Assessment of Forest Above Ground Biomass Through Linear Modeling Technique Using SAR Data

Authors : Arjun G. Koppad

Abstract : The study was conducted in Joida taluk of Uttara Kannada district, Karnataka, India, to assess the land use land cover (LULC) and forest aboveground biomass using L band SAR data. The study area covered has dense, moderately dense, and sparse forests. The sampled area was 0.01 percent of the forest area with 30 sampling plots which were selected randomly. The point center quadrate (PCQ) method was used to select the tree and collected the tree growth parameters viz., tree height, diameter at breast height (DBH), and diameter at the tree base. The tree crown density was measured with a densitometer. Each sample plot biomass was estimated using the standard formula. In this study, the LULC classification was done using Freeman-Durden, Yamaghuchi and Pauli polarimetric decompositions. It was observed that the Freeman-Durden decomposition showed better LULC classification with an accuracy of 88 percent. An attempt was made to estimate the aboveground biomass using SAR backscatter. The ALOS-2 PALSAR-2 L-band data (HH, HV, VV &VH) fully polarimetric quad-pol SAR data was used. SAR backscatter-based regression model was implemented to retrieve forest aboveground biomass of the study area. Cross-polarization (HV) has shown a good correlation with forest above-ground biomass. The Multi Linear Regression analysis was done to estimate aboveground biomass of the natural forest areas of the Joida taluk. The different polarizations (HH &HV, VV &HH, HV & VH, VV&VH) combination of HH and HV polarization shows a good correlation with field and predicted biomass. The RMSE and value for HH & HV and HH & VV were 78 t/ha and 0.861, 81 t/ha and 0.853, respectively. Hence the model can be recommended for estimating AGB for the dense, moderately dense, and sparse forest.
Keywords : forest, biomass, LULC, back scatter, SAR, regression