



ABSTRACT

It has been widely known that climate factors such as ambient temperature potentially influence transportation of particles and gases in surface air and soil. This impact is even larger under circumstances of extreme climate in the tropical zone. IMS Radionuclide and Noble Gas monitoring stations are operated by sampling particulates and gases at surface air level. This could be affected by those factors resulting in fluctuation of background radioactivity from gamma-emitting radionuclides and of Minimum Detectable Concentration (MDC). This study aims to reveal impacts of tropical climate factors including ambient temperature and humidity on background radioactivity levels of interested radionuclides. The results obtained from this work could be used for more accurate analysis and more reliable interpretation of gamma spectrum gain from the newly certified RN65 and other stations located in the tropical area. In addition, these high-quality scientific data would help strengthen the environmental radioactivity databases at the national and international levels.

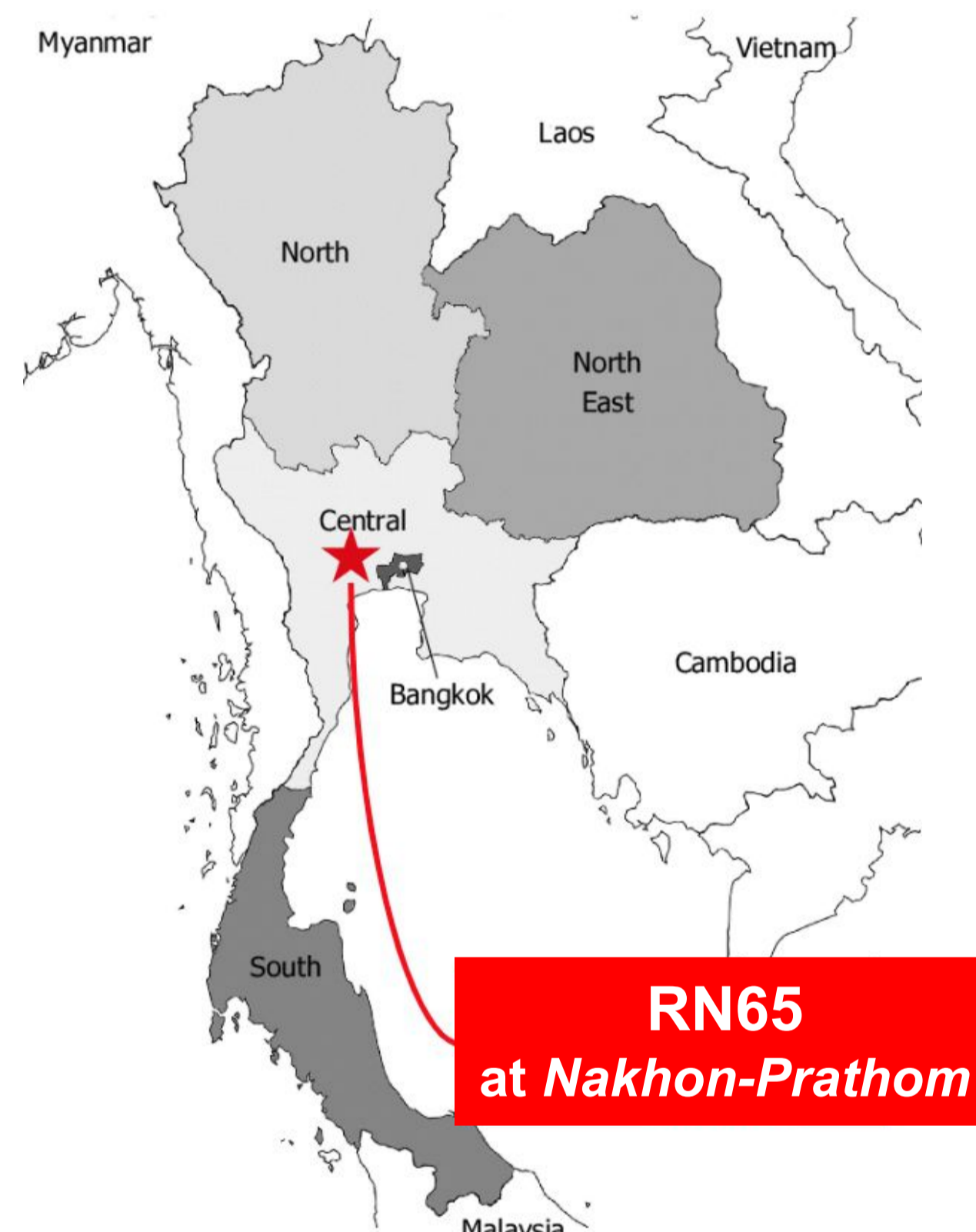
BACKGROUND

Station Information

- THP65 Location: Kasetsart University, Nakhon-Prathom, Thailand
- Installation: Feb 2017
- Location Coordination
 Latitude: 14 01 42.5 N
 Longitude: 99 58 12.1 E
- Certification Date : 14 Dec 2018

