

A Lagrangian stochastic model to predicting pollen dispersion in rice (*Oryza sativa* L.)

基于拉格朗日随机游走模型的水稻花粉扩散研究

**Sponsor:** National Natural Science Foundation of China

**Period:** 2016-2018

**Funding Level:** RMB 210,000

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Rice (*Oryza sativa*) is the most important food crops in China. Its gene flow has received close attention over the past years. Compared with other crops, such as maize and rape, the research of the pollen dispersal model for rice is relatively weak. Since 2002, our team set up a rice pollen diffusion model based on Gaussian Plume model. However, it has some weak points during the model application. With this research, a sub-model of pollen shed in rice is coupled with the Lagrangian stochastic diffusion model to simulate the pollen dispersal of rice. In the modeling process, the following 2 points will be focused on: 1. a improved parameterized scheme of the rice pollen sedimentation velocity; 2. the correlation Lagrangian time scale accounting for 'Cross Trajectory Effect'. Finally, the model is validated by using Durham and Burkard sampler. We can expect this research will improve the reliability and accuracy of rice pollen dispersal model and may provide a serious of data-set for risk assessment and regulation of rice transgene flow on the scientific basis.

水稻 (*Oryza sativa*) 是我国最重要的粮食作物, 它的基因飘流问题一直备受关注。与玉米、油菜等作物相比, 水稻花粉扩散模型的研究相对薄弱。自 2002 年起, 本团队建立了一个以高斯烟羽模型 (Gaussian Plume model, GPM) 为基础的水稻花粉扩散模型, 但在应用过程中发现该模型具有诸多不足。在此研究基础上, 本项目拟开发水稻花粉源强子模型, 与拉格朗日随机游走模型 (Lagrangian stochastic model, LS model) 进行耦合, 建立水稻花粉扩散模型。通过优化水稻花粉沉降速度的参数化方案、引入“交叉轨迹效应”的时间尺度订正参数, 改善水稻花粉扩散过程的模拟精度。最后, 模型利用 Durham 和 Burkard 型花粉采样器的观测数据进行验证。预计项目的研究成果能够有效提高水稻花粉扩散模型的可靠性和准确性, 可为水稻基因飘流的风险评估和安全监管提供基础数据。