ABSTRACT

This research was performed to answer the research question: Which sensors, optical and RADAR, provide better accuracy in mapping tropical forest fragmentation? The potential significance of this research was to understand the capabilities and importance of satellite remote sensors for monitoring forest clearance in Bolivia. Over large areas satellite remote sensing potentially provides a cost-effective solution for this mapping. However, remote sensing using optical (visible and infrared) imagery in tropical regions, such as Bolivia, is often hampered by the existence of clouds. This research focuses on mapping deforestation in the low land tropical area of Bolivia using satellite RADAR, which penetrates cloud, and compares results with those from optical remote sensing, to provide information for analysis of tropical forest fragmentation.

The primary data acquired was the ALOS-1 PALSAR imagery from 2007 obtained from Alaskan Satellite Facility and Landsat 5 TM imagery from 2007 from USGS Earth Explorer. The obtained Landsat imagery was initially subjected to haze removal where maximum amount of haze was reduced. The obtained raw RADAR data was a single look complex (SLC) image with dual polarization (HH + HV). The data were complex data on the slant range coordinate which was later converted to ground range using ortho-rectification where the geometry of SLC image was corrected. Once the geometry of image was corrected, it was subjected to speckle suppression while attempting to preserve the radiometric and spatial resolution of the initial image. Geometric correction was further performed to geo-correct the RADAR imagery.

Classification of both optical and RADAR imagery was performed using pixel based classification via maximum likelihood classifier and object oriented classification via machine learning. Post classification operations were performed on both the classified images for further smoothing. Accuracy assessment was later performed using the ground truth collected during field work which resulted in the overall accuracy of 78.4% for optical and 67.98% for RADAR imagery.