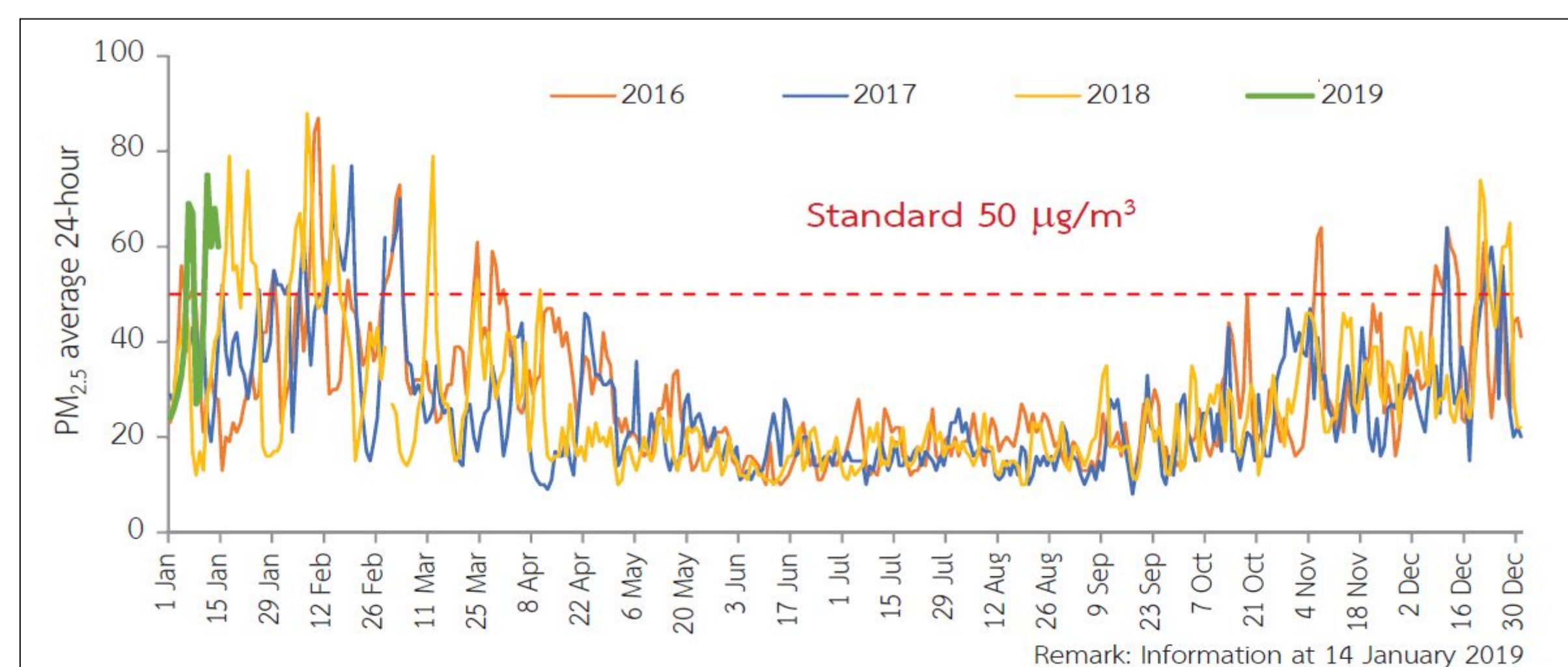
Local Climate Information

- Ambient temperature: 20-37 °C
- Humidity: 50-95%
- Particulate Matter pollution: between Dec 2018 to Jan 2019



Particulate Matter Pollution in Bangkok and other vicinities

Recently, Bangkok and nearby vicinities were polluted by PM_{2.5} between December 2018 and February 2019 (Dry season). PM_{2.5} and PM₁₀ concentrations exceeding the healthy level were reported by the Pollution Control Department.

