Investigating vegetation responses against changes in land surface temperature in Lao tropical forests

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Abstract: MODIS enhanced vegetation index (EVI) and land surface temperature (LST) are considered as sensitive physic and biosphere indicators that could be used for monitoring vegetation cover changes on regional and global scales. However, their characteristics and responses over complex ecosystems such tropical environments are required for further investigation. In this paper, we attempted to investigate the characteristics and responses of vegetation against changes in land surface temperature in different tropical forest covers. We used MODIS LST and EVI time series covered Lao tropical forests over seven-year periods from 2006 to 2012. To achieve these, three major research components were implemented; (1) examining long-term averages of temporal responses of LST and EVI across different land cover types; (2) investigating the seasonal transition in LST and EVI over land covers, and (3) evaluating a possibility of using LST and EVI to discriminate forest/land covers by using linear discrimination analysis (LDA). It was found that LST and EVI reacted differently across four land covers during an annual seasonal circle. Native forest indicated less variation in LST and EVI seasonality and their trajectories were well distinguished from other land covers. In contrast, plantation, mixed wooded/cleared area and agriculture showed more variations in seasonal patterns of LST and EVI. Their annual seasonal transitions showed larger shapes or wider transitional circles. EVI reached its maximum in a rainy season and dropped to lowest point in a dry season for all land covers. This was opposite with seasonal patterns of LST. The linear discriminant analysis (LDA) showed that there was a high possibility of separation of tropical land covers by using long term averages of EVI and LST. Overall accuracy was 0.83 (or 83.37%), with statistically significant (*P<0.001)*.

Keywords: seasonal transition, vegetation response, tropical forest changes, MODIS LST, EVI