

Research on decomposition methods and software development for solving atmospheric pollution problems

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Abstract: This study presents a novel methodology for decomposing and constructing software to solve atmospheric pollution problems. The research addresses the inherent complexity of air pollution modeling by proposing a systematic decomposition approach that separates the problem into distinct, manageable modules: emission sources, chemical transformation, transport and diffusion, and deposition processes. A modular software architecture is developed, integrating numerical methods for solving the advection-diffusion-reaction equations, including finite difference and operator splitting techniques. The software implementation emphasizes computational efficiency, scalability, and user accessibility. Validation against benchmark scenarios and real-world data demonstrates the system's accuracy in predicting pollutant concentrations. The results indicate that the proposed decomposition method not only simplifies the software development process but also enhances maintainability and adaptability for various geographical and meteorological conditions. This work provides a robust computational tool for environmental management and policy-making, contributing to more effective strategies for mitigating air pollution impacts.

Keywords: decomposition, software development, atmospheric pollution, solving a problem