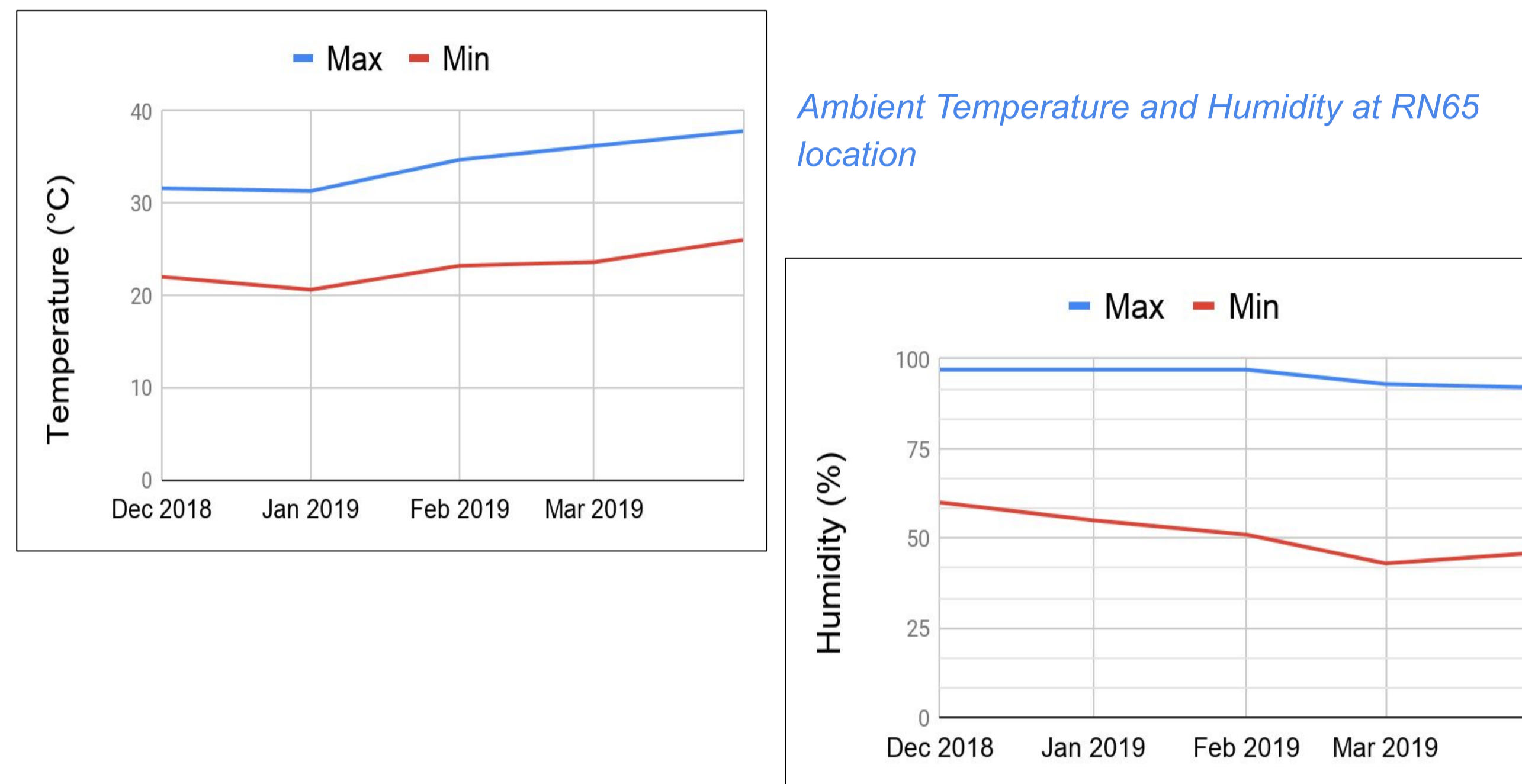


The 24 hrs average PM_{2.5} concentration in Bangkok from 2016 – 2019
 *Data of the Pollution Control Department

