

A Comparison air temperature and land surface temperature to detect an urbanization effect in Jakarta, Indonesia

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Abstract : This study is demonstrating the application of Landsat image for estimating land surface temperature (Ts) and air temperature (Ta) in Jakarta, Indonesia, using observed relationship between Ts and Ta. Traditionally, Ta has been measured at meteorological stations with low horizontal density and it was difficult to observe spatial pattern of Ta over wide areas. The use of satellite remote sensing data can help to overcome the spatial problem of estimating Ta particularly in areas with low station density using satellite-based land surface temperature estimation and ground-based relationship between Ts and Ta.

The statistical approach was used in this study. Ts values obtained from Landsat 1989 and 2006. This validation was applied by comparing Landsat 2006 and ground based measurement observed in 2012. The result shows strong correlation between Landsat Ts and ground base Ts measurement ($R^2 = 0.733$) which means this value is reliable to validate and represent actual land surface temperature. In the validation result, the lowest actual Ts is 15.4 °C and the highest is 31.0° C. The spatial distribution of land surface temperature in 2006 is 10.1°C (minimum) – 26.9 °C (maximum). To understand the relationship between Ta and Ts on image satellite a statistical approach was applied. The range of R-squared value (R^2) was 0.64, highest Ta is 39.1°C whereas Ts is 53.5°C. Although the highest Ts can be 15°C hotter than the corresponding Ta, correlation was enough high to estimate Ta from satellite-derived Ts.

Keywords : urban area, land surface temperature, air temperature, satellite image, statistical approach