

# Assessing the Impacts of Climate Variables on Long-term Air Quality Trends in Peninsular Malaysia

Yijing Zheng

Universiti Kebangsaan Malaysia, Malaysia. Chengdu University of Information Technology, China

## Author list (excluding presenting author)

Yijing Zheng, Maggie Chel Gee Ooi, Liew Juneng, Hin Boo Wee, Mohd Talib Latif, Mohd Shahrul Mohd Nadzir, Norfazrin Mohd Hanif, Andy Chan, Li Li, Norfazilah binti Ahmad, Fredolin Tangang

## Abstract

Climate change is thought to influence the composition of atmospheric air, but little is known about the direct relationship between these variables, especially in a hot tropical climate like that of Malaysia. This work summarizes and analyzes the climate state and air quality of Peninsular Malaysia based on selected ground-based observations of the temperature, precipitation, relative humidity, wind speed, wind direction and concentrations of PM<sub>10</sub>, O<sub>3</sub>, CO, NO<sub>2</sub>, and SO<sub>2</sub> over the last 20 years (2000–2019). The relationship between the climate state and air quality is analyzed using the Pearson correlation and canonical correlation analysis (CCA) methods is employed to predict the degree of change in the future air quality under different warming scenarios. It is found that the Peninsular Malaysia mainly experienced strong precipitation in the central and mountainous regions, while air pollutants are primarily concentrated in densely populated areas. Throughout the period of study (interannual, monthly, and diurnal time series analyses), Peninsular Malaysia became warmer and drier, with a significant increase in temperature (+4.2 %), decrease in the relative humidity (– 4.5 %), and greater fluctuation in precipitation amount. The pollution conditions have worsened; there has been an increase in the PM<sub>10</sub> (+16.4 %), O<sub>3</sub> (+39.5 %), and NO<sub>2</sub> (+2.1 %) concentration over the last 20 years. However, the amount of SO<sub>2</sub> (– 53.6 %) and CO (– 20.6 %) decreased significantly. The analysis of the monthly variation shows a strong bimodality of the PM<sub>10</sub> and O<sub>3</sub> concentrations that corresponds to the monsoon transition. Intensive diurnal fluctuations and correlations are observed for all the variables in this study. According to the CCA, the air quality factors are strongly correlated with meteorological factors; in particular, the CO, O<sub>3</sub>, and PM<sub>10</sub> concentrations interact strongly with the air temperature. These findings show that the future air quality in Peninsular Malaysia has high possibility to deteriorate under warming condition.

## Early Career Scientist

YES, I am an early career scientist.

## IGAC Activities

MAP-AQ: Monitoring, Analysis and Prediction of Air Quality