Impacts of Tropical Climate

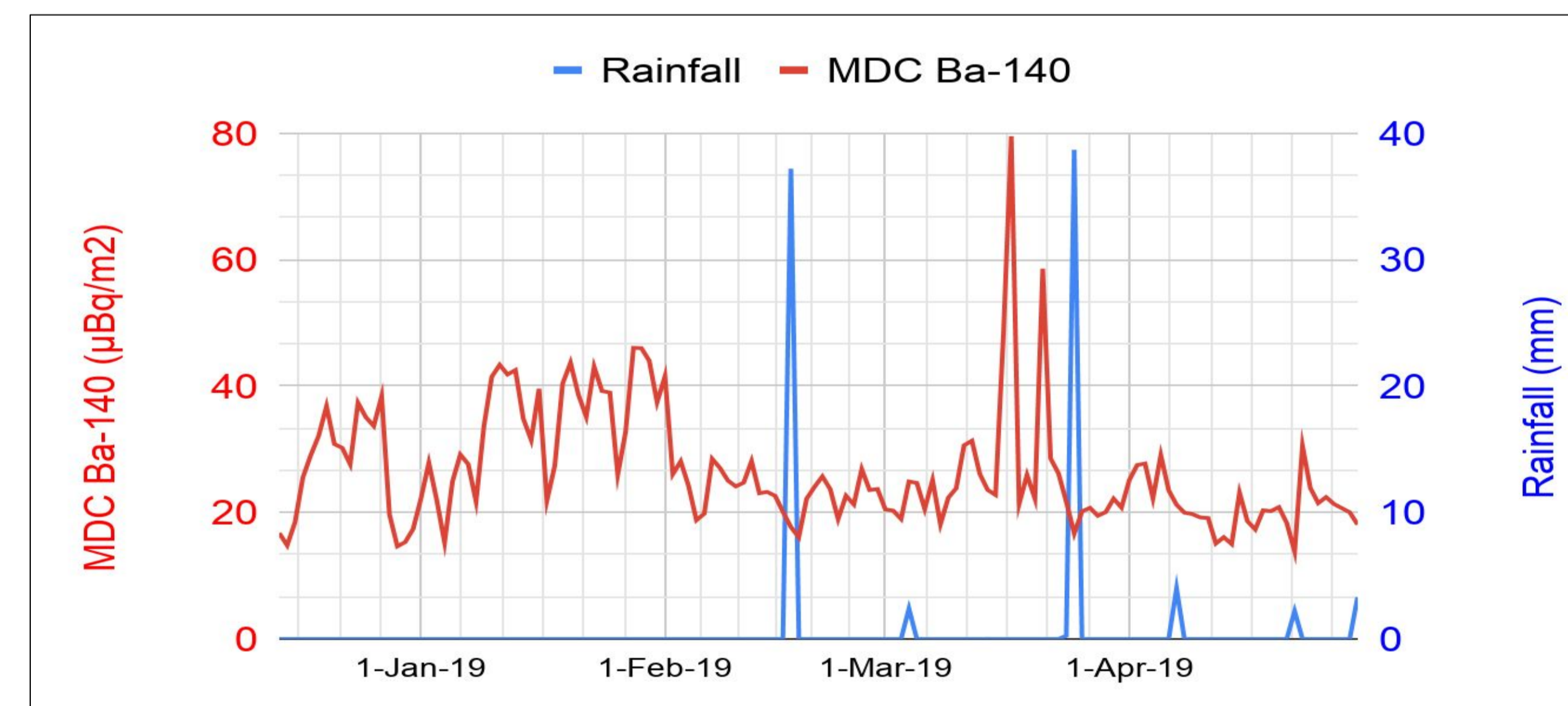
State of Health of RN65

Since the station certification in 2018, there was no significant impact from tropical climate including high temperature, humidity, heavy rainfall, and large difference of temperature between day and night times to SoH of RN65 observed. The station temperature and humidity were 22 ± 1.5 °C and <60%, respectively.



Baseline Sensitivity (Ba-140 MDC)

Rainfall has been observed to degrade the MDC of Ba-140 which is an PTS's indicator to justifies the quality of IMS data generated at Radionuclide Monitoring Station.



