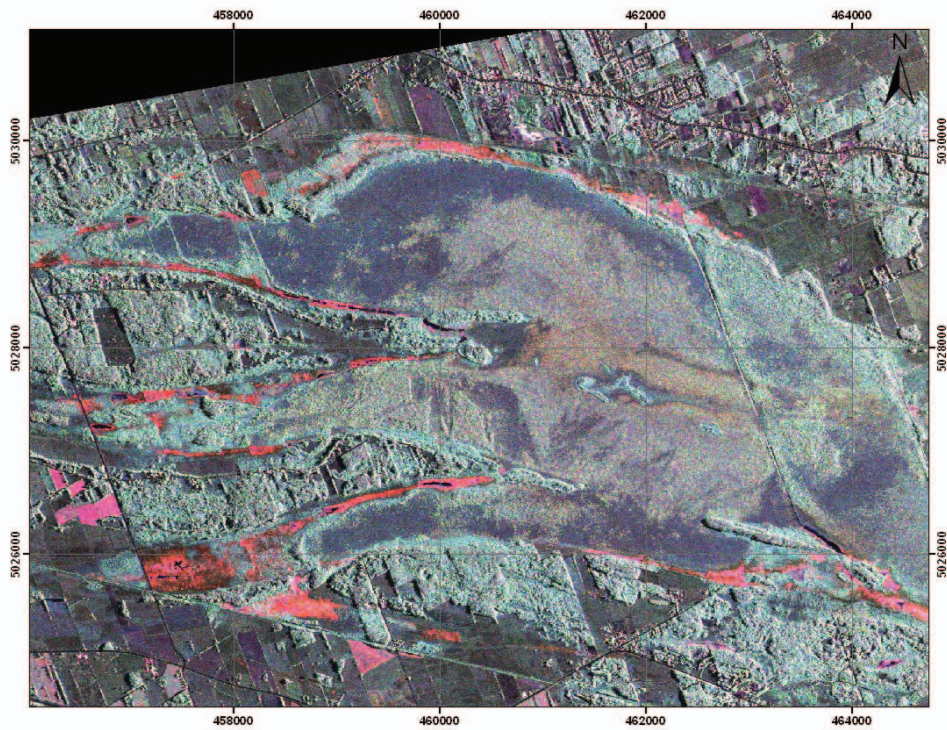


Fig.4 October Acquisition. Leave on-off change cannot be detected