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Comparative study between spatial-implicit and -explicit model: a case study of vegetation pattern in salt marshes

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Comparative study between spatial-implicit and -explicit model: a case study of vegetation pattern in salt marshes

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Abstract: From the inception of plant ecology as an independent field, much attention has been focused on understanding spatial and temporal changes in vegetation. Spatially explicit models, such as cellular automation (CA), were widely used to explore simple rules that control vegetation patterns in nature. However, compared to implicit model which was derived from statistic survey and was widely applied to uncover practical issues, spatial explicit model still rests on mimicking the complexities of real behaviours and stimulate new insights about them. Comparative analysis between these two model types was rarely explored. In this study, we simulated the vegetation pattern of a salt marsh wetland in the Yellow River Estuary with both spatial implicit and spatial explicit model. Besides the processes considered in the spatial implicit model, namely reproduction, mortality, stress tolerance, competition ability, and plant-soil feedbacks, we added spatial dispersal and colonization in the spatial explicit model. Vegetation patterns derived respectively from these two models were compared. In addition, sensitive analysis was implemented to recognize key determinates that contribute the most to differentiated simulations between spatial implicit and explicit models. This study makes it possible to construct spatial explicit model based on spatial implicit models and furthers our acknowledge of differences between spatial implicit and explicit model.

***Keywords**:* vegetation pattern; spatial implicit model; spatial explicit model; cellular automata