EVALUATING THERMAL COMFORT IN CITY LIFE AND ITS RELATION TO SOCIO-ECONOMIC ACTIVITIES

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Abstract: Heat island is one of the urban problems in recent years. Satellite remote sensing is widely used for evaluating its effect. For example algorithms have been developed for land surface temperature retrieval from Multi-functional Transport Satellite (MTSAT). However, human's health and thermal comfort are affected by not only the temperature but also other factors including humidity, wind speed and solar radiation. So we usually use composite temperatures, which are indexes expressing sensible climate, for assessing environment. Measuring sensible climate by satellite remote sensing is useful for evaluating thermal comfort in city life in large area in real time. In previous study, we developed a method for calculating Wet Bulb Globe Temperature (WBGT), a composite temperature used to prevent heat disorder, from thermal infrared data of MTSAT. It enabled evaluating thermal comfort in large hot area by satellite remote sensing. It was found that the formula could be applied when actual WBGT was over around 25, but it was over estimated when WBGT was lower. So we needed to other method for cool season.

The objective of this study is to develop a method for evaluating thermal comfort all year around in both hot and cold seasons. We used Wind Chill Index (WCI), a cold index used to avoid injuries from the cold, in cold season as well as WBGT in hot season. Firstly we prepared WCI calculated from in-situ measurement data and then did regression analysis with 3 bands of MTSAT data. From that, a formula expressing relations between WCI and MTSAT data was derived. Next we calibrated the expression, using data except hot days' so that it became best suited to cold season. Finally we used this formula together with WBGT's formula. The result enabled evaluating real-time thermal comfort with MTSAT data all year around. The database should be effective for

comparative analysis of large area and we could make thermal comfort image mappings in 4km resolution. In addition, regional thermal comfort's relevance to various statistical data about social life could be examined.

Keyword: Wet Bulb Globe Temperature (WBGT),
Wind Chill Index (WCI), Multi-functional Transport Satellite(MTSAT)