Daily value of Ba-140 MDC and Rainfall between December 2018 – 30 April 2019

CONCLUSION

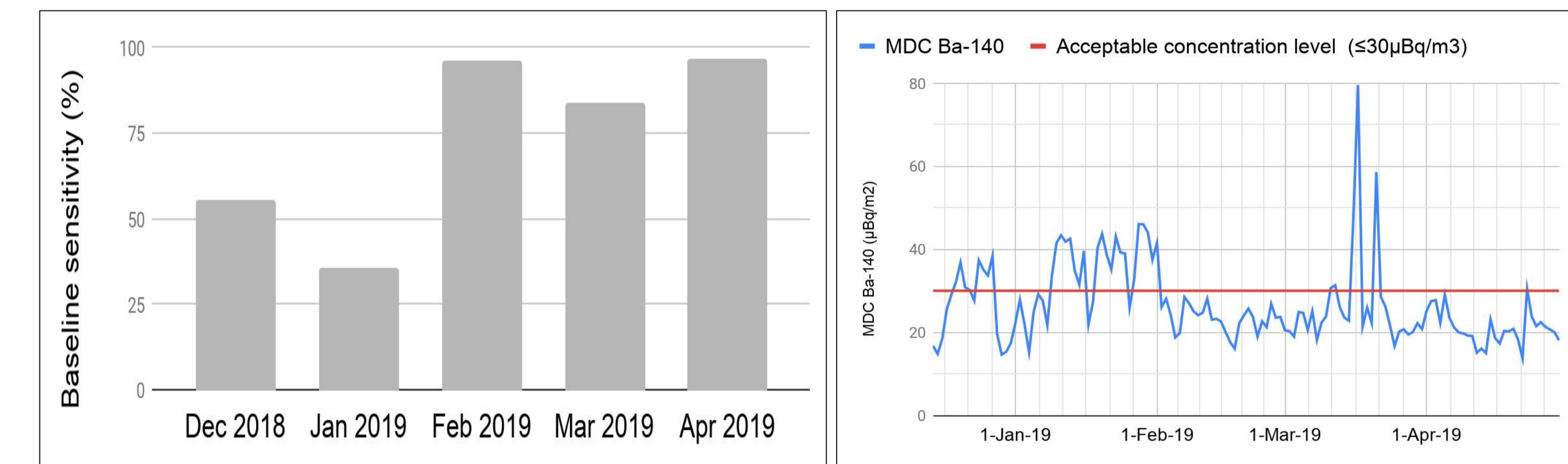
Three important points could be highlighted as follow:

1. For short term operation, the tropical climate has no significant impacts on station operation.
2. Particulate Matter pollution in Bangkok and nearby vicinities decreases the quality of RN65 data by enhances baseline sensitivity measured using MDC of Ba-140.
3. Rainfall might impact the quality of RN65 data by diluting particulate concentrations both in surface air and collected sample.

Impacts of Particulate Matter Pollution

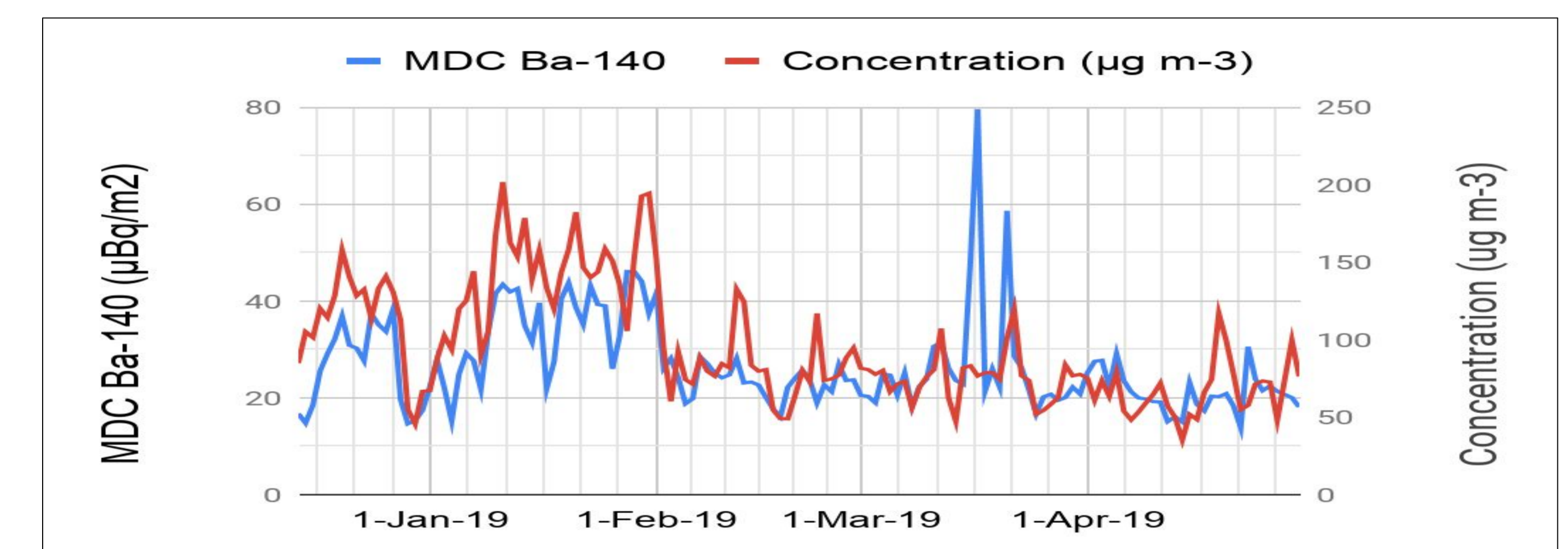
Baseline Sensitivity (Ba-140 MDC)

