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Different combination of MODIS land surface temperature data for daily air surface temperature estimation in North West Vietnam

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Land air temperature (T_a) with high spatial and temporal resolution plays an important role in various applications, such as: crop growth monitoring and simulations, environmental risk models, weather forecasting, land use cover change, urban heat islands, etc. Daily T_a (including T_{a-max}, T_{a-min}, and T_{a-mean}) is usually measured by weather stations (often at 2 m above the ground); thus, T_a is limited in spatial coverage. Satellite data, especially MODIS land surface temperature (LST) data at 1 kilometre and high temporal resolution (4 times per day, combining TERRA and AQUA) are free available and easily to access. However, there is a difference between T_a and LST because of the complex surface energy budget and multiple related variables between them. Several researches states that the T_a could be estimated using MODIS LST data with accurate of 2-4^{o}C. However, there are only a handful of studies using dynamically combining of four MODIS LST data for T_a estimation. In this study, we evaluated all 15 – possible – combinations of four MODIS LST using support vector machine (SVM) and random forests (RFs) models. MODIS LST and T_a data was extracted from 4 weather stations in rural area in North West Vietnam from 2010 to 2012 (three years). Our results indicated that the accuracy of T_a estimation was affected by the different combination and the combined data (multiple variables) gave better results than those of single LST (solely variable), the best result was achieved (coefficient of determination (R^2) = 0.95, 0.97, 0.97; root mean square error (RMSE) =1.7, 1.4, 1.2 ^{o}C for T_{a-min}, T_{a-max}, T_{a-mean} respectively) when all four LSTs were combined and RFs performed better than SVM.