Extreme value theory for modeling and prediction of high PM10 concentration in Johor

ABSTRACT

When consider the extreme level of pollutant concentration, the Extreme Value Theory (EVT) is a best solution to model the extreme data and predict the level of dangerous concentration. This article analyzes the extreme PM10 concentration monitored at three monitoring stations in Johor. The diagnostic plots show that the GEV distribution of EVT with Frechet type is well fitted for modeling the monthly maximum PM10 concentration during the years 2001ó2010, therefore, is sufficient for prediction. The application of EVT in air quality study is concerned on how well the mathematical theory further answer the question relating to the probability that the pollutant concentration will exceed a certain level in a period. In EVT, this quantity is often called return levels. The 10, 20 and 100-year return level is computed for future prediction. It is expected that the Muar station have high PM10 return level since it is located across the Malacca Strait from Sumatra, which is closest to the hot spots. The predicted return levels suggest that the intensity of coming pollution events for PM10 will worse in the future.

Keyword: Extreme value theory (EVT); PM10; Gumbel distribution; Return level; Air quality index