**Polarization Selection for Land Cove Classification with Polarimetric SAR Data**

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The prime objective of this paper is to find out the best polarization or polarization combination for classification of Polarimetric Synthetic Aperture Radar images (POLSAR). Polarimetric SAR has shown that the interpretation of a number of features in a scene is facilitated when the radar is operated in polarimetric mode. Classification of POLSAR images has extensive applications in national economy and military field. We used PALSAR image for our objective. Roorkee city, India and its neighbouring regions were used as study area (30.00° N 77.803° E to 30.00° N 77.980° E). Major land covers were Water, Urban and Vegetation. The four supervised classification techniques i.e. Parallelepiped, Minimum Distance to Mean (MDM), Mahalanobis Distance and Maximum Likelihood (LMC) classifier are applied and there performance is compared for PALSAR images at different polarization i.e., HH, HV, VV, HH-HV, HH-VV, HV-VV and HH-HV-VV. First of all correlation coefficient is calculated between HH, HV and VV polarized images. HH and VV polarized images have strong correlation coefficient to each other with correlation coeeficient of 0.7245. It means that HH and VV polarized images are statistically same. Whereas, HH and HV and HV and VV polarized images are not same statistically. MDM classification was applied on single polarized images i.e HH, HV, and VV, and overall aacuracy (O.A) for HH, HV, and VV was 53.7143%, 62.8571% and 45.7143% respectively. Combination of HH and VV, HH and HV , HV and VV and HH, HV and VV was analysed and the O.A was 49.7143%, 65.1429%, 62.2857%, and 65.1429% respectively. Similarly, Parallelepiped classification was applied on single polarized image and combination of HH and VV, HH and HV, HV and VV and HH, HV and VV for 1 standard deviation (S.D) from mean, 2 S.D from mean and 3 S.D from mean. 2 Standard deviation from mean provides better results as compared with 1 S.D from mean and 3 S.D from mean. Similarly, Mahalanobis and Maximum Likelihood (MLC) classification is performed. This paper concludes that highest overall accuracy is obtained for the combination of HH, HV and VV polarized image for all four supervised i.e. MDM, Mahalanobis and MLC classifiers. Whereas for parallelepiped classifier single polarized image HV provides highest O.A. MLC provides better classification results when compared with other three classifiers for HH, HV and VV polarized image with O.A of 70.2857%.