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辽宁中部城市群一次灰霾天气过程的外来影响程度研究

A case study of regional contributions to the air quality in city clusters in Central Liaoning during a haze episode

关键词: [灰霾](#) [PM₁₀](#) [跨区域影响](#) [NAQPMS](#) [辽宁中部城市群](#) [京津冀城市群](#)

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摘要: 利用中国科学院大气物理研究所自主开发的嵌套网格空气质量模式系统 (NAQPMS) 及其污染源在线追踪技术,对2011年10月27-30日辽宁中部城市群发生的一次灰霾过程的外来影响贡献率进行了模拟计算和分析.研究表明: NAQPMS模式能较好地模拟辽宁中部城市群PM₁₀浓度的时空演化,特别是代表性城市沈阳的PM₁₀浓度的时间变化,这为利用污染源在线追踪技术研究外来影响的贡献率奠定了基础;在此次辽宁中部城市群灰霾天气期间(10月27-30日),外来贡献率随着城市与京津冀地区距离的增加而减小,从营口的61%减小到铁岭的23%,而辽宁省本地贡献率则逐渐增大;京津冀城市群相对于胶东半岛城市群是主要的外来影响源地;在辽宁中部城市群近地层PM₁₀浓度先后达到峰值时段,京津冀地区对营口、鞍山、沈阳、本溪、抚顺和铁岭的贡献率分别为60.6%、42.8%、31.8%、34.9%、30.7%和19.7%,因此,至少可以说京津冀地区对此次灰霾过程中营口、鞍山、沈阳和本溪等地的空气质量恶化具有决定性的作用.本文研究表明,虽然开展区域调控是解决区域灰霾污染的有效措施,但也要注意灰霾污染的跨控制区影响问题.

Abstract. The Nested Air Quality Prediction Model System (NAQPMS) with an online air pollutant tagged module was used to investigate the contributions of regional transport from the North China Plain to the cities in Liaoning province during a severe haze episode on October 27-30, 2011. The results showed that 1 NAQPMS model can reproduce reasonably the spatial-temporal variations of PM₁₀ concentrations over this region, in particular the capital city of Shenyang. 2The regional contributions of PM₁₀ from the Beijing-Tianjin-Hebei (BTH) region decreased as the increase of distance from BTH along the transport pathway, whereas the local contributions showed opposite trends. For example, the regional contribution from BTH decreased from 61% at Yingkou to 23% at Tieling, two cities with a distance of approximately 200 km in between. Nevertheless, the BTH was still the largest regional contribution to the PM₁₀ in Liaoning compared to other regions, e.g., Shandong Peninsula. 3The peak PM₁₀ occurrence during the haze episode in the cities of Liaoning province followed an order from the southwest to the northeast, and the regional contribution from BTH showed a corresponding decrease from the nearest city of Yingkou (60.6%) to Anshan (42.8%), Shenyang (31.8%), Benxi (34.9%), Fushun (30.7%), and to the farthest Tieling (19.7%). The results suggested that the BTH region played a significant role in affecting the air quality in the cities of Liaoning during the haze episode. Therefore, measures to control the air pollution in Liaoning province would be effective if they are implemented together with the Beijing-Tianjin-Hebei region that contributes significantly to the particulate matter in northeast China.

Key words: [haze](#) [PM₁₀](#) [trans-regional impacts](#) [NAQPMS](#) [city cluster in central Liaoning](#) [Beijing-Tianjin-Hebei](#)

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