# THE COMPARISON OF POLARIMETRIC SAR DATA FOR UNSUPERVISED CHANGE DETECTION USING KI ALGROTIHM

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**KEY WORDS:** Change Detection, Polarimetric SAR Data, Kittler-Illingworth Minimum Error Thresholding (KI) Algorithm, Double-thresholding Selection

##### **ABSTRACT:** This paper addresses the change detection capabilities of polarimetric synthetic aperture radar (SAR) for the L-band frequency in comparison with single- and dual-polarization and fully polarimetric SAR data. The combinations of polarized power data are combined co-polarized (HH+VV) power image, combined cross-polarized (HV+VH) power image, combined horizontally transmitted (HH+HV) power image, combined vertically transmitted (VH+VV) power image, and total (HH+HV+VH+VV) power image. All polarization combinations are investigated quantitatively for unsupervised change detection under different topographic characteristics. In particular, highly urbanized area (Osaka), vegetated area (Chiba), and mixed topographic area (Kyoto) in Japan are examined. The unsupervised change detection method applied in this study is based on a closed-loop process. Firstly, adaptive iterative filtering is used to determine the optimal filter size such that the speckle noise is sufficiently reduced. Secondly, the log-ratio image is generated from filtered SAR images and is modeled according to a Gaussian distribution. Thirdly, the Kittler-Illingworth minimum error thresholding (KI) algorithm is applied under generalized Gaussian (GG) assumption to select the optimal double thresholding (*T1*, *T2*) that discriminates the positive changes with backscatter increase and negative changes with backscatter decrease from the unchanged areas. The double thresholding was obtained from the two lowest KI criterion function *JGG(T1,T2)* values, and this showed high potential for generating accurate change detection. From a comparison of the change detection performance for various topographic features, the combined cross-polarized (HV+VH) power data are preferable if fully polarimetric data are unavailable. The selection of filter size affects the change detection accuracy, and is dependent on the topographic characteristics.

**Suggested topics:** Data Processing – Change Detection

**Paper title:** “The Comparison of Polarimetric SAR Data for Unsupervised Change Detection Using KI Algorithm”

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