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Estimation of Vegetation Proportion Cover to Improve Land Surface Emissivity

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Precise estimation of land surface emissivity (LSE) is essential to predict land surface energy budgets and land surface temperature, as LSE is an indicator of material composition. There exist several approaches to LSE estimation employing remote sensing data; however, the prediction of LSE remains a challenging task. Among the existing approaches for calculating LSE, the NDVI threshold method appears to hold well over vegetated areas. To apply the NDVI threshold method, it is necessary to know the proportion of vegetation cover (Pv). This research aims to investigate the impact of Pv's prediction accuracy on the estimation of LSE over the forest ecosystem. In this regard, a field campaign coinciding with a Landsat-8 overpass was undertaken for the mixed temperate forest of the Bavarian Forest National Park, in southeastern Germany. The Pv in situ measurements were made for 37 plots. Four vegetation indices, namely NDVI, variable atmospherically resistant index, wide dynamic range vegetation index, and three-band gradient difference vegetation index, were applied to predict Pv for further use in LSE computing. Unlike previous studies that suggested variable atmospherically resistant index can be estimated Pv with higher prediction accuracy compared to NDVI over the agricultural area, our results showed that the prediction accuracy of Pv is not different when using NDVI over the forest ($R^2_{CV} = 0.42$, $RMSE_{CV} = 0.06$). Pv was measured with the lowest accuracy using the wide dynamic range vegetation index ($R^2_{CV} = 0.014$, $RMSE_{CV} = 0.197$) and three-band gradient difference vegetation index ($R^2_{CV} = 0.032$, $RMSE_{CV} = 0.018$). The results of this study also revealed that the variation in the prediction accuracy of the Pv has an impact on the results of LSE calculation.