논 문

광양만권 오존 발생특성 연구 - 군집분석 중심으로 -

Characteristics of High Ozone Concentration in Gwangyang Bay Area - Based on Cluster Analysis -

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Abstract　　The recent increase in the number of measurement points has caused changes to appear in the high-concentration ozone (O_3) measurement points in the Gwangyang Bay area. Thus, it is necessary to plan emission characteristics and management measures through clustering rather than managing existing points. In the present study, cluster analysis was used to cluster measuring stations with high similarities in the daily average and daily maximum O_3 concentration using the NbCluster Package of R-program. The cluster analysis divided the daily average O_3 concentration into three groups (average A, B, and C clusters), and the daily maximum O_3 concentration into two groups (max A, B clusters). NOx and O_3 concentrations were compared for each cluster. The average concentration of O_3 was high for average C cluster and max B cluster, and the average concentration of NOx was high for average C cluster and max A cluster. Average C cluster represents urban areas with high-rise building and heavy traffic, which have higher O_3 and NOx concentrations than in other clusters. Comparing the VOCs/NOx in Gwangyang Bay area gave the following results: VOCs/NOx in average C cluster was 9.84, similar to the highest 8 ratio in O_3 generation, and VOCs/NOx in average B cluster was 3.68, indicating a VOCs-limited environmental condition. To reduce O_3 by cluster, a method of controlling VOCs, which act as a common precursor for higher O_3 concentrations, is effective, and to this end, measures must be taken to reduce VOC emissions in Yeosu Industrial Complex. Further, it is necessary to simultaneously measure O_3 precursors and O_3 concentrations by installing a photochemical measuring station to establish countermeasures against higher O_3 concentrations at the points of Sindae and Yeonhyang-dong in Suncheon.

Key words: Gwangyang Bay area, O_3, Cluster analysis, VOCs/NOx, VOCs-limited environmental condition

1. 서　　론

　　여수, 순천, 광양을 중심으로 하는 광양만권은 오존 (Ozone)의 전구물질인 NOx (Nitrogen oxides)와 VOCs (Volatile organic compounds)를 대규모로 배출하는 산업단지가 위치하고 있는 임해공업지역으로 환경부는 다른 지역에 비해 오존에 대한 관리가 필요하다고 보고한 바 있다(NIER, 2011).

　　오존은 지상에서 약 15~50 km 상공의 성층권에서 생성되는 성층권 오존과 지표면에서 NO_2의 광화학 반응에 의해 생성되는 지표 오존으로 구분할 수 있다. 성층권 오존은 태양에서 발생하는 유해한 자외선을 차단시켜 지상의 생물을 보호하는 등 긍정적인 역할을 하지만, 지표 오존은 대류권에서 광화학 반응에 의해 생성되며 산화력이 강하여 장시간 흡입하면 호흡기관에 영향을 미쳐서 천식과 기관지 질환을 악화시