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TEMPORAL–SPATIAL CHARACTERISTICS AND KEY INFLUENCING FACTORS OF $PM_{2.5}$ CONCENTRATIONS IN CHINA BASED ON STIRPAT MODEL AND KUZNETS CURVE

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Abstract

China's tremendous economic developments are achieved at the expense of environmental deterioration. In recent years, $PM_{2.5}$ pollution has become increasingly serious in China, attracting widespread attention from the citizens and the government. This study aims to investigate the temporal–spatial characteristics of $PM_{2.5}$ in China in 1998–2012, fully considering the potential influencing factors of $PM_{2.5}$. The satellite remote sensing data compensate for the deficiency of surface monitoring data in China, such as minimising bias from data contamination, broad coverage and representing long-term temporal–spatial resolution data. A largely expanded list of potential impacting factors is selected based on environmental Kuznets curve (EKC) theory and Stochastic Impacts by Regression on Population, Affluence and Technology (STIRPAT) framework. Moran's I tests are used to examine the spatial correlation of $PM_{2.5}$, and the pooled regression, spatial lag and time-fixed effects spatial lag models are used and compared to explore the influencing factors of $PM_{2.5}$. The thresholded first-order inverse distance spatial weight matrix can measure the spatial spillover effect of $PM_{2.5}$ more accurately by fully considering the effect of distance on spatial influence level. Several important findings are derived. Firstly, China's $PM_{2.5}$ shows a distinct positive spatial correlation. The local Moran's I test shows that the significant high–high $PM_{2.5}$ agglomeration regions include Beijing–Tianjin–Hebei region, Yangtze River Delta and central China, connecting the two economic urban agglomerations. Secondly, the regression results of the time-fixed effects spatial lag model indicate that that $PM_{2.5}$ of a given region increases by 0.362% if the $PM_{2.5}$ of its ambient region increases by 1%. Thirdly, factors from all perspectives of STIRPAT model are very effective in explaining $PM_{2.5}$. Fourthly, no inverted "U" shape EKC is found between the overall economic development level and the $PM_{2.5}$ concentration in China in 1998-2012.

Key words: $PM_{2.5}$, EKC, influencing factors, spatial econometric model, spatial autocorrelation, STIRPAT model

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