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Power-Law vs. Exponential Models for Fitting River Peek Flow as Wavelets

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This paper proposes a non-linear differential equation with power-law solution to describe the dynamics of peak flow in river systems. It has been demonstrated theoretically and empirically that non-linear differential equation with power-law solution is superior to the ordinary differential equation with exponential solution in modeling the decay patterns of peak flow in river systems with “V” shape channels. Some fundamental properties of these two types of models, power-law vs. exponential, are discussed and compared. These were validated for characterizing the relationships between the decay of peak flow as the function of time from the day when flow peak occurs using 11 datasets of peak flow events chosen from five gauging stations in the Oak Ridges Moraine (ORM) area, Canada. The differences between the results obtained using these two different types of models were measured using the standard errors of least square fitting as well as the error of linear filtering.