

## Large-scale weather dynamics during the 2015 haze event in Singapore

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The 2015 haze event in South East Asia is widely considered as a period of the worst air quality in the region in more than a decade. The source of the haze was from forest and peatland fire in Sumatra and Kalimantan Islands, Indonesia. The fires were mostly came from the practice of forest clearance known as slash and burn, to be converted to palm oil plantation. Such practice of clearance although occurs seasonally but at 2015 it became worst by the impact of strong El Nino. The long period of dryer atmosphere over the region due to El Nino makes the fire easier to ignite, spread and difficult to stop.

The biomass emission from the forest and peatland fire caused large-scale haze pollution problem in both Islands and further spread into the neighboring countries such as Singapore and Malaysia. In Singapore, for about two months (September-October, 2015) the air quality was in the unhealthy level. Such unfortunate condition caused some socioeconomic losses such as school closure, cancellation of outdoor events, health issues and many more with total losses estimated as ~S\$700 million. The unhealthy level of Singapore's air quality is based on the increasing pollutant standard index ( $PSI > 120$ ) due to the haze arrival, it even reached a hazardous level ( $PSI \sim 300$ ) for several days. PSI is a metric of air quality in Singapore that aggregate six pollutants ( $SO_2$ ,  $PM_{10}$ ,  $PM_{2.5}$ ,  $NO_2$ ,  $CO$  and  $O_3$ ). In this study, we focused on PSI variability in weekly-biweekly time scales (periodicity  $< 30$  days) since it is the least understood compare to their diurnal and seasonal scales.

We have identified three dominant time scales of PSI ( $\sim 5$ ,  $\sim 10$  and  $\sim 20$  days) using Wavelet method and investigated their large-scale atmospheric structures. The PSI associated large-scale column moisture horizontal structures over the Indo-Pacific basin are dominated by easterly propagating gyres in synoptic (macro) scale for the  $\sim 5$  days ( $\sim 10$  and  $\sim 20$  days) time scales. The propagating gyres manifest as cyclical column moisture flux trajectory around Singapore region. Some of its phases are identified to be responsible in transporting the haze from its source to Singapore. The haze source was identified by compositing number of hotspots in grid-space based on the three time scales of PSI. Further discussion about equatorial waves during the haze event will also be presented.