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Effects of various ecological factors on process-based ecological model behavior uncertainty

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Ecological forecasting predicts the effects of environmental changes on ecosystem state and activity. At present, technologically comprehensive forecasting estimates are estimated using process-based ecological models. However, it is difficult to isolate the ecological factors that cause models behavior uncertainty. To solve this problem, this study aimed to construct an ecoinformatic diagnostic framework to explain uncertainty in model behavior with respect to both the mechanisms and algorithms involved in ecological forecasting. We introduce a complicated ecological driving mechanism to the process-based ecological model using analytical software and algorithms. The ecological forecasting study involved three components: (1) model-observation validation, (2) diagnostic framework, and (3) temporal and spatial forecasting methods. Subsequently, as a case study, we apply the diagnostic framework to detect *Eucalyptus* biomass forest patches at a regional scale (196,158 ha) using the 3PG2 (Physiological Principles in Predicting Growth) model. Our results show that this technique improves the accuracy of ecological simulation for ecological forecasting and prevents new uncertainties from being produced by adding a new driving mechanism to the original model structure. We achieved the highest cost performance ratio between the accuracy requirement of model simulation and the availability of observation data. This result was supported by our *Eucalyptus* biomass simulation using the 3PG2 model, in which ecological factors caused 21.83% and 9.05% uncertainty in model behavior temporal and spatial forecasting, respectively. In conclusion, the systematic ecoinformatic diagnostic framework developed here provides a new method that could be applied to research requiring comprehensive ecological forecasting.

Biography

Yin Ren has completed his PhD at the age of 29 years from Nanjing Forestry University and Postdoctoral studies from Institute of Urban Environment, Chinese Academy of Sciences. He is the Director of Urban Environmental Planning and Management. He has published more than 10 papers in reputed journals and has been serving as an Editorial Board Member of *repute*.

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