It was found that, in December 2018 and January 2019, % Baseline Sensivities of RN65 were 56% and 35%, respectively. The reported values were lower than those reported between February and April 2019.



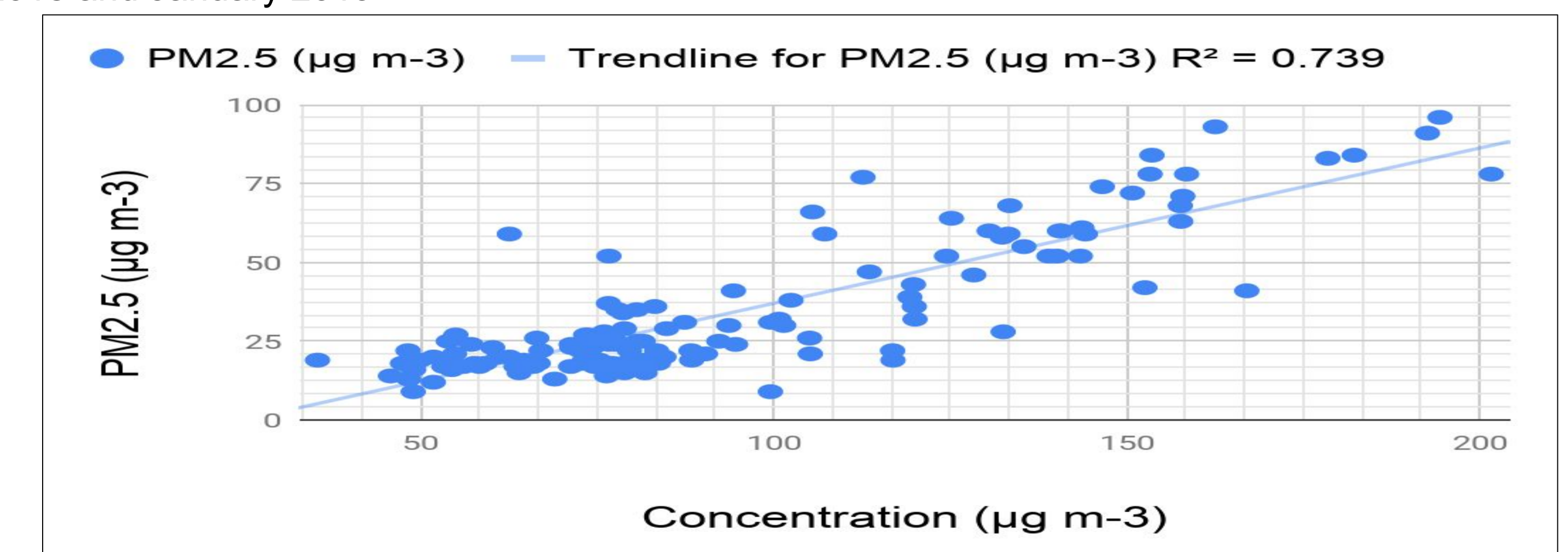
Baseline sensitivity of RN65 during December 2018 - April 2019

In addition, a relationship between MDC of Ba-140 and particulate concentrations was investigated. It was found that high MDC of Ba-140 values were observed when the concentrations of Total Suspended Particulate (TSP) were increased in December 2018 and January 2019 (two data failed of Ba-140 MDC on March 19 were come from too short measuring time).



Similar trend of daily concentration of TSP (Total Suspended Particulate) at RN65 and MDC of Ba-140

The reason of high concentration of TSP at RN65 in December 2018 and January 2019 was further investigated. The finding showed a significant correlation between TSP and PM_{2.5} during the period of investigation. This indicates that high concentration of calculated TSP at RN65 could be caused by an increase of PM_{2.5} concentration in Nakhon Pathom province between December 2018 and January 2019.



Significant correlation between TSP concentrations at RN65 and PM_{2.5} concentrations at Nakhon Pathom