

Comparative Study of Kp index and Local K-index from Phuket Geomagnetic Observatory

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The Planetary K-index (Kp-index) introduced by J. Bartels in 1949[1] has been widely recognized as an excellent global indicator to monitor large-scale geomagnetic storms and solar activities and it is the average standardized index derived from the local K-indices of a global network of geomagnetic observatories located mostly in the mid latitude regions. Many space weather observatories have attempted to generate their own local K-indices for observing the local geomagnetic and ionospheric disturbances [2], [3]. Phuket, Thailand (AACGM 1.07°N, 171.15°E) is located close to the magnetic equator and it always experiences with local irregularity phenomena such as Equatorial Plasma Bubbles (EPB), Equatorial Electrojet (EEJ) etc. Therefore, this work aims to study the local geomagnetic and ionospheric disturbances by generating local K-index using the geomagnetic field data from Phuket's magnetometer. We investigate the generated local K-index comparing the Kp-index. In the literature, local K-index is derived from the maximum fluctuations of horizontal components of the horizontal magnetic fields from a specific observatory in a three-hour interval after each solar regular variation (SR) curve is subtracted from the observed field. The SR curve represents the daily regular magnetic variation and various techniques were proposed to define SR [1]. In this work, based on [3], the SR curve is computed based on the field data from past 27 days. Since the intense of magnetic fluctuation due to the solar activity is depend on the geomagnetic latitude, we also develop a table of magnetic field range classes for K-index conversion with the lower K9 limits values from other geomagnetic observatories that are located at 's the magnetic longitude approximately close to Phuket. Figure 1 shows the comparison of local K-index from Phuket and Kp-index values for a disturbed day (March 17, 2019) and a quiet day (December 3, 2019). In the disturbed day, the values of both indices are quite similar, except sun-set time and after sun-set periods. However, the local K-index value is significantly higher than the Kp-index during the quiet days due the local ionospheric phenomenon. In this work, we also investigate these differences between two K-indices by comparing other ionospheric parameters such as total electron contents (TEC) and the geomagnetic data from other regions.

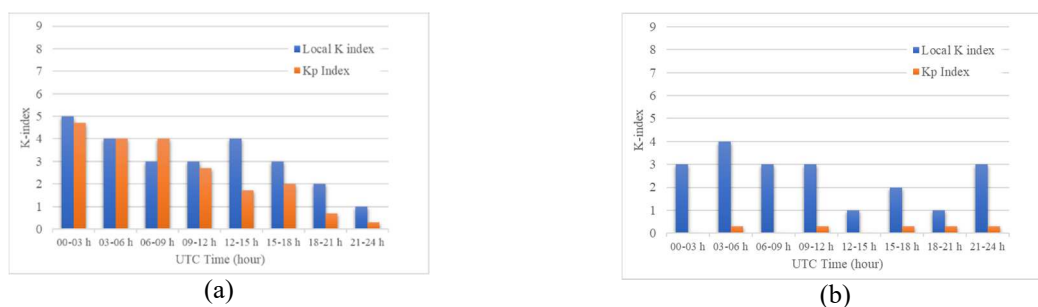


Figure 1. Comparison of Local K-index from Phuket Observatory (AACGM 1.07°N, 171.15°E) and the global Kp index on (a) a solar disturbed day (March 17, 2019) and (b) a solar quiet day (December 3, 2019).

References

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