Bilinear local controllability to the trajectories of the Fokker-Planck equation with a localized control

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We will present a new result on the control of the Fokker-Planck equation, posed on a bounded domain of $\mathbb{R}^d$ ($d \geqslant 1$). More precisely, the control is the drift force, localized on a small open subset. We prove that this system is locally null controllable to regular nonzero trajectories. The results are obtained thanks to a linearization method based on a standard inverse mapping procedure and the fictitious control method. The main novelties of the present article are twofold. Firstly, we propose an alternative strategy to the standard fictitious control method: the algebraic solvability is performed and used directly on the adjoint problem. Secondly, we prove a new Carleman inequality for the heat equation with one order space-varying coefficients: the right-hand side is the gradient of the solution localized on a subset (rather than the solution itself), and the left-hand side can contain arbitrary high derivatives of the solution. This is a joint work with Michel Duprez.