

University of Macau

Abstract

Seasonal Behaviors of PM₁₀ and SO₂ Concentrations in Association with the
Meteorological Conditions of Macau

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The purpose of this study is to investigate the variations of the ambient PM₁₀ and SO₂ concentrations with the local meteorological conditions in the urban areas of the Macau. History of the monitored PM₁₀ and SO₂ concentrations and the meteorological conditions of Macau is reviewed with ten years of air quality data starting from 1991 and the statistics of the meteorological data starting from 1971. It is found that the climate of Macau is mainly influenced by the Asian monsoon and the PM₁₀ and SO₂ concentrations can exhibit distinct seasonal behaviors. High PM₁₀ and SO₂ concentrations are observed during winter (November – February), whereas relatively low PM₁₀ and SO₂ concentrations appear during summer (May – September). As seasonal trends of PM₁₀ and SO₂ are identified and the understanding of the meteorological conditions causing these seasonal trends is necessitated, detailed analysis are carried out based on one year of air quality and meteorological data recorded at two automatic monitoring stations between the May of 1999 and the April of 2000. The results obtained from the correlation between the two in different time scales show that relatively high PM₁₀ concentrations and SO₂ concentrations observed

during winter are caused by the prevalence of the northerly winds carrying a large amount of the dry continental air from the Asian continent, whilst the low concentrations are directly associated with the oceanic air intruding from the South China Sea. In addition, the spikes observed in the daily time series of PM_{10} and SO_2 during the summer period are found to be related to the tropical cyclones, leading to air flow stagnation and the rapid decrease in the relative humidity. However, in the present study the possible weather conditions leading to the PM_{10} and SO_2 episodes observed during winter and spring especially during the March cannot be identified due to lack of information concerning the flow conditions. It is suggested that future studies can be concentrated on the identification and classification of the synoptic patterns leading to PM_{10} and SO_2 episodes when enough data are available.