Malaysian Journal of Tropical Geography, 2025, 51(1): 15-30

LOCAL ATMOSPHERIC OZONE VARIABILITY AND CHANGE AS OBSERVED AT KUALA LUMPUR (2.73^{O}N, 101.7^{O}E), MALAYSIA

Ooi See Hai[1], Azizan Abu Samah[1,2,3], Peter Braesicke[4,5] and Sheeba Nettukandy Chenoli[1,2,3*]

[1]National Antarctic Research Center, Universiti Malaya

[2]Department of Geography, Faculty of Arts and Social Sciences, Universiti Malaya

[3]Institute of Ocean and Earth Sciences Universiti Malaya,
50603 Kuala Lumpur, Malaysia

[4]Research and Development, Deutscher Wetterdienst, Offenbach,Germany

[5]Karlsruhe Institute of Technology, IMK-ASF, Karlsruhe, Germany

Email: sheeba@um.edu.my

ABSTRACT

We present the first comprehensive analysis of attributing large-scale influence on the local changes in atmospheric ozone over Kuala Lumpur (KL). KL is located near the western fringe of the equatorial South China Sea. We focus on radio- and ozone- sonde data available from the Southern Hemisphere ADditional OZonesondes (SHADOZ) network and investigate the variability and trends observed from 1998 to 2016. The most important drivers of variability over KL are the Quasi-biennial oscillation (QBO) and the El Niño Southern Oscillation (ENSO). QBO signatures are evident in both the stratospheric ozone and temperature anomalies (including the 2016 disruption) while ENSO plays a small role in impacting tropospheric ozone and temperature variabilities. Over KL chemical depletion of stratospheric ozone is small and occurs in conjunction with decreasing temperature trend. However, tropospheric ozone and temperature show increasing trends. Apart from attributing observed local ozone and temperature changes to the most important drivers of year-to-year variability, trends obtained are regional indicators of a changing climate.

Keywords: *Stratospheric and tropospheric ozone, variabilities, trends, QBO and ENSO.*

INTRODUCTION

Local, regional and global climate change are linked in many ways. How large-scale atmospheric circulation changes are affecting local variability and long-term trends is increasingly important to judge manifestations of climate change. Here, we will focus on ozone- and temperature-sonde data from Kuala Lumpur (KL) from 1998 to 2016. We will attribute leading modes of variability (namely QBO and ENSO) and discuss the long-term trends. Temperature is an obvious choice in such an assessment, because it is well observed and directly related to climate change. Ozone might be a less obvious choice, but it is driven by circulation and temperature changes and has a direct radiative impact on the thermal structure of the atmosphere