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An Orlicz space dictated by drifts singularities

In a recent paper with Semenov, we established an almost sharp result on weak solvability of singular SDEs. The result is sharp up to the strict inequality in the hypothesis on the magnitude of drift singularities (EJP, 2023). Nothing was known, even at the PDE level, about what happens in the critical case, i.e. when the magnitude of the singularities takes exactly the borderline value. It turns out that the answer lies within a certain Orlicz space. This Orlicz space is essentially dictated by the diffusion equation.