PARTICULATE CONCENTRATIONS IN THE ILOCOS REGION AS INFLUENCED BY TROPICAL CYCLONES

ABSTRACT

The influence of tropical cyclones on air pollution has been the subject of increasing attention as concentrations undergo modest to drastic changes and the likelihood of transboundary pollution during TC events. Literature revealed the northern Philippines notably affected by pollutant transport from East Asia. These and the frequent TC activity in the Western North Pacific Basin and limited information available on the TC influence on air pollution in the country prompted the study for investigation. In this study, TC influence on the particulate concentrations of the Ilocos region using ground-based and MERRA-2 model pollutant and meteorological records were investigated. Significant variations of PM in relation to TC distance and position, and season were noted. Simulated PM showed an inversely proportional relationship with TC distance. PM variations were primarily caused by the changes occurring in the winds due to TC proximity to the region. Wind speeds partly increased as TCs moved towards the region. Changes in concentrations were also affected by the TC-induced accumulation of local emissions and LRT of aerosols related to distant TCs. Meanwhile, TCs located north of the region resulted in higher PM levels due to pollutant build-up and LRT. Seasonal analysis revealed that dispersion outweighed the contribution of the Northeast Asian emissions during the Amihan season causing relatively lower pollution. In contrast, TCs during the Habagat season showed a systematic pattern of influence on pollution wherein increased concentration was noted as TCs moved farther from the region. Transboundary pollution from Malaysia, Borneo, and Indonesia to the region also played an important role in the heightened PM levels. The Amihan and Habagat TC case showed different and similar effects, respectively, with the results of the climatological analysis. The MERRA-2 model has been shown to be very good at simulating the particulate concentrations during TC occurrences. The findings of this study provided information and understanding on the variability of the pollutant levels in the region as influenced by TCs and may aid the public in crafting awareness and control strategies.

Keywords: Particulate matters, tropical cyclone, Luzon, Ilocos Region