Surface Soil Temperatures of Various Land Cover Types within the Chianan Plain, Southern Taiwan

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Surface Soil Temperature (SST) is defined as the surface or near-surface temperature of the ground that consists of the upper boundary of the subsurface temperature-depth curve. SST is an important parameter for understanding subsurface heat transfer and climate change. In this research, I define two types of SST: 1) Measured Surface Soil Temperature (MSST), measured with a data logger in the uppermost centimeters of the ground, and 2) Present Surface Soil Temperature (PSST), estimated from temperature-depth curves.

Results from the experiment indicate that land covers at a 1 m radius above data loggers consist of three types: trees, grass, and bare soil. Values for MSST in 2017 were 23.8-28.3°C, while average annual air temperatures were 23.9-25.2°C. Temperatures for the trees were 23.8-26.2°C, lower than average, while temperatures for bare soil with no shield to solar radiation were higher, 26.0-28.3°C. Land cover types within a 100 m radius surrounding monitoring wells included: trees, buildings, crops, bare soils, and fish ponds. Values for PSST were 24.5-28.5°C and were correlated with the percentage of land cover area to estimate the temperature of various land cover types. Temperatures were 25.2, 25.6, 25.9, 26.8, and 27.6°C for crops, trees, buildings, fish ponds, and bare soils, respectively, with a minimum mean absolute error of 0.5°C. Both PSST and MSST within the study area displayed a correlation with land cover types that indicated a wide range of temperatures, 23-29°C. Studies of surface temperature history using temperature-depth curves should consider the impact of land cover change.