

Title: On the local properties of weak solutions to elliptic equations with divergent-free drift

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Abstract: We discuss the local properties of weak solutions to the equation $-\Delta u + b \cdot \nabla u = 0$ describing the diffusion in an incompressible flow. The corresponding theory is well-known in the case of the general (not necessary divergent-free) sufficiently smooth drift (namely, for $b \in L_n$, where n is the dimension of the space). Our main interest is focused on the case of b with limited smoothness (namely, $b \in L_2$). In this case the structure assumption $\operatorname{div} b = 0$ turns out to be crucial. In the talk we discuss which properties of weak solutions known from the general (i.e. "smooth" theory) are inherited in the case of the divergent-free drifts $b \in L_2$.