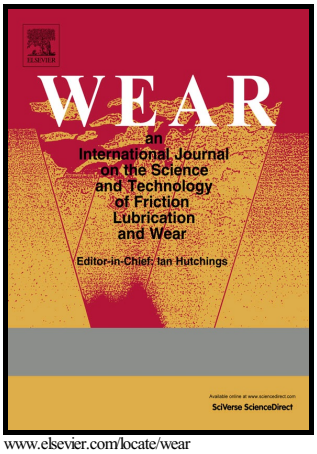

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ABSTRACT

The aim of this paper is to accurately predict the evolution of wheel profile wear and related vehicle dynamics for high-speed trains by considering the stochastic wheel/rail interactions, which experience quite variants with time and along long distant high-speed lines in China. These variants include the rail profiles, track geometries, track irregularities and interface characteristics associated with each segment of track. Mathematic normal distribution is introduced to rationally describe these stochastic parameters. The Archard wear model and FASTSIM algorithm are employed to determine the wear within a contact patch of the wheel, and a strategy based on the travel distance of wheel is used in the profile updating procedure. Referring to previous works, a nonlinear multibody vehicle system model is built and its accuracy was validated by lab tests. In the numerical simulation, three methods of stochastic matching of parameters in wheel/rail interactions are performed, including all constant parameters, only stochastic rail profiles, and both stochastic rail profiles and stochastic track parameters. Comparative studies show that there are good agreements in the wear evaluation of wheel profile between the simulated and measured results, as well as the behavior evaluation of vehicle dynamics in a total travel distance of 300,000 km. It is essential, therefore, to consider the stochastic matchings of parameters in the wheel/rail interaction for predicting the wheel profile wear and vehicle dynamics evolution of high-speed trains.