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The effect of flow variability on the river meandering dynamics

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The dynamics of a meandering river has been widely investigated by the scientific community. However, the effects of discharge variability on the meander evolution is still an open question. In this work, we present numerical simulations of the short-term evolution of a plane river morphology (the Ikeda, Parker and Sawai model is used to describe the stream hydrodynamics) forced by a stochastic flow discharge (simulated by a compound Poisson process). The comparison of the simulation outcomes with those obtained for the same river under a constant discharge (equal to the mean of the stochastic process) shows interesting results. The discharge variability slows down both the formation of the meanders and the occurrence of the cutoff events, and induces lower meander curvilinear wavelengths and excess bank velocities. A theoretical analysis of the relationship between the channel erosion rate and the river discharge for the Kinoshita curve confirms the obtained numerical results.