Investigating Patterns of Severe Air Pollution in the Lower Tropospheric Layer of Tehran Metropolis

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Abstract

Air pollution is now a major problem in Tehran's metropolis, which threatens the health of its citizens more than anything else. The purpose of this study was to introduce frequent and common synoptic patterns in the incidence of severe and critical pollution in Tehran. For this purpose, air pollution data were first obtained from Tehran Air Quality Control Bureau (2007-2017) and then hazardous days were identified based on AQI index at each of the stations. The rest of the NCEP / NCAR database reassessment data was obtained with a spatial resolution of 2.5 at 2.5 ° for sea level, 1000, 925,850 and 700 hp. After delineating a synoptic map of the above alignments, multiple dominant and repetitive synoptic patterns have been identified and analyzed by repeated eye examinations. During the statistical period, 157 days of severe and dangerous contamination were identified. Among the pollutants affecting Tehran, the most pollutants are PM10, PM2/5 and NO2. An in-depth examination of 5 synoptic patterns revealed severe contamination: Patterns of European immigrant high-pressure, Siberian high-pressure, mixture of Siberia and Saudi high pressure, and Pakistani low pressure. In a pattern commonly occurring during warm-weather pollutions, low-pressure Pakistan played the most important role in producing severe winds in the deserts surrounding Tehran, with the most pollutants being PM10 and PM2.5. The second pattern is caused by the cold season pollutions. In the model, the Siberian high pressure in the lower tropospheric layer (below 850 hPa) with cold advection was the main cause of stability and accumulation of pollutants and at higher levels of the Arabian high pressure stack, while intensifying stability and persistence of atmospheric conditions. In this model, cold-weather stability dominates the city of Tehran. In the third dominant pattern of high pressure Saudi Arabia and its tablets in all atmospheric layers cause very strong stability and persistence of pollution and air stability. In this model, due to the dynamic nature of the system, despite the stability, the air temperature gradually increases and conditions are quite different from the seasonal conditions.

Keywords: Severe pollution, Air Quality Index, Boundary Layer, Synoptic patterns, Tehran

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